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

FORM 10-K

x **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2017

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from _____ to _____.

Commission File Number: 001-36042

INTREXON CORPORATION

(Exact name of registrant as specified in its charter)

Virginia	**26-0084895**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification Number)**
20374 Seneca Meadows Parkway Germantown, MD	**20876**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code (301) 556-9900

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Name of each exchange on which registered**
Intrexon Corporation Common Stock, No Par Value	**New York Stock Exchange**

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes x No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No x

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes x No ☐

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes x No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. x

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	x	Accelerated filer	☐
Non-accelerated filer	☐ (Do not check if a smaller reporting company)	Smaller reporting company	☐
Emerging growth company	☐		

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No x

As of June 30, 2017, the aggregate market value of the registrant's common stock held by non-affiliates based upon the closing price of such shares on the New York Stock Exchange on such date was approximately $1.4 billion.

As of February 15, 2018, 129,066,114 shares of common stock, no par value per share, were issued and outstanding.

DOCUMENTS INCORPORATED BY REFERENCE: Portions of the registrant's Definitive Proxy Statement for its 2018 Annual Meeting of Shareholders are incorporated by reference in Part III of this Annual Report on Form 10-K where indicated. Such proxy statement will be filed with the Securities and Exchange Commission within 120 days of the registrant's fiscal year ended December 31, 2017.

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Intrexon®, Oxitec®, Arctic®, ViaGen®, BioPop®, ActoBiotics®, UltraVector®, Trans Ova Genetics®, RheoSwitch®, RheoSwitch Therapeutic System®, RTS®, LEAP®, Design-Build-Test-Learn® and AquAdvantage® are our and/or our affiliates' registered trademarks in the United States and AdenoVerse™, AquaBounty™, EnviroFlight™, AttSite™ and Okanagan Specialty Fruits™ are our and/or our affiliates' common law trademarks in the United States. This Annual Report on Form 10-K, or Annual Report, and the information incorporated herein by reference contain references to trademarks, service marks and trade names owned by us or other companies. Solely for convenience, trademarks, service marks and trade names referred to in this Annual Report and the information incorporated herein, including logos, artwork, and other visual displays, may appear without the ® or ™ symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the rights of the applicable licensor to these trademarks, service marks and trade names. We do not intend our use or display of other companies' trade names, service marks or trademarks to imply a relationship with, or endorsement or sponsorship of us by, any other companies. Other trademarks, trade names and service marks appearing in this Annual Report are the property of their respective owners.

Special Note Regarding Forward-Looking Statements

This Annual Report contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, which statements involve substantial risks and uncertainties. All statements, other than statements of historical facts, included in this Annual Report regarding our strategy, future events, future operations, future financial position, future revenue, projected costs, prospects, plans, objectives of management and expected market growth are forward-looking statements. The words "anticipate," "believe," "estimate," "expect," "intend," "may," "plan," "predict," "project," "would" and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. These forward-looking statements include, among other things, statements about:

- our strategy and overall approach to our business model;
- our ability to successfully enter new markets or develop additional products, whether with our collaborators or independently;
- our ability to successfully enter into optimal strategic relationships with our subsidiaries and operating companies that we may form in the future;
- competition from existing technologies and products or new technologies and products that may emerge;
- actual or anticipated variations in our operating results;
- our current and future joint ventures, or JVs, exclusive channel collaborations, or ECCs, license agreements and other collaborations;
- developments concerning our collaborators and licensees;
- actual or anticipated fluctuations in our competitors' or our collaborators' and licensees' operating results or changes in their respective growth rates;
- our cash position;
- market conditions in our industry;
- our ability to protect our intellectual property and other proprietary rights and technologies;
- our ability to adapt to changes in laws or regulations and policies;
- the ability of our collaborators and licensees to adapt to changes in laws or regulations and policies and to secure any necessary regulatory approvals to commercialize any products developed under the ECCs, license agreements and JVs;
- the ability of our collaborators and licensees to protect our intellectual property and other proprietary rights and technologies;
- the ability of our collaborators and licensees to develop and successfully commercialize products enabled by our technologies;
- the rate and degree of market acceptance of any products developed by our subsidiaries, a collaborator under an ECC, or through a JV or license under a license agreement;
- our ability to retain and recruit key personnel;
- the result of litigation proceedings that we face currently or may face in the future;
- our expectations related to the use of proceeds from our public offerings and other financing efforts;
- our estimates regarding expenses, future revenue, capital requirements and needs for additional financing; and

- the impact of the Tax Cuts and Jobs Act of 2017, or the Tax Act, on our current and future operating results.

Forward-looking statements may also concern our expectations relating to our subsidiaries and other affiliates. We caution you that the foregoing list may not contain all of the forward-looking statements made in this Annual Report.

We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make. We have included important factors in the cautionary statements included in this Annual Report, particularly in Item 1A, "Risk Factors," that could cause actual results or events to differ materially from the forward-looking statements that we make. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, JVs or investments that we may make.

You should read this Annual Report, the documents that we reference in this Annual Report, the audited consolidated financial statements and related notes thereto included in this Annual Report and the documents that we have filed as exhibits to our filings with the Securities and Exchange Commission, or SEC, completely and with the understanding that our actual future results may be materially different from what we expect. We do not assume any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

PART I

Item 1. Business

At present rates of global industrialization and population growth, food and energy supplies and environmental and healthcare resources are becoming more scarce and/or costly. We believe it is not a viable option for mankind to continue on this path — new solutions will be necessary to preserve and globally expand a high quality of life. We believe that synthetic biology is a solution.

We believe we are a leader in the field of synthetic biology, focusing on programming biological systems to alleviate disease, remediate environmental challenges, and provide sustainable food and industrial chemicals. Synthetic biology involves the tightly controlled expression of natural and engineered genes (DNA segments) in a variety of animal, plant and microorganismal hosts. Our historical approach primarily involved an ECC model in which we served principally as the technology engine for a partner experienced in a given commercial arena. As our experience has deepened, we have moved toward more JVs and the self-development of projects we view as particularly compelling and within our increasing areas of expertise.

Synthetic biology is a rapidly evolving discipline that applies engineering principles to biological systems to enable rational, design-based control of cellular function for a specific purpose. Using our suite of proprietary and complementary technologies, we design, build and regulate gene programs, which are DNA sequences that consist of key genetic components. A single gene program or a complex, multi-genic program is fabricated and stored within a DNA vector. Vectors are segments of DNA used as a vehicle to transmit genetic information. DNA vectors can, in turn, be introduced into cells in order to generate a simple or complex cellular system, which are the basic and complex cellular activities that take place within a cell and the interaction of those systems in the greater cellular environment. It is these genetically modified cell systems that can be used to produce biological effector molecules, or be employed directly to enable the development of new and improved products and manufacturing processes across a variety of end markets, including health, food, energy, environment, and consumer. Our synthetic biology capabilities include the ability to precisely control the amount, location and modification of biological molecules to control the function and output of living cells and optimize for desired results at an industrial scale.

Working with our subsidiaries, JVs, and collaborators, we seek to create more effective, less costly and more sustainable solutions than can be provided through current industry practices. Our technologies combine the principles of precision engineering, statistical modeling, automation and production at an industrial scale. We efficiently engineer precise and complex gene programs across many cell types. We apply the engineering principle of a ***design-build-test-learn*** continuum, through which we accumulate knowledge about the characteristics and performance of gene programs and cell lines. This process of continuous learning allows us to enhance our ability to design and build improved and more complex gene programs and cellular systems.

While the field of synthetic biology is still emerging, the addressable markets that may benefit from this approach are large and well-established. In health, synthetic biology may provide new approaches to treating diseases, as well as improvements to the manufacture of existing products. It is estimated that the global biopharmaceuticals market is over $175 billion. While genetically modified salmon or tilapia may be considered new products, the global market for aquaculture was estimated at more than $170 billion in 2017. Genetically modified agricultural plants are already grown on approximately 180 million hectares around the world and are worth an estimated $15 billion. In energy, we are working to create novel, highly engineered bacteria that utilize specific energy feedstocks, typically pipeline grade natural gas, to synthesize commercial end products, such as isobutanol for gasoline blending, 2,3 Butanediol for conversion to synthetic rubber and 1,4 Butanediol for polyester. Today these target markets are estimated to represent over $100 billion in aggregate commercial opportunity.

We believe our technologies are broadly applicable across many diverse end markets, including some end markets that have failed to recognize the applicability of synthetic biology or failed to efficiently utilize biologically-based processes to produce products. To enable us to maximize the number of these markets we could address, we devised a strategy that allowed us to focus on our core expertise in synthetic biology while developing many different commercial product candidates via collaborations in a broad range of industries or end markets. Historically, we built our business primarily around the formation of ECCs. An ECC is an agreement with a collaborator to develop products based on technologies in a specifically defined field. We have sought collaborators with expertise within a specific industry sector and the commitment to provide resources for the commercialization of products within that industry sector. Through our ECCs, we provide expertise in the engineering of gene programs and cellular systems, and our collaborators are responsible for providing market and product development expertise, as well as sales and marketing capabilities. In addition, we have sometimes executed a research collaboration to develop an early-stage program pursuant to which we received reimbursement for our development costs but the exclusive commercial rights, and related access fees, were deferred until completion of an initial research program.

This ECC strategy has allowed us to leverage our capabilities and capital across numerous product development programs and a broader landscape of end markets than we would have been capable of addressing on our own. The strategy has also allowed us to participate in the potential upside from products that are enabled by our technologies across an extensive range of industries, without the need for us to invest considerable resources in bringing individual products to market. We presently are party to a number of these collaborations, which are in varying stages from research and development of product candidates to monitoring the progress of our collaborator in their further development and, we expect, commercialization of product candidates enabled through our collaborations.

Over time, our strategy has evolved away from ECC-type collaborations to relationships and structures that provide us with more control and ownership over the development process and commercialization path. In these new relationships and structures, we bear more of the responsibility to fund the projects and execute on product candidate development.

First, in certain strategic circumstances, we may enter into a JV with a third party collaborator whereby we may contribute access to our technology, cash or both into the JV which we will jointly control with our collaborator. Pursuant to a JV agreement, we may be required to contribute additional capital to the JV, and we may be able to receive a higher financial return than we would normally receive from an ECC to the extent that we and our collaborator are successful in developing one or more products. Second, we are increasing the resources we are expending internally on early-stage proof of concept programs where we can leverage our competitive edge in gene program creation and host cell and genome expertise. We are also seeking to partner more mature programs and capabilities or later-stage assets. In this way, we endeavor to leverage our capital resources and ultimately hope to realize significant value from our mature assets.

As we consider the broad potential applications of our synthetic biology technologies, and consistent with the evolution of our business strategy, we have acquired a number of ventures that are already enabling products that benefit from the application of synthetic biology. Our strategy contemplates the continued acquisition of product-focused companies that we believe may leverage our technologies and expertise in order to expand their respective product applications. We believe that the acquisition of these types of companies allows us to develop and commercialize innovative products and create significant value.

Consistent with the ongoing evolution of our strategy, from principally utilizing ECCs to seeking a more diverse approach to leverage our technology assets, we routinely consider ways to organize our business and the grouping of our assets to facilitate strategic opportunities.

What is synthetic biology?

History

Synthetic biology entails the application of engineering principles to biological systems for the purpose of designing and constructing new biological systems or redesigning/modifying existing biological systems. Biological systems are governed by DNA, the building blocks of gene programs, which control cellular processes by coding for the production of proteins and other molecules that have a functional purpose and by regulating the activities of these molecules. This regulation occurs via complex biochemical and cellular reactions working through intricate cell signaling pathways, and control over these molecules modifies the output of biological systems.

In the early 1970s, scientists utilized basic tools and procedures for transferring DNA from one organism to another. Foundational tools included: gene programs contained in vectors; enzymes that could cut DNA at specific sites; and enzymes that could "glue" two complementary segments of DNA together. Developments between 1980 and the end of the 20th century advanced the field of genetic engineering, including automated DNA sequencing, DNA amplification via polymerase chain reaction and the creation of genetically modified organisms. However, the simplistic "cut-and-paste" nature of the available tools and the absence of genomic sequence information significantly restricted the scope of early synthetic biology efforts.

More recently, synthetic biology has been enabled by the application of information technology and advanced statistical analysis, also known as bioinformatics, to genetic engineering, as well as by improvements in DNA synthesis. Synthetic biology aims to engineer gene-based programs or codes to modify cellular function to achieve a desired biological outcome. For example, applications may include the replacement of a defective protein with a functional protein to treat a broad range of human and animal disease states or the production of multiple proteins through the regulation of several genes in a cell to produce petrochemicals.

Our approach

The essence of our approach is to apply synthetic biology by using an iterative process that is rapid, automated and highly reproducible, in which we:

- ***Design*** genes of interest and gene programs utilizing knowledge of cellular pathways and protein function;
- ***Build*** biological molecules, gene programs and their variants to optimize performance of the biological system;
- ***Test*** gene programs by inserting them into cellular systems and comparing the result(s) to the intended effects; and
- ***Learn*** by utilizing information gained in our iterative processes to create better gene programs and cellular systems using a more informed and efficient process to achieve improved outcomes.

As a result of our approach, we have developed extensive knowledge about many classes of DNA components and the rules governing their expression and activity. We have also assembled an inventory of these DNA components that we can use to rationally construct unique vectors rapidly and with predictable outcomes. The knowledge embedded in our DNA database allows us to create single gene and highly complex multigenic gene programs (an individual gene program containing multiple genes).

To support our approach, we have developed, acquired, and integrated a unique suite of technologies, and we continue to expand upon their capabilities. These technologies include: our UltraVector gene design and fabrication platform and its associated library of modular DNA components; Cell Systems Informatics; RheoSwitch inducible gene switch; AttSite Recombinases; Protein Engineering; Laser-Enabled Analysis and Processing, or LEAP; ActoBiotics platform; and AdenoVerse technology platform. These technologies are complementary in nature and share the following key characteristics:

- **Platform neutral — outcome oriented.** We can work across different cell types with the objective of achieving the intended biological outcome allowing for product development across a broad spectrum of end markets.
- **Knowledge driven.** We use statistical modeling tools and computational analysis to continually acquire more knowledge about biological systems and their design to continually improve our ability to develop new and improved products and processes for our collaborators.
- **Rationally designed.** Our knowledge of biological systems and components allows us to design, build and select gene programs and predict the probable outcome of these programs.
- **Capable of complexity.** Our technologies enable the design and precise control of complex biological molecules and multigenic gene programs.
- **Industrial scale.** We use engineering principles and automation to enable products based on synthetic biology that are commercially viable.

Our competitive strengths

We believe that our technologies, our ability to work across multiple host systems and our approach to synthetic biology — ***design-build-test-learn*** — give us a competitive advantage over traditional industrial processes as well as current approaches to synthetic biology.

We believe that we have the following competitive strengths:

We have a suite of proprietary and complementary technologies

We have built a suite of proprietary and complementary technologies that provides us with a comprehensive ability to design, create, modify and regulate gene programs and cellular systems across multiple host systems (human, animal, insect, plant, fungi, and bacteria). By virtue of the complementary nature of our technologies, we are able to provide our subsidiaries, JVs, and collaborators with a diverse array of capabilities, representing a "one stop shop" to potentially develop and commercialize new and differentiated products enabled by synthetic biology.

Our design-build-test-learn continuum allows us to design and build improved and more complex gene programs

We have developed a core expertise and technologies to ***design***, ***build*** and ***test*** complex gene programs, as well as technologies to isolate cells that best express the desired biological output. We have also developed an extensive bioinformatic software platform that combines information technology with advanced statistical analysis for DNA design and genetic engineering, enabling us to continually ***learn*** and create optimal conditions for our gene programs. Our approach allows us to build improved and more complex gene programs.

We believe we are a leader in synthetic biology

We believe we are the first company focused exclusively on applying synthetic biology across a broad spectrum of end markets and have been working in the field since 1998. Over the last 20 years, we have accumulated extensive knowledge and experience in the design, modification and regulation of gene programs. We believe all of these factors, coupled with our suite of proprietary and complementary technologies, provide us with a first-mover advantage in synthetic biology.

We serve large and diverse end markets with high built-in demand

A vast number of products consumed globally are or can be produced using biologically-based processes. Natural resources are becoming more scarce as demand exceeds supply, creating unmet needs for improvements in development and manufacturing. As a result, the need for complex biologically engineered molecules such as those enabled by our synthetic biology technologies is large and spans multiple industries, including health, food, energy, environment, and consumer. Each of these markets faces unique challenges, however all have unmet needs for improvements in product development and manufacturing that can result in savings of both cost and time as compared to traditional means of industrial design and production. Because synthetic biology has the potential to deliver against these unmet needs, we believe that significant demand already exists for improved products enabled by synthetic biology. Additionally, there are markets utilizing traditional industrial processes that have failed to recognize the significant improvement in performance that could be achieved using synthetic biology.

Our evolving business strategy allows us to leverage the broad potential of synthetic biology

We believe our ECC business model was a capital efficient and rapid way for us to initiate our participation in a diversified range of product opportunities and industrial end markets, including health, food, energy, environment, and consumer. While our ongoing ECCs continue to allow us to participate in the potential upside from products that are enabled by our technologies across an extensive range of industries, we believe that we are now capable of recognizing additional benefit from the product candidates enabled by our technologies through the formation of a variety of business structures, including operating subsidiaries and JVs. The flexibility of this approach, we believe, will enable us to maximize the value we receive for each particular opportunity within various industries in which we operate.

We have experienced management and employees

Our management team, including our Chief Executive Officer, Randal J. Kirk, consists of executives with a track record of success in building and managing research and development-driven companies. Our Chief Science Officer, Thomas D. Reed, was responsible for the initial conception and creation of our UltraVector technology platform. As of December 31, 2017, we had 481 research and development employees.

Our suite of proprietary and complementary technologies

We apply the potential of synthetic biology through our suite of proprietary and complementary technologies that combine the principles of precision engineering, statistical modeling, automation and production at an industrial scale. This enables us to engineer precise and complex gene programs across many cell types rapidly and inexpensively. These technologies include: our UltraVector gene design and fabrication platform and its associated library of modular DNA components; Cell Systems Informatics; RheoSwitch inducible gene switch; AttSite Recombinases; Protein Engineering; LEAP processing; ActoBiotics platform; and AdenoVerse technology platform.

In order to create a highly functional biological system, we recognize the complexity of cellular processes and the necessity to construct an optimized gene program in conditions reflective of the natural environment to allow for the creation of the optimal biological product. This requires a rigorous understanding of cell signaling pathways as well as the interactions that influence the expression of protein. This knowledge is captured in our advanced Cell Systems Informatics, which uses statistical modeling and other analytic frameworks to determine the most efficient pathways for an intended biochemical result, and also plays a critical role in our research and development as this database of information allows us to explore new targets of

potential interest to our current or future subsidiaries, JVs, and collaborators. Moreover, our bioinformatics and computational modeling platform is central to our Protein Engineering, which focuses on designing enhanced and/or novel protein functionalities, including stability, localization, and catalytic activity.

In addition to creating optimized gene programs via the most efficient cell signaling pathways and in the relevant cellular environments, we have a growing library of genetic components with our UltraVector platform that enable design and assembly of gene programs which facilitate control over the quality, function, and performance of living cells. Our RheoSwitch inducible gene switch provides quantitative dose-proportionate regulation of the amount and timing of target protein expression, thereby providing another mechanism to closely control activity of a newly constructed gene program. Further, our AttSite Recombinases allow for stable, targeted gene integration and expression. Once cells have been engineered for the desired biological output, the LEAP automated platform can be used to identify and purify cells of interest, such as antibody expressing cells and stem cells. Furthermore, our ActoBiotics platform allows for targeted *in situ* expression of proteins and peptides from engineered microbes. Finally, our AdenoVerse technology platform is comprised of engineered adenovector serotypes which alone and in conjunction with our ability to further manipulate and improve the platform permits greater tissue specificity and target selection. We believe this platform will deliver a gene capacity exceeding 30kb which is three to six times greater than current viral delivery methods.

Our technology platform is designed to provide a "one stop shop" for start-to-finish conceptualization, engineering, regulation, optimization and production of biologically-based solutions that we believe possess many advantages over traditional processes. Our leading-edge toolkit can empower many different cell platforms allowing for selection of the most effective host to create a desired product or solution for our partners.

Our markets

Synthetic biology has applicability across many diverse end markets. Our goal is to be a leader in the application of synthetic biology for products currently utilizing biologically-based processes, and a leader in the replacement of conventional processes and products with biologically-based substitutes. Through the application of our suite of proprietary and complementary technologies, we believe we can create optimized biological processes and create substitutes for traditional industrial techniques, leading to improved products that are developed and manufactured faster and more cost-effectively.

Human and Animal Health

It is estimated that the global biopharmaceuticals market is over $175 billion and is projected to reach greater than $290 billion by 2021. Additionally, the global animal health market was valued at more than $30 billion in 2015 and is expected to grow to over $50 billion by 2025. We believe that the unreliable, costly discovery and development process for new medicines is being replaced by the engineering of biology at the genetic, molecular, and cellular level. Our ability to regulate complex gene programs and cellular systems by applying the principles of science, engineering, and computational bioinformatics with proprietary technologies is being utilized to design new therapies for humans and animals. We are applying our approach to develop targeted gene therapy applications and novel solutions within oncology, rare diseases, active pharmaceutical ingredients, ocular diseases, human infertility, infectious diseases, and animal health, as well as autoimmune, metabolic, and gastrointestinal disorders. All of our human therapeutic product candidates are in the drug discovery, preclinical, or clinical stages of development.

Food and Agriculture

The Food and Agriculture Organization of the United Nations predicts that by 2050 the world's population will grow to almost 10 billion, global demand for food and other agricultural products is expected to increase 50 percent, and global demand for livestock products will increase by 70 percent. We are focused on enabling efficient, high-quality food production that sustainably supports the necessities of our growing population. By applying our suite of technologies, we aim to facilitate development of agricultural, livestock and aquaculture resources that deliver innovative approaches and superior production yields in an environmentally responsible manner.

Energy and Chemicals

Biological production via precise enzymatic conversion represents a promising approach for the efficient production of important energy products. Despite this promise, current attempts to produce "clean" energy are expensive to implement and operate at near break-even yields despite government assistance. Additionally, many alternative energy initiatives start from food sources such as corn and sugarcane. As a result, these low efficiency processes also compete for arable land and water with the agriculture industry. Using our cellular engineering experience and suite of technologies, we have developed microbial

cell lines for bioconversion of methane to higher carbon content compounds. We believe this proprietary platform holds the potential to modernize the existing gas-to-liquids industry by generating important fuels and chemicals at a fraction of the cost of traditional conversion methods. Our bioconversion approach also is being designed to reach an overall balance between sustainable productive yields and attractive economic returns.

To date we have proven biological production of six valuable and large market fuel and chemical products. These products are isobutanol for gasoline blending, 2,3 Butanediol and isoprene for conversion to synthetic rubber, 1,4 Butanediol for polyester, farnesene for diesel fuel and lubricants and isobutyraldehyde for acrylics. In aggregate, we estimate that these products represent greater than a $100 billion market opportunity.

Environment

As a result of industrialization and rapidly growing global populations, chemicals, heavy metals, and various other contaminants of concern are pervasive in the environment. These pollutants result in poor quality of drinking water, loss of water supply, contaminated ground water and soil, high clean-up costs, and potential health problems. In addition, increased globalization has facilitated the spread of pests that affect human and environmental health by carrying disease and damaging crops. We seek to engineer biological solutions that are designed to protect, preserve or restore the environment and promote sustainability of natural resources. These biological approaches may replace products that present an environmental hazard. Examples include toxin-free, species-specific insect control methods that do not persist in the environment and microbial-based strategies for bioremediation of soil and water contamination.

Consumer Products

Despite its size and the number of products that can be achieved through biological means, the consumer market has experienced limited impact from synthetic biology. We are committed to developing biologically-based processes that displace petroleum-derived ingredients and polymers. Additionally, we are focused on reducing the wasteful practices associated with extracting compounds that occur in limiting amounts in plants and animals. Through our synthetic biology capabilities, we plan to utilize innovative biologically-based applications for the development of products, such as personal care items and decorative arts, to improve the lives of consumers every day.

Our business strategy

We believe our technologies are broadly applicable across many diverse end markets, including some end markets that have failed to recognize the applicability of synthetic biology or failed to efficiently utilize biologically-based processes to produce products. To enable us to maximize the number of these markets we could address, we devised a strategy that allowed us to focus on our core expertise in synthetic biology while developing many different commercial product candidates via collaborations in a broad range of industries or end markets. We built our business primarily around the formation of ECCs, as well as certain research collaborations.

This ECC strategy allowed us to leverage our capabilities and capital across numerous product development programs and a broader landscape of end markets than we would have been capable of addressing on our own. The strategy also allowed us to participate in the potential upside from products that are enabled by our technologies across an extensive range of industries, without the need for us to invest considerable resources in bringing individual products to market. We presently are party to a number of these collaborations, which are in varying stages from research and development of product candidates to monitoring the progress of our collaborator in their further development and, we expect, commercialization of product candidates enabled through our collaboration.

Over time, our strategy has evolved away from ECC-type collaborations to relationships and structures that provide us with more control and ownership over the development process and commercialization path. In these new relationships and structures, we bear more of the responsibility to fund the projects and execute on product candidate development.

First, in certain strategic circumstances, we may enter into a JV with a third party collaborator whereby we may contribute access to our technology, cash or both into the JV which we will jointly control with our collaborator. Pursuant to a JV agreement, we may be required to contribute additional capital to the JV, and we may be able to receive a higher financial return than we would normally receive from an ECC to the extent that we and our collaborator are successful in developing one or more products. Second, we are increasing the resources we are expending internally on early-stage proof of concept programs where we can leverage our competitive edge in gene program creation and host cell and genome expertise and are seeking to partner with more mature programs and capabilities, some of which may be through ECCs. In this way, we endeavor to leverage of our capital resources and ultimately hope to realize significant value from our mature assets. Our gas-to-liquid

platform for bioconversion of methane to higher carbon content compounds, which we refer to as our methane bioconversion platform, or MBP, is an example of our implementation of a JV approach. Based on our internally developed work on our MBP technology, we have executed two JV arrangements with related parties for specific end products.

As we consider the broad potential applications of our synthetic biology technologies, and consistent with the evolution of our business strategy, we have acquired a number of ventures that are already enabling products that benefit from the application of synthetic biology. Our strategy contemplates the continued acquisition of product-focused companies that we believe may leverage our technologies and expertise in order to expand their respective product applications. We believe that the acquisition of these types of companies allows us to develop and commercialize innovative products and create significant value.

Consistent with the ongoing evolution of our strategy, from principally utilizing ECCs to seeking a more diverse approach to leverage our technology assets, we routinely consider ways to organize our business and the grouping of our assets to facilitate strategic opportunities. For example, effective January 1, 2018, we transferred substantially all of our gene and cell therapy assets for human health under a newly-formed wholly owned subsidiary, Precigen, Inc., or Precigen, and we consolidated therapeutic applications of our proprietary ActoBiotics platform under ActoBio Therapeutics, Inc., or ActoBio, another wholly owned subsidiary. Additionally, we may look to partner later-stage assets in the future.

Our ECCs

Although our strategy has evolved away from a focus primarily on ECCs, we remain party to a number of such collaborations, and we may, in the future, elect to enter into additional ECCs, or expand one or more of our existing ECCs. An ECC is an agreement with a collaborator to develop products based on our technologies in one or more specifically defined fields. These fields may be narrowly defined (representing, for example, a specific therapeutic approach for a single indication) or may be broad (representing, for example, an entire class of related products). In each case, we and the collaborator precisely define the field based on factors such as the expertise of the collaborator, the relative markets for the prospective products, the collaborator's resources available to commit to the ECC and our expectations as to other prospective ECCs in related areas. Regardless of the size of the field, under each ECC we grant the collaborator exclusive rights to our services and certain of our platform technologies to commercialize products within the field.

We may realize four general categories of revenue under our ECCs: (i) technology access fees upon signing; (ii) reimbursements of costs incurred by us for our research and development and/or manufacturing efforts related to specific applications provided for in the collaboration; (iii) milestone payments upon the achievement of specified development, regulatory and commercial activities; and (iv) royalties on sales of products arising from the collaboration. We may receive equity in lieu of cash for technology access fees and milestones and also may participate in capital raises to allow earlier-stage collaborators to focus their resources on product development. When such a collaborator develops greater operational or financial resources, however, its shares become a financial asset within Intrexon that is independent of our operational or collaborative purposes.

Generally, each of our ECCs is designed to continue in perpetuity unless terminated. Each of our collaborators, however, retains the right to terminate the ECC for any reason by providing us written notice a certain period of time prior to such termination, generally ninety days. The ECC is also terminable by either party upon the other party's breach of material provisions of the ECC. The failure of our collaborator to exercise diligent efforts to develop products within the field of the ECC constitutes such a breach.

In the event one of our ECCs terminates, we are entitled to immediately pursue a collaboration with a different counterparty within the field of the terminated ECC. Moreover, technologies and product candidates in a relatively early stage of development revert to us, along with data, materials and the rights to applicable regulatory filings related to the reverted products, enabling us to develop those product candidates ourselves or incorporate them into a future collaboration. Product candidates that are at a more advanced stage of development, such as those already generating revenue or being considered for approval by an applicable regulatory body at the time of the ECC's termination are retained by the former collaborator. The collaborator has the right to commercialize such retained products although we are entitled to the royalties or other compensation to which we would be entitled as if the ECC were still in effect. Upon termination, we generally retain any technology access fees or other payments to which we are entitled through the date of termination.

In our ECCs, we retain rights to our existing intellectual property and generally any intellectual property developed using, or otherwise incorporating, our technologies. In addition, we are generally responsible for controlling the prosecution and enforcement of this intellectual property with the exception of the enforcement of patents directed solely and specifically to products developed within the field of each ECC.

Each of our ECCs requires the collaborator to indemnify us for all liability related to products produced pursuant to the ECC and to obtain insurance coverage related to product liability.

See Note 5 to our consolidated financial statements appearing elsewhere in this Annual Report for a discussion of the key financial terms of our significant ECCs.

Our operating subsidiaries

To derive value from the broad potential applications of our synthetic biology technologies, and consistent with the evolution of our business strategy, we routinely consider ways to organize our business to facilitate strategic opportunities. For example, effective January 1, 2018, we transferred substantially all of our gene and cell therapy assets for human health under a newly-formed wholly owned subsidiary, Precigen, and we consolidated therapeutic applications of our proprietary ActoBiotics platform under ActoBio. In addition, we have acquired a number of ventures that are already enabling products that benefit from the application of synthetic biology and that we now operate as subsidiaries. Our strategy contemplates the continued formation and acquisition of such operating subsidiaries. As these enterprises develop, we will determine whether to maintain full ownership, introduce investors via either private or public financing, or seek strategic options to partner or divest the businesses.

Primary wholly owned operating subsidiaries

Precigen, Inc.

Precigen is a fully-integrated gene and cell therapy company committed to delivering precision medicines through innovation that puts patients first. Utilizing platform technologies owned by Precigen or licensed from Intrexon for programming and engineering genetic code, Precigen is developing and investigating next-generation therapeutics to enable patient-focused, cost-effective treatments to address unmet medical needs in the areas of immuno-oncology, autoimmune conditions, and infectious diseases. Precigen is designing investigational therapies intended to be controllable and targeted, with a broad pipeline of internal and partnered programs, all of which are at the preclinical or clinical stages.

ActoBio Therapeutics, Inc.

ActoBio is pioneering a new class of microbe-based ActoBiotics biopharmaceuticals that enable expression and local delivery of disease-modifying therapeutics. The ActoBiotics platform produces biologics through oral or topical administration with treatment applications across many diseases including oral, gastrointestinal, and autoimmune/allergic disorders. We believe this cost-effective approach to development will provide safer and more efficacious treatments than injectable biologics. ActoBio, which is party to a number of our ECC agreements, has a strong research and development pipeline with the latest stage candidate in Phase 2b clinical trials and an extensive portfolio of candidates ready for clinical development across a number of potential indications.

Trans Ova Genetics, L.C.

Trans Ova Genetics, L.C., or Trans Ova, is internationally recognized as a provider of industry-leading bovine reproductive technologies. Intrexon and Trans Ova are building upon Trans Ova's original platform with a goal of achieving higher levels of delivered value to dairy and beef cattle producers. ViaGen, L.C., or ViaGen, a wholly owned subsidiary of Trans Ova, is a provider of cloning technology for non-primate species. Exemplar Genetics, LLC, or Exemplar, a wholly owned subsidiary through the combined ownership of Trans Ova, ViaGen and us, is committed to enabling the study of life-threatening human diseases through the development of miniswine research models and services.

Okanagan Specialty Fruits, Inc.

Okanagan Specialty Fruits, Inc. and its affiliates, or Okanagan, is the pioneering agricultural company behind the world's first non-browning apple without the use of any flavor altering chemical or antioxidant additives. Okanagan is scaling up its commercial supplies of non-browning apples and developing new commercial tree fruit varieties intended to provide benefits to the entire supply chain, from growers to consumers.

Oxitec Limited

Oxitec Limited, or Oxitec, is a pioneering company in biological insect control solutions. Oxitec is developing products that use genetic engineering to control insect pests that spread disease and damage crops. Among the applications of its platform

which uses advanced genetics and molecular biology, Oxitec has developed a new and innovative solution to controlling *Aedes aegypti*, a mosquito that is a known vector for the transmission of infectious disease including dengue fever, chikungunya, and Zika. This genetically engineered, or GE, self-limiting line of the *Aedes aegypti* mosquito, or OX513A, has been approved by Brazil's National Biosafety Committee, or CTNBio, for unrestricted releases throughout the country. Additionally, open field trials of these mosquitoes have been conducted in Brazil, the Cayman Islands, Panama, and Malaysia under relevant permits or approvals. Further approvals will be required for commercial production and use.

Primary majority-owned operating subsidiary

AquaBounty Technologies, Inc.

AquaBounty Technologies, Inc., or AquaBounty, of which we owned approximately 58 percent as of December 31, 2017, is focusing on improving productivity in commercial aquaculture, including the development of the AquAdvantage Salmon, or AAS, an Atlantic salmon that has been genetically enhanced to reach market size in less time than conventionally farmed Atlantic salmon and approved by the Food and Drug Administration, or FDA. In January 2018, AquaBounty raised $12.0 million through an underwritten public offering, in which we participated by investing $5 million. As a result of this transaction, our ownership decreased to approximately 53 percent. In the future, our ownership stake in AquaBounty may drop below 50 percent, which may result in us deconsolidating AquaBounty.

Joint ventures

The following represent our significant JVs as of December 31, 2017.

Intrexon Energy Partners

In March 2014, we and certain investors, or the IEP Investors, including affiliates of Third Security, LLC, or Third Security, a related party, entered into a Limited Liability Company Agreement which governs the affairs and conduct of business of Intrexon Energy Partners, LLC, or Intrexon Energy Partners, a JV formed to optimize and scale-up our MBP technology for the production of certain fuels and lubricants. We also entered into an ECC with Intrexon Energy Partners providing exclusive rights to our technology for the use in bioconversion, as a result of which we received a technology access fee of $25 million while retaining a 50 percent membership interest in Intrexon Energy Partners. The IEP Investors made initial capital contributions, totaling $25 million in the aggregate, in exchange for pro rata membership interests in Intrexon Energy Partners totaling 50 percent. We committed to make additional capital contributions of up to $25 million, and the IEP Investors, as a group and pro rata in accordance with their respective membership interests in Intrexon Energy Partners, have committed to make additional capital contributions of up to $25 million, at the request of the Intrexon Energy Partners' board of managers, or the Intrexon Energy Partners Board, and subject to certain limitations. Intrexon Energy Partners is governed by the Intrexon Energy Partners Board which has five members. Two members of the Intrexon Energy Partners Board are designated by us and three members are designated by a majority of the IEP Investors. We and the IEP Investors have the right, but not the obligation, to make additional capital contributions above the initial limits when and if solicited by the Intrexon Energy Partners Board.

Intrexon Energy Partners II

In December 2015, we and certain investors, or the IEPII Investors, entered into a Limited Liability Company Agreement which governs the affairs and conduct of business of Intrexon Energy Partners II, LLC, or Intrexon Energy Partners II, a JV formed to utilize our MBP technology for the production of 1,4-butanediol, an industrial chemical intermediate used to manufacture spandex, polyurethane, plastics, and polyester. We also entered into an ECC with Intrexon Energy Partners II providing exclusive rights to our technology for use in the field, as a result of which we received a technology access fee of $18 million while retaining a 50 percent membership interest in Intrexon Energy Partners II. The IEPII Investors made initial capital contributions, totaling $18 million in the aggregate, in exchange for pro rata membership interests in Intrexon Energy Partners II totaling 50 percent. In December 2015, the owners of Intrexon Energy Partners II made a capital contribution of $4 million, half of which was paid by us. We committed to make additional capital contributions of up to $10 million, and the IEPII Investors, as a group and pro rata in accordance with their respective membership interests in Intrexon Energy Partners II, have committed to make additional capital contributions of up to $10 million, at the request of the Intrexon Energy Partners II's board of managers, or the Intrexon Energy Partners II Board, and subject to certain limitations. Intrexon Energy Partners II is governed by the Intrexon Energy Partners II Board which has five members. One member of the Intrexon Energy Partners II Board is designated by us and four members are designated by a majority of the IEPII Investors. We and the IEPII Investors have the right, but not the obligation, to make additional capital contributions above the initial limits when and if solicited by the Intrexon Energy Partners II Board.

EnviroFlight

In February 2016, we entered into a series of transactions involving EnviroFlight, LLC, or Old EnviroFlight, Darling Ingredients Inc., or Darling, and a newly formed venture between us and Darling, or New EnviroFlight. This series of integrated transactions resulted in us acquiring substantially all of the assets of Old EnviroFlight and contemporaneously contributing all of these assets, with the exception of certain developed technology, and $3 million of cash to New EnviroFlight in exchange for a non-controlling, 50 percent membership interest in New EnviroFlight. Our contributions to New EnviroFlight included an exclusive license to the developed technology that was retained by us. Darling received the remaining 50 percent membership interest in New EnviroFlight as consideration for terminating rights previously held in the developed technology with Old EnviroFlight. New EnviroFlight was formed to generate high nutrition, low environmental impact animal and fish feed, as well as fertilizer products, from black soldier fly larvae. We and Darling, as members, have each satisfied the commitment to make additional capital contributions of up to $5 million to fund ongoing operations of New EnviroFlight.

Intrexon T1D Partners

In March 2016, we and certain investors, the T1D Investors, including affiliates of Third Security, entered into a Limited Liability Company Agreement which governs the affairs and conduct of business of Intrexon T1D Partners, LLC, or the Intrexon T1D Partners, a JV formed to utilize our proprietary ActoBiotics platform to develop and commercialize products to treat type 1 diabetes. We also entered into an ECC with Intrexon T1D Partners which provides the exclusive rights to our technology for use in the field, as a result of which we received a technology access fee of $10 million while retaining a 50 percent membership interest in Intrexon T1D Partners. The T1D Investors made initial capital contributions, totaling $10 million in the aggregate, in exchange for pro rata membership interests in Intrexon T1D Partners totaling 50 percent. We committed to make capital contributions of up to $5 million, and the T1D Investors, as a group and pro rata in accordance with their respective membership interests in Intrexon T1D Partners, have committed to make additional capital contributions of up to $5 million, at the request of Intrexon T1D Partners' board of managers, or the Intrexon T1D Partners Board, and subject to certain limitations. Intrexon T1D Partners is governed by the Intrexon T1D Partners Board, which has five members. Two members of the Intrexon T1D Partners Board are designated by us and three members are designated by a majority of the T1D Investors. We and the T1D Investors have the right, but not the obligation, to make additional capital contributions above these limits when and if solicited by the Intrexon T1D Partners Board.

S & I Ophthalmic

In September 2013, we entered into a Limited Liability Company Agreement with Sun Pharmaceutical Industries, Inc., an indirect subsidiary of Sun Pharmaceutical Industries Ltd., an international specialty pharmaceutical company focused on chronic diseases, to form S & I Ophthalmic, LLC, or S & I Ophthalmic. In December 2017, the S & I Ophthalmic board of managers agreed to dissolve the JV and terminate the ECC with us. Upon the dissolution, we received $2.6 million, which represents our portion of S & I Ophthalmic's remaining cash after all liabilities were settled.

OvaXon

In December 2013, we entered into an ECC with OvaScience, Inc., or OvaScience, a life sciences company focused on the discovery, development and commercialization of new treatments for infertility. Additionally, we and OvaScience formed OvaXon, LLC, or OvaXon, a JV to create new applications for improving human and animal health. Both we and OvaScience made an initial capital contribution of $1.5 million in January 2014 for a 50 percent membership interest in OvaXon. OvaXon is governed by the OvaXon board of managers, or the OvaXon Board, which has four members, two each from us and OvaScience. In cases in which the OvaXon Board determines that additional capital contributions are necessary in order for OvaXon to conduct business and comply with its obligations, each of us and OvaScience have the right, but not the obligation, to make additional capital contributions to OvaXon subject to the terms of the agreement. OvaScience also licensed certain technology relating to egg precursor cells to OvaXon pursuant to a separate license agreement. In February 2018, OvaScience provided their notice of termination of the ECC between them and us, to be effective in May 2018 in accordance with the ECC agreement. We and OvaScience are in discussions regarding dissolving the OvaXon JV and terminating the related ECC agreement.

See Note 5 to our consolidated financial statements appearing elsewhere in this Annual Report for a discussion of significant collaborations between us and our JVs.

Mergers, acquisitions, and technology in-licensing

We may augment our suite of proprietary technologies through mergers or acquisitions of technologies which then become available to new or existing ventures, including operating subsidiaries, JVs, and collaborations. Among other things, we may pursue technologies that we believe will be generally complementary to our existing technologies and also meet our desired return on investment and other economic criteria. In certain cases, such technologies may already be applied in the production of products or services and in these cases we may seek to expand the breadth or efficacy of such products or services through the use of our technologies. See Note 3 to our consolidated financial statements appearing elsewhere in this Annual Report for further discussion of mergers, acquisitions or significant technology in-licensing activities in 2017.

Competition

We believe that we are a leader in synthetic biology. We do not believe that we have any direct competitors who provide similar technologies which fully enable the commercialization of products developed using synthetic biology across a broad spectrum of biologically based industries. As a result, we believe our competition is more indirect and general in nature, and falls into three broad categories:

- **Synthetic biology service providers**. There are companies that have competing technologies for individual pieces of our suite of complementary technologies. For example, there are companies that can synthesize DNA, and there are companies that can develop monoclonal antibodies. One portion of our proprietary technology related to DNA synthesis and assembly includes the ability to *de novo* synthesize DNA. We believe the following companies engage in the manufacture of DNA componentry: ATUM, Inc., Blue Heron Biotech, LLC (a subsidiary of OriGene), Integrated DNA Technologies, Inc. (IDT), GenScript USA, Inc., and Life Technologies Corporation, now part of Thermo Fisher Scientific Inc.

- **Industrial companies who may develop their own approach to synthetic biology**. Rather than becoming a collaborator with us, potential collaborators may decide to invest time and capital to internally develop their own synthetic biology capabilities. For example, large biopharmaceutical companies, energy companies, and ag-bio companies may pursue a proprietary synthetic biology strategy.

- **Industrial companies who may develop competing products using other technologies**. Products enabled by our synthetic biology will face competition in the market, including from products which have been developed using other industrial technologies. For example, large biopharmaceutical companies pursue other technologies for drug development, and large ag-bio companies pursue other technologies for the development of genetically modified crops. The rapidly evolving market for developing GE T-cells in particular, a primary focus of our collaboration with ZIOPHARM Oncology, Inc., or ZIOPHARM, is characterized by intense competition and rapid innovation. Genetically engineering T-cells faces significant competition in the chimeric antigen receptor, or CAR, technology space from multiple companies and their collaborators, such as Novartis/University of Pennsylvania, Bluebird Bio/Celgene/Baylor College of Medicine/Five Prime/Gilead Sciences/ViroMed Laboratories, Kite Pharma/National Cancer Institute, Juno Therapeutics/Fred Hutchinson Cancer Research Center/Memorial Sloan-Kettering Cancer Center/Seattle Children's Research Institute, Cellectis/Pfizer/Servier, Adaptimmune/GSK and Bellicum Pharmaceuticals. We face competition from non-cell based treatments offered by other companies such as Amgen, AstraZeneca, Bristol-Myers, Incyte, Merck, and Roche.

Intellectual property

As we advance technologies across multiple platforms and synthetic biology areas, correspondingly, we apply a multilayered approach for protecting intellectual property relating to the inventions we have developed internally as well as those we have acquired from third parties, such as by assignment or by in-license. We seek patent protection in the United States and in other countries for our inventions and discoveries, and we develop and protect our key know-how and trade secrets relating to our platform technologies as well as to the products we are developing with our subsidiaries, JVs, and collaborations.

We seek patent protection for our platform technologies, including but not limited to our (i) switch technology; (ii) activator ligands for our switch technology; (iii) portfolio around various genetic componentry such as vectors, cells and organisms containing these genetic componentry; and (iv) cell identification and selection platform. In addition, we seek patents covering specific collaborator's products. With respect to a particular collaborator's product, we may seek patent protection on some or all of the following aspects of the invention such as: the compound or material composition of matter and/or the method or process of making or using the composition.

Through the use of our various platform technologies we seek to design and build proprietary compounds, vectors, methods and processes across a variety of end markets. In particular, we focus our intellectual property on synthetic biology technologies that provide platforms for the design and creation of cells, vectors and components for our subsidiaries, JVs, and collaborations. In addition, we may pursue intermediate and product-specific patents associated with our subsidiaries', JVs', and collaborations' lead programs.

Our success depends, in part, upon our ability to obtain patents and maintain adequate protection for our intellectual property relating to our technologies and products and potential products. We have adopted a strategy of seeking patent protection in the United States and in other jurisdictions globally as we deem appropriate under the circumstances, with respect to certain of the technologies used in or relating to our products and processes. For instance, where we believe appropriate, we have also filed counterpart patents and patent applications in other countries, including Australia, Argentina, Brazil, Canada, China, Europe, Hong Kong, India, Indonesia, Israel, Japan, Korea, Mexico, New Zealand, Philippines, Russia, Singapore, South Africa and Taiwan. In the future we may file in these or additional jurisdictions as deemed appropriate for the protection of our technologies.

As of December 31, 2017, we owned at least 55 issued U.S. patents and 55 pending U.S. patent applications relating to certain aspects of our technologies, and we have pursued counterpart patents and patent applications in other jurisdictions around the world, as we have deemed appropriate. We continue to actively develop our portfolio through the filing of new patent applications, provisional and continuations or divisionals relating to our technologies, methods and products as we and our collaborators deem appropriate.

We have strategic positioning with respect to our key technologies including our owned patent portfolios directed to: our switch technology covering aspects of our switches and gene modulation systems, with a last to expire patent currently in 2032; our portfolio around various genetic componentry, such as vectors, cells and organisms containing these genetic componentry, and their use, with a last to expire patent in 2034; our activator ligand technology covering aspects of our activator ligands and their use, with a last to expire patent in 2034; and our cell identification and selection technology covering aspects of our cell identification and selection platform, including our cell purification, isolation, characterization and manipulation technologies, with a last to expire patent in 2031. Although we cannot be assured that these patents may not be subject to challenge in the future, as of this filing, there are currently no material contested proceedings and/or third party claims with respect to any of these patent portfolios.

Additionally, we complement our intellectual property portfolio with exclusive and non-exclusive patent licenses and options for licenses to third party technologies.

A principal component of our strategy is maximizing the value of our ECCs through our intellectual property that covers our technologies, which is accentuated by intermediate and program-specific intellectual property protections. In addition to owned and in-licensed patents, we solidify our intellectual property protection through a combination of trade secrets, know-how, confidentiality, nondisclosure and other contractual provisions, and security measures to protect our confidential and proprietary information related to each platform and collaborator program. We regularly assess and review the risks and benefits of protecting our developments through each aspect of intellectual property available to us.

Because we rely on trade secrets, know-how and continuing technological advances to protect various aspects of our core technology, we require our employees, consultants and scientific collaborators to execute confidentiality and invention assignment agreements with us to maintain the confidentiality of our trade secrets and proprietary information. Our confidentiality agreements generally provide that the employee, consultant or scientific collaborator will not disclose our confidential information to third parties. These agreements also provide that inventions conceived by the employee, consultant or scientific collaborator in the course of working for us will be our exclusive property. Additionally, our employees agree to take certain steps to facilitate our assertion of ownership over such intellectual property. These measures may not adequately protect our trade secrets or other proprietary information. If they do not adequately protect our rights, third parties could use our technologies, and we could lose any competitive advantage we may have. In addition, others may independently develop similar proprietary information or techniques or otherwise gain access to our trade secrets, which could impair any competitive advantage we may have.

Regulatory environment

Regulations affecting Intrexon

Our ongoing research and development relies on evaluations in animals, which may become subject to bans or additional regulations. As described below, our research operations are also subject to various environmental regulations. However, while

most of the current laws and regulations concerning synthetic biology relate to the end products produced using synthetic biology, this may change. For example, in December 2010, the Presidential Commission for the Study of Bioethical Issues recommended that the federal government oversee, but not regulate, synthetic biology research. The Presidential Commission also recommended that the federal government lead an ongoing review of developments in the synthetic biology field and that the federal government conduct a reasonable risk assessment before the field release of synthetic organisms.

As discussed below and in "Risk factors - Risks associated with our business strategy," the products produced by us and our collaborators enabled by our technology platforms are subject to extensive regulation. While we and our subsidiaries maintain regulatory compliance practices, we rely on our collaborators' compliance with laws and regulations applicable to the products they produce. We do not independently monitor whether our collaborators comply with applicable laws and regulations. Please see the risk factor entitled "Markets in which we, our JVs, and collaborators are developing products using our technologies are subject to extensive regulation, and we rely on our JVs and collaborators to comply with all applicable laws and regulations."

Environmental regulations affecting Intrexon, our JVs and our collaborators

Our JVs and collaborators and we are subject to various federal, state and local environmental laws, rules and regulations, including those relating to the discharge of materials into the air, water and ground, the generation, storage, handling, use, transportation and disposal of hazardous materials and the health and safety of employees with respect to laboratory activities required for the development of products and technologies. These laws and regulations require us and our JVs and collaborators to obtain environmental permits and comply with numerous environmental restrictions. These laws and regulations also may require expensive pollution control equipment or operational changes to limit actual or potential impacts to the environment.

Our laboratory activities and those of our JVs and collaborators inherently involve the use of potentially hazardous materials, which are subject to health, safety and environmental regulations. We design our infrastructure, procedures and equipment to meet our obligations under these regulations. We perform recurring internal and third-party audits and provide employees ongoing training and support, as required. All of our employees must comply with safety instructions and procedures, which are codified in our employment policies. Federal and state laws and regulations impose requirements on the production, importation, use and disposal of chemicals and genetically modified microorganisms, which impact us and our JVs and collaborators. Our, our JVs' and our collaborators' processes may contain GE organisms which, when used in industrial processes, are considered new chemicals under the Toxic Substances Control Act, or TSCA, program of the U.S. Environmental Protection Agency, or EPA. These laws and regulations would require us, our JVs and collaborators to obtain and comply with the EPA's Microbial Commercial Activity Notice process to operate. In the European Union, we and our JVs and collaborators may be subject to a chemical regulatory program known as REACH (Registration, Evaluation, Authorization and Restriction of Chemical Substances). Under REACH, companies are required to register their products with the European Commission, and the registration process could result in significant costs or delay the manufacture or sale of products in the European Union.

Regulations affecting us and our collaborators

Human therapeutics regulation

Government authorities in the United States, at the federal, state and local level, and in other countries extensively regulate, among other things, the research, development, testing, manufacture, including any manufacturing changes, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, import and export of pharmaceutical products such as those being developed by our collaborators. The processes for obtaining regulatory approvals in the United States and in foreign countries, along with subsequent compliance with applicable statutes and regulations, require the expenditure of substantial time and financial resources.

In the United States, pharmaceuticals must receive approval from the FDA before being marketed. The FDA approves drug products other than biological products through its authority under the Federal Food, Drug, and Cosmetic Act, or FDCA, and implementing regulations. The FDA licenses biological drug products, or biologics, through its authority under the Public Health Service Act, or PHSA, and implementing regulations. The development processes for obtaining FDA approval for a non-biological drug product, or a drug, under the FDCA and for biologic licensure under the PHSA are generally similar, but have product-related differences reflected in regulations and in FDA guidance documents.

U.S. pharmaceutical development process

The process required by FDA before a pharmaceutical product candidate may be marketed generally involves the following:

- completion of preclinical laboratory tests and *in vivo* studies in accordance with FDA's current Good Laboratory Practice regulations and other applicable requirements;
- submission to FDA of an application for an Investigational New Drug exemption, or IND;
- approval by an independent institutional review board, or IRB, of each clinical site before a clinical trial is initiated;
- performance of adequate and well-controlled human clinical trials according to FDA's GCP regulations, and any additional requirements for the protection of human research subjects and their health information, to establish the safety and efficacy of the proposed biologic product candidate for its intended use;
- preparation and submission to FDA of an application for marketing approval that includes substantial evidence of safety, purity and potency for a biologic, or of safety and efficacy for a non-biologic drug, from results of nonclinical testing and clinical trials;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities where the product candidate is produced to assess compliance with current Good Manufacturing Practice, or cGMP, and to assure that the facilities, methods and controls are adequate to preserve the product candidate's identity, safety, strength, quality, potency and purity;
- potential FDA inspection of the nonclinical and clinical trial sites that generated the data in support of the application; and
- FDA review and approval or licensure, of the application.

Human clinical trials under an IND

Clinical trials involve administering the product candidate to healthy volunteers or patients under the supervision of qualified investigators. Clinical trials must be conducted and monitored in accordance with FDA's regulations. Further, each clinical trial must be reviewed and approved by an IRB at or servicing each institution at which the clinical trial will be conducted. An IRB is charged with protecting the welfare and rights of trial participants and considers whether the risks to individuals participating in the clinical trials are minimized and are reasonable in relation to anticipated benefits. Clinical trials involving recombinant DNA also must be reviewed by an institutional biosafety committee, an institutional committee that reviews and oversees basic and clinical research that utilizes recombinant DNA at that institution.

Human clinical trials typically are conducted in three sequential phases that may overlap or be combined:

- *Phase 1*. The product candidate is introduced into healthy human subjects and tested for safety, dosage tolerance, absorption, metabolism, distribution, excretion and, if possible, to gain early understanding of its effectiveness. For some product candidates for severe or life-threatening diseases, especially when the product candidate may be too inherently toxic to ethically administer to healthy volunteers, the initial human testing is often conducted in patients.
- *Phase 2*. The product candidate is evaluated in a limited patient population to identify possible adverse effects and safety risks, to evaluate preliminary efficacy evidence for specific targeted diseases and to determine dosage tolerance, optimal dosage and dosing schedule.
- *Phase 3*. The product candidate is administered to an expanded patient population at geographically dispersed clinical trial sites in adequate and well-controlled clinical trials to generate sufficient data to statistically confirm the safety and efficacy of the drug, or the safety, purity, and potency of the biologic. These clinical trials are intended to establish the overall risk/benefit ratio of the product candidate and provide an adequate basis for product labeling.

Post-approval clinical trials, sometimes referred to as Phase 4 clinical trials, may be conducted after initial approval to gain additional experience from treatment of patients in the intended indication, particularly for long-term safety follow-up.

Additional regulation for gene therapy clinical trials

Additional standards apply to clinical trials involving gene therapy. The FDA has issued guidance documents regarding gene therapies, which relate to, among other things: preclinical assessments; chemistry, manufacturing and controls, or CMC, information that should be included in an IND application; the proper design of tests to measure product potency in support of an application; and measures to observe delayed adverse effects in subjects exposed to investigational gene therapies when the risk of such effects is high.

Compliance with cGMP requirements

Drug and biologics manufacturers must comply with applicable cGMP regulations. Manufacturers and others involved in the manufacture and distribution of such products also must register their establishments with FDA and certain state agencies. Both domestic and foreign manufacturing establishments must register and provide additional information to FDA upon their initial participation in the manufacturing process. Establishments may be subject to periodic, unannounced inspections by government authorities to ensure compliance with cGMP requirements and other laws. Discovery of problems may result in a government entity placing restrictions on a product, manufacturer or holder of an approved product, and may extend to requiring withdrawal of the product from the market.

U.S. review and approval processes

The results of the preclinical tests and clinical trials, together with detailed information relating to the product's CMC and proposed labeling, among other things, are submitted to the FDA as part of an application requesting approval to market the product for one or more uses, or indications. For gene therapies, selecting patients with applicable genetic defects is often a necessary condition to effective treatment, and may require diagnostic devices that the FDA has cleared or approved.

If a product candidate receives regulatory approval, the approval may be significantly limited to specific diseases and dosages or the indications for use may otherwise be limited. Further, the FDA may require that certain contraindications, warnings or precautions be included in the product labeling. The FDA may impose restrictions and conditions on product distribution, prescribing or dispensing in the form of a Risk Evaluation and Mitigation Strategy, or REMS, or otherwise limit the scope of any approval. In addition, the FDA may require post-marketing clinical trials designed to further assess a drug's safety and effectiveness, or a biologic's safety, purity, and potency, and testing and surveillance programs to monitor the safety of approved products that have been commercialized.

Post-approval requirements

Rigorous and extensive FDA regulation of drugs and biologics continues after approval, including requirements governing cGMP and advertising and promotion. Changes to the manufacturing process or facility generally require prior FDA approval before being implemented and other types of changes to the approved product, such as adding new indications and additional labeling claims, are also subject to further FDA review and approval. Failure to comply with the applicable requirements may result in administrative, judicial, civil or criminal actions and adverse publicity. These include refusal to approve pending applications or supplemental applications, withdrawal of approval, clinical hold, suspension or termination of clinical trial, warning or untitled letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines or other monetary penalties, refusals of government contracts, mandated corrective advertising or communications with healthcare providers, debarment, restitution, disgorgement of profits or other civil or criminal penalties.

Foreign regulation of human therapeutics

In addition to regulations in the United States, our subsidiaries, such as Precigen and ActoBio, and our collaborators that are focused on the development of human therapeutic products will be subject to a variety of foreign regulations governing clinical trials and commercial sales and distribution of the products enabled by our technologies. Whether or not the developer obtains FDA approval for a product, they must obtain approval by the comparable regulatory authorities of foreign countries or economic areas, such as the European Union, before they may commence clinical trials or market products in those countries or areas. The approval process and requirements governing the conduct of clinical trials, product licensing, pricing and reimbursement vary greatly from place to place, and the time may be longer or shorter than that required for FDA approval.

Regulation of animal based technologies

The development, movement and commercialization of animal based products (animal feeds, genetically modified animals) is governed by either technology or product based laws and regulations specific to each country. In the majority of our target

markets, the relevant regulatory pathway for animal based products is distinct from those governing human medicinal products although the risk assessment parameters and agencies with jurisdiction may be consistent. In the United States, the FDA's Center for Veterinary Medicine regulates GE animals as 'animal drugs' as well as animal feed products. The United States Department of Agriculture, or USDA, regulates veterinary vaccines and biologics, and the EPA regulates pesticide products. Regulatory oversight and jurisdiction is based on either the nature of the product (i.e. meets the definition of an animal drug) or product end use. Specific statutes and regulations also define standards and data requirements that Intrexon and our collaborators must satisfy. While regulatory oversight may vary globally, animal based products must undergo regulatory review and approval prior to their movement and commercial introduction internationally. These regulations are designed to demonstrate product efficacy as well as evaluate potential risk to human/ animal health and the environment. For drugs administered to animals, mature regulatory processes are in place and often evaluated by the same authorities as human pharmaceuticals.

In the case of bioengineered animals (i.e. the AAS), the U.S. and Canada have established regulatory processes led by the FDA and Health Canada/ Canadian Food Inspection Agency, or CFIA, respectively, while other countries, such as Brazil and Argentina amongst others, are in the process of developing new regulations under existing authorities for the advancement and regulation of GE animal technologies. In December 2012, the FDA published an environmental assessment, or EA, for AAS along with its Finding of No Significant Impact, or FONSI, in the Federal Register, confirming that an approval of the pending New Animal Drug Application would not have an adverse effect on the environment and opened up a 60 day period for public comment. In February 2013, the FDA extended the period for public comment by an additional 60 days, which expired in April 2013. Prior to the publication of the EA and FONSI, in September 2010, the FDA held a public meeting of its Veterinary Medicine Advisory Committee to review its findings regarding AAS. The conclusion of its panel of experts was that AAS is indistinguishable from other farmed Atlantic salmon, is safe to eat and does not pose a threat to the environment under its conditions of use. Subsequently, the FDA initiated an EA in compliance with its obligations under the National Environment Policy Act, or NEPA, which requires that all federal agencies consider the possible environmental impacts of any action that they authorize. Subsequently, in November 2015, the FDA approved the New Animal Drug Application for the production, sale and consumption of AAS. AquaBounty is subject to on-going post approval responsibilities as detailed in the FDA letter of approval and summarized in the EA dated in November 2015. In the event that AquaBounty seeks to modify or expand its production sites and methods, the company may require further regulatory approvals. In May 2016, Health Canada concluded its review of AAS and approved it for commercial sale in Canada and the Animal Feed Division of the Animal Health Directorate of CFIA, authorized AAS for use in livestock feeds.

Regulation of self-limiting insect technologies

Oxitec has developed a GE self-limiting line of the mosquito *Aedes aegypti*, the OX513A, as well as other crop pests with the intent of suppressing these insects at the release site(s). While the GE mosquito was historically subject to regulatory review by FDA as a new animal drug, in 2017 jurisdiction was shifted to the EPA. Under the Federal Insecticide, Fungicide, and Rodenticide Act, or FIFRA, the EPA is charged with protecting human health and the environment by ensuring that registered pesticides do not cause unreasonable adverse effects to man or the environment. FIFRA's definition of "pesticide" includes "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest". Prior to this shift, the FDA published in August 2016 a final EA and FONSI regarding impacts on human health, animal health and the environment of the OX513A GE mosquito based on review of information and evidence related to an investigational trial in Key Haven, Florida. Following the transfer of jurisdiction to the EPA, Oxitec has submitted regulatory dossiers to the EPA necessary for the timely release of the OX513A GE mosquito in Florida and other states. The OX513A GE mosquito has also been approved by Brazil's CTNBio for unrestricted releases throughout the country. Additionally, open field trials of these mosquitoes have been conducted in Brazil, the Cayman Islands, Panama, and Malaysia under relevant permits or approvals. Further approvals will be required for commercial production and use.

Self-limiting GE insects used to control crop pests—instead of disease carrying vectors—are regulated by the USDA. Under the Plant Protection Act, the USDA's Animal and Plant Health Inspection Service, or APHIS, has broad authority to regulate plant pests to protect crops and other plants. Because the objective of Oxitec's crop protection platform is to suppress known plant pests, these technologies are currently treated as subject to USDA's jurisdiction. When an applicant has developed sufficient data to demonstrate that the organism no longer poses a plant pest risk, the applicant can petition APHIS to "deregulate" the article, meaning the GE organism should no longer be considered a regulated article under APHIS regulations. In 2017, APHIS released a final EA and subsequent FONSI supporting a limited environmental release of Oxitec's GE diamondback moth. This conclusion was based on the finding that it would be unlikely for these insects to impact the physical, biological and human health environment. These self-limiting insects will also likely be subject to foreign agriculture GE regulations and authorizing bodies, such as CTNBio and the Ministry of Agriculture in Brazil as well as the Office of the Gene Technology Regulator in Australia.

Regulation of agricultural technology/ food products

The manufacturing, marketing and certain areas of research related to some of the potential food products developed by us and our subsidiaries and collaborators are subject to regulation by federal and state governmental authorities in the United States. As it relates to GE foods and/ or plants, they are subject to regulation by the FDA, USDA, and EPA under the US' *Coordinated Framework for the Regulation of Biotechnology*. These technologies have been regulated under this framework for over two decades. Similar regulatory approval systems are in place globally as biotech crops have been planted in over 26 countries in 2016. Okanagan's Arctic apple products are subject to such regulations.

The Arctic Apple has undergone significant regulatory review in recent years, and a few varieties have been successfully deregulated and authorized for sale in the United States. In February 2015, the USDA announced its decision to deregulate Okanagan's Golden Delicious apple variety and Granny Smith apple variety, or together the Arctic apples. In reaching its decision, the USDA conducted a final plant pest risk assessment concluding that Arctic apples are unlikely to pose a plant pest risk to agriculture and other plants in the United States. The USDA also completed an EA to comply with the NEPA and concluded that deregulation is not likely to have a significant impact on the human environment. Concurrent with the USDA, Okanagan also engaged in a voluntary food safety assessment consultation with the FDA regarding its Arctic apples. The FDA completed its assessment in March 2015. Based on the information provided by Okanagan and other information available to the agency, the FDA did not articulate any questions about safety or regulatory issues under the FDCA related to the product. As part of bringing the assessment to closure, Okanagan was required to submit summaries of its safety and nutritional assessments for its Arctic apples. In August 2016, the USDA announced its decision to extend a preliminary determination of nonregulated status to Okanagan's Arctic Fuji apple variety.

Comparable authorities to the federal and state governmental authorities in the United States are involved in other countries, such as the European Food Safety Authority in Europe and Health Canada in Canada. In relation to Okanagan, Health Canada announced its decision in March 2015 that it has no objection to the food use of the Arctic apple in Canada. In reaching its decision, Health Canada conducted a comprehensive assessment of the Golden Delicious and Granny Smith varieties according to its *Guidelines for the Safety Assessment of Novel Foods*. These guidelines are consistent with internationally accepted principles for establishing the safety of foods with novel traits adopted by the Codex Alimentarius Commission. Following this assessment, it was determined that the changes made to the Arctic apple did not pose a greater risk to human health than apples currently available on the Canadian market. In addition, Health Canada also concluded that the Arctic apple would have no impact on allergies and that there are no differences in the nutritional value of the Arctic apple compared to other traditional apple varieties available for consumption.

Energy and chemical regulation

The environmental regulations discussed above also govern the development, manufacture and marketing of energy and chemical products. For example, the use of genetically-modified microorganisms, or GMMs, such as our yeast and methanotroph strains, is subject to laws and regulations in many countries. In the United States, the EPA regulates the commercial use of GMMs as well as potential products produced from GMMs. Various states within the United States could choose to regulate products made with GMMs as well. While the strain of genetically modified yeast that we use, S. cerevisiae, is eligible for exemption from EPA review because it is generally recognized as safe, we must satisfy certain criteria to achieve this exemption, including but not limited to, use of compliant containment structures and safety procedures. We expect to encounter GMM regulations in most if not all of the countries in which we may seek to make our products; however, the scope and nature of these regulations will likely vary from country to country. If we cannot meet the applicable requirements in countries in which we intend to produce our products using GMMs, then our business will be adversely affected.

Chemical products produced by us and our collaborators may be subject to government regulations in our target markets. In the United States, the EPA administers the requirements of the TSCA, which regulates the commercial registration, distribution and use of many chemicals. Before an entity can manufacture or distribute significant volumes of a chemical, it needs to determine whether that chemical is listed in the TSCA inventory. If the substance is listed, then manufacture or distribution can commence immediately. If not, then in most cases a "Chemical Abstracts Service" number registration and pre-manufacture notice must be filed with the EPA, which has 90 days to review the filing. A similar requirement exists in Europe under the REACH regulation. Additional regulations may apply to specific subsets of chemicals such as, for example, fuel products that are subject to regulation by various government agencies including, in the United States, the EPA and the California Air Resources Board.

Research and development

As of December 31, 2017, we had 481 research and development employees. We incurred expenses of $143.2 million, $112.1 million and $147.5 million in 2017, 2016, and 2015, respectively, on research and development activities. We anticipate that our research and development expenditures will increase substantially as we investigate other applications for our synthetic biotechnologies, including expending internal resources on unpartnered programs. Our primary domestic research and development operations are located in laboratory facilities in Germantown, Maryland; South San Francisco, California; Davis, California; and San Diego, California; and our primary international research and development operations are located in laboratory facilities in Budapest, Hungary; Ghent, Belgium; Campinas, Brazil; and Oxford, England.

Financial information

Collaboration revenues, product revenues, service revenues and other revenues and operating income for each of the last three fiscal years, along with assets as of December 31, 2017 and 2016, are set forth in the consolidated financial statements, which are included in Item 8 of this Annual Report. Financial information about geographic areas is set forth in Note 2 to our consolidated financial statements appearing elsewhere in this Annual Report.

Production

As of December 31, 2017, we had 230 production employees. Our primary domestic production facilities, including approximately 380 acres of land, are located in Sioux Center, Iowa. The land and facilities are primarily used for our embryo transfer and in vitro fertilization processes, as well as housing livestock used in such processes. We also lease or own regional production facilities and land in California, Maryland, Missouri, New York, Oklahoma, South Dakota, Texas, and Washington for these purposes. Additionally, we have commenced initial scale up of commercial production of our non-browning apples in Washington, our AAS salmon in Canada, and our GE mosquitoes in Piracicaba, Brazil, in anticipation of generating future revenues from each of these product lines.

Employees

As of December 31, 2017, we had 906 full-time and 100 part-time employees. We consider our employee relations to be good.

Corporate information

We are a Virginia corporation and our principal executive offices are located at 20374 Seneca Meadows Parkway, Germantown, MD 20876, and our telephone number is (301) 556-9900.

Additional Information

Our website is *www.dna.com*. The information on, or that can be accessed through, our website does not constitute part of this Annual Report. We post regulatory filings on this website as soon as reasonably practicable after they are electronically filed with or furnished to the SEC. These filings include annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, Section 16 reports on Forms 3, 4, and 5, and any amendments to those reports filed with or furnished to the SEC. Access to these filings on our website is available free of charge. Copies are also available, without charge, from Intrexon Corporation Investor Relations, 20374 Seneca Meadows Parkway, Germantown, Maryland 20876. Reports filed with the SEC may be viewed at *www.sec.gov* or obtained at the SEC Public Reference Room at 100 F Street, NE, Washington, D.C. 20549. Information regarding the operation of the Public Reference Room may be obtained by calling the SEC at 1-800-SEC-0330. We also post our press releases on our website. Information on our website is not deemed to be incorporated by reference into this Annual Report.

In addition, our Corporate Governance Guidelines, Code of Business Conduct and Ethics, and charters for the Audit Committee, the Compensation Committee and the Nominating and Governance Committee are available free of charge to shareholders and the public through the "Corporate Governance" section of our website. Printed copies of the foregoing are available to any shareholder upon written request to our Communications Department at the address set forth on the cover of this Annual Report or may be requested through our website, *www.dna.com.*

Item 1A. Risk Factors

Investing in our common stock involves a high degree of risk. You should carefully consider the risks described below, together with the other information contained in this Annual Report, including our consolidated financial statements and the related notes appearing at the end of this Annual Report, before making your decision to invest in shares of our common stock. We cannot assure you that any of the events discussed in the risk factors below will not occur. These risks could have a material and adverse impact on our business, results of operations, financial condition or prospects. If that were to happen, the trading price of our common stock could decline, and you could lose all or part of your investment.

This Annual Report also contains forward-looking statements that involve risks and uncertainties. Our actual results could differ materially from those anticipated in these forward-looking statements as a result of certain factors, including the risks faced by us described below and elsewhere in this Annual Report. See "Special Note Regarding Forward-Looking Statements" for information relating to these forward-looking statements.

Risks related to our financial position, operating results and need for additional capital

We have a history of net losses, and we may not achieve or maintain profitability.

We have incurred net losses attributable to Intrexon since our inception, including losses attributable to Intrexon of $117.0 million, $186.6 million and $84.5 million in 2017, 2016 and 2015, respectively. As of December 31, 2017, we had an accumulated deficit of $847.8 million. We may incur losses and negative cash flow from operating activities for the foreseeable future. To date, we have derived a significant portion of our revenues from ECCs and license agreements. With the evolution of our business strategy, we anticipate greater levels of revenues from products and services as we successfully scale up and commercialize new products. We may also realize significant future revenues from strategic transactions involving our subsidiaries or JVs. If our existing collaborators terminate their ECCs, license agreements or JVs with us or we are unable to commercialize products through our subsidiaries and JVs or enter into strategic transactions, our revenues could be adversely affected. In addition, certain of our collaborations and license agreements provide for milestone payments, future royalties and other forms of contingent consideration, the payment of which are uncertain as they are dependent on our collaborators' abilities and willingness to successfully develop and commercialize products. Moreover, many of the products being commercialized by us are in the early stages of development or preliminary stages of sales. We expect a significant period of time could pass before the achievement of contractual milestones and the realization of royalties on products commercialized under our collaborations or before commercialization of our various products and revenues is sufficient to achieve profitability. As a result, our expenses may exceed revenues for the foreseeable future, and we may not achieve profitability. If we fail to achieve profitability, or if the time required to achieve profitability is longer than we anticipate, we may not be able to continue our business. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis.

We may need substantial additional capital in the future in order to fund our business.

We expect our future capital requirements will be substantial, particularly as we continue to develop our business and expand our synthetic biology technology platform and for capital investment needed to scale up our commercial operations. Although we believe that our existing cash and cash equivalents and short-term and long-term investments and cash expected to be received from our current collaborators and for sales of products and services provided by our consolidated subsidiaries will enable us to fund our operating expenses and capital expenditure requirements for at least the next 12 months, we may need additional capital if our current plans and assumptions change. Our need for additional capital will depend on many factors, including:

- the commercial success of products being developed by our subsidiaries, JVs and unpartnered programs;
- the commercial success of our ECCs and license agreements;
- whether we are successful in obtaining payments in connection with strategic transactions;
- whether we are successful in obtaining payments from our collaborators and licensees;
- whether we can enter into additional ECCs, license agreements or JVs;
- the progress and scope of the collaborative and independent research and development projects performed by us and our collaborators and licensees;

- the timing and capital requirements to scale up our various products and services offerings;
- the effect of any acquisitions of other businesses or technologies that we may make in the future;
- whether we decide to develop internal development or manufacturing capabilities;
- the filing, prosecution and enforcement of our intellectual property;
- investments we may make in current and future collaborators, including JVs;
- our ability to maintain or improve the volume and pricing of our current product offerings and to develop new offerings, including those which may incorporate new technologies; and
- the costs associated with legal activities, including litigation, arising in the course of our business activities and our ability to prevail in any such legal activities.

In December 2017, we entered into an agreement with the R.J. Kirk Declaration of Trust, an entity affiliated with Randal J. Kirk, pursuant to which the R.J. Kirk Declaration of Trust purchased 1,207,980 shares of our common stock in a private placement, for aggregate gross proceeds of $13.7 million. In January 2018, we completed an underwritten public offering of our shares providing us net proceeds of $82.2 million. In October 2017, we entered into a Preferred Stock Equity Facility Agreement with Kapital Joe, LLC, or Kapital Joe, an entity affiliated with Mr. Kirk, pursuant to which we may, at our sole and exclusive option, issue and sell to Kapital Joe, up to $100 million of our Series A Redeemable Preferred Stock, or Series A Preferred Stock. We are currently party to an "at-the-market" sales agreement with Cantor Fitzgerald & Co., or Cantor, under which we may offer and sell from time to time our common stock with aggregate proceeds of up to $200 million through Cantor as our sales agent. To date, no offerings have occurred under this agreement.

If future financings involve the issuance of equity securities, our existing shareholders would suffer further dilution. If we raise debt financing, we may be subject to restrictive covenants that limit our ability to conduct our business. We may not be able to raise sufficient additional funds on terms that are favorable to us, if at all. If we fail to raise sufficient funds and continue to incur losses, our ability to fund our operations, take advantage of strategic opportunities, develop products or technologies, or otherwise respond to competitive pressures could be significantly limited. If this happens, we may be forced to delay or terminate research or development programs or the commercialization of products resulting from our technologies, curtail or cease operations or obtain funds through strategic transactions, ECCs, JVs or other collaborative and licensing arrangements that may require us to relinquish commercial rights, or grant licenses on terms that are not favorable to us. If adequate funds are not available, we will not be able to successfully execute our business plan or continue our business.

Our quarterly and annual operating results may fluctuate in the future. As a result, we may fail to meet or exceed the expectations of research analysts or investors, which could cause our stock price to decline.

Our financial condition and operating results have varied significantly in the past and may continue to fluctuate from quarter to quarter and year to year in the future due to a variety of factors, many of which are beyond our control. Factors relating to our business that may contribute to these fluctuations include the following factors, as well as other factors described elsewhere in this Annual Report:

- our ability to achieve or maintain profitability;
- our relationships, and the associated exclusivity terms, with collaborators and licensees in our target end markets;
- our ability to develop and maintain technologies that our collaborators and licensees continue to use and that new collaborators are seeking;
- our ability to enter into strategic transactions, ECCs, license agreements or JVs;
- the feasibility of producing and commercializing products enabled by our technologies;
- obligations to provide resources to our collaborators or to the collaborations themselves pursuant to the terms of the relevant ECC, license agreement or JV agreement;
- our ability to manage our growth;

- the outcomes of research programs, clinical trials, or other product development and approval processes conducted by our collaborators and licensees;
- the ability of our collaborators and licensees to develop and successfully commercialize products enabled by our technologies;
- our ability to successfully scale up production of our commercial products and customer acceptance thereof;
- risks associated with the international aspects of our business;
- our ability to integrate any businesses or technologies we may acquire with our business;
- our ability to accurately report our financial results in a timely manner;
- our dependence on, and the need to attract and retain, key management and other personnel;
- our ability to obtain, protect and enforce our intellectual property rights;
- our ability to prevent the theft or misappropriation of our intellectual property, know-how or technologies;
- potential advantages that our competitors, the competitors of our collaborators, and potential competitors may have in securing funding or developing competing technologies or products;
- our ability to obtain additional capital that may be necessary to expand our business;
- our collaborators' ability to obtain additional capital that may be necessary to develop and commercialize products under our ECCs, license agreements and JVs;
- our exposure to the volatility associated with recording the fair value of securities of our collaborators held by us;
- business interruptions such as power outages and other natural disasters;
- public concerns about the ethical, legal and social ramifications of GE products and processes;
- the impact of new accounting pronouncements on our current and future operating results;
- our ability to use our net operating loss carryforwards to offset future taxable income;
- the impact of the Tax Act on our current and future operating results; and
- the results of our consolidated subsidiaries.

Due to the various factors mentioned above, and others, the results of any prior quarterly or annual periods should not be relied upon as indications of our future operating performance.

We have a limited operating history, which may make it difficult to evaluate our current business and predict our future performance.

We have been in existence since 1998. From 1998 until 2010, our operations focused primarily on organizing and staffing our company and developing our technologies. Our current business strategy, including our plans to focus on partnering later-stage assets, is still being tested. In January 2011, we recognized our first revenues from our first ECC and many of our products and services offerings are either awaiting regulatory approvals or in the early stage of commercialization. Outside of collaboration and license fee payments, which vary over time, we have not generated significant revenues, including revenues or royalties from product sales by us or our collaborators. Our limited operating history may make it difficult to evaluate our current business and predict our future performance. Any assessments of our current business and predictions made about our future success or viability may not be as accurate as they could be if we had a longer operating history. We have encountered and will continue to encounter risks and difficulties frequently experienced by growing companies in rapidly changing industries. If we do not address these risks successfully, our business will be harmed.

We may pursue strategic acquisitions and investments which could have an adverse impact on our business if they are unsuccessful.

We have made acquisitions in the past and, if appropriate opportunities become available, we may acquire additional businesses, assets, technologies or products to enhance our business in the future. In connection with any future acquisitions, we could:

- issue additional equity securities, which would dilute our current shareholders;
- incur substantial debt to fund the acquisitions; or
- assume significant liabilities.

Although we conduct due diligence reviews of our acquisition targets, such processes may fail to reveal significant liabilities. Acquisitions involve numerous risks, including:

- problems integrating the purchased operations, facilities, technologies or products;
- unanticipated costs and other liabilities;
- diversion of management's attention from our core businesses;
- adverse effects on existing business relationships with current and/or prospective collaborators, customers and/or suppliers;
- risks associated with entering markets in which we have no or limited prior experience; and
- potential loss of key employees.

Acquisitions also may require us to record goodwill and non-amortizable intangible assets that will be subject to impairment testing on a regular basis and potential periodic impairment charges, incur amortization expenses related to certain intangible assets, and incur large and immediate write-offs and restructuring and other related expenses, all of which could harm our operating results and financial condition. In addition, we may acquire companies that have insufficient internal financial controls, which could impair our ability to integrate the acquired company and adversely impact our financial reporting. If we fail in our integration efforts with respect to any of our acquisitions and are unable to efficiently operate as a combined organization, our business and financial condition may be adversely affected.

As a result of the Company's annual goodwill impairment test, the Company recorded a $13.8 million goodwill impairment charge in the year ended December 31, 2017. See Note 11 to our consolidated financial statements appearing elsewhere in this Annual Report for additional discussion.

We may encounter difficulties in connection with our acquisitions.

We cannot be certain that any acquisition will be successful or that we will realize the anticipated benefits of the acquisition. In particular, we may not be able to realize the strategic and operational benefits and objectives we had anticipated. In addition, we may face increased competition in the markets for any acquired products. Any of the following factors may have a material adverse effect on our business, operating results and financial condition. These factors may include:

- the potential disruption of our ongoing business and diversion of management resources;
- unanticipated expenses related to the acquired operations;
- the impairment of relationships with the acquired customers;
- the impairment of relationships with key suppliers and their ability to meet our demand;
- potential unknown liabilities associated with the acquired business and technology;
- potential liabilities related to litigation involving the acquired companies;

- potential periodic impairment of goodwill and intangible assets acquired; and
- potential inability to retain, integrate and motivate key personnel.

We own equity interests in several of our collaborators and have exposure to the volatility and liquidity risks inherent in holding their equity.

Our collaborators may have limited capital in which case we may allow them to pay technology access fees, milestone payments or other contractual payments in shares of their common stock or other equity. As a result, we own equity interests in several of our collaborators. Owning equity in our collaborators further increases our exposure to the risks of our collaborators' businesses beyond our dependence on these collaborators to provide market and product development expertise, as well as sales, marketing and regulatory capabilities. Our equity ownership in our collaborators exposes us to volatility and the potential for negative returns. We may have restrictions on resale and/or limited markets to sell our equity ownership. In many cases, our equity position is a minority position which exposes us to further risk as we are not able to exert control over the companies in which we hold securities.

We evaluate prospective collaborators based on a variety of factors such as their capabilities, capacity and expertise in a defined field. The process by which we obtain equity interests in our collaborators and the factors we consider in deciding whether to acquire, hold or dispose of these equity positions may differ significantly from those that an independent investor would consider when purchasing equity interests in the collaborator. One significant factor would include our own expectation as to the success of our efforts to assist the collaborator in developing products enabled by our technologies.

We own common stock of several publicly traded companies and the values of those equity interests are subject to market price volatility. We own preferred stock in publicly traded companies, most of which may be converted into shares of common stock in the future, and the value of these equity interests is subject to fluctuation due to uncertainties of the timing and occurrence of the defined conversion events, the volatility of the underlying common stock, and changes in general economic and financial conditions of the collaborator. For each collaborator where we own equity securities, we make an accounting policy election to present them at either the fair value at the end of each reporting period or using the cost or equity method depending on our level of influence. We have adopted the fair value method of accounting for certain of these securities, and therefore, have recorded them at fair value at the end of each reporting period with the unrealized gain or loss recorded as a separate component of other income or expense, net, for the period. As of December 31, 2017 and 2016, the aggregate original cost basis of our common stock investments was $102.6 million and $104.0 million, respectively, and the market value was $15.1 million and $23.5 million, respectively. As of December 31, 2017 and 2016, the aggregate original cost basis of our preferred stock investments was $148.3 million and $127.4 million, respectively, and the market value was $161.2 million and $129.5 million, respectively. The fair value of these securities is subject to fluctuation in the future due to the volatility of the stock market, changes in general economic conditions and changes in the financial conditions of the investee.

The equity of our collaborators may not be publicly traded, and if it is traded publicly, the trading market could be limited or have low trading volume. In some cases, we could hold unregistered shares and we may not have demand registration rights with respect to those shares. We own preferred stock in publicly traded companies that may be converted into shares of common stock, but the timing of that conversion is uncertain and may never occur. If the conversion does not occur, there is a risk that we may not be able to sell the preferred stock. We evaluate whether any discounts for trading restrictions or other basis for lack of marketability should be applied to the fair value of the securities at inception of the ECC or JV. In the event we conclude that a discount should be applied, the fair value of the securities is adjusted at inception of the ECC or JV and re-evaluated at each reporting period thereafter. We have substantial liquidity risk related to these holdings, and we may not be able to sell, or sell quickly, all or part of these equity interests.

In connection with future ECCs or JVs, we may, from time to time, receive from collaborators, both public and private, warrants, rights and/or options, all of which involve special risks. To the extent we receive warrants or options in connection with future ECCs or JVs, we would be exposed to risks involving pricing differences between the market value of underlying securities and our exercise price for the warrants or options, a possible lack of liquidity and the related inability to close a warrant or options position, all of which could ultimately have an adverse effect on our financial position.

We use estimates in determining the fair value of certain assets and liabilities. If our estimates prove to be incorrect, we may be required to write down the value of these assets or write up the value of these liabilities, which could adversely affect our financial position.

Our ability to measure and report our financial position and operating results is influenced by the need to estimate the impact or outcome of future events on the basis of information available at the time of the financial statements. An accounting estimate is

considered critical if it requires that management make assumptions about matters that were highly uncertain at the time the accounting estimate was made. If actual results differ from management's judgments and assumptions, then they may have an adverse impact on our results of operations and cash flows.

Fair value is estimated based on a hierarchy that maximizes the use of observable inputs and minimizes the use of unobservable inputs. Observable inputs are inputs that reflect the assumptions that market participants would use in pricing the asset or liability developed based on market data obtained from sources independent of the reporting entity. Unobservable inputs are inputs that reflect the reporting entity's own assumptions about the assumptions market participants would use in pricing the asset or liability developed based on the best information available in the circumstances. The fair value hierarchy prioritizes the inputs to valuation techniques into three broad levels whereby the highest priority is given to Level 1 inputs and the lowest to Level 3 inputs.

Over time, as we have expanded the nature of our operations, the number and complexity of estimates we use in determining fair value has increased. As of December 31, 2017 and 2016, 22 percent and 35 percent of our consolidated total assets, respectively, were measured at fair value on a recurring basis, including 19 percent and 14 percent as of December 31, 2017 and 2016, respectively, which were considered Level 3 valuations. Our largest Level 3 asset carried at fair value is our investment in preferred stock of ZIOPHARM. As of December 31, 2017 and 2016, liabilities measured at fair value on a recurring basis were not a significant portion of our total liabilities. We estimate the fair value of our assets and liabilities using assumptions that we believe are appropriate and are used by market participants. The methodology used to estimate these values is complex and uses asset- and liability-specific data and market inputs for assumptions including interest and discount rates and expected future performance and liquidity dates.

Valuations are highly dependent upon the reasonableness of management's assumptions and the predictability of the relationships that drive the results of our valuation methodologies. Because of the inherent unpredictability in the future performance of the investments requiring Level 3 valuations, we may be required to adjust the value of certain assets, which could adversely affect our financial position.

We rely on our collaborators, subsidiaries and other third parties to deliver timely and accurate information in order to accurately report our financial results in the time frame and manner required by law.

We need to receive timely, accurate and complete information from a number of third parties in order to accurately report our financial results on a timely basis. We rely on our collaborators and subsidiaries to provide us with complete and accurate information regarding revenues, expenses and payments owed to or by us on a timely basis. In addition, we intend to rely on current and future collaborators under our collaboration agreements and JVs to provide us with product sales and cost saving information in connection with royalties, if any, owed to us. If the information that we receive is not accurate, our consolidated financial statements may be materially incorrect and may require restatement, and we may not receive the full amount of consideration to which we are entitled under our collaboration agreements or JVs. Although we have audit rights with these parties, performing such an audit could be expensive and time consuming and may not be adequate to reveal any discrepancies in a timeframe consistent with our reporting requirements. We own a significant equity position in several of our collaborators, including a majority position in two of our collaborators. In the future, we may need to consolidate the financial statements of one or more other collaborators into our consolidated financial statements. Although we have contractual rights to receive information and certifications allowing us to do this, such provisions may not ensure that we receive information that is accurate or timely. As a result, we may have difficulty completing accurate and timely financial disclosures, which could have an adverse effect on our business.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.

As of December 31, 2017, we had net operating loss carryforwards of approximately $244.3 million for U.S. federal income tax purposes available to offset future taxable income and U.S. federal and state research and development tax credits of $7.7 million prior to consideration of annual limitations that may be imposed under Section 382 of the Internal Revenue Code of 1986, as amended, or Section 382. These carryforwards begin to expire in 2022. As a result of our past issuances of stock, as well as due to prior mergers and acquisitions, certain of Intrexon's net operating losses have been subject to limitations pursuant to Section 382. As of December 31, 2017, Intrexon has utilized all net operating losses subject to Section 382 limitations, other than those losses inherited via acquisitions. As of December 31, 2017, approximately $33.6 million of domestic net operating losses were acquired via acquisition and are limited based on the value of the target at the time of the transaction. Future changes in stock ownership may also trigger an ownership change and, consequently, a Section 382 limitation. As of December 31, 2017, our direct foreign subsidiaries had foreign loss carryforwards of approximately $151.4 million, most of which do not expire.

The Tax Act introduces certain limitations on utilization of losses that are generated after 2017, generally limiting utilization of those losses to 80 percent of future annual taxable income. However, losses generated after 2017 will generally have an indefinite carryforward period.

The effects of the Tax Act on our business have not yet been fully analyzed and could have an adverse effect on our business.

On December 22, 2017, the Tax Act was signed into law. We are in the process of analyzing the Tax Act and its possible effects on us, including on our subsidiaries. The Tax Act, among other things, reduces the corporate tax rate to 21 percent effective January 1, 2018, eliminates the corporate alternative minimum tax, imposes a new minimum tax on global intangible low-taxed income ("GILTI") and implements a modified territorial tax system that includes a one-time transition tax on deemed repatriated earnings of foreign subsidiaries. Where a reasonable estimate could be determined, we have recorded provisional amounts in our consolidated financial statements for the year ended December 31, 2017, which primarily resulted in the write down of our domestic deferred tax assets by $87.5 million as a result of the new corporate tax rate. This reduction in deferred tax assets was fully offset by a reduction in our valuation allowance. We have provisionally estimated our one-time transition tax exposure to be zero.

The provisional amounts we recorded are subject to further refinement within the measurement period prescribed by Staff Accounting Bulletin No. 118, or SAB 118. As a result, the recorded amounts are subject to change, possibly materially, due to, among other things, changes in interpretations of the Tax Act, any legislative action to address questions that arise because of the Tax Act, any changes in accounting standards for income taxes or related interpretations in response to the Tax Act, or any updates or changes to estimates we have utilized to provisionally determine the transition impact.

We are exposed to exchange rate fluctuation.

We have international subsidiaries in a number of foreign countries, including Belgium, Brazil, Canada, England and Hungary. As a consequence, we are exposed to risks associated with changes in foreign currency exchange rates. We present our consolidated financial statements in U.S. dollars. Our international subsidiaries have assets and liabilities denominated in currencies other than the U.S. dollar. Future expenses and revenues of our international subsidiaries are expected to be denominated in currencies other than in U.S. dollars. Therefore, movements in exchange rates to translate from foreign currencies may have an impact on our reported results of operations, financial position and cash flows.

Risks related to our technologies and business operations

Ethical, legal and social concerns about synthetic biologically engineered products and processes could limit or prevent the use of products or processes using our technologies, limit consumer acceptance and limit our revenues.

Our technologies and the technologies of our JVs and collaborators involve the use of synthetic biologically engineered products or synthetic biological technologies. Public perception about the safety and environmental hazards of, and ethical concerns over, GE products and processes could influence public acceptance of our and our collaborators' technologies, products and processes.

The subject of genetically modified organisms has received negative publicity, which has aroused public debate. In addition, certain of the products of our operating subsidiaries have been the subject of negative publicity, including AAS, Arctic apples and GE mosquitoes. This adverse publicity has led to, and could continue to lead to, greater regulation and trade restrictions on imports of genetically altered products. Further, there is a risk that products produced using our technologies could cause adverse health effects or other adverse events, which could also lead to negative publicity.

There is also an active and vocal group of opponents to genetically modified organisms who wish to ban or restrict the technology and who, at a minimum, hope to sway consumer perceptions and acceptance of this technology. Their efforts include regulatory legal challenges and labeling campaigns for genetically modified products, as well as application of pressure to consumer retail outlets seeking a commitment not to carry genetically modified products. Further, these groups have a history of bringing legal action against companies attempting to bring new biotechnology products to market. For example, on March 30, 2016, a coalition of non-governmental organizations filed a complaint against the FDA, the United States Fish and Wildlife Service, and related individuals for their roles in the approval of AAS. We may be subject to future additional litigation brought by one or more of these organizations in their attempt to block the development or sale of our products. In addition, animal rights groups and various other organizations and individuals have attempted to stop genetic engineering activities by pressing for legislation and additional regulation in these areas. We may not be able to overcome the negative consumer

perceptions and potential legal hurdles that these organizations seek to instill or assert against our products and our business could be harmed.

If we and our collaborators are not able to overcome the ethical, legal and social concerns relating to synthetic biological engineering, products and processes using our technologies may not be accepted. These concerns could result in increased expenses, regulatory scrutiny, delays or other impediments to our programs or the public acceptance and commercialization of products and processes dependent on our technologies or inventions. The ability of us and our collaborators to develop and commercialize products, or processes using our technologies could be limited by public attitudes and governmental regulation.

Inadvertent releases or unintended consequences of releases of synthetic biology technologies by us or others could lead to adverse effects on our business and results of operations.

The synthetic biological technologies that we develop may have significantly enhanced characteristics compared to those found in naturally occurring organisms, enzymes or microbes. While we produce many of these synthetic biological technologies only for use in a controlled laboratory and industrial environment, the release of such synthetic biological technologies into uncontrolled environments could have unintended consequences. Any adverse effect resulting from such a release, by us or others, could have a material adverse effect on the public acceptance of our products and our business and financial condition. Such a release could result in enhanced regulatory activity and we could have exposure to liability for any resulting harm.

We may become subject to increasing regulation in the future.

Our ongoing research and development relies on evaluations in animals, which may become subject to bans or additional regulations. As described above, our research operations are also subject to various environmental regulations. However, while most of the current laws and regulations concerning synthetic biology relate to the end products produced using synthetic biology, this may change. For example, the Presidential Commission for the Study of Bioethical Issues in December 2010 recommended that the federal government oversee, but not regulate, synthetic biology research. The Presidential Commission also recommended that the government lead an ongoing review of developments in the synthetic biology field and that the government conduct a reasonable risk assessment before the field release of synthetic organisms. Synthetic biology may become subject to additional government regulations as a result of the recommendations, which could require us to incur significant additional capital and operating expenditures and other costs in complying with these laws and regulations.

We have limited experience bringing new products through development and successful commercialization. Even if our technologies enable new products, we or our collaborators may not be successful in commercializing the products that result from our technologies.

Even if our technologies enable new products, there is no guarantee that we or our collaborators will be successful in creating additional products enabled by our technologies. Furthermore, neither we nor our collaborators may be able to commercialize the resulting products or our collaborators may decide to use other methods competitive with our technologies that do not utilize synthetic biology. Several of our wholly and majority-owned subsidiaries have received regulatory approvals, including AquaBounty and Okanagan. These approvals do not, however, guarantee our success in commercializing the products of these subsidiaries. If we are not successful in commercializing our products, our business could be harmed.

Changing labeling requirements may negatively impact consumer acceptance of the products of our operating subsidiaries.

Under current labeling laws, we are not required to label AAS or our Arctic apples at the retail level as containing genetically modified ingredients. However, because several states either passed or considered new laws specifying varying requirements for labeling products sold at the retail level that contain genetically modified ingredients, the United States Congress passed the Labeling Act to establish a national standard for package labeling for foods containing genetically modified ingredients. The USDA has until July 2018 to implement this new law. Labeling requirements could cause consumers to view the label as either a warning or as an indication that AAS is inferior to traditional Atlantic salmon or Arctic apples are inferior to traditional apples, which could negatively impact consumer acceptance of the products of our operating subsidiaries.

The FDA has only approved a few gene therapies.

The FDA first approved a gene therapy for use in humans in 2017, and to date has only approved a limited number. The field of gene therapies is still very early in development and remains predominantly experimental. Clinical trials with gene therapies have encountered a multitude of significant technical problems in the past, including unintended integration with host DNA leading to serious adverse events, poor levels of protein expression, transient protein expression, viral overload, immune reactions to either viral capsids utilized to deliver DNA, DNA itself, proteins expressed or cells transfected with DNA. There

can be no assurance that our development efforts or those of our collaborators will be successful, that we or they will receive the regulatory approvals necessary to initiate clinical trials, where applicable, or that we will ever be able to successfully commercialize a product enabled by our technologies. To the extent that we or our collaborators utilize viral constructs or other systems to deliver gene therapies and the same or similar delivery systems demonstrate unanticipated and/or unacceptable side effects in preclinical or clinical trials conducted by ourselves or others, we may be forced to, or elect to, discontinue development of such products.

If we lose key personnel, including key management personnel, or are unable to attract and retain additional personnel, it could delay our product development programs, harm our research and development efforts, and we may be unable to pursue collaborations or develop our own products.

Our business involves complex operations across a variety of markets and requires a management team and employee workforce that is knowledgeable in the many areas in which we operate. The loss of any key members of our management, including our Chief Executive Officer, Randal J. Kirk, or the failure to attract or retain other key employees who possess the requisite expertise for the conduct of our business, could prevent us from developing and commercializing our products for our target markets and entering into collaborations or licensing arrangements to execute on our business strategy. In addition, the loss of any key scientific staff, or the failure to attract or retain other key scientific employees, could prevent us from developing our technologies for our target markets and entering into ECCs, JVs or licensing arrangements or from further developing and commercializing our products and services offerings to execute on our business strategy. We may not be able to attract or retain qualified employees in the future due to the intense competition for qualified personnel among biotechnology, synthetic biology and other technology-based businesses, or due to the unavailability of personnel with the qualifications or experience necessary for our business. If we are not able to attract and retain the necessary personnel to accomplish our business objectives, we may experience staffing constraints that will adversely affect our ability to meet the demands of our collaborators and customers in a timely fashion or to support our internal research and development programs. In particular, our product and process development programs are dependent on our ability to attract and retain highly skilled scientists. Competition for experienced scientists and other technical personnel from numerous companies and academic and other research institutions may limit our ability to attract and retain such personnel on acceptable terms.

Our planned activities, including the further development and scale-up of operating subsidiaries, will require additional expertise in specific industries and areas applicable to the products and processes developed through our technologies or acquired through strategic or other transactions, especially in the end markets that we seek to penetrate. These activities will require the addition of new personnel, and the development of additional expertise by existing personnel. The inability to attract personnel with appropriate skills or to develop the necessary expertise could impair our ability to grow our business.

We may encounter difficulties managing our growth, which could adversely affect our business.

Currently, we are working simultaneously on multiple projects targeting several industries. These diversified operations place increased demands on our limited resources and require us to substantially expand the capabilities of our administrative and operational resources and to attract, train, manage and retain qualified management, technicians, scientists and other personnel. As our operations expand domestically and internationally, we will need to continue to manage multiple locations and additional relationships with various customers, collaborators, suppliers and other third parties. Our ability to manage our operations, growth and various projects effectively will require us to make additional investments in our infrastructure to continue to improve our operational, financial and management controls and our reporting systems and procedures and to attract and retain sufficient numbers of talented employees, which we may be unable to do effectively. As a result, we may be unable to manage our expenses in the future, which may negatively impact our gross margins or operating margins in any particular quarter. In addition, we may not be able to successfully improve our management information and control systems, including our internal control over financial reporting, to a level necessary to manage our growth.

Competitors and potential competitors may develop products and technologies that make ours obsolete or garner greater market share than ours.

We do not believe that we have any direct competitors who provide comparable technologies of similar depth and breadth which enable to the same extent the commercialization of products developed using synthetic biology across a broad spectrum of biologically-based industries. However, there are companies that have competing technologies for individual pieces of our proprietary suite of complementary technologies. One portion of our proprietary technology related to DNA synthesis and assembly includes the ability to synthesize new DNA. We believe the following companies engage in the manufacture of DNA components: ATUM, Inc., Blue Heron Biotech, LLC (a subsidiary of OriGene), Integrated DNA Technologies, Inc. (IDT), GenScript USA, Inc., and Life Technologies Corporation, now part of Thermo Fisher Scientific Inc.

The synthetic biology industry and each of the commercial sectors we have targeted are characterized by rapid technological change and extensive competition. Our future success will depend on our ability to maintain a competitive position with respect to technological advances. Academic institutions also are working in this field. Technological development by others may result in our technologies, as well as products developed by our collaborators using our technologies, becoming obsolete.

The rapidly evolving market for developing GE T-cells in particular, is characterized by intense competition and rapid innovation. Genetically engineering T-cells faces significant competition in the CAR technology space from multiple companies and their collaborators, such as Novartis/University of Pennsylvania, Bluebird Bio/Celgene/Baylor College of Medicine/Five Prime/Gilead Sciences/ViroMed Laboratories, Kite Pharma/National Cancer Institute, Juno Therapeutics/Fred Hutchinson Cancer Research Center/Memorial Sloan-Kettering Cancer Center/Seattle Children's Research Institute, Cellectis/Pfizer/Servier, Adaptimmune/GSK and Bellicum Pharmaceuticals. We face competition from non-cell based treatments offered by other companies such as Amgen, AstraZeneca, Bristol-Myers, Incyte, Merck, and Roche.

Our ability to compete successfully will depend on our ability to develop proprietary technologies that can be used by our collaborators to produce products that reach the market in a timely manner and are technologically superior to and/or are less expensive than other products on the market. Certain of our competitors may benefit from local government subsidies and other incentives that are not available to us or our collaborators. As a result, our competitors may be able to develop competing and/or superior technologies and processes, and compete more aggressively and sustain that competition over a longer period of time than we or our collaborators can. As more companies develop new intellectual property in our markets, a competitor could acquire patent or other rights that may limit products using our technologies, which could lead to litigation.

We may be sued for product liability.

Each of our collaborations requires the collaborator to indemnify us for liability related to products produced pursuant to the ECC or JV and to obtain insurance coverage related to product liability in amounts considered standard for the industry. We believe that these industry-standard coverage amounts range from $10 million to $40 million in the aggregate. Even so, we may be named in product liability suits relating to products that are produced by our collaborators using our technologies. Moreover, as we develop more products through our own operations and JVs, our potential exposure to such claims will increase. These claims could be brought by various parties, including other companies who purchase products from us or our collaborators or by the end users of the products. We cannot guarantee that our collaborators will not breach the indemnity and insurance coverage provisions of the ECCs or JVs. Further, insurance coverage is expensive and may be difficult to obtain, and may not be available to us or to our collaborators in the future on acceptable terms, or at all. We cannot assure you that we or our collaborators will have adequate insurance coverage against potential claims. In addition, although we currently maintain product liability insurance for our technologies in amounts we believe to be commercially reasonable, if the coverage limits of these insurance policies are not adequate, a claim brought against us, whether covered by insurance or not, could have a material adverse effect on our business, results of operations, financial condition and cash flows. This insurance may not provide adequate coverage against potential losses, and if claims or losses exceed our liability insurance coverage, we may go out of business. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our product candidates. Regardless of the merits or eventual outcome, liability claims may result in:

- reduced resources of our management to pursue our business strategy;
- decreased demand for products enabled by our technologies;
- injury to our or our collaborators' reputations and significant negative media attention;
- withdrawal of clinical trial participants;
- initiation of investigations by regulators;
- product recalls, withdrawals or labeling, marketing or promotional restrictions;
- significant costs to defend resulting litigation;
- substantial monetary awards to trial participants or patients;
- loss of revenue; and

- the inability to commercialize any products using our technologies.

We depend on sophisticated information technology and infrastructure.

We rely on various information systems to manage our operations. These systems are complex and include software that is internally developed, software licensed from third parties and hardware purchased from third parties. These products may contain internal errors or defects, particularly when first introduced or when new versions or enhancements are released. Failure of these systems could have an adverse effect on our business, which in turn may materially adversely affect our operating results and financial condition.

We may incur significant costs complying with environmental, health and safety laws and regulations, and failure to comply with these laws and regulations could expose us to significant liabilities.

We use hazardous chemicals and radioactive and biological materials in our business and are subject to a variety of federal, state, local and international laws and regulations governing, among other matters, the use, generation, manufacture, transportation, storage, handling, disposal of, and human exposure to these materials both in the United States and overseas, including regulation by governmental regulatory agencies, such as the Occupational Safety and Health Administration and the EPA. We have incurred, and will continue to incur, capital and operating expenditures and other costs in the ordinary course of our business in complying with these laws and regulations.

We have international operations and assets and may have additional international operations and assets in the future. Our international operations and assets may be subject to various economic, social and governmental risks.

Our international operations and any future international operations may expose us to risks that could negatively impact our future results. Our operations may not develop in the same way or at the same rate as might be expected in a country with an economy similar to the United States. The additional risks that we may be exposed to in these cases include, but are not limited to:

- tariffs and trade barriers;
- currency fluctuations, which could decrease our revenues or increase our costs in U.S. dollars;
- regulations related to customs and import/export matters;
- tax issues, such as tax law changes and variations in tax laws;
- limited access to qualified staff;
- inadequate infrastructure;
- cultural and language differences;
- inadequate banking systems;
- different and/or more stringent environmental laws and regulations;
- restrictions on the repatriation of profits or payment of dividends;
- crime, strikes, riots, civil disturbances, terrorist attacks or wars;
- nationalization or expropriation of property;
- law enforcement authorities and courts that are weak or inexperienced in commercial matters; and
- deterioration of political relations among countries.

The agricultural products of several of our operating subsidiaries are subject to disease outbreaks which can increase the cost of production and/ or reduce production harvests, and the loss of existing organisms and germplasm would result in the loss of commercial technology.

Several of the products of our operating subsidiaries, including Trans Ova, Exemplar, AquaBounty and Okanagan, are subject to periodic outbreaks of a variety of diseases. Although these companies take measures to protect their stock, there can be no assurance that a disease will not damage or destroy existing organisms or germplasm. The economic impact of disease to our subsidiaries' production systems can be significant, as farmers must incur the cost of preventive measures, such as vaccines and antibiotics, and then if infected, the cost of lost or reduced harvests.

Our plans to pursue development and commercialization of adoptive cellular therapies based on CAR T-cell therapies, or CARs, are new approaches to cancer treatment that present significant challenges in a competitive landscape and the success of our efforts depends in large part on our owned and licensed intellectual property, and our efforts may be affected by litigation and developments in intellectual property law outside of our control.

Through our wholly owned subsidiary, Precigen, we intend to employ technologies licensed from the University of Texas MD Anderson Cancer Center, or MD Anderson, together with our existing suite of proprietary technologies, through both our existing exclusive collaboration agreement with ZIOPHARM and our existing collaboration with Ares Trading S.A., or Ares Trading, a subsidiary of the biopharmaceutical business of Merck KGaA, to pursue the development and commercialization of adoptive cellular therapies based on CARs under control of RheoSwitch technology targeting a variety of cancer malignancies. Because this is a new approach to cancer immunotherapy and cancer treatment generally, developing and commercializing product candidates subjects us and our collaborators to a number of challenges, including:

- obtaining regulatory approval from the FDA and other regulatory authorities that have very limited experience with the commercial development of genetically modified T-cell therapies for cancer;
- developing and deploying consistent and reliable processes for engineering a patient's T-cells *ex vivo* and infusing the engineered T-cells back into the patient;
- possibly conditioning patients with chemotherapy in conjunction with delivering each of the potential products, which may increase the risk of adverse side effects of the potential products;
- educating medical personnel regarding the potential side effect profile of each of the potential products, such as the potential adverse side effects related to cytokine release;
- developing processes for the safe administration of these potential products, including long-term follow-up for all patients who receive the potential products;
- sourcing additional clinical and, if approved, commercial supplies for the materials used to manufacture and process the potential products;
- developing a manufacturing process and distribution network with a cost of goods that allows for an attractive return on investment;
- establishing sales and marketing capabilities after obtaining any regulatory approval required to gain market access and acceptance;
- developing therapies for types of cancers beyond those addressed by the current potential products;
- not infringing the intellectual property rights, in particular, the patent rights, of third parties, including competitors developing alternative CAR T-cell therapies; and
- avoiding any applicable regulatory barriers to market, such as data and marketing exclusivities held by third parties, including competitors with approved CAR T-cell therapies.

We cannot be sure that T-cell immunotherapy technologies developed in our collaborations will yield satisfactory products that are safe and effective, scalable, or profitable.

We and our collaborators are dependent on patents, know-how, and proprietary technology in our collaborations, both our own and licensed from others. Any termination of these licenses could result in the loss of significant rights and could harm our ability to commercialize our product candidates. Disputes may also arise between us and these licensors regarding intellectual property subject to a license agreement, including those relating to:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- whether and the extent to which our technology and processes, and the technology and processes of our collaborators, infringe on intellectual property of the licensor that is not subject to the license agreement;
- our right to sublicense patent and other rights to third parties under collaborative development relationships;
- whether we and our collaborators are complying with our diligence obligations with respect to the use of the licensed technology in relation to our development and commercialization of our potential products under our collaborations; and
- the allocation of ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and by us and our collaborators.

If disputes over intellectual property that we or our collaborators have licensed in connection with our collaboration prevent or impair our or our collaborators ability to maintain our current licensing arrangements, particularly with MD Anderson, on acceptable terms, we may be unable to successfully develop and commercialize the affected potential products. We are generally also subject to all of the same risks with respect to protection of intellectual property that we license as we are for intellectual property that we own. If we or our licensors fail to adequately protect this intellectual property, our ability to commercialize potential products under our collaborations could suffer.

Because our gene therapy technology is novel, it is difficult to predict the time and cost of development and of subsequently obtaining regulatory approval.

There can be no assurance that we, including our subsidiaries and our collaborators, will not experience problems or delays in developing new product candidates and that such problems or delays will not cause unanticipated costs, or that any such development problems can be solved. We also may experience unanticipated problems or delays in expanding our manufacturing capacity, which may prevent the completion of clinical trials and the commercializing of products on a timely or profitable basis, if at all. For example, we, a collaborator or another group may uncover a previously unknown risk with any of our product candidates, and this may prolong the period of observation required for obtaining regulatory approval or may necessitate additional clinical testing.

In addition, the clinical trial requirements of the FDA, European Medicines Agency, or EMA, and other regulatory authorities and the criteria these regulators when evaluating product candidates vary substantially according to the type, complexity, novelty and intended use and market of such product candidates. The regulatory approval process for novel product candidates such as ours can be more expensive and take longer than for other, better known or more extensively studied product candidates. Even if we and our collaborators are successful in developing product candidates, it is difficult to determine how long it will take or how much it will cost to obtain regulatory approvals in either the United States or the European Union or how long it will take to commercialize these product candidates.

Regulatory requirements governing gene and cell therapy products have changed frequently and may continue to change in the future. For example, the FDA has established the Office of Cellular, Tissue and Gene Therapies within the Center for Biologics Evaluation and Research, or CBER, to consolidate the review of gene therapy and related products, and has established the Cellular, Tissue and Gene Therapies Advisory Committee to advise CBER in its review. Gene therapy clinical trials conducted at institutions that receive funding for recombinant DNA research from U.S. National Institutes of Health, or NIH, also potentially are subject to review by the NIH office of Biotechnology Activities' Recombinant DNA Advisory Committee, or RAC; however, NIH has announced that the RAC will only publicly review clinical trials if the trials cannot be evaluated by standard oversight bodies and pose unusual risks. Although the FDA decides whether individual gene therapy protocols may proceed, the RAC public review process, if undertaken, can delay the initiation of a clinical trial, even if the FDA has reviewed the trial design and details and approved its initiation. Conversely, the FDA can put an IND on a clinical hold even if the RAC has provided a favorable review or an exemption from in-depth, public review. In addition, adverse developments in clinical trials of gene therapy products conducted by others may cause the FDA or other oversight bodies to change the requirements for approval of any of our product candidates and those of our collaborators.

There is a high failure rate for drugs and biologics proceeding through clinical trials, at all stages of development.

Results from preclinical studies or previous clinical trials are not necessarily predictive of future clinical trial results, and interim results of a clinical trial are not necessarily indicative of final results. Our product candidates and those of our collaborators may fail to show the desired results in clinical development despite demonstrating positive results in preclinical studies or having successfully advanced through initial clinical trials.

There is a high failure rate for drugs and biologics proceeding through clinical trials. Many companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in late-stage clinical trials even after achieving promising results in preclinical testing and earlier-stage clinical trials. Data obtained from preclinical and clinical activities are subject to varying interpretations, which may delay, limit or prevent regulatory approval. In addition, we and our collaborators may experience regulatory delays or rejections as a result of many factors, including changes in regulatory policy during the period of product candidate development. Any such delays could materially and adversely affect our business, financial condition, results of operations and prospects.

Our and our collaborators' product candidates may cause undesirable side effects or have other properties that could delay or prevent their regulatory approval, limit the commercial potential or result in significant negative consequences following any potential marketing approval.

There have been several significant adverse side effects in gene therapy treatments in the past, including reported cases of leukemia and death seen in other trials using other vectors. While new recombinant vectors and other approaches have been developed to reduce these side effects, gene therapy and synthetic biology therapy in general is still a relatively new approach to disease treatment and additional adverse side effects could develop. There also is the potential risk of delayed adverse events following exposure to these products due to persistent biologic activity of the genetic material or other components of products used to carry the genetic material.

Other possible adverse side effects that could occur with treatment with synthetic biology products include an immunologic reaction early after administration which, while not necessarily adverse to the patient's health, could substantially limit the effectiveness of the treatment. In previous clinical trials involving adeno-associated virus, or AAV, vectors for gene therapy, some subjects experienced the development of a T-cell response, whereby after the vector is within the target cell, the cellular immune response system triggers the removal of transduced cells by activated T-cells. If similar effect occurs with our or our collaborators' products, we or our collaborators may decide or be required to halt or delay further clinical development of our product candidates.

Additionally, if any of our or our collaborators' product candidates receives marketing approval, FDA could require us to adopt a REMS to ensure that the benefits outweigh its risks, which may include, among other things, a medication guide outlining the risks of the product for distribution to patients and a communication plan to health care practitioners. Such requirements could prevent us from achieving or maintaining market acceptance of our product candidates and could significantly harm our business, prospects, financial condition and results of operations.

We and our collaborators may find it difficult to enroll patients in clinical trials, which could delay or prevent us and our collaborators from proceeding with clinical trials.

Identifying and qualifying patients to participate in clinical trials of our and our collaborators' product candidates is critical to success. The timing of clinical trials depends on the ability to recruit patients to participate as well as completion of required follow-up periods. If patients are unwilling to participate in our or our collaborators' clinical studies for any number of reasons, such as because of negative publicity from adverse events related to the biotechnology or gene therapy fields, the timeline for recruiting patients, conducting studies and obtaining regulatory approval may be delayed. These delays could result in increased costs, delays in advancing product candidates, or termination of the clinical trials altogether.

Even if we and our collaborators complete the necessary clinical trials, we cannot predict when, or if, we and our collaborators will obtain regulatory approval to commercialize a product candidate and the approval may be for a more narrow indication than we seek.

We and our collaborators cannot commercialize a product candidate until the appropriate regulatory authorities have reviewed and approved the product candidate. Even where product candidates meet their endpoints in clinical trials, the regulatory authorities may not complete their review processes in a timely manner, or may not grant regulatory approval. Additional delays may result if an FDA Advisory Committee or other regulatory authority recommends non-approval or restrictions on approval. In addition, we and our collaborators may experience delays or rejections based upon additional government

regulation from future legislation or administrative action, or changes in regulatory authority policy during the period of product development, clinical trials and the review process.

Regulatory authorities also may approve a product candidate for more limited indications than requested or they may impose significant limitations in the form of narrow indications, warnings or a REMS. These regulatory authorities may require precautions or contra-indications with respect to conditions of use or they may grant approval subject to the performance of costly post-marketing clinical trials. In addition, regulatory authorities may not approve the labeling claims that are necessary or desirable for the successful commercialization of our product candidates. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates and materially and adversely affect our business, financial condition, results of operations and prospects.

Even if we or our collaborators obtain regulatory approval for a product candidate, the product will remain subject to regulatory oversight.

Even if we and our collaborators obtain regulatory approval for our product candidates, these candidates will be subject to ongoing regulatory requirements for manufacturing, labeling, packaging, storage, advertising, promotion, sampling, record-keeping and submission of safety and other post-market information. Regulatory approvals also may be subject to a REMS, limitations on the approved indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials, and surveillance to monitor the quality, safety and efficacy of the product. For example, the holder of an approved Biologics License Application, or BLA, is obligated to monitor and report adverse events and any failure of a product to meet the specifications in the BLA. The FDA guidance advises that patients treated with some types of gene therapy undergo follow-up observations for potential adverse events for as long as 15 years. The holder of an approved BLA also must submit new or supplemental applications and obtain FDA approval for certain changes to the approved product, product labeling or manufacturing process. Advertising and promotional materials must comply with FDA rules and are subject to FDA review, in addition to other potentially applicable federal and state laws.

In addition, product manufacturers and their facilities are subject to continual review and periodic inspections by the FDA and other regulatory authorities for compliance with cGMPs requirements and adherence to commitments made in the U.S. or foreign marketing application. If we, our collaborators, or a regulatory authority, discover previously unknown problems with a product, such as adverse events of unanticipated severity or frequency, or problems with the facility where the product is manufactured or disagrees with the promotion, marketing or labeling of that product, a regulatory authority may impose restrictions relative to that product, the manufacturing facility or us, including requiring recall or withdrawal of the product from the market or suspension of manufacturing.

If we fail to comply with applicable regulatory requirements following approval of any of our product candidates, a regulatory authority may take adverse actions, which include, among other things, a range of sanctions from issuing a warning letter to causing us to withdraw the product from the market.

In addition, the FDA's policies, and those of equivalent foreign regulatory agencies, may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative action, either in the United States or abroad. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained and we may not achieve or sustain profitability, which would materially and adversely affect our business, financial condition, results of operations and prospects.

Risks related to manufacturing human therapeutics

Synthetic biology therapies are novel, complex and difficult to manufacture. We or our collaborators could experience production problems that result in delays in product development or commercialization programs or otherwise adversely affect our business.

The manufacturing processes that we and our collaborators use to produce synthetic biology product candidates for human therapeutics are complex, novel and have not been validated for commercial use. Several factors could cause production interruptions, including equipment malfunctions, facility contamination, raw material shortages or contamination, natural disasters, disruption in utility services, human error or disruptions in the operations of our suppliers.

Our and our collaborators' synthetic biology product candidates require processing steps that are more complex than those required for most chemical pharmaceuticals. Moreover, unlike chemical pharmaceuticals, the physical and chemical properties of a biologic often cannot be fully characterized. As a result, assays of the finished product may not be sufficient to ensure that the product will perform in the intended manner. Accordingly, it is necessary to employ multiple steps to control our manufacturing process to assure that the product candidate is made strictly and consistently in compliance with the process. Problems with the manufacturing process, even minor deviations from the normal process, could result in product defects or manufacturing failures that result in lot failures, product recalls, product liability claims or insufficient inventory. We or our collaborators may encounter problems achieving adequate quantities and quality of clinical-grade materials that meet FDA, EMA or other applicable standards or specifications with consistent and acceptable production yields and costs.

Any problems in our manufacturing process or facilities could make us a less attractive collaborator for potential partners, which could limit our access to additional attractive development programs.

Delays in obtaining regulatory approval of manufacturing processes and facilities or disruptions in manufacturing processes may delay or disrupt our commercialization efforts.

Before we or our collaborators can begin to commercially manufacture our product candidates for human therapeutics, we must obtain regulatory approval from the FDA for the applicable manufacturing process and facility. A manufacturing authorization must also be obtained from the appropriate European Union regulatory authorities. In addition, the manufacturing facility must pass a pre-approval inspection by the FDA before any of our product candidates can obtain marketing approval. In order to obtain approval, we will need to ensure that all of the processes, methods and equipment are compliant with cGMP, and perform extensive audits of vendors, contract laboratories and suppliers. If any of our vendors, contract laboratories or suppliers is found to be out of compliance with cGMP, we may experience delays or disruptions in manufacturing while we work with these third parties to remedy the violation or while we work to identify suitable replacement vendors. The cGMP requirements govern quality control of the manufacturing process and documentation policies and procedures. In complying with cGMP, we will be obligated to expend time, money and effort in production, record keeping and quality control to assure that the product meets applicable specifications and other requirements. If we fail to comply with these requirements, we would be subject to possible regulatory action and may not be permitted to sell any products that we may develop.

Ethical, legal and social issues related to genetic testing may reduce demand for our product candidates, if approved.

We anticipate that prior to receiving certain cellular, gene, or other synthetic biology therapies, patients may be required to undergo genetic testing. Genetic testing has raised concerns regarding the appropriate utilization and the confidentiality of information provided by genetic testing. Genetic tests for assessing a person's likelihood of developing a chronic disease have focused public attention on the need to protect the privacy of genetic information. For example, concerns have been expressed that insurance carriers and employers may use these tests to discriminate on the basis of genetic information, resulting in barriers to the acceptance of genetic tests by consumers. This could lead to governmental authorities prohibiting genetic testing or calling for limits on or regulating the use of genetic testing, particularly for diseases for which there is no known cure. Any of these scenarios could decrease demand for our product candidates, if approved.

The commercial success of any of our and our collaborators' product candidates will depend upon the degree of market acceptance by physicians, patients, third-party payors and others in the medical community.

Ethical, social and legal concerns about cellular, gene or other synthetic biology therapies could result in additional regulations restricting or prohibiting our products. Even with the requisite approvals from the FDA in the United States, EMA in the European Union and other regulatory authorities internationally, the commercial success of product candidates will depend, in part, on the acceptance of physicians, patients and health care payors of synthetic biology therapy products in general, and our and our collaborators' product candidates in particular, as medically necessary, cost-effective and safe. Any product that we or our collaborators commercialize may not gain acceptance by physicians, patients, health care payors and others in the medical community. If these products do not achieve an adequate level of acceptance, we may or our collaborators may not generate significant product revenue to make the products profitable.

Risks associated with our business strategy

The continued evolution of our business strategy and the restructuring of our business and assets may not be a successful strategy and may increase our capital requirements, increase our costs or otherwise harm our operating results and financial condition.

Our business strategy has evolved, and continues to evolve, toward relationships and structures that provide us with more control and ownership over the development process and commercialization path. This new strategy or approach entails risks in implementation and operations and there is no guarantee that it will be successful. Furthermore, the changing focus of our business strategy may require additional capital beyond what we have historically used and what is available and we may incur costs associated with the implementation and execution of our changing business strategy. In addition, as we perform our annual impairment tests, we will evaluate the impact of changes in our business strategy and, as a result, may incur impairment charges and write-offs and other related expenses, any of which, if material, could harm our operating results and financial condition.

If we fail to maintain and successfully manage our existing ECCs or JVs, we may not be able to develop and commercialize our technologies and achieve or sustain profitability.

We have entered into ECCs or JVs with strategic collaborators to develop products enabled by our technologies. There can be no guarantee that we can successfully manage these ECCs or JVs. We must use diligent efforts to carry out development activities under the ECCs. The exclusivity provisions of each ECC restrict our ability to commercialize our technologies in the designated field covered by the ECC. In most cases, the collaborator may terminate the ECC with us for any reason upon 90 days' notice. In all cases, the ECC may be terminated if we fail to exercise diligent efforts or breach, and fail to cure, other provisions of the ECC. In addition, since our efforts to date have focused on a small number of collaborators in certain targeted sectors, our business could be adversely affected if one or more of these collaborators terminate their ECCs or JVs, fail to use our technologies or fail to develop commercially viable products enabled by our technologies.

Ongoing dependence on ECCs or JVs also will subject us to other risks, including:

- we have relinquished important rights regarding the commercialization, marketing and distribution of products and we may disagree with our collaborators' plans in these areas;
- although we retain broad rights with respect to intellectual property developed under the ECCs, our collaborators have the right, under certain circumstances, to take control of the enforcement of such intellectual property;
- we may have lower revenues than if we were to develop, manufacture, market and distribute products enabled by our technologies ourselves;
- a collaborator could, without the use of our synthetic biology technologies, develop and market a competing product either independently or in collaboration with others, including our competitors;
- our collaborators could be undercapitalized or fail to secure sufficient resources to fund the development and/or commercialization of the products enabled by our technologies in accordance with the ECC;
- our collaborators could become unable or less willing to expend their resources on research and development or commercialization efforts with respect to our technologies due to general market conditions, their financial condition or other circumstances beyond our control;
- we may be unable to manage multiple simultaneous ECCs or JVs or fulfill our obligations with respect thereto;
- disagreements with a collaborator could develop and any conflict with a collaborator could reduce our ability to enter into future ECCs or JVs and negatively impact our relationships with one or more existing collaborators;
- our collaborators could terminate our ECC or JV with them, in which case, our collaborators may retain rights related to certain products, we may not be able to find another collaborator to develop different products in the field and we may not be able to develop different products in the field ourselves;
- our business could be negatively impacted if any of our collaborators undergo a change of control to a third party who is not willing to work with us on the same terms or commit the same resources as our current collaborator; and

- our collaborators may operate in countries where their operations could be adversely affected by changes in the local regulatory environment or by political unrest.

If any of these events occur, or if we fail to maintain our ECCs or JVs with our collaborators, we may not be able to commercialize our existing and potential technologies, grow our business or generate sufficient revenues to support our operations.

Certain of our collaborators, including some businesses over which we have significant influence, will need additional capital.

In order for certain of our collaborators to execute on their business plans, they will have future capital requirements. We may be asked to, or need to, invest additional funds in these collaborators so that they can execute on their business plans. If we fail to invest such additional funds, the collaborator may not have sufficient capital to continue operations.

We rely on our collaborators to develop, commercialize and market certain products, and they may not be successful.

We depend on our collaborators to commercialize certain products enabled by our technologies. If our collaborators are not able to successfully develop the products enabled by our technologies, none of these enabled products will become commercially available and we will receive no back-end payments under our ECCs or JVs. Because we do not currently and may never possess the resources necessary to independently develop and commercialize all of the potential products that may result from our technologies, our ability to succeed in certain markets depends on our ability to develop and commercialize potential products through an ECC or JV. Some of our existing collaborators do not themselves have the resources necessary to commercialize products and they in turn will need to rely on additional sources of financing or third party collaborations. In addition, pursuant to our current ECCs or JVs and similar ECCs or JVs that we may enter into in the future, we have limited or no control over the amount or timing of resources that any collaborator is able or willing to devote to developing products or collaborative efforts. Any of our collaborators may fail to perform its obligations under the ECC. Our collaborators may breach or terminate their ECCs or JVs with us or otherwise fail to conduct their collaborative activities successfully and in a timely manner. If any of these events were to occur, our revenues, financial condition and results of operations could be adversely affected.

The sales process for strategic transactions or JVs may be lengthy and unpredictable, and we may expend substantial funds and management effort with no assurance of successfully entering into such transactions to commercialize our technologies.

Historically, the sales process for our ECCs and JVs has at times been lengthy and unpredictable. Our evolving focus on consummating strategic transactions and JVs may be equally or more challenging to consummate. Our sales and licensing efforts may require the effective demonstration of the benefits, value, differentiation, validation of our products, technologies and services and significant education and training of multiple personnel and departments within the potential collaborator's organization. We may expend substantial funds and management effort with no assurance that we will execute a transaction or otherwise sell our products, technologies or services. In addition, this lengthy sales cycle makes it more difficult for us to accurately forecast revenue in future periods and may cause revenues and operating results to vary significantly in such periods.

We have entered into a number of ECCs and JVs to date, and we require collaborators to successfully commercialize the products enabled by our technologies.

Our current ECCs and JVs may not be successful. Moreover, because we have limited financial and managerial resources, we will be required to prioritize our application of resources to particular development efforts. Any resources we expend on one or more of these efforts could be at the expense of other potentially profitable opportunities. If we focus our efforts and resources on one or more of these markets and they do not lead to commercially viable products, our revenues, financial condition and results of operations could be adversely affected.

Many of our current collaborators have no experience producing products at the commercial scale needed for the development of their business, and they will not succeed if they cannot effectively commercialize their products.

To the extent we continue to depend on collaborations to develop products with our technologies, our collaborators must demonstrate the ability to utilize our technologies to produce desired products at the commercial scale and on an economically viable basis or they must collaborate with others to do so. The products and processes developed using our technologies may not perform as expected when applied at commercial scale, or our collaborators may encounter operational challenges for which we and they are unable to devise a workable solution. For example, contamination in the production process could

decrease process efficiency, create delays and increase our collaborators' costs. Moreover, under the terms of our ECCs or JVs, we limit the ability of our collaborators to partner their programs with third parties. We and our collaborators may not be able to scale up our production in a timely manner, if at all, even if our collaborators successfully complete product development in their laboratories and pilot and demonstration facilities. If this occurs, the ability of our collaborators to commercialize products and processes using our technologies will be adversely affected, and, with respect to any products that are brought to market, our collaborators may not be able to lower the cost of production, which would adversely affect our ability to increase the future profitability of our business.

Markets in which we, our JVs, and collaborators are developing products using our technologies are subject to extensive regulation, and we rely on our JVs and collaborators to comply with all applicable laws and regulations.

Our technologies are used in products that are subject to extensive regulation by governmental authorities. We depend on our JVs and collaborators to comply with these laws and regulations with respect to products they produce using our technologies and we do not independently monitor whether our collaborators comply with applicable laws and regulations. If either we, our JVs or our collaborators fail to comply with applicable laws and regulations, we are subject to substantial financial and operating risks because, in addition to our own compliance, we also depend on our JVs and collaborators to produce the end products enabled by our technologies for sale, and because, in many cases, we have, or in the future may have, a substantial equity interest in our JVs and collaborators. These regulatory risks are extensive and include the following:

- complying with these regulations, including seeking approvals, the uncertainty of the scope of future regulations, and the costs of continuing compliance with regulations could affect our sales and profitability and that of our JVs and collaborators and materially impact our operating results;
- our business could be adversely affected if our processes and those used by our JVs and collaborators to manufacture their final products fail to be approved by the applicable regulatory authorities;
- where products are subject to regulatory approval, the regulatory approval process can be lengthy, costly, time consuming and inherently unpredictable, and if we and our JVs and collaborators are ultimately unable to obtain regulatory approval for products using our technologies, our business will be substantially harmed;
- even if we and our JVs and collaborators are able to commercialize products using our technologies, the product may become subject to post-approval regulatory requirements, unfavorable pricing regulations, third-party payor reimbursement practices or regulatory reform initiatives that could harm our business;
- we and our JVs and collaborators conduct on-going research and development that relies on evaluations in animals, which may become subject to bans or additional regulations;
- compliance with existing or future environmental laws and regulations could have a material adverse impact on the development and commercialization of products using our technologies; and
- to the extent products produced using our technologies are commercialized outside the United States, they will be subject to additional laws and regulations under the jurisdictions in which such products are commercialized.

The markets in which we and our collaborators are developing products using our technologies are highly competitive.

The markets in which we and our collaborators are developing products are, and will continue to be, highly competitive, and there can be no assurance that we or our collaborators will be able to compete effectively. There are numerous companies presently in these markets that are developing products that may compete with, and could adversely affect the prices for, any products developed by our collaborators using our technologies. Many of these competitors and potential competitors are well-established companies with significant resources and experience, along with well-developed distribution systems and networks for their products, valuable historical relationships with potential customers and extensive sales and marketing programs for their products. Some of these competitors may use these resources and their market influence to impede the development and/or acceptance of the products developed by our collaborators using our technologies.

To the extent that any of our collaborators' competitors are more successful with respect to any key competitive factor or our collaborators are forced to reduce, or are unable to raise, the price of any products enabled by our technologies in order to remain competitive, our operating results and financial condition could be materially adversely affected. Competitive pressure could arise from, among other things, safety and efficacy concerns, limited demand or a significant number of additional competitive products being introduced into a particular market, price reductions by competitors, the ability of competitors to

capitalize on their economies of scale, the ability of competitors to produce or otherwise procure products similar or equivalent to those of our collaborators at lower costs and the ability of competitors to access more or newer technology than our collaborators can access (including our own).

Our right to terminate our ECCs is limited.

Generally, we do not have the right to terminate an ECC except in limited circumstances such as the collaborator's failure to exercise diligent efforts in performing its obligations under the ECC, including its development of products enabled by our technologies, or its breach of a term of the ECC that remains uncured for a specified period of time. Moreover, each of our collaborators receives an exclusive license to use all of our technologies in a designated field, potentially in perpetuity. The collaborators we choose in particular fields may not be in the best position to maximize the value of our technologies in that field, if they are capable of commercializing any products at all. In addition, the scope of the field for a particular ECC may prove to be too broad and result in the failure to maximize the value of our technologies in that field.

A significant portion of our business is conducted by JVs that we cannot operate solely for our benefit.

In JVs we share ownership and management of a company with one or more parties who may not have the same goals, strategies, priorities or resources as we do and may compete with us outside the JV. JVs are intended to be operated for the benefit of all JV partners, rather than for our exclusive benefit. Operating a business as a JV often requires additional organizational formalities as well as time-consuming procedures for sharing information and making decisions. In JVs we are required to foster our relationships with our JV partners as well as promote the overall success of the JV, and if a JV partner changes or relationships deteriorate, our success in the JV may be materially adversely affected. The benefits from a successful JV are shared among the JV partners, so we do not receive all the benefits from our successful JVs. Moreover, as a partial owner of a JV, we are exposed to potential risks and liabilities that we do not face when we enter into an ECC.

Risks related to our intellectual property

Our ability to compete may decline if we do not adequately protect our proprietary technologies or if we lose some of our intellectual property rights through costly litigation or administrative proceedings.

Our success depends in part on our ability to obtain patents and maintain adequate protection of our intellectual property in the United States and abroad for our suite of technologies and resultant products and potential products. We have adopted a strategy of seeking patent protection in the United States and abroad with respect to certain of the technologies used in or relating to our products and processes. We have also in-licensed rights to additional patents and pending patent applications in the United States and abroad. We intend to continue to apply for patents relating to our technologies, methods and products as we deem appropriate.

We have strategic positioning with respect to our key technologies including patent portfolios directed to: our switch technology covering aspects of our gene switches, such as our RheoSwitch Therapeutic System, and gene modulation systems, vectors, cells and organisms containing these switches, and their use; our activator ligand technology covering aspects of our activator ligands and their use; and our cell identification and selection technology covering aspects of our cell identification and selection platform, including our cell purification, isolation, characterization and manipulation technologies. We have also filed counterpart patents and patent applications in other jurisdictions, including Australia, Argentina, Brazil, Canada, China, Europe, Hong Kong, India, Indonesia, Israel, Japan, Korea, Mexico, New Zealand, Philippines, Russia, Singapore, South Africa and Taiwan. In the future we may file in these or additional jurisdictions as deemed appropriate for the protection of our technologies.

The enforceability of patents, as well as the actual patent term and expiration thereof, involves complex legal and factual questions and, therefore, the extent of enforceability cannot be guaranteed. Issued patents and patents issuing from pending applications may be challenged, invalidated or circumvented. Moreover, the United States Leahy-Smith America Invents Act, enacted in September 2011, brought significant changes to the U.S. patent system, which include a change to a "first to file" system from a "first to invent" system and changes to the procedures for challenging issued patents and disputing patent applications during the examination process, among other things. These changes could increase the costs and uncertainties surrounding the prosecution of our patent applications and the enforcement or defense of our patent rights. Additional uncertainty may result from legal precedent handed down by the United States Court of Appeals for the Federal Circuit and United States Supreme Court as they determine legal issues concerning the scope and construction of patent claims and inconsistent interpretation of patent laws by the lower courts. Accordingly, we cannot ensure that any of our pending patent applications will result in issued patents, or even if issued, predict the breadth of the claims upheld in our and other companies' patents. Given that the degree of future protection for our proprietary rights is uncertain, we cannot ensure that we were the first

to invent the inventions covered by our pending patent applications, we were the first to file patent applications for these inventions, the patents we have obtained, particularly certain patents claiming nucleic acids, proteins, or methods, are valid and enforceable, and the proprietary technologies we develop will be patentable.

In addition, unauthorized parties may attempt to copy or otherwise obtain and use our products or technology. Monitoring unauthorized use of our intellectual property is difficult, and we cannot be certain that the steps we have taken will prevent unauthorized use of our technologies, particularly in certain foreign countries where the local laws may not protect our proprietary rights as fully as in the United States. Moreover, third parties could practice our inventions in territories where we do not have patent protection. Such third parties may then try to import into the United States or other territories products, or information leading to potentially competing products, made using our inventions in countries where we do not have patent protection for those inventions. If competitors are able to use our technologies, our ability to compete effectively could be harmed. Moreover, others may independently develop and obtain patents for technologies that are similar to or superior to our technologies. If that happens, we may need to license these technologies, and we may not be able to obtain licenses on reasonable terms, if at all, which could harm our business.

We also rely on trade secrets to protect our technologies, especially in cases when we believe patent protection is not appropriate or obtainable. However, trade secrets are difficult to protect. While we require our employees, academic collaborators, collaborators, consultants and other contractors to enter into confidentiality agreements, we may not be able to adequately protect our trade secrets or other proprietary or licensed information. If we cannot maintain the confidentiality of our proprietary and licensed technologies and other confidential information, our ability and that of our licensor to receive patent protection and our ability to protect valuable information owned or licensed by us may be imperiled. Enforcing a claim that a third-party entity illegally obtained and is using any of our trade secrets is expensive and time consuming, and the outcome is unpredictable. Moreover, our competitors may independently develop equivalent knowledge, methods and know-how.

Litigation or other proceedings or third-party claims of intellectual property infringement could require us to spend significant time and money and could prevent us from commercializing our technologies or impact our stock price.

Our commercial success also depends in part on not infringing patents and proprietary rights of third parties, and not breaching any licenses or other agreements that we have entered into with regard to our technologies, products and business. We cannot ensure that patents have not been issued to third parties that could block our or our collaborators' ability to obtain patents or to operate as we would like. There may be patents in some countries that, if valid, may block our ability to make, use or sell our products in those countries, or import our products into those countries, if we are unsuccessful in circumventing or acquiring the rights to these patents. There also may be claims in patent applications filed in some countries that, if granted and valid, also may block our ability to commercialize products or processes in these countries if we are unable to circumvent or license them.

The biotechnology industry is characterized by frequent and extensive litigation regarding patents and other intellectual property rights. Many companies have employed intellectual property litigation as a way to gain a competitive advantage. Our involvement in litigation, interferences, opposition proceedings or other intellectual property proceedings inside and outside of the United States, to defend our intellectual property rights or as a result of alleged infringement of the rights of others, may divert management time from focusing on business operations and could cause us to spend significant amounts of money. Some of our competitors may have significantly greater resources and, therefore, they are likely to be better able to sustain the cost of complex patent or intellectual property litigation than we could. The uncertainties associated with litigation could have a material adverse effect on our ability to raise the funds necessary to continue our business or to enter into additional collaborations with others. Furthermore, any potential intellectual property litigation also could force us or our collaborators to do one or more of the following:

- stop selling, incorporating or using products that use the intellectual property at issue;
- obtain from the third party asserting its intellectual property rights a license to sell or use the relevant technology, which license may not be available on reasonable terms, if at all; or
- redesign those products or processes that use any allegedly infringing technology, or relocate the operations relating to the allegedly infringing technology to another jurisdiction, which may result in significant cost or delay to us, or which could be technically infeasible.

The patent landscape in the field of synthetic biology is particularly complex. We are aware of U.S. and foreign patents and pending patent applications of third parties that cover various aspects of synthetic biology including patents that some may

view as covering aspects of our technologies. In addition, there may be patents and patent applications in the field of which we are not aware. In many cases, the technologies we develop are early-stage technologies and we and our collaborators are just beginning the process of designing and developing products using these technologies. Although we will seek to avoid pursuing the development of products that may infringe any patent claims that we believe to be valid and enforceable, we and our collaborators may fail to do so. Moreover, given the breadth and number of claims in patents and pending patent applications in the field of synthetic biology and the complexities and uncertainties associated with them, third parties may allege that we or our collaborators are infringing upon patent claims even if we do not believe such claims to be valid and enforceable.

Except for claims we believe will not be material to our financial results, no third party has asserted a claim of infringement against us. Others may hold proprietary rights that could prevent products using our technologies from being marketed. Any patent-related legal action against persons who license our technologies, our collaborators or us claiming damages and seeking to enjoin commercial activities relating to products using our technologies or our processes could subject us to potential liability for damages and require our licensor or us to obtain a license to continue to manufacture or market such products or any future product candidates that use our technologies. We cannot predict whether we or our licensor would prevail in any such actions or that any license required under any of these patents would be made available on commercially acceptable terms, if at all. In addition, we cannot be sure that any such products or any future product candidates or processes could be redesigned to avoid infringement, if necessary. Accordingly, an adverse determination in a judicial or administrative proceeding, or the failure to obtain necessary licenses, could prevent our collaborators from developing and commercializing products using our technologies, which could harm our business, financial condition and operating results.

If any of our competitors have filed patent applications or obtained patents that claim inventions also claimed by us, we may have to participate in interference proceedings declared by the United States Patent and Trademark Office, or the USPTO, to determine priority of invention and, thus, the right to the patents for these inventions in the United States. These proceedings could result in substantial cost to us even if the outcome is favorable. Even if successful, an interference may result in loss of certain of our important claims.

Any litigation or proceedings could divert our management's time and efforts. Even unsuccessful claims could result in significant legal fees and other expenses, diversion of management time, and disruption in our business. Uncertainties resulting from initiation and continuation of any patent or related litigation could harm our ability to compete.

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

The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent process. Given the size of our intellectual property portfolio, compliance with these provisions involves significant time and expense. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case.

If we do not obtain additional protection under the Hatch-Waxman Amendments and similar foreign legislation by extending the patent terms and obtaining data exclusivity for our technologies, our business may be materially harmed.

Depending upon the timing, duration and specifics of FDA marketing approval of products using our technologies, one or more of the U.S. patents we own or license may be eligible for limited patent term restoration under the Drug Price Competition and Patent Term Restoration Act of 1984, referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, we may not be granted an extension because of, for example, failing to apply within applicable deadlines, failing to apply prior to expiration of relevant patents or otherwise failing to satisfy applicable requirements. Moreover, the applicable time period or the scope of patent protection afforded could be less than we request. If we are unable to obtain patent term extension or restoration or the term of any such extension is less than we request, our competitors may obtain approval of competing products following our patent expiration, and our ability to generate revenues could be materially adversely affected.

Enforcing our intellectual property rights may be difficult and unpredictable.

If we were to initiate legal proceedings against a third party to enforce a patent claiming one of our technologies, the defendant could counterclaim that our patent is invalid and/or unenforceable or assert that the patent does not cover its manufacturing processes, manufacturing components or products. Proving patent infringement may be difficult, especially where it is possible

to manufacture a product by multiple processes. Furthermore, in patent litigation in the United States, defendant counterclaims alleging both invalidity and unenforceability are commonplace. Although we believe that we have conducted our patent prosecution in accordance with the duty of candor and in good faith, the outcome following legal assertions of invalidity and unenforceability during patent litigation is unpredictable. With respect to the validity of our patent rights, we cannot be certain, for example, that there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, we would not be able to exclude others from practicing the inventions claimed therein. Such a loss of patent protection could have a material adverse impact on our business. Even if our patent rights are found to be valid and enforceable, patent claims that survive litigation may not cover commercially valuable products or prevent competitors from importing or marketing products similar to our own, or using manufacturing processes or manufacturing components similar to those used to produce the products using our technologies.

Although we believe we have obtained assignments of patent rights from all inventors, if an inventor did not adequately assign their patent rights to us, a third party could obtain a license to the patent from such inventor. This could preclude us from enforcing the patent against such third party.

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

The laws of some foreign countries do not protect intellectual property rights to the same extent as the laws of the United States. Many companies have encountered significant problems in protecting and defending intellectual property rights in certain foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to synthetic biology. This could make it difficult for us to stop the infringement of our patents or misappropriation of our other intellectual property rights. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate.

If our technologies or products using our technologies are stolen, misappropriated or reverse engineered, others could use the technologies to produce competing technologies or products.

Third parties, including our collaborators, contract manufacturers, contractors and others involved in our business often have access to our technologies. If our technologies, or products using our technologies, were stolen, misappropriated or reverse engineered, they could be used by other parties that may be able to reproduce our technologies or products using our technologies for their own commercial gain. If this were to occur, it would be difficult for us to challenge this type of use, especially in countries with limited intellectual property protection.

Confidentiality agreements with employees and others may not adequately prevent disclosures of trade secrets and other proprietary information.

We have taken measures to protect our trade secrets and proprietary information, but these measures may not be effective. We require our new employees and consultants to execute confidentiality agreements upon the commencement of an employment or consulting arrangement with us. These agreements generally require that all confidential information developed by the individual or made known to the individual by us during the course of the individual's relationship with us be kept confidential and not disclosed to third parties. These agreements also generally provide that inventions conceived by the individual in the course of rendering services to us shall be our exclusive property. Nevertheless, our proprietary information may be disclosed, third parties could reverse engineer our technologies or products using our technologies and others may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets. Costly and time-consuming litigation could be necessary to enforce and determine the scope of our proprietary rights, and failure to obtain or maintain trade secret protection could adversely affect our competitive business position.

Risks related to our common stock

We do not anticipate paying cash dividends, and accordingly, shareholders should rely on stock appreciation for return on their investment.

We have never declared or paid cash dividends on our capital stock. We do not anticipate paying cash dividends in the future and intend to retain all of our future earnings, if any, to finance the operations, development and growth of our business. As a result, appreciation of the price of our common stock, which may never occur, will provide a return to shareholders. Investors seeking cash dividends should not invest in our common stock. We have on two occasions distributed equity securities to our shareholders as a special stock dividend: 17,830,305 shares of ZIOPHARM common stock were distributed in June 2015 and

1,776,557 shares of AquaBounty common stock were distributed in January 2017. However, it is possible that we may never declare a special dividend again and shareholders should not rely upon potential future special dividends as a source of return on their investment.

Our stock price is volatile and purchasers of our common stock could incur substantial losses.

Our stock price has been, and is likely to continue to be, volatile. The market price of our common stock could fluctuate significantly for many reasons, including in response to the risks described in this "Risk Factors" section, or for reasons unrelated to our operations, such as reports by industry analysts, investor perceptions or negative announcements by our collaborators regarding their own performance, as well as industry conditions and general financial, economic and political instability. From January 1, 2016 through February 15, 2018, our common stock has traded as high as $40.24 per share and as low as $10.26 per share. The stock market in general as well as the market for biopharmaceutical companies in particular has experienced extreme volatility that has often been unrelated to the operating performance of particular companies. The market price of our common stock may be influenced by many factors, including, among others:

- announcements of acquisitions, collaborations, financings or other transactions by us;
- public concern as to the safety of our products;
- termination or delay of a development program;
- the recruitment or departure of key personnel; and
- the other factors described in this "Risk Factors" section.

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

The trading market for our shares of common stock depends, in part, on the research and reports that securities or industry analysts publish about us or our business. We do not have any control over these analysts. If securities or industry analysts do not continue to cover us, the trading price for our shares of common stock may be negatively impacted. If one or more of the analysts who covers us downgrades our shares of common stock, changes their opinion of our shares or publishes inaccurate or unfavorable research about our business, our share price would likely decline. If one or more of these analysts ceases coverage of us or fails to publish reports on us regularly, demand for our shares of common stock could decrease and we could lose visibility in the financial markets, which could cause our share price and trading volume to decline.

If our executive officers and directors choose to act together, they may be able to control our management and operations, acting in their own best interests and not necessarily those of other shareholders.

As of December 31, 2017, our executive officers and directors owned approximately 51 percent of our voting common stock, including shares subject to outstanding options and warrants. As a result, these shareholders, acting together, would be able to significantly influence all matters requiring approval by our shareholders, including the election of directors and the approval of mergers or other business combination transactions, as well as our management and affairs. The interests of this group of shareholders may not always coincide with the interests of other shareholders, and they may act in a manner that advances their best interests and not necessarily those of other shareholders. This concentration of ownership control may:

- delay, defer or prevent a change in control;
- entrench our management and/or the board of directors; or
- impede a merger, consolidation, takeover or other business combination involving us that other shareholders may desire.

We have engaged in transactions with companies in which Randal J. Kirk, our Chief Executive Officer, and his affiliates have an interest.

We have engaged in a variety of transactions, including ECCs, with companies in which Mr. Kirk and affiliates of Mr. Kirk have a direct or indirect interest. See Notes 5, 14, 18 and 22 to our consolidated financial statements appearing elsewhere in this Annual Report for a discussion of such transactions. For example, we are party to a services agreement with Third Security,

or Services Agreement with Third Security, for which Third Security provides certain services to us in return for a monthly fee of shares of our common stock. Mr. Kirk serves as the Senior Managing Director and Chief Executive Officer of Third Security and owns 100 percent of the equity interests of Third Security. We believe that each of these transactions was on terms no less favorable to us than terms we could have obtained from unaffiliated third parties, and each of these transactions was approved by at least a majority of the disinterested members of the audit committee of our board of directors. In addition, subsequent to our consummation of the ECCs with certain related parties, Mr. Kirk and his affiliates invested in these companies. Furthermore, as we execute on these ECCs or JVs going forward, a conflict may arise between our interests and those of Mr. Kirk and his affiliates.

As of December 31, 2017, Randal J. Kirk controlled approximately 47 percent of our common stock and is able to control or significantly influence corporate actions, which may result in Mr. Kirk taking actions contrary to the desires of our other shareholders.

We have historically been controlled, managed and principally funded by Randal J. Kirk, our Chairman and Chief Executive Officer, and affiliates of Mr. Kirk, including Third Security. As of December 31, 2017, Mr. Kirk and shareholders affiliated with him beneficially owned approximately 47 percent of our voting stock, including 1,207,980 shares of our common stock purchased by an affiliate of Mr. Kirk in a private placement which closed in December 2017. Affiliates of Mr. Kirk purchased 1,000,000 shares of our common stock as part of our public offering which closed in January 2018. In addition, pursuant to a Preferred Stock Equity Facility, or Preferred Stock Facility, we may, from time to time at our sole and exclusive option, issue and sell to an affiliate of Mr. Kirk up to 1,000,000 shares of our Series A Preferred Stock, which will be convertible into shares of our common stock upon the approval of our shareholders, subject to regulatory approval, at a conversion rate based on future market prices. Mr. Kirk is able to control or significantly influence all matters requiring approval by our shareholders, including the election of directors and the approval of mergers or other business combination transactions. The interests of Mr. Kirk may not always coincide with the interests of other shareholders, and he may take actions that advance his personal interests and are contrary to the desires of our other shareholders.

In connection with the Preferred Stock Facility, we have filed an amendment to our articles of incorporation to set the designations of our new Series A Preferred Stock with terms that are preferential to those of our common stock.

Our articles of incorporation authorize us to issue, without the approval of our shareholders, one or more classes or series of preferred stock having such designations, preferences, limitations and relative rights, including preferences over our common stock respecting dividends and distributions, as our board of directors may determine. In connection with our Preferred Stock Facility, we filed an amendment to our articles of incorporation to set the designations of our Series A Preferred Stock, which, if and when issued, will have certain preferences over our common stock, including accrued dividends of 8 percent per annum and, subject to limited exceptions, seniority to our common stock with respect to the rights to the payment of dividends and on parity with our common stock with respect to the distribution of assets in the event of a liquidation, dissolution, or winding up or change of control of the Company.

After December 31, 2020, the holder of the Series A Preferred Stock, if and when issued, may require us to redeem any or all of the outstanding Series A Preferred Stock.

If we are unable to obtain the approval of our shareholders to convert any outstanding shares of Series A Preferred Stock prior to December 31, 2020, the holder of the Series A Preferred Stock may require us to redeem any or all of the outstanding shares of Series A Preferred Stock at the issue price of $100 per share plus any accumulated but unpaid dividends thereon to, but not including, the redemption date, subject to adjustments. Any such redemption of our Series A Preferred Stock in cash would reduce the cash that we have available to invest in our business. In the event that we have issued Series A Preferred Stock and redemption is required, there can be no assurance that we will have enough cash at such time to redeem the outstanding shares.

A significant portion of our total outstanding shares of common stock is restricted from immediate resale but may be sold into the market in the near future. This could cause the market price of our common stock to drop significantly, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares of common stock intend to sell shares, could reduce the market price of our common stock. If Mr. Kirk or any of his affiliates were to sell a substantial portion of the shares they hold, it could cause our stock price to decline.

In addition, as of December 31, 2017, there were 11,382,747 shares subject to outstanding options that will become eligible for sale in the public market to the extent permitted by any applicable vesting requirements, lock-up agreements and Rules 144 and

701 under the Securities Act of 1933, as amended. Shares issuable upon the exercise of such options can be freely sold in the public market upon issuance and once vested. Additionally, we have 4,747,496 of shares available for grant under the 2013 Omnibus Incentive Plan.

We are subject to anti-takeover provisions in our articles of incorporation and bylaws and under Virginia law that could delay or prevent an acquisition of our Company, even if the acquisition would be beneficial to our shareholders.

Certain provisions of Virginia law, the commonwealth in which we are incorporated, and our articles of incorporation and bylaws could hamper a third party's acquisition of us, or discourage a third party from attempting to acquire control of us. These provisions include:

- a provision allowing our board of directors to issue preferred stock with rights senior to those of the common stock without any vote or action by the holders of our common stock. The issuance of preferred stock could adversely affect the rights and powers, including voting rights, of the holders of common stock;
- establish advance notice requirements for nominations for election to the board of directors or for proposing matters that can be acted on at shareholder meetings;
- the inability of shareholders to convene a shareholders' meeting without the support of shareholders owning together 25 percent of our common stock;
- the application of Virginia law prohibiting us from entering into a business combination with the beneficial owner of 10 percent or more of our outstanding voting stock for a period of three years after the 10 percent or greater owner first reached that level of stock ownership, unless we meet certain criteria;
- allow the authorized number of our directors to be changed only by resolution of our board of directors;
- limit the manner in which shareholders can remove directors from the board;
- require that shareholder actions must be effected at a duly called shareholder meeting and prohibit actions by our shareholders by written consent; and
- limit who may call a special meeting of shareholders.

These provisions also could limit the price that certain investors might be willing to pay in the future for shares of our common stock. In addition, these provisions make it more difficult for our shareholders, should they choose to do so, to remove our board of directors or management.

If we fail to maintain an effective system of internal control over financial reporting, we may not be able to accurately report our financial results or prevent fraud. As a result, shareholders could lose confidence in our financial and other public reporting, which would harm our business and the trading price of our common stock.

Effective internal controls over financial reporting are necessary for us to provide reliable financial reports and, together with adequate disclosure controls and procedures, are designed to prevent fraud. Any failure to implement required new or improved controls, or difficulties encountered in their implementation could cause us to fail to meet our reporting obligations. In addition, any testing by us conducted in connection with Section 404 of the Sarbanes-Oxley Act, or any subsequent testing by our independent registered public accounting firm, may reveal deficiencies in our internal controls over financial reporting that are deemed to be material weaknesses or that may require prospective or retroactive changes to our financial statements or identify other areas for further attention or improvement. Inferior internal controls could also cause investors to lose confidence in our reported financial information, which could have a negative effect on the trading price of our common stock.

Item 1B. Unresolved Staff Comments

Not applicable.

Item 2. Properties

We establish the geographic locations of our research and development operations based on proximity to the relevant market expertise and access to available talent pools. The following table shows information about our primary lab operations as of December 31, 2017:

Location	Square Footage
Germantown, Maryland	56,258
South San Francisco, California	55,609
Davis, California	32,867
San Diego, California	23,409
Budapest, Hungary	18,367
Ghent, Belgium	14,198
Campinas, Brazil	12,530
Oxford, England	10,000

Our primary domestic production facilities are located in Sioux Center, Iowa, and include approximately 274,000 square feet of production and office facilities and approximately 380 acres of land. The land and production facilities are primarily used for embryo transfer and in vitro fertilization processes, as well as housing livestock used in such processes. We also lease or own regional production facilities and land in California, Maryland, Missouri, New York, Oklahoma, South Dakota, Texas, and Washington for these purposes. Additionally, we have commenced initial scale up of commercial production of our non-browning apples in Washington, our AAS salmon in Canada, and our GE mosquitoes in Piracicaba, Brazil, in anticipation of generating future revenues from each of these product lines.

We lease an additional 40,000 square feet of administrative offices in South San Francisco, California; West Palm Beach, Florida; Germantown, Maryland; and Blacksburg, Virginia. The terms of our leases range from one to ten years. See also "Management's Discussion and Analysis of Financial Condition and Results of Operations — Contractual Obligations and Commitments."

Item 3. Legal Proceedings

We are involved in litigation or legal matters incidental to our business activities. While the outcome of these matters cannot be predicted with certainty, we do not currently expect that any of these matters will have a material adverse effect on our business or financial position. However, should one or more of these matters be resolved in a manner adverse to our current expectation, the effect on our results of operations for a particular fiscal reporting period could be material.

In May 2016, two putative shareholder class action lawsuits, captioned *Hoffman v. Intrexon Corporation et al.* and *Gibrall v. Intrexon Corporation et al.*, were filed in the U.S. District Court for the Northern District of California on behalf of purchasers of our common stock between May 12, 2015 and April 20, 2016, or the Class Period. In July 2016, the court consolidated the lawsuits and appointed a lead plaintiff. The consolidated amended complaint names as defendants us and certain of our current and former officers, or the Defendants. It alleges, among other things, that the Defendants made materially false and/or misleading statements during the Class Period with respect to our business, operations, and prospects in violation of Sections 10(b) and 20(a) of the Securities Exchange Act of 1934, as amended, or Exchange Act. The plaintiffs' claims are based in part upon allegations in a report published in April 2016 on the Seeking Alpha financial blog. The plaintiffs seek compensatory damages, interest and an award of reasonable attorneys' fees and costs. The Defendants moved to dismiss the case. On February 24, 2017, the court granted the Defendants' motion to dismiss the lawsuit on the grounds that the plaintiff failed to state a claim, while granting the plaintiff leave to amend. The plaintiff subsequently notified the court that it would seek to appeal the court's ruling rather than amend its complaint. On April 26, 2017, the court entered final judgment in the case. Notice of appeal was filed by the plaintiff on May 26, 2017. On October 26, 2017, the plaintiff filed a voluntary motion to dismiss the case, which the court of appeals granted on November 1, 2017.

In July 2016, a putative shareholder derivative action captioned *Basile v. Kirk et al.* was filed in the Circuit Court of Fairfax County, Virginia, against certain of our directors, our CEO, and Third Security, and naming us as a nominal defendant. The complaint alleges causes of action for breaches of fiduciary duty and unjust enrichment relating to the entry by us into the Services Agreement with Third Security. The plaintiff seeks, among other things, damages in an unspecified amount, disgorgement of improper benefits, appropriate equitable relief, and an award of attorney fees and other costs and expenses.

The complaint is substantially similar to two separate demands made by shareholders concerning the Services Agreement and Mr. Kirk's compensation. Our board of directors appointed a Special Litigation Committee, or the SLC, consisting of independent directors to investigate the claims and allegations made in the derivative action and in the two shareholder demands and to decide on our behalf whether the claims and allegations should be pursued. The *Basile* case was stayed pending the report of the SLC. In November 2016, the SLC completed its review and evaluation and unanimously determined that the claims were without merit because the compensation arrangements were the result of an informed and disinterested decision-making process and were fair to the Company, and that prosecution of the asserted claims was not in our or our shareholders' best interest. Based upon the determination of the SLC, on February 24, 2017 we moved to dismiss the court action pursuant to Virginia statute. On June 8, 2017, the court granted our motion to dismiss while granting the plaintiff leave to amend. On August 30, 2017, the plaintiff filed a consent motion for leave to amend along with the amended shareholder derivative complaint. We moved to dismiss the amended complaint on October 6, 2017. On January 25, 2018, the court granted our motion and dismissed the plaintiff's amended complaint with prejudice.

In addition to the shareholder demands described above, in June and July 2016, two shareholders made separate demands under Virginia law demanding that we file suit against certain of our current officers and directors for alleged breaches of fiduciary duty and other claims. The demands were based upon and asserted the allegations previously published in April 2016 in the Seeking Alpha financial blog. In July 2016, our board of directors authorized the SLC to expand its review to include all such allegations. In February 2017, the SLC completed its review and evaluation and unanimously determined that there was no basis for any of the allegations, that our officers and directors did not breach their fiduciary duties or any other applicable law, and that prosecution of the asserted claims was not in our or our shareholders' best interest. Following the SLC's determination, in March 2017, one of the putative shareholders filed a derivative complaint captioned *Luger v. Kirk et al.* in the Circuit Court of Fairfax County, Virginia. We are a nominal defendant in this action, and other defendants include certain of our directors, our CEO, and Third Security. The complaint alleges causes of action for breaches of fiduciary duty and unjust enrichment relating to our entry into the Services Agreement with Third Security, our CEO's compensation, and certain allegations contained in the April 2016 Seeking Alpha financial blog piece. Based on the determination of the SLC and a review of applicable law, we intend to defend the lawsuit vigorously; however, there can be no assurance regarding the ultimate outcome of this case.

The Division of Enforcement of the SEC is conducting an investigation which we believe concerns certain issues raised by the foregoing matters. We have met with the SEC staff and are voluntarily cooperating with their investigation. Our board of directors has authorized the SLC to monitor our interaction with the SEC staff.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Market Information and Holders of Record

Our common stock trades on the New York Stock Exchange (NYSE) under the symbol "XON". The following table sets forth for the periods indicated the high and low sales prices per share of our common stock as reported on the NYSE:

	High	Low
Year Ended December 31, 2017		
Fourth Quarter	$ 20.49	$ 10.26
Third Quarter	25.30	17.04
Second Quarter	26.99	18.41
First Quarter	26.95	18.55
Year Ended December 31, 2016		
Fourth Quarter	$ 32.90	$ 24.01
Third Quarter	30.56	22.88
Second Quarter	38.60	22.81
First Quarter	40.24	18.52

As of February 15, 2018, we had 283 holders of record of our common stock. The actual number of shareholders is greater than this number of record holders and includes shareholders who are beneficial owners but whose shares are held in street name by brokers and other nominees. This number of holders of record also does not include shareholders whose shares may be held in trust by other entities.

Dividends

We have never declared or paid any cash dividends on our capital stock. We currently intend to retain earnings, if any, to finance the growth and development of our business. We do not expect to pay any cash dividends on our common stock in the foreseeable future. We have on two occasions distributed equity securities of other companies we owned to our shareholders as a special stock dividend: 17,830,305 shares of ZIOPHARM common stock were distributed in June 2015 and 1,776,557 shares of AquaBounty common stock were distributed in January 2017. Payment of future dividends, if any, will be at the discretion of our board of directors and will depend on our financial condition, results of operations, capital requirements, restrictions contained in current or future financing instruments, provisions of applicable law and other factors that our board of directors deems relevant.

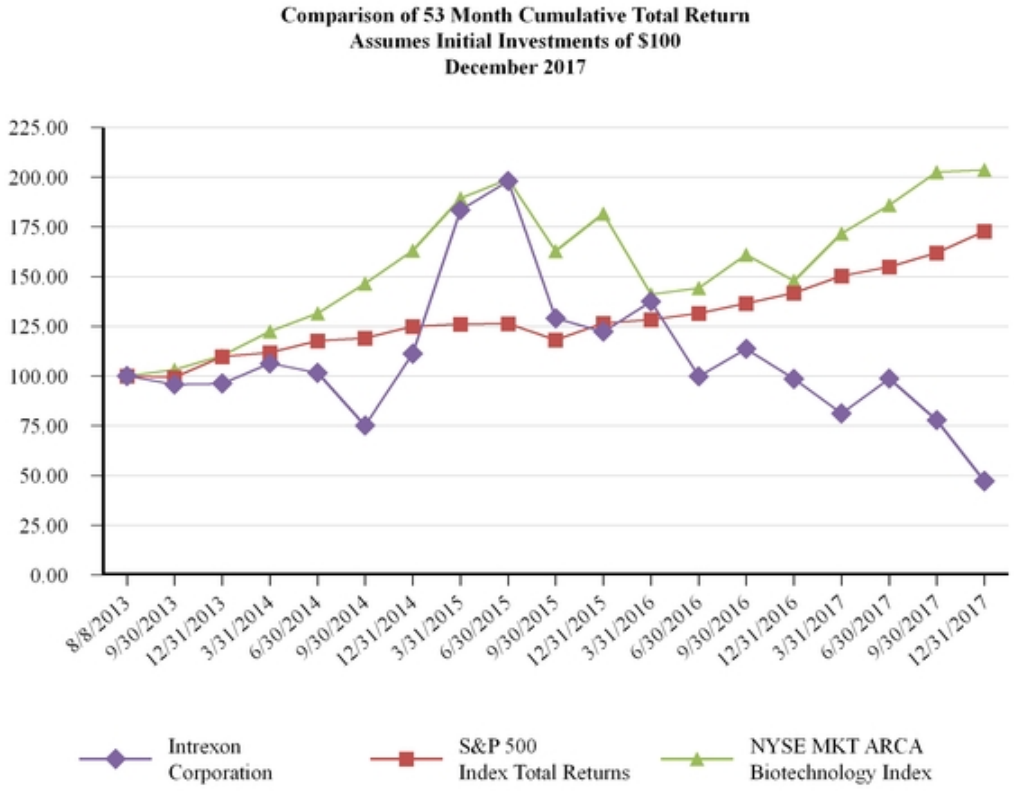
Securities Authorized for Issuance Under Equity Compensation Plans

Information about our equity compensation plans is incorporated herein by reference to Item 12 of Part III of this Annual Report.

Stock Performance Graph

This performance graph shall not be deemed "soliciting material" or to be "filed" with the SEC for purposes of Section 18 of the Exchange Act, or otherwise subject to the liabilities under that Section, and shall not be deemed to be incorporated by reference into any filing of Intrexon Corporation under the Securities Act of 1933, as amended, or the Exchange Act.

The following graph shows a comparison from August 8, 2013 (the date our common stock commenced trading on the NYSE) through December 31, 2017 of the cumulative total return for our common stock, the Standard & Poor's 500 Stock Index (S&P 500 Index) and the NYSE MKT ARCA Biotechnology Index. The graph assumes that $100 was invested at the market close on August 8, 2013 in the common stock of Intrexon Corporation, the S&P 500 Index and the NYSE MKT ARCA Biotechnology Index and data for the S&P 500 Index and the NYSE MKT ARCA Biotechnology Index assumes reinvestments of dividends. The stock price performance of the following graph is not necessarily indicative of future stock price performance.



Company / Index	Base Period 8/8/2013	9/30/2013	12/31/2013	3/31/2014	6/30/2014	9/30/2014	12/31/2014
Intrexon Corporation	**$ 100.00**	$ 95.79	$ 96.24	$ 106.31	$ 101.62	$ 75.13	$ 111.32
S&P 500 Index	**100.00**	99.38	109.82	111.81	117.66	118.99	124.86
NYSE MKT ARCA Biotechnology Index	**100.00**	103.12	110.29	122.45	131.51	146.60	163.14

Company / Index	3/31/2015	6/30/2015	9/30/2015	12/31/2015	3/31/2016	6/30/2016	9/30/2016	12/31/2016
Intrexon Corporation	$ 183.46	$ 198.01	$ 129.03	$ 122.34	$ 137.51	$ 99.86	$ 113.69	$ 98.60
S&P 500 Index	126.04	126.39	118.26	126.59	128.29	131.44	136.50	141.72
NYSE MKT ARCA Biotechnology Index	189.33	198.84	162.87	181.72	141.07	144.32	160.93	147.87

Company / Index	3/31/2017	6/30/2017	9/30/2017	12/31/2017
Intrexon Corporation	$ 81.24	$ 98.74	$ 77.92	$ 47.22
S&P 500 Index	150.33	154.98	161.93	172.68
NYSE MKT ARCA Biotechnology Index	171.56	185.84	202.52	203.59

Recent Sales of Unregistered Securities and Use of Proceeds from Registered Securities

(a) Sales of Unregistered Securities

From January 1, 2017 through December 31, 2017, we consummated the following transactions involving the issuance of unregistered securities:

- the issuance of 500,650 unregistered shares of our common stock during 2017, as payment under the Services Agreement entered into and effective as of November 1, 2015, as amended, by and between us and Third Security as previously discussed in our Current Reports on Form 8-K filed on October 30, 2015; November 3, 2016; and December 30, 2016;

- the issuance of 221,743 unregistered shares of our common stock in March 2017 in connection with our purchase of the remaining 49% of outstanding equity of Biological & Popular Culture, Inc. as previously disclosed in our Quarterly Reports on Form 10-Q filed on May 10, 2017, August 9, 2017, and November 9, 2017;

- the issuance of 480,422 unregistered shares of our common stock in March 2017, as payment of deferred consideration in connection with our acquisition of Oxitec as previously discussed in our Current Reports on Form 8-K filed on August 12, 2015 and September 8, 2015;

- the issuance of 2,049 unregistered shares of our common stock at a weighted average issuance price of $21.94 per share in May and June 2017 as payment under a consulting agreement between us and Hyphen Fund Management LLC; and

- the issuance of 1,207,980 unregistered shares of our common stock on December 29, 2017 to the R.J. Kirk Declaration of Trust, an entity affiliated with Mr. Kirk, at a price per share of $11.33 for an aggregate purchase price of $13.7 million, as previously discussed in our Current Report on Form 8-K filed on January 2, 2018.

Other than with respect to the shares issued in connection with our acquisition of Oxitec, which were issued in reliance on exemptions from registration under Rule 506(b) of Regulation D and/ or Regulation S under the Securities Act, we issued the above referenced shares of common stock in reliance on exemptions from registration under Section 4(a)(2) of the Securities Act.

(b) Use of Proceeds

None.

(c) Issuer Purchases of Equity Securities

None.

Item 6. Selected Financial Data

The following tables set forth our selected consolidated financial data for the periods and as of the dates indicated. You should read the following selected consolidated financial data in conjunction with our audited consolidated financial statements and the related notes thereto included elsewhere in this Annual Report and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section of this Annual Report.

The selected consolidated financial data set forth below as of December 31, 2017 and 2016, and for the years ended December 31, 2017, 2016 and 2015, are derived from our audited consolidated financial statements included elsewhere in this Annual Report. The selected consolidated financial data set forth below as of December 31, 2015, 2014, and 2013, and for the years ended December 31, 2014 and 2013, are derived from our audited consolidated financial statements contained in reports previously filed with the SEC, not included herein. Our audited and unaudited consolidated financial statements have been prepared in U.S. dollars in accordance with generally accepted accounting principles in the United States, or U.S. GAAP.

Our historical results for any prior period are not necessarily indicative of results to be expected in any future period, and our results for any interim period are not necessarily indicative of results to be expected for a full fiscal year.

	Year Ended December 31,				
	2017(2)(5)	2016	2015(3)	2014(4)	2013(5)
	(In thousands, except share and per share amounts)				
Statement of Operations Data:					
Collaboration and licensing revenues	$ 145,579	$ 109,871	$ 87,821	$ 45,212	$ 23,525
Product revenues	33,589	36,958	41,879	11,481	164
Service revenues	50,611	43,049	42,923	14,761	—
Total revenues	230,981	190,926	173,605	71,930	23,760
Total operating expenses	368,871	316,092	320,469	141,892	81,783
Operating loss	(137,890)	(125,166)	(146,864)	(69,962)	(58,023)
Net loss	(126,820)	(190,274)	(87,994)	(85,616)	(40,908)
Net loss attributable to noncontrolling interests	9,802	3,662	3,501	3,794	1,928
Net loss attributable to Intrexon	(117,018)	(186,612)	(84,493)	(81,822)	(38,980)
Accretion of dividends on redeemable convertible preferred stock	—	—	—	—	(18,391)
Net loss attributable to common shareholders	(117,018)	(186,612)	(84,493)	(81,822)	(57,371)
Net loss attributable to common shareholders per share, basic and diluted	$ (0.98)	$ (1.58)	$ (0.76)	$ (0.83)	$ (1.40)
Weighted average shares outstanding, basic and diluted	119,998,826	117,983,836	111,066,352	99,170,653	40,951,952

	December 31,				
	2017(2)(5)	2016	2015(3)	2014(4)	2013(5)
	(In thousands)				
Balance Sheet Data:					
Cash and cash equivalents	$ 68,111	$ 62,607	$ 135,782	$ 27,466	$ 49,509
Short-term and long-term investments	6,273	180,595	207,975	115,608	188,561
Equity securities, current and non-current	15,100	23,522	83,653	164,889	141,525
Investments in preferred stock	161,225	129,545	—	—	—
Total assets	846,851	949,068	982,046	576,272	469,472
Deferred revenue, current and non-current	236,397	310,142	197,729	113,209	73,571
Other liabilities(1)	63,909	69,678	79,431	53,774	14,558
Total Intrexon shareholders' equity	533,631	560,237	694,078	384,761	366,722
Noncontrolling interests	12,914	9,011	10,808	24,528	14,621
Total equity	546,545	569,248	704,886	409,289	381,343

(1) Other liabilities include $8,037, $7,948, $8,528, $10,369, and $1,653 of long term debt as of December 31, 2017, 2016, 2015, 2014, and 2013, respectively; and $8,801, $15,629, and $20,485 of deferred consideration as of December 31, 2016, 2015, and 2014, respectively.

(2) In 2017, we acquired GenVec, Inc., or GenVec, and began including the results of its operations effective on the acquisition date.

(3) In 2015, we acquired ActoGeniX NV, or ActoGeniX, Okanagan, and Oxitec and began including the results of their operations effective on the respective acquisition dates.

(4) In 2014, we acquired Medistem, Inc. and Trans Ova and began including the results of their operations effective on the respective acquisition dates.

(5) In 2013, we acquired ownership interests in AquaBounty and Biological & Popular Culture, Inc., or BioPop, which resulted in our gaining control over these entities, resulting in consolidation effective on the respective acquisition dates. We acquired the remaining 49 percent of outstanding equity of BioPop in March 2017.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion and analysis of financial condition and results of operations is provided to enhance the understanding of, and should be read in conjunction with, Part I, Item 1, "Business" and Item 8, "Financial Statements and Supplementary Data." For information on risks and uncertainties related to our business that may make past performance not indicative of future results, or cause actual results to differ materially from any forward-looking statements, see "Special Note Regarding Forward-Looking Statements," and Part I, Item 1A, "Risk Factors."

Financial overview

We have incurred significant losses since our inception. We anticipate that we may continue to incur significant losses for the foreseeable future, and we may never achieve or maintain profitability. Outside of collaboration and license fee payments, which vary over time, we have not generated significant revenues, including revenues or royalties from product sales by us or our collaborators. Certain of our consolidated subsidiaries require regulatory approval and/or commercial scale-up before they may commence significant product sales and operating profits.

We expect our future capital requirements will be substantial, particularly as we continue to develop our business and expand our synthetic biology technology platform. In January 2018, we closed a public offering of 6,900,000 shares of our common stock, including 1,000,000 shares of common stock purchased by affiliates of Third Security, the net proceeds of which were $82.2 million, after deducting underwriting discounts and commissions and estimated offering expenses payable by us. In October 2017, we entered into a Preferred Stock Facility with an affiliate of Third Security, under which we may, at our sole and exclusive option, issue and sell up to $100 million of newly issued Series A Preferred Stock and which expires April 30, 2019. We believe that our existing cash and cash equivalents, short-term investments, cash expected to be received through our current collaborators and for sales of products and services provided by our consolidated subsidiaries, cash received in our January 2018 offering, and any issuances of Series A Preferred Stock under the Preferred Stock Facility will enable us to fund our operating expenses and capital expenditure requirements for at least the next 12 months.

Sources of revenue

Historically, we have derived our collaboration and licensing revenues through agreements with counterparties for the development and commercialization of products enabled by our technologies. Generally, the terms of these collaborations provide that we receive some or all of the following: (i) technology access fees upon signing; (ii) reimbursements of costs incurred by us for our research and development and/or manufacturing efforts related to specific applications provided for in the collaboration; (iii) milestone payments upon the achievement of specified development, regulatory and commercial activities; and (iv) royalties on sales of products arising from the collaboration.

Our technology access fees and milestone payments may be in the form of cash or securities of the collaborator. Our collaborations contain multiple arrangements, and we typically defer revenues from the technology access fees and milestone payments received and recognize such revenues in the future over the anticipated performance period. We are also entitled to sublicensing revenues in those situations where our collaborators choose to license our technologies to other parties. See Note 2 to our consolidated financial statements appearing elsewhere in this Annual Report for additional discussion of our revenue recognition for these collaborations.

From time to time, we and certain collaborators may cancel the agreements, relieving us of any further performance obligations under the agreement. When no further performance obligations are required of us under an agreement, we may recognize any remaining deferred revenue.

We generate product and service revenues primarily through sales of products or services that are created from technologies developed or owned by us. Our primary current offerings include sales of advanced reproductive technologies, including our bovine embryo transfer and in vitro fertilization processes and from genetic preservation and sexed semen processes and applications of such processes to other livestock, as well as sales of livestock and embryos produced using these processes and used in production. Revenue is recognized when (i) persuasive evidence of an arrangement exists, (ii) services have been

rendered or delivery has occurred such that risk of loss has passed to the customer, (iii) the price is fixed or determinable, and (iv) collection from the customer is reasonably assured.

In future periods, our revenues will depend in part on our ability to partner our more mature programs and capabilities, the number of collaborations to which we are party, the advancement and creation of programs within our collaborations and the extent to which our collaborators bring products enabled by our technologies to market. Our revenues will also depend upon our ability to maintain or improve the volume and pricing of our current product and service offerings and to develop and scale up production of new offerings from the various technologies of our subsidiaries. Our future revenues may also include additional revenue streams we may acquire through mergers and acquisitions. In light of our limited operating history and experience, there can be no assurance as to the timing, magnitude and predictability of revenues to which we might be entitled.

Cost of products and services

Cost of products and services includes primarily labor and related costs, drugs and supplies used primarily in the embryo transfer and in vitro fertilization processes, livestock and feed used in production, and facility charges, including rent and depreciation. Fluctuations in the price of livestock and feed have not had a significant impact on our operating margins and no derivative financial instruments are used to mitigate the price risk.

Research and development expenses

We recognize research and development expenses as they are incurred. Our research and development expenses consist primarily of:

- salaries and benefits, including stock-based compensation expense, for personnel in research and development functions;
- fees paid to consultants and contract research organizations who perform research on our behalf and under our direction;
- costs related to laboratory supplies used in our research and development efforts;
- costs related to certain in-licensed technology rights;
- depreciation of leasehold improvements and laboratory equipment;
- amortization of patents and related technologies acquired in mergers and acquisitions; and
- rent and utility costs for our research and development facilities.

We have no individually significant research and development projects and our research and development expenses primarily relate to either the costs incurred to expand or otherwise improve our multiple platform technologies, the costs incurred to develop a specific application of our technologies in support of current or prospective collaborators, or costs incurred to expand or otherwise improve our products and services. Research and development expenses, including costs for preclinical and clinical development, incurred for programs we support pursuant to an ECC agreement are typically reimbursed by the collaborator at cost and all other research and development programs may be terminated or otherwise deferred at our discretion. The amount of our research and development expenses may be impacted by, among other things, the number of ECCs and the number and size of programs we may support on behalf of an ECC.

The table below summarizes our research and development expenses incurred to expand or otherwise improve our multiple platform technologies, the costs incurred to develop a specific application of our technologies in support of current or prospective collaborators and licensees, or costs incurred to expand or otherwise improve our products and services for the years ended December 31, 2017, 2016, and 2015. Other research and development expenses for these periods include indirect salaries and overhead expenses that are not allocated to either expanding or improving our multiple platform technologies, specific applications of our technologies in support of current or prospective collaborators and licensees, or expanding or improving our product and services offerings. Research and development expenses for the year ended December 31, 2015 include a $59.6 million payment in our common stock for an exclusive license to certain technologies owned by MD Anderson to be used in the expansion and improvement of our platform technologies.

	Year Ended December 31,		
	2017	2016	2015
	(In thousands)		
Expansion or improvement of our platform technologies	$ 14,515	$ 12,195	$ 75,779
Specific applications of our technologies in support of current and prospective collaborators and licensees	77,001	62,960	41,306
Expansion or improvement of our product and service offerings	27,134	17,585	10,537
Other	24,557	19,395	19,861
Total research and development expenses	$ 143,207	$ 112,135	$ 147,483

We expect that our research and development expenses will increase as we enter into new collaborations, develop our own proprietary programs, and expand our offerings. We believe these increases will likely include increased costs related to the hiring of additional personnel in research and development functions, increased costs paid to consultants and contract research organizations and increased costs related to laboratory supplies. Research and development expenses may also increase as a result of ongoing research and development operations which we might assume through mergers and acquisitions.

Selling, general and administrative expenses

Selling, general and administrative, or SG&A, expenses consist primarily of salaries and related costs, including stock-based compensation expense, for employees in executive, operational, finance, sales and marketing, information technology, legal and corporate communications functions. Other significant SG&A expenses include rent and utilities, insurance, accounting and legal services and expenses associated with obtaining and maintaining our intellectual property.

We expect that our SG&A expenses will continue to increase to support our expanding operations as we explore new partnering opportunities and continue to develop our proprietary programs. We believe that these increases will likely include costs related to the hiring of additional personnel and increased fees for business development functions, costs associated with defending the Company in litigation matters, the costs of outside consultants and other professional services. SG&A expenses may also increase as a result of ongoing operations which we might assume through mergers and acquisitions.

Other income (expense), net

We hold equity securities and preferred stock received and/or purchased from certain collaborators. Other than investments accounted for using the equity method discussed below, we elected the fair value option to account for our equity securities and preferred stock held in these collaborators. These equity securities and preferred stock are recorded at fair value at each reporting date. Unrealized appreciation (depreciation) resulting from fair value adjustments are reported as other income (expense) in the consolidated statement of operations. As such, we bear the risk that fluctuations in the securities' share prices may significantly impact our results of operations. In June 2015, we recorded a realized gain related to the distribution of all our shares of ZIOPHARM to our shareholders as a special stock dividend.

Interest income consists of interest earned on our cash and cash equivalents and short-term and long-term investments. Dividend income consists of the monthly preferred stock dividends received from our investments in preferred stock.

In June 2015, we entered into an agreement with Harvest Intrexon Enterprise Fund I, LP, or Harvest, an investment fund sponsored by Harvest Capital Strategies, LLC, and a related party based on ownership in the fund by affiliates of Third Security. Harvest was established to invest in life science research and development start-up opportunities that we offered to Harvest with exclusive rights of first-look and first negotiation. In September 2017, the commitment period for Harvest was terminated and, as a result, the agreement with Harvest terminated. The termination of the agreement had no effect on the existing collaborations with Harvest-controlled entities. Through September 2017, as consideration for providing exclusive rights of first-look and first negotiation, we received a portion of the management fee collected by the fund sponsor of Harvest for our obligation to provide Harvest with investment proposals that were suitable for pursuit by a start-up. These fees will decrease as a result of the termination of the Harvest agreement. These fees are included in other income.

Equity in net income (loss) of affiliates

Equity in net income or loss of affiliates is our pro-rata share of our equity method investments' operating results, adjusted for accretion of basis difference. We account for investments in our JVs and start-up entities backed by Harvest using the equity

method of accounting since we have the ability to exercise significant influence, but not control, over the operating activities of these entities.

Results of operations

Comparison of the year ended December 31, 2017 to the year ended December 31, 2016

The following table summarizes our results of operations for the years ended December 31, 2017 and 2016, together with the changes in those items in dollars and as a percentage:

	Year Ended December 31,		Dollar Change	Percent Change
	2017	2016		
	(In thousands)			
Revenues				
Collaboration and licensing revenues (1)	$ 145,579	$ 109,871	$ 35,708	32.5 %
Product revenues	33,589	36,958	(3,369)	(9.1)%
Service revenues	50,611	43,049	7,562	17.6 %
Other revenues	1,202	1,048	154	14.7 %
Total revenues	230,981	190,926	40,055	21.0 %
Operating expenses				
Cost of products	33,263	37,709	(4,446)	(11.8)%
Cost of services	29,525	23,930	5,595	23.4 %
Research and development	143,207	112,135	31,072	27.7 %
Selling, general and administrative	146,103	142,318	3,785	2.7 %
Impairment loss	16,773	—	16,773	N/A
Total operating expenses	368,871	316,092	52,779	16.7 %
Operating loss	(137,890)	(125,166)	(12,724)	10.2 %
Total other income (expense), net	22,473	(47,865)	70,338	147.0 %
Equity in loss of affiliates	(14,283)	(21,120)	6,837	(32.4)%
Loss before income taxes	(129,700)	(194,151)	64,451	(33.2)%
Income tax benefit	2,880	3,877	(997)	(25.7)%
Net loss	(126,820)	(190,274)	63,454	(33.3)%
Net loss attributable to noncontrolling interests	9,802	3,662	6,140	167.7 %
Net loss attributable to Intrexon	$ (117,018)	$ (186,612)	$ 69,594	(37.3)%

(1) Including $130,670 and $93,792 from related parties for the years ended December 31, 2017 and 2016, respectively.

Collaboration and licensing revenues

The following table shows the collaboration and licensing revenue recognized for the years ended December 31, 2017 and 2016, together with the changes in those items. See Note 5 to our consolidated financial statements appearing elsewhere in this Annual Report for further discussion of our collaboration and licensing revenues.

	Year Ended December 31,		Dollar Change
	2017	2016	
	(In thousands)		
ZIOPHARM Oncology, Inc.	$ 69,812	$ 33,836	$ 35,976
Oragenics, Inc.	2,020	2,752	(732)
Fibrocell Science, Inc.	7,344	5,942	1,402
Genopaver, LLC	6,690	6,117	573
S & I Ophthalmic, LLC	755	6,141	(5,386)
OvaXon, LLC	1,966	2,934	(968)
Intrexon Energy Partners, LLC	10,665	17,552	(6,887)
Persea Bio, LLC	946	1,278	(332)
Ares Trading S.A.	10,738	10,192	546
Intrexon Energy Partners II, LLC	3,672	3,169	503
Intrexon T1D Partners, LLC	5,968	1,908	4,060
Harvest start-up entities (1)	15,232	4,974	10,258
Other	9,771	13,076	(3,305)
Total	$ 145,579	$ 109,871	$ 35,708

(1) For the years ended December 31, 2017 and 2016, revenue recognized from collaborations with Harvest start-up entities include Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; Relieve Genetics, Inc.; AD Skincare, Inc.; Genten Therapeutics, Inc.; and CRS Bio, Inc.

Collaboration and licensing revenues increased $35.7 million, or 33 percent, over the year ended December 31, 2016 due primarily to (i) the recognition of previously deferred revenue totaling $28.9 million related to our second ECC with ZIOPHARM for the treatment of graft-versus-host disease, which was mutually terminated in December 2017 and (ii) a full year of recognition of deferred revenue associated with the payment received in June 2016 from ZIOPHARM to amend our collaborations.

Product revenues and gross margin

Product revenue decreased $3.4 million, or 9 percent, from the year ended December 31, 2016. The decrease in product revenues was primarily due to lower customer demand for cows and live calves. Gross margin on products improved slightly in the current period primarily due to a decline in the average cost of cows.

Service revenues and gross margin

Service revenue increased $7.6 million, or 18 percent, over the year ended December 31, 2016. The increase in service revenues relates to an increase in the number of bovine in vitro fertilization cycles performed due to higher customer demand. Gross margin on services decreased slightly in the current period primarily due to an increase in royalties and commissions due to vendors.

Research and development expenses

Research and development expenses increased $31.1 million, or 28 percent, over the year ended December 31, 2016. The increase is due primarily to increases in (i) lab supplies and consulting expenses, (ii) salaries, benefits and other personnel costs for research and development employees, (iii) depreciation and amortization, and (iv) rent and utilities expenses. Lab supplies and consulting expenses increased $11.3 million due to (i) the progression of certain programs into the preclinical and clinical

phases with certain of our collaborators and (ii) the expansion or improvement of certain of our platform technologies. Salaries, benefits and other personnel costs increased $8.0 million due to an increase in research and development headcount necessary to invest in current or expanding platforms and to develop new prospective collaborations and other partnering opportunities. Depreciation and amortization increased $5.8 million primarily as a result of (i) the amortization of developed technology acquired from Oxitec, which began in November 2016 upon the completion of certain operational and regulatory events, and (ii) the amortization of developed technology acquired from GenVec in June 2017. Rent and utilities expenses increased $3.3 million due to the expansion of certain facilities to support our increased headcount.

Selling, general and administrative expenses

SG&A expenses increased $3.8 million, or 3 percent, over the year ended December 31, 2016. Salaries, benefits and other personnel costs increased $4.2 million primarily due to increased headcount to support our expanding operations. Legal and professional fees increased $4.2 million primarily due to (i) increased legal fees to defend ongoing litigation and to support our evolving corporate strategy and (ii) consulting fees related to potential business opportunities and public relations. These increases were partially offset by $4.3 million in litigation expenses recorded in 2016 arising from the entrance of a court order in our trial with XY, LLC, or XY.

Impairment loss

Impairment loss for the year ended December 31, 2017 of $16.8 million resulted from our annual test for goodwill and indefinite-lived intangible asset impairment in the fourth quarter. Based on the price per share received by AquaBounty in its recent underwritten public offering, we determined that it was more likely than not that the fair value of our AquaBounty reporting unit was less than the carrying value and recorded a $13.0 million impairment charge representing the estimated excess of carrying value over fair value of this reporting unit. Additionally, in the fourth quarter, we decided to forgo further development of certain of our in-process research and development assets and as a result recorded a $3.0 million impairment charge.

Total other income (expense), net

Total other income (expense), net, increased $70.3 million, or 147 percent, over the year ended December 31, 2016. This increase was primarily attributable to (i) the change in fair market value of our equity securities portfolio, investments in preferred stock, and other convertible instruments and (ii) a full year of dividend income from our investment in preferred stock of ZIOPHARM.

Equity in net loss of affiliates

Equity in net loss of affiliates for the year ended December 31, 2017 and 2016 includes our pro-rata share of the net losses of our investments we account for using the equity method of accounting. The $6.8 million, or 32 percent, decrease was primarily due to the temporary redeployment of certain resources away from JV programs towards supporting prospective new platforms and additional collaborations.

Comparison of the year ended December 31, 2016 to the year ended December 31, 2015

The following table summarizes our results of operations for the years ended December 31, 2016 and 2015, together with the changes in those items in dollars and as a percentage:

	Year Ended December 31,		Dollar Change	Percent Change
	2016	2015		
	(In thousands)			
Revenues				
Collaboration and licensing revenues (1)	$ 109,871	$ 87,821	$ 22,050	25.1 %
Product revenues	36,958	41,879	(4,921)	(11.8)%
Service revenues	43,049	42,923	126	0.3 %
Other revenues	1,048	982	66	6.7 %
Total revenues	190,926	173,605	17,321	10.0 %
Operating expenses				
Cost of products	37,709	40,746	(3,037)	(7.5)%
Cost of services	23,930	23,183	747	3.2 %
Research and development	112,135	147,483	(35,348)	(24.0)%
Selling, general and administrative	142,318	109,057	33,261	30.5 %
Total operating expenses	316,092	320,469	(4,377)	(1.4)%
Operating loss	(125,166)	(146,864)	21,698	(14.8)%
Total other income (expense), net	(47,865)	68,830	(116,695)	(169.5)%
Equity in loss of affiliates	(21,120)	(8,944)	(12,176)	136.1 %
Loss before income taxes	(194,151)	(86,978)	(107,173)	123.2 %
Income tax benefit (expense)	3,877	(1,016)	4,893	>200%
Net loss	(190,274)	(87,994)	(102,280)	116.2 %
Net loss attributable to noncontrolling interests	3,662	3,501	161	4.6 %
Net loss attributable to Intrexon	$ (186,612)	$ (84,493)	$ (102,119)	120.9 %

(1) Including $93,792 and $77,354 from related parties for the years ended December 31, 2016 and 2015, respectively.

Collaboration and licensing revenues

The following table shows the collaboration and licensing revenue recognized for the years ended December 31, 2016 and 2015, together with the changes in those items. See Note 5 to our consolidated financial statements appearing elsewhere in this Annual Report for further discussion of our collaboration and licensing revenues.

	Year Ended December 31,		Dollar Change
	2016	2015	
	(In thousands)		
ZIOPHARM Oncology, Inc.	$ 33,836	$ 19,306	$ 14,530
Oragenics, Inc.	2,752	6,535	(3,783)
Fibrocell Science, Inc.	5,942	12,179	(6,237)
Genopaver, LLC	6,117	3,829	2,288
S & I Ophthalmic, LLC	6,141	4,115	2,026
OvaXon, LLC	2,934	2,540	394
Intrexon Energy Partners, LLC	17,552	13,447	4,105
Persea Bio, LLC	1,278	1,241	37
Ares Trading S.A.	10,192	4,728	5,464
Intrexon Energy Partners II, LLC	3,169	167	3,002
Intrexon T1D Partners, LLC	1,908	—	1,908
Harvest start-up entities (1)	4,974	266	4,708
Other	13,076	19,468	(6,392)
Total	$ 109,871	$ 87,821	$ 22,050

(1) For the year ended December 31, 2016, revenue recognized from collaborations with Harvest start-up entities include Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; Relieve Genetics, Inc.; AD Skincare, Inc.; Genten Therapeutics, Inc.; and CRS Bio, Inc. For the year ended December 31, 2015, revenue recognized from collaborations with Harvest start-up entities include Thrive Agrobiotics, Inc.

Collaboration and licensing revenues increased $22.1 million over the year ended December 31, 2015 due to (i) the recognition of deferred revenue for upfront payments received from collaborations signed by us in 2016, including the consideration received in June 2016 from ZIOPHARM to amend the collaborations between us; and (ii) increased research and development services for these collaborations and for the expansion of programs or the addition of new programs with previously existing collaborators, including ZIOPHARM, Genopaver, LLC, Ares Trading, and our JVs with S & I Ophthalmic and Intrexon Energy Partners. This increase is partially offset by the recognition in 2015 of previously deferred revenue related to collaboration agreements for which we satisfied all of our obligations or which were terminated during 2015.

Product revenues and gross margin

Product revenues decreased $4.9 million, or 12 percent, from the year ended December 31, 2015. The decrease in product revenues and gross margin primarily relates to a decrease in the quantities of cows and live calves sold due to lower customer demand for these products and also due to a decline in average sales price of cows previously used in production.

Service revenues and gross margin

Revenues and gross margin on services were consistent year over year.

Research and development expenses

Research and development expenses decreased $35.3 million, or 24 percent, from the year ended December 31, 2015. The decrease is due primarily to the inclusion in 2015 of a $59.6 million payment in common stock for an exclusive license to certain technologies owned by MD Anderson. This decrease was partially offset by increases in (i) salaries, benefits and other personnel costs for research and development employees, (ii) lab supplies and consulting expenses, and (iii) depreciation and

amortization. Salaries, benefits and other personnel costs increased $7.3 million due to (i) an increase in research and development headcount to support new and expanded collaborations and (ii) a full year of costs for research and development employees assumed in our 2015 acquisitions. Lab supplies and consulting expenses increased $10.6 million as a result of (i) the progression into the preclinical phase with certain of our collaborators, (ii) the increased level of research and development services provided to our collaborators, and (iii) a full year of compensation costs incurred for employees assumed in our 2015 acquisitions. Depreciation and amortization increased $5.7 million primarily as a result of (i) inclusion of a full year of depreciation and amortization on property, equipment and intangible assets from our 2015 acquisitions and (ii) a full year of amortization of AquaBounty's intangible assets which commenced upon regulatory approval in November 2015.

Selling, general and administrative expenses

SG&A expenses increased $33.3 million, or 31 percent, over the year ended December 31, 2015. Salaries, benefits and other personnel costs for SG&A employees increased $3.2 million due to (i) increased headcount, including the hiring of two new executive officers and additional business development professionals; (ii) a full year of non-cash compensation paid to our CEO pursuant to the compensation agreement into which we entered in November 2015; and (iii) a full year of salaries, benefits and other personnel costs for employees assumed in our 2015 acquisitions. These increases were partially offset by a decrease in performance-based cash incentives for our executive officers in 2016. Legal and professional expenses increased $18.6 million primarily due to (i) a full year of non-cash consulting expenses pursuant to the Services Agreement with Third Security into which we entered in November 2015; (ii) expenses incurred to support domestic and international government affairs for regulatory and other approvals necessary to commercialize our products and services; (iii) increased legal fees to defend ongoing litigation; and (iv) incremental costs incurred to support our 2015 acquisitions and other business development activities. In 2016, we also recorded $4.3 million in litigation expenses arising from the entrance of a court order in our trial with XY.

Total other income (expense), net

Total other income (expense), net, decreased $116.7 million, or 170 percent, from the year ended December 31, 2015. This decrease was attributable to the $81.4 million realized gain recognized upon the special stock dividend of all of our shares of ZIOPHARM to our shareholders in June 2015 and the decrease in fair value of our equity securities portfolio. These decreases were partially offset by preferred stock dividend income received from ZIOPHARM.

Equity in net loss of affiliates

Equity in net loss of affiliates increased $12.2 million, or 136 percent, over the year ended December 31, 2015. The increase is due to the addition of our new JVs entered into in 2016, including our investments in start-up entities backed by Harvest, as well as additional expenses incurred by our other JVs as their programs continue to progress.

Liquidity and capital resources

Sources of liquidity

We have incurred losses from operations since our inception and as of December 31, 2017, we had an accumulated deficit of $847.8 million. From our inception through December 31, 2017, we have funded our operations principally with proceeds received from private and public offerings, cash received from our collaborators and through product and service sales made directly to customers. As of December 31, 2017, we had cash and cash equivalents of $68.1 million and short-term investments of $6.3 million. In January 2018, we closed a public offering of 6,900,000 shares of our common stock, including 1,000,000 shares of common stock purchased by affiliates of Third Security, the net proceeds of which were $82.2 million, after deducting underwriting discounts and commissions and estimated offering expenses payable by us. In October 2017, we entered into a Preferred Stock Facility with an affiliate of Third Security, under which we may, at our sole and exclusive option, issue and sell up to $100 million of newly issued Series A Preferred Stock. Cash in excess of immediate requirements is invested primarily in money market funds and U.S. government debt securities in order to maintain liquidity and preserve capital.

We currently generate cash receipts primarily from technology access fees, reimbursement of research and development services performed by us and sales of products and services.

Cash flows

The following table sets forth the significant sources and uses of cash for the periods set forth below:

	Year Ended December 31,		
	2017	2016	2015
	(In thousands)		
Net cash provided by (used in):			
Operating activities	$ (104,139)	$ (55,975)	$ 35,669
Investing activities	104,332	(28,392)	(259,245)
Financing activities	4,284	12,065	331,683
Effect of exchange rate changes on cash and cash equivalents	1,027	(873)	209
Net increase (decrease) in cash and cash equivalents	$ 5,504	$ (73,175)	$ 108,316

Cash flows from operating activities:

In 2017, our net loss was $126.8 million, which includes the following significant noncash expenses that total $114.9 million: (i) $41.6 million of stock-based compensation expense, (ii) $31.1 million of depreciation and amortization expense, (iii) $16.8 million of impairment losses, (iv) $14.3 million of equity in net loss of affiliates, and (v) $11.1 million of shares issued as payment for services, partially offset by $16.8 million of noncash dividend income. Additionally, we had a $74.6 million net increase in our operating assets and liabilities. In 2016, our net loss was $190.3 million, which includes the following significant noncash expenses that total $157.6 million: (i) $58.9 million of unrealized and realized losses on our equity securities and preferred stock, (ii) $42.2 million of stock-based compensation expense, (iii) $24.6 million of depreciation and amortization expense, (iv) $21.1 million of equity in net loss of affiliates, and (v) $10.8 million of shares issued as payment for services, partially offset by $7.4 million of noncash dividend income. Additionally, we had a $17.7 million net increase in our operating assets and liabilities primarily as a result of the recognition of previously deferred revenue, partially offset by a $10.0 million technology access fee received in cash pursuant to a new collaboration. During 2015, we received net cash receipts for technology access fees of $85.5 million pursuant to new collaborations with Ares Trading, ZIOPHARM, and Intrexon Energy Partners II. Our net loss was $88.0 million, which include the following significant noncash expenses that total $116.0 million: (i) $59.6 million of common stock issued to MD Anderson for the in-license of certain technologies, (ii) $38.7 million of stock-based compensation expense and (iii) $17.7 million of depreciation and amortization expense, partially offset by $66.9 million of noncash unrealized and realized gains on our equity securities.

Cash flows from investing activities:

During 2017, we received proceeds of $174.5 million from the maturity of short-term investments, and used $46.7 million for purchases of property, plant and equipment, $14.2 million for the purchase of a land-based aquaculture facility by AquaBounty, and $11.2 million for investments in our JVs. During 2016, we used $31.6 million for purchases of property, plant and equipment, $11.5 million for investments in our JVs, $7.2 million to acquire the assets of Old EnviroFlight, $3.0 million for the issuances of notes receivable, $2.3 million for purchases of equity securities and warrants of certain of our collaborators, and we received $26.7 million of net proceeds from the maturity of short-term investments. During 2015, we used $123.9 million, net of cash received, for the acquisitions of ActoGeniX, Okanagan and Oxitec, $93.6 million for net purchases of short-term and long-term investments, $17.1 million for the purchase of equity securities and warrants pursuant to public financings by three of our collaborators, $13.4 million for investments in our JVs, and $12.7 million for purchases of property, plant and equipment.

Cash flows from financing activities:

During 2017, we received $13.7 million proceeds from a private placement of our common stock with an affiliate of Third Security and paid $8.7 million of deferred consideration to former shareholders of acquired businesses. During 2016, we received $19.2 million from stock option exercises and paid $6.7 million of deferred consideration to former shareholders of an acquired business. During 2015, we received $328.2 million of net proceeds from our public offerings in January and August.

Future capital requirements

We established our strategy and business model of commercializing our technologies through collaborations with development expertise in 2010, and we consummated our first collaboration in January 2011. We believe that our efforts to partner our more

mature programs and capabilities and to continue to consummate collaborations across our various industries will result in additional upfront, milestone and cost recovery payments in the future.

We believe that our existing cash and cash equivalents, short-term investments, cash expected to be received from our current collaborators and for sales of products and services provided by our consolidated subsidiaries, proceeds received from any issuance of Series A Preferred Stock under the Preferred Stock Facility, and proceeds from our January 2018 underwritten public offering will enable us to fund our operating expenses and capital expenditure requirements for at least the next 12 months.

We have based our estimates on assumptions that may prove to be wrong, and we may use our available capital resources sooner than we currently expect. Our future capital requirements will depend on many factors, including:

- progress in our research and development programs, as well as the magnitude of these programs;
- the timing, receipt and amount of any payments received in connection with strategic transactions;
- the timing, receipt and amount of upfront, milestone and other payments, if any, from present and future collaborators, if any;
- the timing, receipt and amount of sales and royalties, if any, from our potential products;
- our ability to maintain or improve the volume and pricing of our current product and service offerings and to develop new offerings, including those which may incorporate new technologies;
- the timing and capital requirements to scale up our various product and service offerings and customer acceptance thereof;
- our ability to maintain and establish additional collaborative arrangements and/or new strategic initiatives;
- the timing of regulatory approval of products of our collaborations and operations;
- the resources, time and cost required for the preparation, filing, prosecution, maintenance and enforcement of patent claims;
- investments we may make in current and future collaborators, including JVs;
- strategic mergers and acquisitions, including both the upfront acquisition cost as well as the cost to integrate, maintain, and expand the strategic target; and
- the costs associated with legal activities, including litigation, arising in the course of our business activities and our ability to prevail in any such legal disputes.

Until such time, if ever, as we can regularly generate positive operating cash flows, we may finance our cash needs through a combination of equity offerings, including issuances from the Preferred Stock Facility; debt financings; government or other third-party funding; strategic alliances and licensing arrangements. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interests of our common shareholders will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our common shareholders. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through government or other third-party funding, marketing and distribution arrangements or other strategic transactions, collaborations, or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or to grant licenses on terms that may not be favorable to us.

Contractual obligations and commitments

The following table summarizes our significant contractual obligations and commitments as of December 31, 2017 and the effects such obligations are expected to have on our liquidity and cash flows in future periods:

	Total	Less Than 1 Year	1-3 Years	3-5 Years	More Than 5 Years
			(In thousands)		
Operating leases	$ 67,887	$ 7,964	$ 18,301	$ 15,578	$ 26,044
Purchase commitments	15,802	5,067	10,735	—	—
Long term debt	5,905	502	773	1,192	3,438
Contingent consideration	585	—	585	—	—
Total	$ 90,179	$ 13,533	$ 30,394	$ 16,770	$ 29,482

In addition to the obligations in the table above, as of December 31, 2017 we also have the following significant contractual obligations described below.

In conjunction with the formation of our JVs, we committed to making future capital contributions of at least $45.0 million to the JVs, subject to certain conditions and limitations. As of December 31, 2017, our remaining capital contribution commitments to our JVs were $19.2 million. These future capital contributions are not included in the table above due to the uncertainty of the timing and amounts of such contributions.

We are party to in-licensed research and development agreements with various academic and commercial institutions where we could be required to make future payments for annual maintenance fees as well as for milestones and royalties we might receive upon commercial sales of products which incorporate their technologies. These agreements are generally subject to termination by us and therefore no amounts are included in the tables above. As of December 31, 2017, we also had research and development commitments with third parties totaling $10.7 million that had not yet been incurred.

In January 2015, we and ZIOPHARM jointly entered into a license agreement with MD Anderson whereby we received an exclusive license to certain technologies owned by MD Anderson. ZIOPHARM will receive access to these technologies pursuant to the terms of our ECC. We and ZIOPHARM are obligated to reimburse MD Anderson for out of pocket expenses for maintaining patents covering the licensed technologies. These reimbursements are not included in the table above due to the uncertainty of the timing and amounts of such reimbursements.

As part of our August 2014 acquisition of Trans Ova, we agreed to pay a portion of certain cash proceeds received from the litigation with XY. These amounts are not included in the table above due to the uncertainty of whether and when any amounts may be due.

In conjunction with a prior transaction associated with Trans Ova's subsidiary, ViaGen, in September 2012, we may be obligated to make certain future contingent payments to the former equity holders of ViaGen, up to a total of $3.0 million if certain revenue targets, as defined in the share purchase agreement, are met. This amount is not included in the table above due to the uncertainty of when we will make any of these future payments, if ever.

In January 2009, AquaBounty was awarded a grant to provide funding of a research and development project from the Atlantic Canada Opportunities Agency, a Canadian government agency. Amounts claimed by AquaBounty must be repaid in the form of a 10 percent royalty on any products commercialized out of this research and development project until fully paid. Because the timing of commercialization is subject to additional regulatory considerations, the timing of repayment is uncertain. AquaBounty claimed all amounts available under the grant, resulting in total long term debt of $2.1 million on our consolidated financial statements as of December 31, 2017. This amount is not included in the table above due to the uncertainty of the timing of repayment.

Net operating losses

As of December 31, 2017, we had net operating loss carryforwards of approximately $244.3 million for U.S. federal income tax purposes available to offset future taxable income, and U.S. federal and state research and development tax credits of $7.7 million, prior to consideration of annual limitations that may be imposed under Section 382. These carryforwards begin to expire in 2022. Our direct foreign subsidiaries have foreign loss carryforwards of approximately $151.4 million, most of which

do not expire. Excluding certain deferred tax liabilities totaling $15.6 million, our remaining net deferred tax assets, which primarily relate to these loss carryforwards, are offset by a valuation allowance due to our history of net losses.

As a result of our past issuances of stock, as well as due to prior mergers and acquisitions, certain of Intrexon's net operating losses have been subject to limitations pursuant to Section 382. As of December 31, 2017, Intrexon has utilized all net operating losses subject to Section 382 limitations, other than those losses inherited via acquisitions. As of December 31, 2017, approximately $33.6 million of domestic net operating losses were inherited via acquisition, including approximately $13.4 million related to our acquisition of GenVec, and are limited based on the value of the target at the time of the transaction. Future changes in stock ownership may also trigger an ownership change and, consequently, a Section 382 limitation.

We do not file a consolidated income tax return with AquaBounty. As of December 31, 2017, AquaBounty had loss carryforwards for federal and foreign income tax purposes of approximately $28.2 million and $15.7 million, respectively, and foreign research tax credits of $2.8 million available to offset future taxable income, prior to consideration of annual limitations that may be imposed under Section 382 or analogous foreign provisions. These carryforwards will begin to expire in 2018. As a result of our ownership in AquaBounty passing 50 percent in 2013, an annual Section 382 limitation of approximately $0.9 million per year will apply to losses and credits carried forward by AquaBounty from prior years, which are also subject to prior Section 382 limitations.

The Tax Act introduces certain limitations on utilization of net operating losses that are generated after 2017, generally limiting utilization of those losses to 80 percent of future annual taxable income. However, losses generated after 2017 will generally have an indefinite carryforward period.

Off-balance sheet arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements, other than operating leases and purchase commitments as mentioned above, as defined under SEC rules.

Critical accounting policies and estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which we have prepared in accordance with U.S. GAAP. The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported revenues and expenses during the reporting periods. We evaluate these estimates and judgments on an ongoing basis. We base our estimates on historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Our actual results may differ from these estimates under different assumptions or conditions.

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

Revenue recognition

We generate collaboration and licensing revenue through the execution of agreements with collaborators and licensing agreements whereby the collaborators or the licensees obtain exclusive access to our proprietary technologies for use in the research, development and commercialization of products and/or treatments in a contractually specified field of use. Generally, the terms of these agreements provide that we receive some or all of the following: (i) upfront payments upon consummation of the agreement; (ii) reimbursements for costs incurred by us for research and development and/or manufacturing efforts related to specific applications provided for in the agreement; (iii) milestone payments upon the achievement of specified development, regulatory and commercial activities; and (iv) royalties on sales of products arising from the collaboration or licensing agreement.

Our collaborations and licensing agreements typically contain multiple elements, or deliverables, including technology licenses, research and development services, and in certain cases manufacturing services. We identify the deliverables within the agreements and evaluate which deliverables represent separate units of accounting. Analyzing the agreements to identify deliverables requires the use of judgment. A deliverable is considered a separate unit of accounting when the deliverable has value to the collaborator or licensee on a standalone basis based on the consideration of the relevant facts and circumstances for each agreement.

Consideration received is allocated at the inception of the agreement to all identified units of accounting based on their relative selling price. When available, the relative selling price for each deliverable is determined using vendor specific objective evidence, or VSOE, of the selling price or third-party evidence of the selling price, if VSOE does not exist. If neither VSOE nor third-party evidence of the selling price exists, we use our best estimate of the selling price for the deliverable. The amount of allocable consideration is limited to amounts that are fixed or determinable. The consideration received is allocated among the separate units of accounting, and the applicable revenue recognition criteria are applied to each of the separate units. We recognize the revenue allocated to each unit of accounting as we deliver the related goods or services. If we determine that certain deliverables should be treated as a single unit of accounting, then the revenue is recognized using either a proportional performance or straight-line method, depending on whether we can reasonably estimate the level of effort required to complete our performance obligations under an arrangement and whether such performance obligations are provided on a best-efforts basis. As we cannot reasonably estimate our performance obligations related to our collaborators or licensees, we recognize revenue on a straight-line basis over the period we expect to complete our performance obligations, which is reevaluated each reporting period.

The terms of our agreements may provide for milestone payments upon achievement of certain defined events. We apply the Milestone Method for recognizing milestone payments. Under the Milestone Method, we recognize consideration that is contingent upon the achievement of a milestone in its entirety as revenue in the period in which the milestone is achieved only if the milestone is substantive in its entirety. A milestone is considered substantive when it meets all of the following criteria:

- The consideration is commensurate with either the entity's performance to achieve the milestone or the enhancement of the value of the delivered item or items as a result of a specific outcome resulting from the entity's performance to achieve the milestone;
- The consideration relates solely to past performance; and
- The consideration is reasonable relative to all of the deliverables and payment terms within the arrangement.

In the event that a milestone is not considered substantive, we recognize the milestone consideration as revenue using the same method applied to the upfront payments.

Research and development services are a deliverable satisfied by us in accordance with the terms of the collaboration and licensing agreements and we consider these services to be inseparable from the license to the core technology; therefore, reimbursements of services performed are recognized as revenue. Because reimbursement (i) is contingent upon performance of the services by us, (ii) does not include a profit component and (iii) does not relate to any future deliverable, the revenue is recognized during the period in which the related services are performed and collection of such amounts is reasonably assured. Payments received for manufacturing services will be recognized when the earnings process related to the manufactured materials has been completed. Royalties to be received under the agreements will be recognized as earned.

From time to time, we and certain collaborators may cancel the agreements, relieving us of any further performance obligations under the agreement. When no further performance obligations are required of us under an agreement, we recognize any remaining deferred revenue.

We recognized $145.6 million, $109.9 million and $87.8 million of collaboration and licensing revenues in the years ended December 31, 2017, 2016 and 2015, respectively. As of December 31, 2017 and 2016, we have $230.5 million and $297.9 million, respectively, of deferred revenue related to our receipt of upfront and milestone payments.

We generate product and service revenues primarily through sales of products or services which are created from technologies developed or owned by us. Our current offerings include sales of advanced reproductive technologies, including our bovine embryo transfer and in vitro fertilization processes and from genetic preservation and sexed semen processes and applications of such processes to other livestock, as well as sales of livestock and embryos produced using these processes and used in production. Revenue is recognized when (i) persuasive evidence of an arrangement exists, (ii) services have been rendered or delivery has occurred such that risk of loss has passed to the customer, (iii) the price is fixed or determinable, and (iv) collection from the customer is reasonably assured. We recognized $82.3 million, $77.9 million, and $83.4 million of these product and service revenues for the years ended December 31, 2017, 2016 and 2015, respectively.

Effective January 1, 2018, we adopted Accounting Standards Update (ASU) 2014-09, as amended by ASU 2015-14, *Revenue from Contracts with Customers (Topic 606)*, which clarifies the principles for recognizing revenue and develops a common revenue standard for U.S. GAAP. Topic 606 outlines a single comprehensive model for us to use in accounting for our revenues arising from contracts with customers and supersedes the revenue recognition discussed above. See Note 2 to our consolidated

financial statements appearing elsewhere in this Annual Report for a description of this recent accounting pronouncement and anticipated impact to our financial statements.

Valuation of investments in equity securities

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset and liability. We use a three-tier fair value hierarchy to prioritize the inputs used in our fair value measurements. These tiers include: Level 1, defined as observable inputs such as quoted prices in active markets for identical assets and liabilities, which includes our cash equivalents and certain investments in equity securities of our publicly held collaborators; Level 2, defined as inputs other than quoted prices included in Level 1 that are observable for the asset or liability either directly or indirectly, which includes our short-term and long-term investments and certain investments in equity securities of our publicly held collaborators; and Level 3, defined as unobservable inputs for the asset or liability used to measure fair value to the extent that observable inputs are not available.

We hold equity securities received and/or purchased from certain collaborators. For each collaborator where we own equity securities, we make an accounting policy election to present them either (i) at the fair value at the end of each reporting period or (ii) using the cost or equity method depending on our level of influence. Other than investments accounted for using the equity method, we have elected the fair value option to account for equity securities held in these collaborators. These equity securities are recorded at fair value at each reporting date and are subject to market price volatility. Unrealized gains and losses resulting from fair value adjustments are reported in the consolidated statement of operations. The fair value of these equity securities is subject to fluctuation in the future due to the volatility of the stock market, changes in general economic conditions and changes in the financial conditions of these collaborators. Equity securities that we do not intend to sell within one year are classified as noncurrent in the consolidated balance sheet. As of December 31, 2017 and 2016, our equity securities in our collaborators are valued at $15.1 million and $23.5 million, respectively.

We record the fair value of securities received on the date the collaboration is consummated or the milestone is achieved using the closing, quoted price of the collaborator's security on that date, assuming the transfer of the consideration is considered perfunctory. If the transfer of the consideration is not considered perfunctory, we consider the specific facts and circumstances to determine the appropriate date on which to evaluate fair value. We also evaluate whether any discounts for trading restrictions or other basis for lack of marketability should be applied to the fair value of the securities at inception of the collaboration. In the event we conclude that a discount should be applied, the fair value of the securities is adjusted at inception of the collaboration and re-evaluated at each reporting period thereafter.

We account for investments in which we have the ability to exercise significant influence over, but not control, the operating activities of the investee using the equity method or election of the fair value option. If the fair value option is elected, the investment is accounted for as described for equity securities above. Under the equity method, we include our pro-rata share of the investee's operating results, adjusted for accretion of basis difference, in our consolidated statement of operations with the corresponding increase or decrease applied to the carrying value of the investment. We account for investments in our JVs and start-up entities backed by Harvest using the equity method of accounting since we have the ability to exercise significant influence, but not control, over the operating activities of these entities.

Investments in preferred stock

We hold preferred stock in certain of our collaborators, most of which may be converted to common stock as described in Note 7 to our consolidated financial statements included appearing elsewhere in this Annual Report. We elected the fair value option to account for our investments in preferred stock whereby the value of preferred stock is adjusted to fair value as of each reporting date and unrealized gains and losses are reported in the consolidated statement of operations. These investments are subject to fluctuation in the future due to, among other things, the likelihood and timing of conversion of certain of the preferred stock into common stock, the volatility of each collaborator's common stock, and changes in general economic and financial conditions of the collaborators. These Level 3 investments are classified as noncurrent in the consolidated balance sheet since we do not intend to sell the investment nor expect the investments that are convertible into common stock to be converted within one year. As of December 31, 2017 and 2016, our investments in preferred stock are valued at $161.2 million and $129.5 million, respectively.

We are entitled to monthly dividends and record dividend income. We recorded $16.8 million and $7.4 million of dividend income in 2017 and 2016, respectively.

Valuation allowance for net deferred tax assets

We record a valuation allowance to offset any net deferred tax assets if, based upon the available evidence, it is more likely than not that we will not recognize some or all of the deferred tax assets. We have had a history of net losses since inception, and as a result, we have established a 100 percent valuation allowance for our net domestic and certain foreign deferred tax assets. If circumstances change and we determine that we will able to realize some or all of these net deferred tax assets in the future, we will record an adjustment to the valuation allowance.

Additionally, enacted changes in domestic or foreign tax rates, such as those as part of the Tax Act, that require remeasurement of our deferred tax assets and liabilities, also require remeasurement of our valuation allowance.

Consolidation of variable interest entities

We identify entities that (i) that do not have sufficient equity investment at risk to permit the entity to finance its activities without additional subordinated financial support, or (ii) in which the equity investors lack an essential characteristic of a controlling financial interest as variable interest entities, or "VIEs". We perform an initial and on-going evaluation of the entities with which we have variable interests to determine if any of these entities are VIEs. If an entity is identified as a VIE, we perform an assessment to determine whether we have both: (i) the power to direct activities that most significantly impact the VIE's economic performance, and (ii) have the obligation to absorb losses from or the right to receive benefits of the VIE that could potentially be significant to the VIE. If both of these criteria are satisfied, we are identified as the primary beneficiary of the VIE. As of December 31, 2017 and 2016, we determined that certain of our collaborators and JVs as well as Harvest were VIEs. We were not the primary beneficiary for these entities since we did not have the power to direct the activities that most significantly impact the economic performance of the VIEs. Our aggregate investment balance of these VIEs as of December 31, 2017 and 2016 was $185.3 million and $159.1 million, respectively, which represents our maximum risk of loss related to the identified VIEs.

Valuation of goodwill and long-lived assets

We evaluate long-lived assets to be held and used, which include property, plant and equipment and intangible assets subject to amortization, for impairment whenever events or changes in circumstances indicate that the carrying amount of the assets may not be recoverable. Conditions that would necessitate an impairment assessment include a significant decline in the observable market value of an asset, a significant change in the extent or manner an asset is used, or a significant adverse change that would indicate that the carrying amount of an asset or group of assets is not recoverable.

Goodwill and indefinite-lived intangible assets, which include in-process research and development, are tested for impairment annually, or more frequently if events or circumstances between annual tests indicate that the assets may be impaired. Impairment losses on goodwill and indefinite-lived intangible assets are recognized based solely on a comparison of their fair value to carrying value, without consideration of any recoverability test. We monitor the progression of our in-process research and development, as the likelihood of success is contingent upon regulatory approval. During the year ended December 31, 2017, we recorded $16.8 million of impairment charges to write down the values of goodwill and in-process research and development recorded in certain of our acquisitions. See additional discussion regarding this impairment in Note 11 to our consolidated financial statements appearing elsewhere in this Annual Report. We did not record any impairment charges during the years ended December 31, 2016 or 2015.

Stock-based compensation

We record the fair value of stock options issued to employees and non-employees as of the grant date as stock-based compensation expense. Stock-based compensation expense for employees and non-employees is recognized over the requisite service period, which is typically the vesting period. We recorded stock-based compensation expense of $41.6 million, $42.2 million and $38.7 million for the years ended December 31, 2017, 2016 and 2015, respectively. We utilize the Black-Scholes option-pricing model to estimate the grant-date fair value of all stock options. The Black-Scholes option-pricing model requires the use of assumptions for estimated expected volatility, estimated expected term of stock options, risk-free rate, estimated expected dividend yield, and the fair value of the underlying common stock at the date of grant. Because we do not have sufficient history to estimate the expected volatility of our common stock price, expected volatility is based on a blended approach which utilizes the volatility of our common stock and the volatility of peer public entities that are similar in size and industry. We estimate the expected term of all stock options based on previous history of exercises. The risk-free rate is based on the U.S. Treasury yield curve in effect at the time of grant for the expected term of the option. The expected dividend yield is 0 percent as we do not expect to declare cash dividends in the near future. The fair value of the underlying common stock is determined based on the quoted market price of our common stock on the NYSE. Forfeitures are recorded when incurred. The

assumptions used in the Black-Scholes option-pricing model for the years ended December 31, 2017, 2016 and 2015 are set forth below:

	Year Ended December 31,		
	2017	2016	2015
Valuation Assumptions			
Expected dividend yield	0%	0%	0%
Expected volatility	57%—60%	59%—60%	59%—62%
Expected term (years)	6.25	6.25	6.25
Risk-free interest rate	1.89%—2.27%	1.23%—2.17%	1.56%—1.95%

We had 11,382,747 options outstanding as of December 31, 2017 of which 5,306,697 were exercisable. We had 11,640,383 options outstanding as of December 31, 2016 of which 3,418,035 were exercisable. Total unrecognized stock-based compensation expense related to non-vested awards as of December 31, 2017 and 2016, was $69.0 million and $94.0 million, respectively, and is expected to be recognized over a weighted-average period of approximately two and three years, respectively. The weighted average grant date fair value for options granted in 2017, 2016 and 2015 was $12.19, $16.28 and $25.96, respectively.

Inventory

The Company's inventory primarily includes adult female cows which are used in certain production processes and are recorded at acquisition cost using the first-in, first-out method or at market, whichever is lower. Work-in-process inventory includes allocations of production costs and facility costs on gestating livestock and are recorded at the lower of cost or market. Significant declines in the price of cows could result in unfavorable adjustments to inventory balances. As of December 31, 2017 and 2016, total inventory was $20.5 million and $21.1 million, respectively.

Recent accounting pronouncements

See Note 2 to our consolidated financial statements appearing elsewhere in this Annual Report for a description of recent accounting pronouncements applicable to our business, which is incorporated herein by reference.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

The following sections provide quantitative information on our exposure to interest rate risk, stock price risk, and foreign currency exchange risk. We make use of sensitivity analyses which are inherently limited in estimating actual losses in fair value that can occur from changes in market conditions.

Interest rate risk

We had cash, cash equivalents and short-term and long-term investments of $74.4 million and $243.2 million as of December 31, 2017 and 2016, respectively. Our cash and cash equivalents and short-term and long-term investments consist of cash, money market funds, U.S. government debt securities and certificates of deposit. The primary objectives of our investment activities are to preserve principal, maintain liquidity and maximize income without significantly increasing risk. Our investments consist of U.S. government debt securities and certificates of deposit which may be subject to market risk due to changes in prevailing interest rates that may cause the fair values of our investments to fluctuate. We believe that a hypothetical 100 basis point increase in interest rates would not materially affect the fair value of our interest-sensitive financial instruments and any such losses would only be realized if we sold the investments prior to maturity.

Investments in publicly traded companies' common stock

We have common stock investments in several publicly traded companies that are subject to market price volatility. We have adopted the fair value method of accounting for these investments, except for our investment in AquaBounty as further described below, and therefore, have recorded them at fair value at the end of each reporting period with the unrealized gain or loss recorded as a separate component of other income (expense), net, for the period. As of December 31, 2017 and 2016, the original aggregate cost basis of these investments was $102.6 million and $104.0 million, respectively, and the market value was $15.1 million and $23.5 million, respectively. The fair value of these investments is subject to fluctuation in the future due to the volatility of the stock market, changes in general economic conditions and changes in the financial conditions of these

companies. The fair value of these investments as of December 31, 2017 would be approximately $16.6 million and $12.1 million, respectively, based on a hypothetical 10 percent increase or 20 percent decrease in the value of the investments. The fair value of these investments as of December 31, 2016 would be approximately $25.9 million and $18.8 million, respectively, based on a hypothetical 10 percent increase or 20 percent decrease in the value of the investments.

The common stock of AquaBounty commenced trading on the NASDAQ Stock Market in January 2017 and ceased trading on the London Stock Exchange in May 2017. As of December 31, 2017, we owned 5,162,277 shares or approximately 58 percent; as a result of the AquaBounty underwritten public offering in January 2018, our ownership interest dropped to 53 percent. The fair value of our investment in AquaBounty as of December 31, 2017 and 2016, based on AquaBounty's quoted closing price on the NASDAQ Stock Market and London Stock Exchange, respectively, was $18.2 million and $40.1 million, respectively. The fair value of our investment in AquaBounty as of December 31, 2017 would be approximately $20.0 million and $14.6 million, respectively, based on a hypothetical 10 percent increase or 20 percent decrease in the share price of AquaBounty. The fair value of our investment in AquaBounty as of December 31, 2016 would be approximately $44.1 million and $32.1 million, respectively, based on a hypothetical 10 percent increase or 20 percent decrease in the share price of AquaBounty.

Investments in publicly traded companies' preferred stock

We have preferred stock investments in several publicly traded companies, most of which may be converted to common stock in the future. We have adopted the fair value method of accounting for these investments whereby the value of preferred stock is adjusted to fair value as of each reporting date. As of December 31, 2017 and 2016, the original cost basis of these investments, including dividends, was $148.3 million and $127.4 million, respectively, and the fair value of these investments was $161.2 million and $129.5 million, respectively. The fair value of these investments is subject to fluctuation in the future due to, among other things, the likelihood and timing of conversion of certain of the preferred stock into common stock, the volatility of each company's common stock, and changes in general economic and financial conditions of these companies. The fair value of these investments as of December 31, 2017 would be approximately $177.3 million and $129.0 million, respectively, based on a hypothetical 10 percent increase or 20 percent decrease in the value of the investments. The fair value of these investments as of December 31, 2016 would be approximately $142.5 million and $103.6 million, respectively, based on a hypothetical 10 percent increase or 20 percent decrease in the value of the investments.

Foreign currency exchange risk

We have international subsidiaries in Belgium, Brazil, Canada, England, and Hungary. These subsidiaries' assets, liabilities, and current revenues and expenses are denominated in their respective foreign currency. We do not hedge our foreign currency exchange rate risk. The effect of a hypothetical 10 percent change in foreign currency exchange rates applicable to our business would not have a material impact on our consolidated financial statements.

Item 8. Financial Statements and Supplementary Data

The information required by this Item 8 is contained on pages F-1 through F-60 of this Annual Report and is incorporated herein by reference.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

Management, with the participation of our chief executive officer and our chief financial officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2017. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily

applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on their evaluation of our disclosure controls and procedures as of December 31, 2017, our chief executive officer and chief financial officer have concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Management's Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting as such term is defined in Rule 13a-15(f) and Rule 15d-15(f) of the Exchange Act. Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Our internal control over financial reporting includes those policies and procedures that:

(i) pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of our assets;

(ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of consolidated financial statements in accordance with generally accepted accounting principles, and that our receipts and expenditures are being made only in accordance with authorizations of our management and directors; and

(iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on the consolidated financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions or that the degree of compliance with the policies or procedures may deteriorate.

Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2017. In making this assessment, our management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in *Internal Control - Integrated Framework* (2013). Based on this evaluation, management concluded that our internal control over financial reporting was effective as of December 31, 2017.

PricewaterhouseCoopers LLP, an independent registered public accounting firm, has audited the effectiveness of our internal control over financial reporting as of December 31, 2017, as stated in their report, which is included in Part II Item 8 of this Annual Report.

Changes in Internal Control Over Financial Reporting

There have been no changes in our internal control over financial reporting during the quarter ended December 31, 2017 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

The information required by this item is hereby incorporated by reference to our Definitive Proxy Statement relating to our 2018 Annual Meeting of Shareholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2017.

Our board of directors has adopted a Code of Business Conduct and Ethics applicable to all officers, directors and employees, which is available on our website (*investors.dna.com*) under "Corporate Governance." We will provide a copy of this document, without charge, upon request, by writing to us at Intrexon Corporation, 20374 Seneca Meadows Parkway, Germantown, Maryland 20876, Attention: Investor Relations. We intend to satisfy the disclosure requirement under Item 5.05 of Form 8-K regarding amendment to, or waiver from, a provision of our Code of Business Conduct and Ethics by posting such information on our website at the address and location specified above.

Item 11. Executive Compensation

The information required by this item is hereby incorporated by reference to our Definitive Proxy Statement relating to our 2018 Annual Meeting of Shareholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2017.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this item is hereby incorporated by reference to our Definitive Proxy Statement relating to our 2018 Annual Meeting of Shareholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2017.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by this item is hereby incorporated by reference to our Definitive Proxy Statement relating to our 2018 Annual Meeting of Shareholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2017.

Item 14. Principal Accounting Fees and Services

The information required by this item is hereby incorporated by reference to our Definitive Proxy Statement relating to our 2018 Annual Meeting of Shareholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2017.

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) The following consolidated financial statements of Intrexon Corporation and its subsidiaries, and the independent registered public accounting firm reports thereon, are included in Part II, Item 8 of this Annual Report:

1. Financial Statements.

Consolidated Financial Statements of Intrexon Corporation and Subsidiaries

Report of Independent Registered Public Accounting Firm

Consolidated Balance Sheets as of December 31, 2017 and 2016

Consolidated Statements of Operations for the Years Ended December 31, 2017, 2016, and 2015

Consolidated Statements of Comprehensive Loss for the Years Ended December 31, 2017, 2016, and 2015

Consolidated Statements of Shareholders' and Total Equity for the Years Ended December 31, 2017, 2016 and 2015

Consolidated Statements of Cash Flows for the Years Ended December 31, 2017, 2016, and 2015

Notes to Consolidated Financial Statements for the Years Ended December 31, 2017, 2016, and 2015

2. Financial Statement Schedules.

Financial Statements of ZIOPHARM Oncology, Inc.

Report of Independent Registered Public Accounting Firm

Balance Sheets as of December 31, 2015 and 2014

Statements of Operations for the Years Ended December 31, 2015, 2014, and 2013

Statements of Changes in Stockholders' Equity for the Years Ended December 31, 2015, 2014, and 2013

Statements of Cash Flows for the Years Ended December 31, 2015, 2014, and 2013

Notes to Financial Statements for the Years Ended December 31, 2015, 2014, and 2013

All other financial statement schedules have been omitted because either the required information is not applicable or the information required is included in the consolidated financial statements and notes thereto included in this Annual Report.

3. Exhibits.

The exhibits are listed in Item 15(b) below.

(b) Exhibits

The following exhibits are filed with this Annual Report or incorporated by reference:

Exhibit No.	Description
1.1*	Controlled Equity OfferingSM Sales Agreement between Intrexon and Cantor Fitzgerald & Co., dated November 11, 2015 (14)

2.1*	Amended and Restated Membership Interest Purchase Agreement, dated as of August 8, 2014, by and among Intrexon, Trans Ova Genetics, L.C., the Sellers named on the signature pages thereto, and Pro-Edge, LP., as the Securityholders Representative (6)
2.2*	Agreement for the Acquisition of the Entire Issued and To Be Issued Share Capital of Oxitec Limited, dated August 7, 2015, by and among Intrexon, the Sellers named therein, the Warrantors (as defined therein) and 3729th Single Member Shelf Trading Company Limited (12)
2.3*	Agreement and Plan of Merger, dated as of January 24, 2017, by and among Intrexon, GenVec and Intrexon GV Holding, Inc. (23)
3.1*	Amended and Restated Articles of Incorporation (3)
3.1A*	Articles of Amendment to the Amended and Restated Articles of Incorporation (26)
3.2*	Amended and Restated Bylaws (15)
4.1*	Specimen certificate evidencing shares of common stock (2)
4.2*	Form of Second Amended and Restated Warrant to Purchase Shares of Common Stock (2)
4.3*	Eighth Amended and Restated Investors' Rights Agreement, dated March 1, 2013, by and among Intrexon and the holders of the Company's preferred stock and certain holders of Intrexon's common stock and Joinder thereto (1)
10.1†*	Intrexon Corporation Amended and Restated 2008 Equity Incentive Plan (2)
10.2†*	Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, effective as of June 9, 2014 (9)
10.2A†*	Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, Form of Restricted Stock Agreement (9)
10.2B†*	Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, Form of Incentive Stock Option Agreement (9)
10.2C†*	Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, Form of Nonqualified Stock Option Agreement (9)
10.2D†*	Amendment to the Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, effective as of June 11, 2015 (11)
10.2E†*	Amendment to the Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, effective as of June 9, 2016 (16)
10.2F†*	Amendment to the Intrexon Corporation Amended and Restated 2013 Omnibus Incentive Plan, effective as of June 28, 2017 (24)
10.2G†*	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Restricted Stock Unit Agreement, by and between Intrexon and Randal J. Kirk, effective as of November 1, 2015 (13)
10.2H†*	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Restricted Stock Unit Agreement, by and between Intrexon and Randal J. Kirk, effective as of November 1, 2016 (20)
10.2I†*	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Restricted Stock Unit Agreement, by and between Intrexon and Randal J. Kirk, dated as of December 30, 2016 (21)
10.2J†*	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Restricted Stock Unit Agreement, by and between Intrexon and Randal J. Kirk, effective as of April 1, 2017 (22)
10.2K†**	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Form of Restricted Stock Unit Agreement for Officers
10.2L†**	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Form of Restricted Stock Unit Agreement for Directors
10.3*	Exclusive Channel Partner Agreement, dated as of January 6, 2011, between Intrexon and ZIOPHARM Oncology, Inc., as amended (1)
10.3A*	Second Amendment to Exclusive Channel Partner Agreement, dated March 27, 2015, between Intrexon and ZIOPHARM Oncology, Inc. (10)

10.3B*	Third Amendment to Exclusive Channel Partner Agreement by and between ZIOPHARM Oncology, Inc. and Intrexon Corporation dated as of June 29, 2016 (17)
10.3C*	Amendment to Exclusive Channel Collaboration Agreement by and between ZIOPHARM Oncology, Inc. and Intrexon Corporation dated as of June 29, 2016 (17)
10.4#*	Exclusive Channel Collaboration Agreement, dated as of June 5, 2012, between Intrexon and Oragenics, Inc. (1)
10.4A**	Amendment No. 1 to the Exclusive Channel Collaboration Agreement between Intrexon and Oragenics, Inc. dated July 21, 2016
10.4B**	Amendment No. 2 to the Exclusive Channel Collaboration Agreement between Intrexon and Oragenics, Inc. dated November 8, 2017
10.5#*	Exclusive Channel Collaboration Agreement, dated as of August 6, 2012, between Intrexon and Synthetic Biologics, Inc. (1)
10.6#*	Exclusive Channel Collaboration Agreement, dated as of October 5, 2012, between Intrexon and Fibrocell Science, Inc. (1)
10.7*	First Amendment to Exclusive Channel Collaboration Agreement, dated as of June 28, 2013, between Intrexon and Fibrocell Science, Inc. (1)
10.8#*	Exclusive Channel Collaboration Agreement, dated as of February 14, 2013, between Intrexon and AquaBounty Technologies, Inc. (1)
10.9*	Relationship Agreement, dated as of December 5, 2012, between Intrexon and AquaBounty Technologies, Inc. (1)
10.10#*	Exclusive Channel Collaboration Agreement, dated as of March 29, 2013, between Intrexon and Genopaver, LLC (1)
10.11†*	Second Amended and Restated Employment Agreement, dated as of August 31, 2006, between Intrexon and Thomas D. Reed (2)
10.12#*	Exclusive Channel Collaboration Agreement, dated as of September 30, 2013, between Intrexon and S & I Ophthalmic, LLC (4)
10.13#*	Limited Liability Company Agreement, dated as of September 30, 2013, among Intrexon, Caraco Pharmaceutical Laboratories Ltd. and S & I Ophthalmic, LLC (4)
10.14#*	Exclusive Channel Collaboration Agreement, dated as of March 26, 2014, by and between Intrexon Corporation and Intrexon Energy Partners, LLC (5)
10.15#*	Amended and Restated Limited Liability Company Agreement of Intrexon Energy Partners, LLC, dated as of March 26, 2014, by and among Intrexon and the parties thereto (5)
10.16*	Letter Agreement by and between ZIOPHARM Oncology, Inc., Intrexon and The University of Texas System Board of Regents on behalf of The University of Texas MD Anderson Cancer Center, dated as of January 9, 2015 (7)
10.17*	Securities Issuance Agreement by and among Intrexon, The University of Texas System Board of Regents on behalf of The University of Texas MD Anderson Cancer Center dated as of January 13, 2015 (7)
10.18*	Securities Issuance Agreement by and among Intrexon, The University of Texas System Board of Regents on behalf of The University of Texas MD Anderson Cancer Center dated as of January 13, 2015 (7)
10.19*	Registration Rights Agreement by and among Intrexon, The University of Texas System Board of Regents on behalf of The University of Texas MD Anderson Cancer Center dated as of January 13, 2015 (7)
10.20#*	License Agreement by and among ZIOPHARM Oncology, Inc., Intrexon and The University of Texas System Board of Regents on behalf of The University of Texas MD Anderson Cancer Center, dated as of January 13, 2015 (8)
10.21#*	License and Collaboration Agreement, dated as of March 27, 2015, among Intrexon, ARES Trading S.A. and ZIOPHARM Oncology, Inc. (10)
10.22†*	Intrexon Corporation Annual Executive Incentive Plan, adopted as of April 29, 2015 (11)
10.23*	Services Agreement, by and between Intrexon Corporation and Third Security, LLC, effective as of November 1, 2015 (13)

10.23A*	First Amendment to Services Agreement, by and between Intrexon Corporation and Third Security, LLC, effective as of October 31, 2016 (20)
10.23B*	Second Amendment to Services Agreement, by and between Intrexon Corporation and Third Security, LLC, effective as of December 30, 2016 (21)
10.23C*	Third Amendment to Services Agreement, by and between Intrexon Corporation and Third Security, LLC, dated as of December 28, 2017 (27)
10.24*	Securities Issuance Agreement by and between ZIOPHARM Oncology, Inc. and Intrexon Corporation dated as of June 29, 2016 (17)
10.25†*	Employment Agreement, dated May 16, 2016 between Intrexon and Geno J. Germano (19)
10.26†*	Offer Letter, dated August 3, 2016 between Intrexon and Andrew Last, PhD (18)
10.27†*	Preferred Stock Equity Facility Agreement, dated October 16, 2017, by and between Kapital Joe, LLC and Intrexon Corporation (25)
21.1	List of Subsidiaries of Intrexon Corporation
23.1	Consent of PricewaterhouseCoopers LLP
23.2	Consent of RSM US LLP
31.1	Certification of Randal J. Kirk, Chairman and Chief Executive Officer (Principal Executive Officer) of Intrexon Corporation, pursuant to Rules 13a-14(a) and 15d-14(a) promulgated under the Securities Exchange Act of 1934, as amended, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	Certification of Rick L. Sterling, Chief Financial Officer (Principal Financial Officer) of Intrexon Corporation, pursuant to Rules 13a-14(a) and 15d-14(a) promulgated under the Securities Exchange Act of 1934, as amended, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1**	Certification of Randal J. Kirk, Chairman and Chief Executive Officer (Principal Executive Officer) of Intrexon Corporation, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2**	Certification of Rick L. Sterling, Chief Financial Officer (Principal Financial Officer) of Intrexon Corporation, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101**	Interactive Data File (Intrexon Corporation and Subsidiaries Consolidated Financial Statements for the years ended December 31, 2016, 2015 and 2014, formatted in XBRL (eXtensible Business Reporting Language)). Attached as Exhibit 101 are the following documents formatted in XBRL: (i) the Consolidated Balance Sheets as of December 31, 2017 and 2016, (ii) the Consolidated Statements of Operations for the years ended December 31, 2017, 2016 and 2015, (iii) the Consolidated Statements of Shareholders' and Total Equity for the years ended December 31, 2017, 2016 and 2015, (iv) the Consolidated Statements of Cash Flows for the years ended December 31, 2017, 2016 and 2015 and (v) the Notes to Consolidated Financial Statements for the years ended December 31, 2017, 2016 and 2015.

* Previously filed and incorporated by reference to the exhibit indicated in the following filings by Intrexon:

(1) Registration Statement on Form S-1, filed with the Securities and Exchange Commission on July 9, 2013.

(2) Amendment No. 1 to Registration Statement on Form S-1, filed with the Securities and Exchange Commission on July 29, 2013.

(3) Current Report on Form 8-K, filed with the Securities and Exchange Commission on August 15, 2013.

(4) Current Report on Form 8-K/A, filed with the Securities and Exchange Commission on October 30, 2013.

(5) Current Report on Form 8-K/A, filed with the Securities and Exchange Commission on April 4, 2014.

(6) Current Report on Form 8-K, filed with the Securities and Exchange Commission on August 11, 2014.

(7) Current Report on Form 8-K, filed with the Securities and Exchange Commission on January 14, 2015.

(8) Current Report on Form 8-K/A, filed with the Securities and Exchange Commission on January 28, 2015.

(9) Current Report on Form 8-K, filed with the Securities and Exchange Commission on June 13, 2014.

(10) Current Report on Form 8-K, filed with the Securities and Exchange Commission on April 2, 2015.

(11) Current Report on Form 8-K, filed with the Securities and Exchange Commission on June 17, 2015.

(12) Current Report on Form 8-K, filed with the Securities and Exchange Commission on August 12, 2015.

(13) Current Report on Form 8-K/A, filed with the Securities and Exchange Commission on November 3, 2015.

(14) Current Report on Form 8-K, filed with the Securities and Exchange Commission on November 12, 2015.

(15) Current Report on Form 8-K, filed with the Securities and Exchange Commission on March 14, 2016.

(16) Current Report on Form 8-K, filed with the Securities and Exchange Commission on June 13, 2016.

(17) Current Report on Form 8-K, filed with the Securities and Exchange Commission on June 30, 2016.

(18) Current Report on Form 8-K, filed with the Securities and Exchange Commission on August 8, 2016.

(19) Quarterly Report on Form 10-Q, filed with the Securities and Exchange Commission on August 9, 2016.

(20) Current Report on Form 8-K, filed with the Securities and Exchange Commission on November 3, 2016.

(21) Current Report on Form 8-K, filed with the Securities and Exchange Commission on December 30, 2016.

(22) Current Report on Form 8-K, filed with the Securities and Exchange Commission on March 31, 2017.

(23) Amendment No. 2 to the Registration Statement on Form S-4, filed with the Securities and Exchange Commission on May 11, 2017.

(24) Current Report on Form 8-K, filed with the Securities and Exchange Commission on June 30, 2017.

(25) Current Report on Form 8-K, filed with the Securities and Exchange Commission on October 16, 2017.

(26) Quarterly Report on Form 10-Q, filed with the Securities and Exchange Commission on November 9, 2017.

(27) Current Report on Form 8-K, filed with the Securities and Exchange Commission on January 2, 2018.

** Furnished herewith

† Indicates management contract or compensatory plan.

Portions of the exhibit (indicated by asterisks) have been omitted pursuant to a confidential treatment order granted by the Securities and Exchange Commission.

(c) Financial Statement Schedules

The response to Item 15(a)2 is incorporated herein by reference.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

Dated: March 1, 2018

INTREXON CORPORATION

By: /S/ RANDAL J. KIRK
Randal J. Kirk
Chief Executive Officer and Chairman of the Board of Directors

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/S/ RANDAL J. KIRK Randal J. Kirk	Chief Executive Officer and Chairman of the Board of Directors (Principal Executive Officer)	3/1/2018
/S/ RICK L. STERLING Rick L. Sterling	Chief Financial Officer (Principal Accounting and Financial Officer)	3/1/2018
/S/ CESAR L. ALVAREZ Cesar L. Alvarez	Director	3/1/2018
/S/ STEVEN FRANK Steven Frank	Director	3/1/2018
/S/ VINITA D. GUPTA Vinita D. Gupta	Director	3/1/2018
/S/ FRED HASSAN Fred Hassan	Director	3/1/2018
/S/ JEFFREY B. KINDLER Jeffrey B. Kindler	Director	3/1/2018
/S/ DEAN J. MITCHELL Dean J. Mitchell	Director	3/1/2018
/S/ ROBERT B. SHAPIRO Robert B. Shapiro	Director	3/1/2018
/S/ JAMES S. TURLEY James S. Turley	Director	3/1/2018

Index to the Financial Statements and Schedules

Intrexon Corporation and Subsidiaries

Consolidated Financial Statements

December 31, 2017, 2016 and 2015

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of Intrexon Corporation

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Intrexon Corporation and its subsidiaries as of December 31, 2017 and 2016, and the related consolidated statements of operations, of comprehensive loss, of shareholders' and total equity and of cash flows for each of the three years in the period ended December 31, 2017, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2017, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2016**,** and the results of their operations and their cash flows for each of the three years in the period ended December 31, 2017 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2017, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control Over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) ("PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ PricewaterhouseCoopers LLP

Raleigh, North Carolina
March 1, 2018

We have served as the Company's auditor since 2006.

Intrexon Corporation and Subsidiaries
Consolidated Balance Sheets
December 31, 2017 and 2016

(Amounts in thousands, except share data)	2017	2016
Assets		
Current assets		
Cash and cash equivalents	$ 68,111	$ 62,607
Restricted cash	6,987	6,987
Short-term investments	6,273	174,602
Equity securities	5,285	—
Receivables		
Trade, net	19,775	21,637
Related parties, net	17,913	16,793
Notes, net	—	1,500
Other	2,153	2,555
Inventory	20,493	21,139
Prepaid expenses and other	7,057	7,361
Total current assets	154,047	315,181
Long-term investments	—	5,993
Equity securities, noncurrent	9,815	23,522
Investments in preferred stock	161,225	129,545
Property, plant and equipment, net	112,674	64,672
Intangible assets, net	232,877	225,615
Goodwill	153,289	157,175
Investments in affiliates	18,870	23,655
Other assets	4,054	3,710
Total assets	$ 846,851	$ 949,068

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Balance Sheets
December 31, 2017 and 2016

(Amounts in thousands, except share data)	2017	2016
Liabilities and Total Equity		
Current liabilities		
Accounts payable	$ 8,701	$ 8,478
Accrued compensation and benefits	6,474	6,540
Other accrued liabilities	21,080	15,776
Deferred revenue	42,870	53,364
Lines of credit	233	820
Current portion of long term debt	502	386
Deferred consideration	—	8,801
Related party payables	313	440
Total current liabilities	80,173	94,605
Long term debt, net of current portion	7,535	7,562
Deferred revenue, net of current portion	193,527	256,778
Deferred tax liabilities, net	15,620	17,007
Other long term liabilities	3,451	3,868
Total liabilities	300,306	379,820
Commitments and contingencies (Note 17)		
Total equity		
Common stock, no par value, 200,000,000 shares authorized as of December 31, 2017 and 2016; and 122,087,040 shares and 118,688,770 shares issued and outstanding as of December 31, 2017 and 2016, respectively	—	—
Additional paid-in capital	1,397,005	1,325,780
Accumulated deficit	(847,820)	(729,341)
Accumulated other comprehensive loss	(15,554)	(36,202)
Total Intrexon shareholders' equity	533,631	560,237
Noncontrolling interests	12,914	9,011
Total equity	546,545	569,248
Total liabilities and total equity	$ 846,851	$ 949,068

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Operations
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands, except share and per share data)	2017	2016	2015
Revenues			
Collaboration and licensing revenues, including $130,670, $93,792, and $77,354 from related parties in 2017, 2016, and 2015, respectively	$ 145,579	$ 109,871	$ 87,821
Product revenues	33,589	36,958	41,879
Service revenues	50,611	43,049	42,923
Other revenues	1,202	1,048	982
Total revenues	230,981	190,926	173,605
Operating Expenses			
Cost of products	33,263	37,709	40,746
Cost of services	29,525	23,930	23,183
Research and development	143,207	112,135	147,483
Selling, general and administrative	146,103	142,318	109,057
Impairment loss	16,773	—	—
Total operating expenses	368,871	316,092	320,469
Operating loss	(137,890)	(125,166)	(146,864)
Other Income (Expense), Net			
Unrealized and realized appreciation (depreciation) in fair value of equity securities and preferred stock	2,586	(58,894)	66,876
Interest expense	(611)	(861)	(1,244)
Interest and dividend income	19,485	10,190	1,884
Other income, net	1,013	1,700	1,314
Total other income (expense), net	22,473	(47,865)	68,830
Equity in net loss of affiliates	(14,283)	(21,120)	(8,944)
Loss before income taxes	(129,700)	(194,151)	(86,978)
Income tax benefit (expense)	2,880	3,877	(1,016)
Net loss	$ (126,820)	$ (190,274)	$ (87,994)
Net loss attributable to the noncontrolling interests	9,802	3,662	3,501
Net loss attributable to Intrexon	$ (117,018)	$ (186,612)	$ (84,493)
Net loss attributable to Intrexon per share, basic and diluted	$ (0.98)	$ (1.58)	$ (0.76)
Weighted average shares outstanding, basic and diluted	119,998,826	117,983,836	111,066,352

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Comprehensive Loss
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands)	2017	2016	2015
Net loss	$ (126,820)	$ (190,274)	$ (87,994)
Other comprehensive income (loss):			
Unrealized gain (loss) on investments	87	430	(561)
Gain (loss) on foreign currency translation adjustments	20,599	(23,901)	(12,108)
Comprehensive loss	(106,134)	(213,745)	(100,663)
Comprehensive loss attributable to the noncontrolling interests	9,764	3,683	3,422
Comprehensive loss attributable to Intrexon	$ (96,370)	$ (210,062)	$ (97,241)

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Shareholders' and Total Equity
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands, except share data)	Common Stock Shares	Common Stock Amount	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Intrexon Shareholders' Equity	Noncontrolling Interests	Total Equity
Balances at December 31, 2014	100,557,932	$ —	$ 843,001	$ (4)	$ (458,236)	$ 384,761	$ 24,528	$ 409,289
Stock-based compensation expense	—	—	38,507	—	—	38,507	181	38,688
Exercises of stock options and warrants	1,148,463	—	14,462	—	—	14,462	—	14,462
Shares issued as payment for services	70,925	—	2,169	—	—	2,169	—	2,169
Shares issued in public offerings, net of issuance costs	9,922,256	—	328,234	—	—	328,234	—	328,234
Shares issued as consideration for license agreement	2,100,085	—	59,579	—	—	59,579	—	59,579
Shares issued in business combinations	2,552,151	—	126,863	—	—	126,863	—	126,863
Acquisition of noncontrolling interest	307,074	—	9,412	—	—	9,412	(10,978)	(1,566)
Adjustments for noncontrolling interests	—	—	(249)	—	—	(249)	499	250
Noncash dividend	—	—	(172,419)	—	—	(172,419)	—	(172,419)
Net loss	—	—	—	—	(84,493)	(84,493)	(3,501)	(87,994)
Other comprehensive income (loss)	—	—	—	(12,748)	—	(12,748)	79	(12,669)
Balances at December 31, 2015	116,658,886	—	1,249,559	(12,752)	(542,729)	694,078	10,808	704,886
Stock-based compensation expense	—	—	42,108	—	—	42,108	73	42,181
Exercises of stock options and warrants	1,400,146	—	19,165	—	—	19,165	—	19,165
Shares issued as payment for services	434,061	—	10,777	—	—	10,777	—	10,777
Shares issued in asset acquisition	136,340	—	4,401	—	—	4,401	—	4,401
Shares issued as payment for contingent consideration	59,337	—	1,583	—	—	1,583	—	1,583
Acquisition of noncontrolling interest	—	—	(1,813)	—	—	(1,813)	1,813	—
Net loss	—	—	—	—	(186,612)	(186,612)	(3,662)	(190,274)
Other comprehensive loss	—	—	—	(23,450)	—	(23,450)	(21)	(23,471)
Balances at December 31, 2016	118,688,770	$ —	$1,325,780	$ (36,202)	$ (729,341)	$ 560,237	$ 9,011	$ 569,248

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Shareholders' and Total Equity
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands, except share data)	Common Stock Shares	Common Stock Amount	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Intrexon Shareholders' Equity	Noncontrolling Interests	Total Equity
Balances at December 31, 2016	118,688,770	$ —	$1,325,780	$ (36,202)	$ (729,341)	$ 560,237	$ 9,011	$ 569,248
Cumulative effect of adoption of ASU 2016-09	—	—	1,461	—	(1,461)	—	—	—
Stock-based compensation expense	—	—	41,525	—	—	41,525	51	41,576
Exercises of stock options and warrants	149,429	—	952	—	—	952	28	980
Shares issued as payment for services	654,456	—	11,118	—	—	11,118	—	11,118
Shares issued in private placement	1,207,980	—	13,686	—	—	13,686	—	13,686
Shares and warrants issued in business combination	684,240	—	16,997	—	—	16,997	—	16,997
Acquisitions of noncontrolling interests	221,743	—	5,082	—	—	5,082	(5,995)	(913)
Shares issued as payment of deferred consideration	480,422	—	—	—	—	—	—	—
Adjustments for noncontrolling interests	—	—	2,789	—	—	2,789	(2,802)	(13)
Noncash dividend	—	—	(22,385)	—	—	(22,385)	22,385	—
Net loss	—	—	—	—	(117,018)	(117,018)	(9,802)	(126,820)
Other comprehensive income	—	—	—	20,648	—	20,648	38	20,686
Balances at December 31, 2017	122,087,040	$ —	$1,397,005	$ (15,554)	$ (847,820)	$ 533,631	$ 12,914	$ 546,545

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Cash Flows
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands)	2017	2016	2015
Cash flows from operating activities			
Net loss	$ (126,820)	$ (190,274)	$ (87,994)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:			
Depreciation and amortization	31,145	24,572	17,743
Loss on disposal of long-lived assets	3,124	666	633
Impairment loss	16,773	—	—
Unrealized and realized (appreciation) depreciation on equity securities and preferred stock	(2,586)	58,894	(66,876)
Noncash dividend income	(16,756)	(7,421)	—
Amortization of premiums on investments	411	1,070	642
Equity in net loss of affiliates	14,283	21,120	8,944
Stock-based compensation expense	41,576	42,202	38,667
Shares issued as payment for services	11,118	10,777	2,169
Shares issued as consideration for license agreement	—	—	59,579
Provision for bad debts	1,217	1,963	1,757
Deferred income taxes	(2,528)	(3,467)	1,117
Other noncash items	(517)	1,662	460
Changes in operating assets and liabilities:			
Restricted cash	—	(6,987)	—
Receivables:			
Trade	740	2,588	(12,138)
Related parties	631	6,804	(11,042)
Notes	—	(42)	—
Other	661	271	5,286
Inventory	663	3,807	(774)
Prepaid expenses and other	492	(932)	(2,729)
Other assets	(1,436)	2,189	(2,119)
Accounts payable	(3,402)	3,618	(3,263)
Accrued compensation and benefits	(1,466)	(12,402)	10,491
Other accrued liabilities	3,007	9,002	1,593
Deferred revenue	(75,337)	(25,481)	74,434
Deferred consideration	(313)	(630)	(943)
Related party payables	(147)	310	(64)
Other long term liabilities	1,328	146	96
Net cash provided by (used in) operating activities	(104,139)	(55,975)	35,669

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Cash Flows
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands)	2017	2016	2015
Cash flows from investing activities			
Purchases of investments	—	(75,246)	(181,572)
Maturities of investments	174,542	101,987	88,000
Purchases of equity securities, preferred stock, and warrants	(1,161)	(2,308)	(17,080)
Proceeds from sales of equity securities	235	280	—
Acquisitions of businesses, net of cash received	2,054	—	(123,928)
Investments in affiliates	(11,189)	(11,542)	(13,442)
Cash paid in asset acquisition	(14,219)	(7,244)	—
Purchases of property, plant and equipment	(46,666)	(31,629)	(12,749)
Proceeds from sale of property, plant and equipment	1,636	274	626
Issuances of notes receivable	(2,400)	(2,964)	(600)
Proceeds from repayment of notes receivable	1,500	—	1,500
Net cash provided by (used in) investing activities	104,332	(28,392)	(259,245)
Cash flows from financing activities			
Proceeds from issuance of shares in a private placement	13,686	—	—
Proceeds from issuance of shares in public offerings, net of issuance costs	—	—	328,234
Acquisitions of noncontrolling interests	(913)	—	(1,566)
Advances from lines of credit	5,906	5,075	15,232
Repayments of advances from lines of credit	(6,493)	(4,816)	(16,944)
Proceeds from long term debt	325	547	81
Payments of long term debt	(519)	(1,201)	(1,564)
Payments of deferred consideration for acquisitions	(8,678)	(6,705)	(6,252)
Proceeds from stock option exercises	980	19,165	14,462
Payment of stock issuance costs	(10)	—	—
Net cash provided by financing activities	4,284	12,065	331,683
Effect of exchange rate changes on cash and cash equivalents	1,027	(873)	209
Net increase (decrease) in cash and cash equivalents	5,504	(73,175)	108,316
Cash and cash equivalents			
Beginning of period	62,607	135,782	27,466
End of period	$ 68,111	$ 62,607	$ 135,782

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Consolidated Statements of Cash Flows
Years Ended December 31, 2017, 2016 and 2015

(Amounts in thousands)	2017	2016	2015
Supplemental disclosure of cash flow information			
Cash paid during the period for interest	$ 617	$ 964	$ 1,195
Cash paid during the period for income taxes	566	10	1,165
Significant noncash financing and investing activities			
Stock received as consideration for collaboration agreements	$ —	$ 18,766	$ 9,149
Preferred stock received as consideration for collaboration amendments	—	120,000	—
Receivables converted to preferred stock	3,385	—	—
Stock and warrants issued in business combinations	16,997	—	126,863
Stock issued to acquire noncontrolling interests	5,082	—	9,412
Stock issued in asset acquisition	—	4,401	—
Contingent consideration assumed in asset acquisition	—	3,660	—
Stock issued as payment for contingent consideration	—	1,583	—
Noncash dividend to shareholders	22,385	—	172,419
Deferred consideration payable related to acquisition	—	—	1,992
Purchases of equipment included in accounts payable and other accrued liabilities	2,257	652	782
Receivable recorded in anticipation of dissolution of affiliate	2,598	—	—
Transfer of inventory to breeding stock	—	1,191	—

The accompanying notes are an integral part of these consolidated financial statements.

Intrexon Corporation and Subsidiaries
Notes to Consolidated Financial Statements
(Amounts in thousands, except share and per share data)

1. Organization and Basis of Presentation

Intrexon Corporation ("Intrexon"), a Virginia corporation, uses synthetic biology to focus on programming biological systems to alleviate disease, remediate environmental challenges, and provide sustainable food and industrial chemicals, which may be accomplished through collaborations and joint ventures. Intrexon's primary domestic operations are in California, Florida, Maryland, and Virginia, and its primary international operations are in Belgium and Hungary. There have been no commercialized products derived from Intrexon's collaborations to date.

Trans Ova Genetics, L.C. ("Trans Ova"), a provider of advanced reproductive technologies and other genetic processes to cattle breeders and other producers, is a wholly owned subsidiary of Intrexon with primary operations in Iowa, Maryland, Missouri, Oklahoma and Texas.

Oxitec Limited ("Oxitec"), a pioneering company in biological insect control solutions, is a wholly owned subsidiary of Intrexon with primary operations in England and Brazil.

Intrexon Produce Holdings, Inc. ("IPHI") is a wholly owned subsidiary of Intrexon. Okanagan Specialty Fruits, Inc. ("Okanagan"), a company which developed and received regulatory approval for the world's first non-browning apple without the use of any flavor-altering chemical or antioxidant additives, is a wholly owned subsidiary of IPHI with primary operations in Canada. Fruit Orchard Holdings, Inc. ("FOHI") is a wholly owned subsidiary of IPHI with primary operations in Washington.

ViaGen, L.C. ("ViaGen"), a provider of genetic preservation and cloning technologies, and Exemplar Genetics, LLC ("Exemplar"), a provider of genetically engineered swine for medical and genetic research, are wholly owned subsidiaries with primary operations in Texas and Iowa, respectively.

In March 2017, Intrexon acquired the remaining 49% of the equity of Biological & Popular Culture, Inc. ("BioPop"), a California company developing artwork, children's toys and novelty goods that are derived from living organisms or enabled by synthetic biology for $900 in cash and 221,743 shares of Intrexon common stock valued at $5,082. Upon closing this transaction, BioPop became a wholly owned subsidiary of Intrexon.

As of December 31, 2017, Intrexon owned approximately 58% of AquaBounty Technologies, Inc. ("AquaBounty"), a company focused on improving productivity in commercial aquaculture. In January 2017, in conjunction with the listing by AquaBounty of their common stock on the NASDAQ Stock Market, Intrexon purchased $25,000 of additional AquaBounty common stock and subsequently distributed shares of AquaBounty common stock as a dividend to Intrexon shareholders. See Notes 14 and 22 for additional discussion.

Intrexon Corporation and its consolidated subsidiaries are hereinafter referred to as the "Company."

These consolidated financial statements are presented in United States dollars and are prepared under accounting principles generally accepted in the United States of America ("U.S. GAAP").

2. Summary of Significant Accounting Policies

Principles of Consolidation

The accompanying consolidated financial statements reflect the operations of the Company and its subsidiaries. All intercompany accounts and transactions have been eliminated.

Revenue Recognition

The Company generates collaboration and licensing revenue through the execution of agreements with collaborators (known as exclusive channel collaborations, "ECC" or "ECCs") and licensing agreements whereby the collaborators or the licensee obtain exclusive access to the Company's proprietary technologies for use in the research, development and commercialization of products and/or treatments in a contractually specified field of use. Generally, the terms of these agreements provide that the Company receives some or all of the following: (i) upfront payments upon consummation of the agreement,

(ii) reimbursements for costs incurred by the Company for research and development and/or manufacturing efforts related to specific applications provided for in the agreement, (iii) milestone payments upon the achievement of specified development, regulatory and commercial activities, and (iv) royalties on sales of products arising from the collaboration or licensing agreement.

The Company's collaboration and licensing agreements typically contain multiple elements, or deliverables, including technology licenses, research and development services, and in certain cases manufacturing services. The Company identifies the deliverables within the agreements and evaluates which deliverables represent separate units of accounting. Analyzing the agreements to identify deliverables requires the use of judgment. A deliverable is considered a separate unit of accounting when the deliverable has value to the collaborator or licensee on a standalone basis based on the consideration of the relevant facts and circumstances for each agreement.

Consideration received is allocated at the inception of the agreement to all identified units of accounting based on their relative selling price. When available, the relative selling price for each deliverable is determined using vendor specific objective evidence ("VSOE") of the selling price or third-party evidence of the selling price, if VSOE does not exist. If neither VSOE nor third-party evidence of the selling price exists, the Company uses its best estimate of the selling price for the deliverable. The amount of allocable consideration is limited to amounts that are fixed or determinable. The consideration received is allocated among the separate units of accounting, and the applicable revenue recognition criteria are applied to each of the separate units. The Company recognizes the revenue allocated to each unit of accounting as the Company delivers the related goods or services. If the Company determines that certain deliverables should be treated as a single unit of accounting, then the revenue is recognized using either a proportional performance or straight-line method, depending on whether the Company can reasonably estimate the level of effort required to complete its performance obligations under an arrangement and whether such performance obligations are provided on a best-efforts basis. As the Company cannot reasonably estimate its performance obligations related to its collaborators or licensees, the Company recognizes revenue on a straight-line basis over the period it expects to complete its performance obligations, which is reevaluated each reporting period.

The terms of the Company's agreements may provide for milestone payments upon achievement of certain defined events. The Company applies the Milestone Method for recognizing milestone payments. Under the Milestone Method, the Company recognizes consideration that is contingent upon the achievement of a milestone in its entirety as revenue in the period in which the milestone is achieved only if the milestone is substantive in its entirety. A milestone is considered substantive when it meets all of the following criteria:

(1) The consideration is commensurate with either the entity's performance to achieve the milestone or the enhancement of the value of the delivered item or items as a result of a specific outcome resulting from the entity's performance to achieve the milestone;

(2) The consideration relates solely to past performance; and

(3) The consideration is reasonable relative to all of the deliverables and payment terms within the arrangement.

In the event that a milestone is not considered substantive, the Company recognizes the milestone consideration as revenue using the same method applied to upfront payments.

Research and development services are a deliverable satisfied by the Company in accordance with the terms of the collaboration and licensing agreements and the Company considers these services to be inseparable from the license to the core technology; therefore, reimbursements of services performed are recognized as revenue. Because reimbursement (i) is contingent upon performance of the services by the Company, (ii) does not include a profit component, and (iii) does not relate to any future deliverable, the revenue is recognized during the period in which the related services are performed and collection of such amounts is reasonably assured. Payments received for manufacturing services will be recognized when the earnings process related to the manufactured materials has been completed. Royalties to be received under the agreements will be recognized as earned.

From time to time, the Company and certain collaborators may cancel their agreements, relieving the Company of any further performance obligations under the agreement. When no further performance obligations are required of the Company under an agreement, the Company recognizes any remaining deferred revenue.

The Company generates product and service revenues primarily through sales of products and services which are created from technologies developed or owned by the Company. The Company's current offerings include sales of advanced reproductive technologies, including the Company's bovine embryo transfer and in vitro fertilization processes and from genetic preservation

and sexed semen processes and applications of such processes to other livestock, as well as sales of livestock and embryos produced using these processes and used in production. Revenue is recognized when (i) persuasive evidence of an arrangement exists, (ii) services have been rendered or delivery has occurred such that risk of loss has passed to the customer, (iii) the price is fixed or determinable, and (iv) collection from the customer is reasonably assured.

Research and Development

The Company considers that regulatory requirements inherent in the research and development of new products preclude it from capitalizing such costs. Research and development expenses include salaries and related costs of research and development personnel, including stock-based compensation expense, and the costs of consultants, certain in-licensed technology rights, facilities, materials and supplies associated with research and development projects as well as various laboratory studies. Indirect research and development costs include depreciation, amortization and other indirect overhead expenses.

The Company has research and development arrangements with third parties that include upfront and milestone payments. As of December 31, 2017 and 2016, the Company had research and development commitments with third parties that had not yet been incurred totaling $10,682 and $10,631, respectively. The commitments are generally cancellable by the Company at any time upon written notice.

Cash and Cash Equivalents

All highly liquid investments with an original maturity of three months or less at the date of purchase are considered to be cash equivalents. Cash balances at a limited number of banks may periodically exceed insurable amounts. The Company believes that it mitigates its risk by investing in or through major financial institutions with high quality credit ratings. Recoverability of investments is dependent upon the performance of the issuer. As of December 31, 2017 and 2016, the Company had cash equivalent investments in highly liquid money market accounts at major financial institutions of $43,012 and $43,808, respectively.

Restricted Cash

Restricted cash represents funds deposited with the U.S. Treasury, as required by a court decision resulting from litigation against Trans Ova (Note 17).

Short-term and Long-term Investments

As of December 31, 2017, short-term investments include U.S. government debt securities and certificates of deposit. The Company determines the appropriate classification as short-term or long-term at the time of purchase based on original maturities and management's reasonable expectation of sales and redemption. The Company reevaluates such classification at each balance sheet date. The Company's written investment policy requires investments to be explicitly rated by two of the three following rating services: Standard & Poor's, Moody's and/or Fitch and to have a minimum rating of A1, P1 and/or F-1, respectively, from those agencies. In addition, the investment policy limits the amount of credit exposure to any one issuer.

Equity Securities

The Company holds equity securities received and/or purchased from certain collaborators. Other than investments accounted for using the equity method, the Company elected the fair value option to account for its equity securities held in these collaborators. These equity securities are recorded at fair value at each reporting date and are subject to market price volatility. Unrealized gains and losses resulting from fair value adjustments are reported in the consolidated statement of operations. The fair value of these equity securities is subject to fluctuation in the future due to the volatility of the stock market, changes in general economic conditions and changes in the financial conditions of these collaborators. Equity securities that the Company does not intend to sell within one year are classified as noncurrent in the consolidated balance sheet.

The Company records the fair value of securities received on the date the collaboration is consummated or the milestone is achieved using the closing, quoted price of the collaborator's security on that date, assuming the transfer of consideration is considered perfunctory. If the transfer of the consideration is not considered perfunctory, the Company considers the specific facts and circumstances to determine the appropriate date on which to evaluate fair value. The Company also evaluates whether any discounts for trading restrictions or other basis for lack of marketability should be applied to the fair value of the securities at inception of the collaboration. In the event the Company concludes that a discount should be applied, the fair value of the securities is adjusted at inception of the collaboration and re-evaluated at each reporting period thereafter.

Investments in Preferred Stock

The Company holds preferred stock in certain of its collaborators, most of which may be converted to common stock as described in Note 7. The Company elected the fair value option to account for its investments in preferred stock whereby the value of preferred stock is adjusted to fair value as of each reporting date and unrealized gains and losses are reported in the consolidated statement of operations. These investments are subject to fluctuation in the future due to, among other things, the likelihood and timing of conversion of certain of the preferred stock into common stock, the volatility of each collaborator's common stock, and changes in general economic and financial conditions of the collaborators. The investments are classified as noncurrent in the consolidated balance sheet since the Company does not intend to sell the investments nor expect the investments that are convertible into common stock to be converted within one year.

The Company is entitled to monthly dividends and records dividend income as described in Note 7.

Fair Value of Financial Instruments

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset and liability. As a basis for considering such assumptions, the Company uses a three-tier fair value hierarchy that prioritizes the inputs used in its fair value measurements. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are as follows:

Level 1:	Quoted prices in active markets for identical assets and liabilities;
Level 2:	Other than quoted prices included in Level 1 inputs that are observable for the asset or liability, either directly or indirectly; and
Level 3:	Unobservable inputs for the asset or liability used to measure fair value to the extent that observable inputs are not available.

Concentrations of Risk

Due to the Company's mix of fixed and variable rate securities holdings, the Company's investment portfolio is susceptible to changes in interest rates. As of December 31, 2017, gross unrealized losses on the Company's short-term investments were not material. From time to time, the Company may liquidate some or all of its investments to fund operational needs or other activities, such as capital expenditures or business acquisitions, or distribute its equity securities to shareholders as a stock dividend. Depending on which investments the Company liquidates to fund these activities, the Company could recognize a portion, or all, of the gross unrealized losses.

Financial instruments which potentially subject the Company to concentrations of credit risk consist primarily of trade and related party receivables. The Company controls credit risk through credit approvals, credit limits and monitoring procedures. The Company performs ongoing credit evaluations of its customers but generally does not require collateral to support accounts receivable.

Equity Method Investments

The Company accounts for its investments in each of its joint ventures and for its investments in start-up entities backed by the Harvest Intrexon Enterprise Fund I, LP ("Harvest"), a related party, (Note 18) using the equity method of accounting based upon relative ownership interest. The Company's investments in these entities are included in investments in affiliates in the accompanying consolidated balance sheets.

The Company accounts for its investment in Oragenics, Inc. ("Oragenics"), one of its collaborators, using the fair value option. The fair value of the Company's investment in Oragenics was $3,085 and $7,244 as of December 31, 2017 and 2016, respectively, and is included as equity securities in the accompanying consolidated balance sheets. The Company's ownership of Oragenics was 29.4% and 29.5% as of December 31, 2017 and 2016, respectively. Unrealized appreciation (depreciation) in the fair value of these securities was $(4,159), $(10,523), and $4,863 for the years ended December 31, 2017, 2016, and 2015, respectively. See Note 7 for additional discussion regarding Oragenics.

In 2015, the Company determined that ZIOPHARM Oncology, Inc. ("ZIOPHARM") met the criteria of SEC Regulation S-X Article 3-09 for inclusion of separate financial statements of an equity method investment as the Company determined it had significant influence over ZIOPHARM until the Company distributed its share of ZIOPHARM common stock to shareholders in the form of a special stock dividend (Note 14). Upon disposition, the Company realized a gain of $81,401 during the year ended December 31, 2015.

Summarized financial data as of December 31, 2017 and 2016, and for the years ended December 31, 2017, 2016, and 2015, for the Company's equity method investments for which separate financial statements are not included, pursuant to SEC Regulation S-X Article 3-09, are shown in the following tables.

	December 31,	
	2017	2016
Current assets	$ 61,086	$ 77,761
Non-current assets	13,598	11,040
Total assets	74,684	88,801
Current liabilities	6,213	11,588
Net assets	$ 68,471	$ 77,213

	Year Ended December 31,		
	2017	2016	2015
Revenues, net	$ 254	$ 417	$ 1,176
Operating expenses	41,904	62,373	32,513
Operating loss	(41,650)	(61,956)	(31,337)
Other, net	(8)	1,535	(64)
Net loss	$ (41,658)	$ (60,421)	$ (31,401)

Variable Interest Entities

The Company identifies entities that (i) do not have sufficient equity investment at risk to permit the entity to finance its activities without additional subordinated financial support or (ii) in which the equity investors lack an essential characteristic of a controlling financial interest as variable interest entities ("VIE" or "VIEs"). The Company performs an initial and on-going evaluation of the entities with which the Company has variable interests to determine if any of these entities are VIEs. If an entity is identified as a VIE, the Company performs an assessment to determine whether the Company has both (i) the power to direct activities that most significantly impact the VIE's economic performance and (ii) have the obligation to absorb losses from or the right to receive benefits of the VIE that could potentially be significant to the VIE. If both of these criteria are satisfied, the Company is identified as the primary beneficiary of the VIE.

As of December 31, 2017 and 2016, the Company determined that certain of its collaborators and joint ventures as well as Harvest were VIEs. The Company was not the primary beneficiary for these entities since it did not have the power to direct the activities that most significantly impact the economic performance of the VIEs. The Company's aggregate investment balances of these VIEs as of December 31, 2017 and 2016, were $185,261 and $159,115, respectively, which represents the Company's maximum risk of loss related to the identified VIEs.

Trade Receivables

Trade receivables consist of credit extended to the Company's customers in the normal course of business and are reported net of an allowance for doubtful accounts. The Company reviews its customer accounts on a periodic basis and records bad debt expense for specific amounts the Company evaluates as uncollectible. Past due status is determined based upon contractual terms. Amounts are written off at the point when collection attempts have been exhausted. Management estimates uncollectible amounts considering such factors as current economic conditions and historic and anticipated customer performance. This estimate can fluctuate due to changes in economic, industry or specific customer conditions which may require adjustment to the allowance recorded by the Company. Management has included amounts believed to be uncollectible in the allowance for doubtful accounts.

The following table shows the activity in the allowance for doubtful receivable accounts for the years ended December 31, 2017, 2016, and 2015:

	2017	2016	2015
Beginning balance	$ 3,703	$ 2,081	$ 565
Charged to operating expenses	1,217	1,963	1,757
Write offs of accounts receivable, net of recoveries	(289)	(341)	(241)
Ending balance	$ 4,631	$ 3,703	$ 2,081

Inventory

The Company's inventory primarily includes adult female cows which are used in certain production processes and are recorded at acquisition cost using the first-in, first-out method or at market, whichever is lower. Work-in-process inventory includes allocations of production costs and facility costs for products currently in production and is recorded at the lower of cost or market. Significant declines in the price of cows could result in unfavorable adjustments to inventory balances.

Property, Plant and Equipment

Property, plant and equipment are stated at cost, less accumulated depreciation and amortization. Major additions or betterments are capitalized and repairs and maintenance are generally expensed as incurred. Depreciation and amortization is calculated using the straight-line method over the estimated useful lives of the assets. The estimated useful lives of these assets are as follows:

	Years
Land improvements	4–20
Buildings and building improvements	3–25
Furniture and fixtures	1–10
Equipment	1–10
Breeding stock	1–4
Computer hardware and software	1–7

Leasehold improvements are amortized over the shorter of the useful life of the asset or the applicable lease term, generally one to twenty years.

Goodwill

Goodwill represents the future economic benefits arising from other assets acquired in a business combination that are not individually identified and separately recognized. Goodwill is reviewed for impairment at least annually. The Company performs a qualitative assessment to determine whether it is more-likely-than-not that the fair value of a reporting unit is less than its carrying amount prior to performing the goodwill impairment test. If this is the case, the goodwill impairment test is required. If it is more-likely-than-not that the fair value of a reporting unit is greater than the carrying amount, the goodwill impairment test is not required.

If the goodwill impairment test is required, first, the fair value of the reporting unit is compared with its carrying amount (including goodwill). If the fair value of the reporting unit is less than its carrying amount, an indication of goodwill impairment exists for the reporting unit and the entity must record the impairment charge for the excess carrying amount, which is limited to the amount of goodwill allocated to the reporting unit. If the fair value of the reporting unit exceeds its carrying amount, no goodwill impairment charge is necessary.

The Company performs its annual impairment review of goodwill in the fourth quarter, or sooner if a triggering event occurs prior to the annual impairment review. See Note 11 for additional discussion regarding the results of this review for the year ended December 31, 2017.

Intangible Assets

Intangible assets subject to amortization consist of patents, developed technologies and know-how; customer relationships; and trademarks acquired as a result of mergers and acquisitions. These intangible assets are subject to amortization, were recorded at fair value at the date of acquisition and are stated net of accumulated amortization. Indefinite-lived intangible assets consist of in-process research and development technologies acquired in mergers or acquisitions and were recorded at fair value at the dates of the respective acquisitions.

The Company amortizes long-lived intangible assets to reflect the pattern in which the economic benefits of the intangible asset are expected to be realized. The intangible assets are amortized over their estimated useful lives, ranging from three to twenty-one years for the patents, developed technologies and know-how; customer relationships; and trademarks.

Impairment of Long-Lived Assets

Long-lived assets to be held and used, including property, plant and equipment and intangible assets subject to amortization, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of the assets may not be recoverable. Conditions that would necessitate an impairment assessment include a significant decline in the observable market value of an asset, a significant change in the extent or manner in which an asset is used, or a significant adverse change that would indicate that the carrying amount of an asset or group of assets is not recoverable.

Indefinite-lived intangible assets, including in-process research and development, are tested for impairment annually, or more frequently if events or circumstances between annual tests indicate that the asset may be impaired. Impairment losses on indefinite-lived intangible assets are recognized based solely on a comparison of their fair value to carrying value, without consideration of any recoverability test. The Company monitors the progression of its in-process research and development, as the likelihood of success is contingent upon commercial development or regulatory approval.

Self-insurance Reserves

Effective January 1, 2017, the Company commenced a self-insurance program for a significant portion of its employee health benefit programs. The Company maintains stop-loss coverage with third party insurers to limit its individual claims and total exposure under those programs. The Company estimates its accrued liability for the ultimate costs to close known claims, including claims incurred but not yet reported to the Company, as of the balance sheet date. The Company's recorded estimated liability for self-insurance is based on the insurance company's incurred loss estimates and management's judgment, including assumptions and factors related to the frequency and severity of claims and the Company's claims development history.

The assessment of self-insurance reserves is a highly subjective process that requires judgments about future events. Self-insurance reserves are reviewed at least quarterly to determine the adequacy of the accruals and related financial statement disclosure. The ultimate settlement of self-insurance reserves may differ significantly from amounts the Company has accrued in its consolidated financial statements.

Foreign Currency Translation

The assets and liabilities of foreign subsidiaries, where the local currency is the functional currency, are translated from their respective functional currencies into United States dollars at the exchange rates in effect at the balance sheet date, with resulting foreign currency translation adjustments recorded in the consolidated statement of comprehensive loss. Revenue and expense amounts are translated at average rates during the period.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to both differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases as well as operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date of the change. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized.

The Company identifies any uncertain income tax positions and recognizes the effect of income tax positions only if those positions are more likely than not of being sustained. Recognized income tax positions are measured at the largest amount that

is greater than 50% likely of being realized. Changes in recognition or measurement are reflected in the period in which the change in judgment occurs. The Company records interest, if any, related to unrecognized tax benefits as a component of interest expense. Penalties, if any, are recorded in selling, general and administrative expenses.

On December 22, 2017, the Tax Cuts and Jobs Act (the "Tax Act") was signed into law and significantly revised U.S. corporate income tax law by, among other things, reducing the corporate income tax rate to 21% effective January 1, 2018, eliminating the corporate alternative minimum tax and implementing a modified territorial tax system that includes a one-time transition tax on deemed repatriated earnings foreign subsidiaries. The SEC Staff issued Staff Accounting Bulletin No. 118 ("SAB 118") to address the application of U.S. GAAP in situations when a registrant does not have the necessary information available, prepared, or analyzed, including computations, in reasonable detail to complete the accounting for certain income tax effects of the Tax Act. The Company has recognized provisional tax impacts related to revaluation of most of the Company's domestic deferred tax assets, the impact of revaluation of those deferred tax assets on the Company's valuation allowance and elimination of the corporate alternative minimum tax, and included those amounts in the consolidated financial statements for the year ended December 31, 2017. The actual impact of the Tax Act may differ from the Company's estimates due to, among other things, changes in interpretations and assumptions made, and guidance that may be issued as a result of the Tax Act.

In addition, the Tax Act implemented a new minimum tax on global intangible low-taxed income ("GILTI"). A company can elect an accounting policy to account for GILTI in either of the following ways:

- As a period charge in the future period the tax arises; or
- As part of deferred taxes related to the investment or subsidiary.

The Company is currently in the process of analyzing this provision and, as a result, is not yet able to reasonably estimate its effect. Therefore, the Company has not made any provisional adjustments related to potential GILTI tax in its consolidated financial statements and has not made a policy decision regarding whether to record deferred taxes under the GILTI regime.

The accounting is expected to be completed within the one-year measurement period as allowed by SAB 118 for items impacted or introduced by the Tax Act.

Share-Based Payments

Intrexon uses the Black-Scholes option pricing model to estimate the grant-date fair value of all stock options. The Black-Scholes option pricing model requires the use of assumptions for estimated expected volatility, estimated expected term of stock options, risk-free rate, estimated expected dividend yield, and the fair value of the underlying common stock at the date of grant. Since Intrexon does not have sufficient history to estimate the expected volatility of its common stock price, expected volatility is based on a blended approach which utilizes the volatility of Intrexon's common stock and the volatility of peer public entities that are similar in size and industry. Intrexon estimates the expected term of all options based on previous history of exercises. The risk-free rate is based on the U.S. Treasury yield curve in effect at the time of grant for the expected term of the option. The expected dividend yield is 0% as Intrexon does not expect to declare cash dividends in the near future. The fair value of the underlying common stock is determined based on the quoted market price on the New York Stock Exchange. Forfeitures are recorded when incurred. The assumptions used in the Black-Scholes option pricing model for the years ended December 31, 2017, 2016 and 2015 are set forth in the table below:

	2017	2016	2015
Valuation assumptions			
Expected dividend yield	0%	0%	0%
Expected volatility	57%—60%	59%—60%	59%—62%
Expected term (years)	6.25	6.25	6.25
Risk-free interest rate	1.89%—2.27%	1.23%—2.17%	1.56%—1.95%

Net Loss per Share

Basic net loss per share is calculated by dividing net loss attributable to common shareholders by the weighted average shares outstanding during the period, without consideration of common stock equivalents. Diluted net loss per share is calculated by adjusting weighted average shares outstanding for the dilutive effect of common stock equivalents outstanding for the period, using the treasury-stock method. For purposes of the diluted net loss per share calculation, stock options and warrants are

considered to be common stock equivalents but are excluded from the calculation of diluted net loss per share because their effect would be anti-dilutive and, therefore, basic and diluted net loss per share were the same for all periods presented.

Segment Information

While the Company generates revenues from multiple sources, including collaboration agreements, licensing, and products and services primarily associated with bovine reproduction, management is organized around a singular research and development focus to further the development of the Company's underlying synthetic biology technologies. Accordingly, the Company has determined that it operates in one segment. As of December 31, 2017 and 2016, the Company had $21,837 and $13,265, respectively, of long-lived assets in foreign countries. The Company recognized revenues derived in foreign countries totaling $17,605, $11,969, and $5,918 for the years ended December 31, 2017, 2016 and 2015, respectively.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting periods. Actual results could differ from those estimates.

Recently Adopted Accounting Pronouncements

In January 2017, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2017-04, *Intangibles-Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment* ("ASU 2017-04"). The provisions of ASU 2017-04 simplify how an entity is required to test goodwill for impairment by eliminating Step 2 from the goodwill impairment test. The Company elected to early adopt this standard in the fourth quarter of 2017 and utilized the guidance for the annual goodwill impairment test (Note 11).

In January 2017, the FASB issued ASU 2017-01, *Business Combinations (Topic 805) - Clarifying the Definition of a Business* ("ASU 2017-01"). The provisions of ASU 2017-01 clarify the definition of a business to assist entities with evaluating whether transactions should be accounted for as acquisitions (or disposals) of assets or businesses. The Company adopted this standard in the second quarter of 2017, and the implementation of this standard did not have a material impact on the Company's consolidated financial statements.

In October 2016, the FASB issued ASU 2016-17, *Consolidation (Topic 810) - Interests Held through Related Parties That Are under Common Control* ("ASU 2016-17"). The provisions of ASU 2016-17 amend the consolidation guidance on how a reporting entity that is the single decision maker of a VIE should treat indirect interests in the entity held through related parties that are under common control with the reporting entity when determining whether it is the primary beneficiary of that VIE. The Company adopted this standard effective January 1, 2017, and the implementation of this standard did not have a material impact on the Company's consolidated financial statements.

In March 2016, the FASB issued ASU 2016-09, *Stock Compensation (Topic 718) - Improvements to Employee Share-Based Payment Accounting* ("ASU 2016-09"). The provisions of ASU 2016-09 simplify various aspects of the accounting for employee share-based payment transactions, including the income tax consequences, classification of awards as either equity or liabilities, and classification on the statement of cash flows. The Company adopted this standard effective January 1, 2017. Upon adoption in the first quarter of 2017, the Company elected to recognize forfeitures as they occur and recorded an opening adjustment to additional paid-in capital and accumulated deficit for previously unrecognized stock-based compensation costs due to estimating forfeitures on unvested shares totaling $1,461. The Company also recognized deferred tax assets of $17,843 related to the excess tax benefits that previously arose directly from tax deductions related to equity compensation greater than stock-based compensation costs recognized in the consolidated financial statements and the cumulative adjustment for forfeitures. These deferred tax assets were fully offset by a valuation allowance (Note 13). The adoption was on a modified retrospective basis and had no impact on prior periods.

In March 2016, the FASB issued ASU 2016-07, *Investments-Equity Method and Joint Ventures (Topic 323) - Simplifying the Transition to the Equity Method of Accounting* ("ASU 2016-07"). The provisions of ASU 2016-07 eliminate the requirement that when an investment qualifies for use of the equity method as a result of an increase in the level of ownership interest or degree of influence, an adjustment must be made to the investment, results of operations, and retained earnings retroactively on a step-by-step basis as if the equity method had been in effect during all previous periods that the investment had been held. The Company adopted this standard effective January 1, 2017, and the implementation of this standard did not have a material impact on the Company's consolidated financial statements.

In July 2015, the FASB issued ASU 2015-11, *Inventory (Topic 330) - Simplifying the Measurement of Inventory* ("ASU 2015-11"). The provisions of ASU 2015-11 provide guidance for simplifying the calculation for subsequent measurement of inventory measured using the first-in-first-out or average cost methods. The Company adopted this standard effective January 1, 2017, and the implementation of this standard did not have a material impact on the Company's consolidated financial statements.

Recently Issued Accounting Pronouncements

In May 2014, the FASB issued ASU 2014-09, *Revenue from Contracts with Customers* ("ASU 2014-09"). The FASB issued ASU 2014-09 to clarify the principles for recognizing revenue and to develop a common revenue standard for U.S. GAAP. The standard outlines a single comprehensive model for entities to use in accounting for revenue arising from contracts with customers and supersedes the most current revenue recognition guidance. This guidance was originally effective for annual periods and interim periods within those annual periods beginning after December 15, 2016 and early adoption was not permitted. In August 2015, the FASB issued ASU 2015-14, *Revenue from Contracts with Customers (Topic 606) - Deferral of the Effective Date*, which deferred the effective date of the guidance in ASU 2014-09 by one year to December 15, 2017 for interim and annual reporting periods beginning after that date, and is effective for the Company for the year ending December 31, 2018. In 2016 and 2017, the FASB clarified the implementation guidance on principal versus agent, identifying performance obligations, licensing, narrow-scope improvements, practical expedients, and to expedite improvements to ASU 2014-09 by issuing ASU 2016-08, *Revenue from Contracts with Customers (Topic 606) - Principal versus Agent Considerations*, ASU 2016-10, *Revenue from Contracts with Customers (Topic 606) - Identifying Performance Obligations and Licensing*, and ASU 2016-12, *Revenue from Contracts with Customers (Topic 606) - Narrow-Scope Improvements and Practical Expedients*, ASU 2016-20, *Technical Corrections and Improvements to Topic 606, Revenue from Contracts with Customers*, and ASU 2017-13, *Revenue Recognition (Topic 605), Revenue from Contracts with Customers (Topic 606), Leases (Topic 840), and Leases (Topic 842)*. The Company continues to progress in the evaluation of its collaborations and licensing agreements and product and service revenue arrangements to determine the impact, if any, that the implementation of this standard will have on the Company's consolidated financial statements. The Company completed its review of collaboration and licensing agreements and product and service revenue arrangements and determined that other than the cumulative catch-up adjustment and related increased deferred revenue discussed below the standard will not have a significant impact on its financial position, results of operations and disclosures for these revenue arrangements. Upon adoption using the modified retrospective approach in the first quarter of 2018, the Company expects to recognize a cumulative catch-up adjustment to increase deferred revenue and accumulated deficit in the net amount of $40,413. Under the current guidance, the Company recorded the upfront payment received from Ares Trading S.A. ("Ares Trading") net of the required payment made to ZIOPHARM as deferred revenue and is recognizing the deferred revenue over the estimated recognition period (Note 5). The new guidance requires gross presentation for these payments and would have resulted in the Company recording the full amount of the upfront payment received from Ares Trading as deferred revenue, recognizing the deferred revenue over the estimated recognition period, and immediately expensing the payment made to ZIOPHARM. As a result of this change under the new guidance, the Company expects to record $40,789 of additional deferred revenue relating to the additional unrecognized portion of the upfront payment, which will be recognized over the remainder of the expected recognition period. Additionally, the Company expects to reduce deferred revenue by $376 as a portion of the Company's previously deferred revenue related to a milestone payment received from ZIOPHARM pursuant to an ECC (Note 5) would have been recognized immediately under the new guidance. The milestone payment was received by the Company in form of the ZIOPHARM's common stock and under current guidance was valued on the date the milestone was achieved. Under the new guidance, the milestone would have been valued at contract inception with any difference in the value between contract inception and milestone achievement recorded as a gain or loss on the equity securities. Any revenue arrangements entered into subsequent to December 31, 2017 with financial or other significant terms which differ from the financial or other significant terms of the Company's existing revenue arrangements will be evaluated under this new standard.

In February 2018, the FASB issued ASU 2018-02, *Income Statement-Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income* ("ASU 2018-02"). The provisions of ASU 2018-02 allow a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the Tax Act. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2018, with early adoption permitted, and is effective for the Company for the year ending December 31, 2019. The amendments in ASU 2018-02 may be applied either in the period of adoption or retrospectively to each period (or periods) in which the effect of the change in the U.S. federal corporate income tax rate in the Tax Act is recognized. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

In July 2017, the FASB issued ASU 2017-11, *Earnings Per Share (Topic 260), Distinguishing Liabilities from Equity (Topic 480) and Derivatives and Hedging (Topic 815): I. Accounting for Certain Financial Instruments with Down Round Features;*

II. Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily Redeemable Noncontrolling Interests with a Scope Exception ("ASU 2017-11"). The amendments in Part I of ASU 2017-11 change the classification analysis of certain equity-linked financial instruments (or embedded features) with down round features. When determining whether certain financial instruments should be classified as liabilities or equity instruments, a down round feature no longer precludes equity classification when assessing whether the instrument is indexed to an entity's own stock. The amendments also clarify existing disclosure requirements for equity-classified instruments. As a result, a freestanding equity-linked financial instrument (or embedded conversion option) no longer would be accounted for as a derivative liability at fair value as a result of the existence of a down round feature. For freestanding equity-classified financial instruments, the amendments require entities that present earnings per share ("EPS") in accordance with Topic 260 to recognize the effect of the down round feature when it is triggered. That effect is treated as a dividend and as a reduction of income available to common shareholders in basic EPS. Convertible instruments with embedded conversion options that have down round features are now subject to the specialized guidance for contingent beneficial conversion features (in Subtopic 470-20, *Debt-Debt with Conversion and Other Options*), including related EPS guidance (in Topic 260). The amendments in Part II of ASU 2017-11 re-characterize the indefinite deferral of certain provisions of Topic 480 that now are presented as pending content in the FASB codification, to a scope exception. Those amendments do not have an accounting effect. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2018, with early adoption permitted, and is effective for the Company for the year ended December 31, 2019. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

In May 2017, the FASB issued ASU 2017-09, *Compensation-Stock Compensation (Topic 718) – Scope of Modification Accounting* ("ASU 2017-09"). The provisions of ASU 2017-09 provide guidance about which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting in Topic 718. An entity should account for the effects of a modification unless (a) the fair value of the modified award is the same as the fair value of the original award, (b) the vesting conditions of the modified award are the same as the vesting conditions of the original award and (c) the classification of the modified award as an equity instrument or a liability instrument is the same as the classification of the original award immediately before the original award is modified. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2017, and is effective for the Company for the year ending December 31, 2018. The amendments in ASU 2017-09 should be applied prospectively to an award modified on or after the adoption date. As this standard is prospective in nature, the impact to the Company's consolidated financial statements will depend on the nature of any future award modifications.

In November 2016, the FASB issued ASU 2016-18, *Statement of Cash Flows (Topic 230) - Restricted Cash (A Consensus of the FASB Emerging Issues Task Force)* ("ASU 2016-18"). The provisions of ASU 2016-18 require amounts generally described as restricted cash and restricted cash equivalents to be included with cash and cash equivalents when reconciling the total beginning and ending balances for the periods presented on the statement of cash flows. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2017, and is effective for the Company for the year ending December 31, 2018. The impact of the implementation of this standard will modify the Company's current disclosures and reclassifications within the consolidated statement of cash flows.

In October 2016, the FASB issued ASU 2016-16, *Income Taxes (Topic 740) - Intra-Entity Transfers of Assets Other Than Inventory* ("ASU 2016-16"). The provisions of ASU 2016-16 remove the prohibition in ASC 740 against the immediate recognition of the current and deferred income tax effects of intra-entity transfers of assets other than inventory. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2017, and is effective for the Company for the year ending December 31, 2018. The implementation of this standard is not expected to have a material impact on the Company's consolidated financial statements.

In August 2016, the FASB issued ASU 2016-15, *Statement of Cash Flows (Topic 230) - Classification of Certain Cash Receipts and Cash Payments* ("ASU 2016-15"). The provisions of ASU 2016-15 address eight specific cash flow issues and how those certain cash receipts and cash payments are presented and classified in the statement of cash flows under Topic 230, *Statement of Cash Flows*, and other Topics. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2017, and is effective for the Company for the year ending December 31, 2018. The implementation of this standard is not expected to have a material impact on the Company's consolidated financial statements.

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)* ("ASU 2016-02"). The provisions of ASU 2016-02 set out the principles for the recognition, measurement, presentation and disclosure of leases for both parties to a contract (i.e. lessees and lessors). The new standard requires lessees to apply a dual approach, classifying leases as either finance or operating leases based on the principle of whether or not the lease is effectively a financed purchase by the lessee. This classification will determine whether lease expense is recognized based on an effective interest method or on a straight-line

basis over the term of the lease, respectively. A lessee is also required to record a right-of-use asset and a lease liability for all leases with a term of greater than 12 months regardless of their classification. Leases with a term of 12 months or less will be accounted for in a similar manner as under existing guidance for operating leases today. ASU 2016-02 supersedes the previous lease standard, Topic 840, *Leases*. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2018, and is effective for the Company for the year ending December 31, 2019. The Company is currently evaluating its lease agreements to determine the impact that the implementation of this standard will have on the Company's consolidated financial statements as it relates to the classification of leases under the dual approach and the recognition of a right-of-use asset and a lease liability.

In January 2016, the FASB issued ASU 2016-01, *Financial Instruments - Overall (Subtopic 825-10) - Recognition and Measurement of Financial Assets and Financial Liabilities* ("ASU 2016-01"). The provisions of ASU 2016-01 make targeted improvements to enhance the reporting model for financial instruments to provide users of financial statements with more decision-useful information, including certain aspects of recognition, measurement, presentation, and disclosure of financial instruments. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2017, and is effective for the Company for the year ending December 31, 2018. The implementation of this standard is not expected to have a material impact on the Company's consolidated financial statements.

Reclassifications

Certain insignificant reclassifications have been made to the prior year consolidated financial statements to conform to the current year presentation.

3. Mergers and Acquisitions

GenVec Acquisition

In June 2017, pursuant to an Agreement and Plan of Merger (the "GenVec Merger Agreement"), the Company acquired 100% of the outstanding shares of GenVec, Inc. ("GenVec"), a clinical-stage company and pioneer in the development of AdenoVerse gene delivery technology. Pursuant to the GenVec Merger Agreement, the former shareholders of GenVec received an aggregate of 684,240 shares of the Company's common stock and have the right to receive contingent consideration equal to 50% of any milestone or royalty payments received under one of GenVec's collaboration agreements, provided such payments are received within three years after the closing of the transaction. The Company also assumed warrants held by certain former shareholders of GenVec. The results of GenVec's operations subsequent to the acquisition date have been included in the consolidated financial statements.

The fair value of the total consideration transferred was $17,582. The acquisition date fair value of each class of consideration transferred is presented below:

Common shares	$	15,616
Warrants		1,381
Contingent consideration		585
	$	17,582

The fair value of the shares of the Company's common stock issued was based on the quoted closing price of the Company's common stock immediately prior to the closing of the acquisition. The fair value of the warrants assumed was estimated using the Black-Scholes option-pricing model. The fair value of the contingent consideration was determined using a probability weighted discounted cash flows model and is considered a freestanding financial instrument and recorded at fair value each reporting period. The estimated fair value of assets acquired and liabilities assumed at the acquisition date is shown below:

Cash and cash equivalents	$	2,054
Short term investments		542
Trade receivables		75
Other receivables		97
Prepaid expenses and other		227
Property and equipment		250
Intangible assets		14,000
Other noncurrent assets		58
Total assets acquired		17,303
Accounts payable		2,158
Accrued compensation and benefits		1,226
Other accrued expenses		856
Other long term liabilities		92
Deferred tax liabilities		239
Total liabilities assumed		4,571
Net assets acquired		12,732
Goodwill		4,850
Total consideration	$	17,582

The acquired intangible assets include developed technology, the fair value of which was determined using the multi-period excess earning method, which is a variation of the income approach that converts future cash flows to single discounted present value amounts. The intangible assets are being amortized over a useful life of eleven years. Goodwill, which is not deductible for tax purposes, represents the assembled workforce and the anticipated buyer-specific synergies arising from the combination of the Company's and GenVec's technology.

Acquisition-related costs totaling $507 and $12 are included in selling, general and administrative expenses in the accompanying consolidated statements of operations for the years ended December 31, 2017 and 2016, respectively.

Oxitec Acquisition

In September 2015, pursuant to a Stock Purchase Agreement (the "Oxitec Purchase Agreement"), the Company acquired 100% of the issued outstanding share capital of Oxitec. The aggregated consideration paid consisted of (i) 1,359,343 shares of the Company's common stock (the "Stock Consideration") and (ii) $90,199 in cash (the "Cash Consideration"), inclusive of net cash and working capital adjustments as defined in the Oxitec Purchase Agreement totaling $9,449. Stock Consideration totaling 480,422 shares and Cash Consideration totaling $1,991 were withheld as escrow at closing and were issued and paid, respectively, in March 2017. The results of Oxitec's operations subsequent to the acquisition date have been included in the consolidated financial statements.

The fair value of the total consideration transferred was $146,394. The acquisition date fair value of the Stock Consideration and Cash Consideration is presented below:

Cash	$	90,199
Common shares		56,195
	$	146,394

The fair value of the shares of the Company common stock issued was based on the quoted closing price of the Company's common stock as of the closing date of the acquisition. The estimated fair value of assets acquired and liabilities assumed at the acquisition date is shown below:

Cash	$	3,780
Trade receivables		125
Other receivables		7,395
Prepaid expenses and other		121
Property, plant, and equipment		1,198
Intangible assets		96,854
Total assets acquired		109,473
Accounts payable		1,187
Accrued compensation and benefits		246
Other accrued liabilities		210
Deferred revenue		120
Deferred tax liabilities		12,584
Total liabilities assumed		14,347
Net assets acquired		95,126
Goodwill		51,268
Total consideration	$	146,394

The acquired intangible assets primarily include in-process research and development, the fair value of which was determined using the multi-period excess earning method, which is a variation of the income approach that converts future cash flows to single discounted present value amounts. In November 2016, the Company re-evaluated certain of the acquired in-process research and development technology and determined it was placed in service as developed technology and began amortizing the original amount capitalized using a useful life of eighteen years. Goodwill, which is not deductible for tax purposes, represents the assembled workforce and the potential for future Oxitec products and technologies.

Acquisition-related costs totaling $1,675 are included in selling, general and administrative expenses in the accompanying consolidated statement of operations for the year ended December 31, 2015.

Okanagan Acquisition

In April 2015, pursuant to a Stock Purchase Agreement (the "Okanagan Purchase Agreement"), the Company acquired 100% of the outstanding shares of Okanagan. Pursuant to the Okanagan Purchase Agreement, the former shareholders of Okanagan received an aggregate of 707,853 shares of the Company's common stock and $10,000 cash in exchange for all shares in Okanagan. The results of Okanagan's operations subsequent to the acquisition date have been included in the consolidated financial statements.

The fair value of the total consideration transferred was $40,933. The acquisition date fair value of each class of consideration transferred is presented below:

Cash	$	10,000
Common shares		30,933
	$	40,933

The fair value of the shares of the Company's common stock issued was based on the quoted closing price of the Company's common stock as of the closing date of the acquisition. The estimated fair value of assets acquired and liabilities assumed at the acquisition date is shown below:

Cash	$	58
Trade receivables		16
Other receivables		49
Property, plant, and equipment		32
Intangible assets		36,500
Total assets acquired		36,655
Accounts payable		181
Deferred revenue		181
Deferred tax liabilities		8,847
Total liabilities assumed		9,209
Net assets acquired		27,446
Goodwill		13,487
Total consideration	$	40,933

The acquired intangible assets primarily include developed technology, patents and know-how and the fair values of the acquired assets were determined using the with-and-without method, which is a variation of the income approach that utilizes estimated cash flows with all assets in place at the valuation date and estimated cash flows with all assets in place except the intangible assets at the valuation date. The intangible assets are being amortized over a useful life of fourteen years. Goodwill, which is not deductible for tax purposes, represents potential future applications of Okanagan's technology to other fruits, including additional apple varietals, and anticipated buyer-specific synergies arising from the combination of the Company's and Okanagan's technologies.

Acquisition-related costs totaling $267 are included in selling, general and administrative expenses in the accompanying consolidated statement of operations for the year ended December 31, 2015.

ActoGeniX Acquisition

In February 2015, the Company acquired 100% of the membership interests of ActoGeniX NV ("ActoGeniX"), a European biopharmaceutical company, pursuant to a Stock Purchase Agreement (the "ActoGeniX Purchase Agreement"). ActoGeniX's platform technology complements the Company's suite of proprietary technologies available for current and future collaborators. Pursuant to the ActoGeniX Purchase Agreement, the former members of ActoGeniX received an aggregate of 965,377 shares of the Company's common stock and $32,739 in cash in exchange for all membership interests of ActoGeniX. The results of ActoGeniX's operations subsequent to the acquisition date have been included in the consolidated financial statements.

The fair value of the total consideration transferred was $72,474. The acquisition date fair value of each class of consideration transferred is presented below:

Cash	$	32,739
Common shares		39,735
	$	72,474

The fair value of the shares of the Company's common stock issued was based on the quoted closing price of the Company's common stock as of the closing date of the acquisition. The estimated fair value of assets acquired and liabilities assumed at the acquisition date is shown below:

Cash	$	3,180
Other receivables		305
Prepaid expenses and other		31
Property, plant and equipment		209
Intangible assets		68,100
Other noncurrent assets		23
Total assets acquired		71,848
Accounts payable		230
Accrued compensation and benefits		196
Other accrued liabilities		253
Deferred revenue		732
Deferred tax liabilities		612
Total liabilities assumed		2,023
Net assets acquired		69,825
Goodwill		2,649
Total consideration	$	72,474

The acquired intangible assets primarily include in-process research and development, the fair value of which was determined using the multi-period excess earnings and with-and-without methods, which are both variations of the income approach that convert future cash flows to single discounted present value amounts. In August 2015, the Company re-evaluated the acquired in-process research and development technology and determined that it was placed in service as developed technology and began amortizing the original amount capitalized using a useful life of eighteen years. Goodwill, which is not deductible for tax purposes, represents the assembled workforce and anticipated buyer-specific synergies arising from the combination of the Company's and ActoGeniX's technologies.

Acquisition-related costs totaling $381 are included in selling, general and administrative expenses in the accompanying consolidated statement of operations for the year ended December 31, 2015.

Unaudited Condensed Pro Forma Financial Information

GenVec's results of operations subsequent to the acquisition are included in the consolidated statement of operations. The following unaudited condensed pro forma financial information for the years ended December 31, 2017 and 2016, is presented as if the acquisition had been consummated on January 1, 2016:

	Year Ended December 31,	
	2017	2016
	Pro Forma	
Revenues	$ 231,213	$ 191,437
Loss before income taxes	(136,966)	(201,210)
Net loss	(134,275)	(197,144)
Net loss attributable to the noncontrolling interests	9,802	3,662
Net loss attributable to Intrexon	(124,473)	(193,482)

The results of operations of the 2015 acquisitions discussed above subsequent to the acquisitions are included in the consolidated statement of operations. The following unaudited condensed pro forma financial information for the year ended December 31, 2015 is presented as if the 2015 acquisitions had been consummated on January 1, 2014:

	Year Ended December 31, 2015
	Pro Forma
Revenues	$ 174,558
Loss before income taxes	(99,751)
Net loss	(99,594)
Net loss attributable to the noncontrolling interests	3,501
Net loss attributable to Intrexon	(96,093)

4. Investments in Joint Ventures

S & I Ophthalmic

In September 2013, the Company entered into a Limited Liability Company Agreement ("Sun LLC Agreement") with Sun Pharmaceutical Industries, Inc. ("Sun Pharmaceutical Subsidiary"), an indirect subsidiary of Sun Pharmaceutical Industries Ltd. ("Sun Pharmaceutical"), an international specialty pharmaceutical company focused on chronic diseases, to form S & I Ophthalmic, LLC ("S & I Ophthalmic"). The Sun LLC Agreement governs the affairs and the conduct of business of S & I Ophthalmic. S & I Ophthalmic leverages experience and technology from both the Company and Sun Pharmaceutical. Both the Company and Sun Pharmaceutical Subsidiary made an initial capital contribution of $5,000 in October 2013 for a 50% membership interest in S & I Ophthalmic. S & I Ophthalmic is governed by a board of managers which has four members, two each from the Company and Sun Pharmaceutical Subsidiary. In 2015, both the Company and Sun Pharmaceutical Subsidiary made subsequent capital contributions of $5,000.

In December 2017, both the Company and Sun Pharmaceutical Subsidiary agreed to dissolve S & I Ophthalmic and terminate the related ECC agreement. The Company is entitled to receive $2,598 upon the dissolution of S & I Ophthalmic which represents the Company's portion of S & I Ophthalmic's remaining cash after all liabilities are settled and is included in related party receivables in the accompanying consolidated balance sheet as of December 31, 2017. The Company's investment in S & I Ophthalmic was $3,236 as of December 31, 2016 and is included in investments in affiliates in the accompanying consolidated balance sheet.

OvaXon

In December 2013, the Company and OvaScience, Inc. ("OvaScience"), a life sciences company focused on the discovery, development and commercialization of new treatments for infertility, entered into a Limited Liability Company Agreement ("OvaXon LLC Agreement") to form OvaXon, LLC ("OvaXon"), a joint venture to create new applications for improving human and animal health. Both the Company and OvaScience made an initial capital contribution of $1,500 in January 2014 for a 50% membership interest in OvaXon. OvaXon is governed by the OvaXon board of managers ("OvaXon Board") which has four members, two each from the Company and OvaScience. In cases in which the OvaXon Board determines that additional capital contributions are necessary in order for OvaXon to conduct business and comply with its obligations, each of the Company and OvaScience has the right, but not the obligation, to make additional capital contributions to OvaXon subject to the OvaXon LLC Agreement. Through December 31, 2017, both the Company and OvaScience have made subsequent capital contributions of $4,350.

The Company's investment in OvaXon was $146 and $65 as of December 31, 2017 and 2016, respectively, and is included in investments in affiliates in the accompanying consolidated balance sheets. See additional discussion in Note 22.

Intrexon Energy Partners

In March 2014, the Company and certain investors (the "IEP Investors"), including an affiliate of Third Security, LLC ("Third Security"), entered into a Limited Liability Company Agreement which governs the affairs and conduct of business of Intrexon Energy Partners, LLC ("Intrexon Energy Partners"), a joint venture formed to optimize and scale-up the Company's methane bioconversion platform ("MBP") technology for the production of certain fuels and lubricants. The Company also entered into

an ECC with Intrexon Energy Partners providing exclusive rights to the Company's technology for the use in bioconversion, as a result of which the Company received a technology access fee of $25,000 while retaining a 50% membership interest in Intrexon Energy Partners. The IEP Investors made initial capital contributions, totaling $25,000 in the aggregate, in exchange for pro rata membership interests in Intrexon Energy Partners totaling 50%. In addition, Intrexon has committed to make capital contributions of up to $25,000, and the IEP Investors, as a group and pro rata in accordance with their respective membership interests in Intrexon Energy Partners, have committed to make additional capital contributions of up to $25,000, at the request of Intrexon Energy Partners' board of managers (the "Intrexon Energy Partners Board") and subject to certain limitations. As of December 31, 2017, the Company's remaining commitment was $6,011. Intrexon Energy Partners is governed by the Intrexon Energy Partners Board which has five members. Two members of the Intrexon Energy Partners Board are designated by the Company and three members are designated by a majority of the IEP Investors. The Company and the IEP Investors have the right, but not the obligation, to make additional capital contributions above the initial limits when and if solicited by the Intrexon Energy Partners Board.

The Company's investment in Intrexon Energy Partners was $(444) and $(477) as of December 31, 2017 and 2016, respectively, and is included in other accrued liabilities in the accompanying consolidated balance sheets.

Intrexon Energy Partners II

In December 2015, the Company and certain investors (the "IEPII Investors"), including Harvest, entered into a Limited Liability Company Agreement which governs the affairs and conduct of business of Intrexon Energy Partners II, LLC ("Intrexon Energy Partners II"), a joint venture formed to utilize the Company's MBP technology for the production of 1,4-butanediol, an industrial chemical used to manufacture spandex, polyurethane, plastics, and polyester. The Company also entered into an ECC with Intrexon Energy Partners II which provides exclusive rights to the Company's technology for use in the field, as a result of which the Company received a technology access fee of $18,000 while retaining a 50% membership interest in Intrexon Energy Partners II. The IEPII Investors made initial capital contributions, totaling $18,000 in the aggregate, in exchange for pro rata membership interests in Intrexon Energy Partners II totaling 50%. In December 2015, the owners of Intrexon Energy Partners II made a capital contribution of $4,000, half of which was paid by the Company. Intrexon has committed to make additional capital contributions of up to $10,000, and the IEPII Investors, as a group and pro rata in accordance with their respective membership interests in Intrexon Energy Partners II, have committed to make additional capital contributions of up to $10,000, at the request of Intrexon Energy Partners II's board of managers (the "Intrexon Energy Partners II Board") and subject to certain limitations. Intrexon Energy Partners II is governed by the Intrexon Energy Partners II Board which has five members. One member of the Intrexon Energy Partners II Board is designated by the Company and four members are designated by a majority of the IEPII Investors. The Company and the IEPII Investors have the right, but not the obligation, to make additional capital contributions above the initial limits when and if solicited by the Intrexon Energy Partners II Board.

The Company's investment in Intrexon Energy Partners II was $572 and $1,414 as of December 31, 2017 and 2016, respectively, and is included in investments in affiliates in the accompanying consolidated balance sheets.

EnviroFlight

In February 2016, the Company entered into a series of transactions involving EnviroFlight, LLC ("Old EnviroFlight"), Darling Ingredients Inc. ("Darling") and a newly formed venture between the Company and Darling ("New EnviroFlight"). The Company determined that the series of integrated transactions to acquire substantially all of the assets of Old EnviroFlight for cash, common stock, and contingent consideration should be accounted for as a single transaction, which constituted a business, and considered New EnviroFlight to be the accounting acquirer. Consideration paid to Old EnviroFlight was $4,244 in cash, 136,340 shares of the Company's common stock valued at $4,401 and contingent consideration estimated at $3,660. Contemporaneously, all the assets acquired from Old EnviroFlight, with the exception of certain developed technology, and $3,000 of cash were contributed to New EnviroFlight in exchange for a non-controlling, 50% membership interest in New EnviroFlight. The Company's contributions to New EnviroFlight included an exclusive license to the developed technology that was retained by the Company. Darling received the remaining 50% membership interest in New EnviroFlight as consideration for terminating rights previously held in the developed technology with Old EnviroFlight. New EnviroFlight was formed to generate high-nutrition, low environmental impact animal and fish feed, as well as fertilizer products, from black soldier fly larvae. The Company and Darling as members have each agreed to make additional capital contributions of up to $5,000 to fund ongoing operations of New EnviroFlight. As of December 31, 2017, the Company's remaining commitment was $250, which was satisfied in January 2018. All of the employees of Old EnviroFlight became employees of New EnviroFlight.

The Company determined that its investment in New EnviroFlight should be accounted for using the equity method of accounting. The Company recorded an estimated fair value of $5,425 for its investment in New EnviroFlight and $9,880 for the

retained developed technology intangible asset. The developed technology is being amortized over a period of twenty-one years. The contingent consideration liability payable to the members of Old EnviroFlight is considered a freestanding financial instrument and is recorded at fair value each reporting period. New EnviroFlight met a regulatory milestone, as defined in the asset purchase agreement, and the members of Old EnviroFlight received a portion of the contingent consideration consisting of 59,337 shares of the Company's common stock valued at $1,583 in October 2016. The members of Old EnviroFlight may receive up to $4,000 of additional shares of the Company's common stock if certain commercial milestones are met prior to February 2019. Based upon management's assessment of the likelihood of New EnviroFlight achieving the commercial milestones, the Company wrote-off the remaining balance of its estimated liability during the year ended December 31, 2017 (Note 8).

The Company's investment in New EnviroFlight was $7,092 and $4,189 as of December 31, 2017 and 2016, respectively, and is included in investments in affiliates in the accompanying consolidated balance sheets.

Intrexon T1D Partners

In March 2016, the Company and certain investors (the "T1D Investors"), including affiliates of Third Security, entered into a Limited Liability Company Agreement which governs the affairs and conduct of business of Intrexon T1D Partners, LLC ("Intrexon T1D Partners"), a joint venture formed to utilize the Company's proprietary ActoBiotics platform to develop and commercialize products to treat type 1 diabetes. The Company also entered into an ECC with Intrexon T1D Partners which provides the exclusive rights to the Company's technology for use in the field, as a result of which the Company received a technology access fee of $10,000 while retaining a 50% membership interest in Intrexon T1D Partners. The T1D Investors made initial capital contributions, totaling $10,000 in the aggregate, in exchange for pro rata membership interests in Intrexon T1D Partners totaling 50%. Intrexon has committed to make capital contributions of up to $5,000, and the T1D Investors, as a group and pro rata in accordance with their respective membership interests in Intrexon T1D Partners, have committed to make additional capital contributions of up to $5,000, at the request of Intrexon T1D Partners' board of managers (the "Intrexon T1D Partners Board") and subject to certain limitations. As of December 31, 2017, the Company's remaining commitment was $2,900. Intrexon T1D Partners is governed by the Intrexon T1D Partners Board, which has five members. Two members of the Intrexon T1D Partners Board are designated by the Company and three members are designated by a majority of the T1D Investors. The Company and the T1D Investors have the right, but not the obligation, to make additional capital contributions above these limits when and if solicited by the Intrexon T1D Partners Board.

The Company's investment in Intrexon T1D Partners was $(943) and $806 as of December 31, 2017 and 2016, respectively, and is included in other accrued liabilities and investments in affiliates, respectively, in the accompanying consolidated balance sheets.

5. Collaboration and Licensing Revenue

The Company's collaborations and licensing agreements provide for multiple deliverables to be delivered by the Company and typically include a license to the Company's technology platforms, participation in collaboration committees, performance of certain research and development services and may include obligations for certain manufacturing services. The Company typically groups these deliverables into two units of accounting based on the nature of the deliverables and the separation criteria. The first deliverable ("Unit of Accounting 1") includes the license to the Company's technology platform, the Company's participation on the collaboration committees and any research and development services associated with its technology platforms. The deliverables for Unit of Accounting 1 are combined because they cannot be individually separated. If applicable, the second deliverable ("Unit of Accounting 2") includes manufacturing services to be provided for any Company materials in an approved product. These services have standalone value and are contingent due to uncertainties on whether an approved product will ever be developed thereby requiring manufacture by the Company at that time. All upfront consideration is allocated to Unit of Accounting 1. Unit of Accounting 2 is determined to be a contingent deliverable at the inception of the collaboration due to the uncertainties surrounding whether an approved product will ever be developed and require manufacturing by the Company. The upfront consideration allocated to Unit of Accounting 1 is recognized over the expected life of the Company's technology platform using a straight-line approach which approximates the period the Company expects to complete its performance obligations.

The Company recognizes the reimbursement payments received for research and development services in the period when the services are performed and collection is reasonably assured. At the inception of each collaboration, the Company determines whether any milestone payments are substantive and can be recognized when earned. The milestone payments are typically not considered substantive. Royalties related to product sales will be recognized when earned since payments relate directly to products that have been fully developed and for which the Company has satisfied all of its obligations.

The Company determines whether collaborations and licensing agreements are individually significant for disclosure based on a number of factors, including total revenue recorded by the Company pursuant to collaboration and licensing agreements, collaborators or licensees with either majority-owned subsidiaries or equity method investments, or other qualitative factors. Collaboration and licensing revenues generated from consolidated subsidiaries are eliminated in consolidation. The following tables summarize the amounts recorded as revenue in the consolidated statements of operations for each significant collaboration or licensing agreement for the years ended December 31, 2017, 2016 and 2015.

	Year Ended December 31, 2017		
	Revenue Recognized From		
	Upfront and Milestone Payments	Research and Development Services	Total
ZIOPHARM Oncology, Inc.	$ 48,313	$ 21,499	$ 69,812
Oragenics, Inc.	1,047	973	2,020
Fibrocell Science, Inc.	2,419	4,925	7,344
Genopaver, LLC	273	6,417	6,690
S & I Ophthalmic, LLC	—	755	755
OvaXon, LLC	—	1,966	1,966
Intrexon Energy Partners, LLC	2,500	8,165	10,665
Persea Bio, LLC	500	446	946
Ares Trading S.A.	6,389	4,349	10,738
Intrexon Energy Partners II, LLC	2,000	1,672	3,672
Intrexon T1D Partners, LLC	1,109	4,859	5,968
Harvest start-up entities (1)	2,442	12,790	15,232
Other	4,645	5,126	9,771
Total	$ 71,637	$ 73,942	$ 145,579

(1) For the year ended December 31, 2017, revenue recognized from collaborations with Harvest start-up entities include Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; Relieve Genetics, Inc.; AD Skincare, Inc.; Genten Therapeutics, Inc.; and CRS Bio, Inc.

	Year Ended December 31, 2016		
	Revenue Recognized From		
	Upfront and Milestone Payments	Research and Development Services	Total
ZIOPHARM Oncology, Inc.	$ 11,529	$ 22,307	$ 33,836
Oragenics, Inc.	1,047	1,705	2,752
Fibrocell Science, Inc.	2,419	3,523	5,942
Genopaver, LLC	273	5,844	6,117
S & I Ophthalmic, LLC	—	6,141	6,141
OvaXon, LLC	—	2,934	2,934
Intrexon Energy Partners, LLC	2,500	15,052	17,552
Persea Bio, LLC	500	778	1,278
Ares Trading S.A.	6,389	3,803	10,192
Intrexon Energy Partners II, LLC	2,000	1,169	3,169
Intrexon T1D Partners, LLC	821	1,087	1,908
Harvest start-up entities (1)	1,383	3,591	4,974
Other	5,572	7,504	13,076
Total	$ 34,433	$ 75,438	$ 109,871

(1) For the year ended December 31, 2016, revenue recognized from collaborations with Harvest start-up entities include Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; Relieve Genetics, Inc.; AD Skincare, Inc.; Genten Therapeutics, Inc.; and CRS Bio, Inc.

	Year Ended December 31, 2015		
	Revenue Recognized From		
	Upfront and Milestone Payments	Research and Development Services	Total
ZIOPHARM Oncology, Inc.	$ 2,855	$ 16,451	$ 19,306
Oragenics, Inc.	5,679	856	6,535
Fibrocell Science, Inc.	6,046	6,133	12,179
Genopaver, LLC	273	3,556	3,829
S & I Ophthalmic, LLC	—	4,115	4,115
OvaXon, LLC	—	2,540	2,540
Intrexon Energy Partners, LLC	2,500	10,947	13,447
Persea Bio, LLC	500	741	1,241
Ares Trading S.A.	3,933	795	4,728
Intrexon Energy Partners II, LLC	167	—	167
Harvest start-up entities (1)	46	220	266
Other	10,514	8,954	19,468
Total	$ 32,513	$ 55,308	$ 87,821

(1) For the year ended December 31, 2015, revenue recognized from collaborations with Harvest start-up entities include Thrive Agrobiotics, Inc.

The following is a summary of the terms of the Company's significant collaborations and licensing agreements.

ZIOPHARM Collaborations

In January 2011, the Company entered into an ECC with ZIOPHARM, a related party. Pursuant to the ECC, ZIOPHARM received a license to the Company's technology platform within the field of oncology as defined more specifically in the

agreement. Upon execution of the ECC, the Company received 3,636,926 shares of ZIOPHARM's common stock valued at $17,457 as upfront consideration. In addition to the deliverables discussed above, the Company transferred two clinical product candidates to ZIOPHARM that resulted in a separate unit of accounting for which $1,115 of the upfront consideration was allocated and recognized as collaboration revenue in 2011. The remaining $16,342 of upfront consideration was allocated to Unit of Accounting 1 discussed above. The Company was entitled to additional shares of common stock representing the lesser of (i) the original shares received or (ii) the number of shares representing 7.495% of ZIOPHARM's outstanding shares at the date of the dosing of the first patient in a Phase II clinical trial of a product candidate created, produced or developed by ZIOPHARM using the Company's technology ("ZIOPHARM Milestone"). In October 2012, the ZIOPHARM Milestone was achieved and the Company received 3,636,926 shares of ZIOPHARM's common stock valued at $18,330 as milestone consideration. Since the ZIOPHARM Milestone was not substantive, the Company allocated the ZIOPHARM Milestone to the applicable units of accounting and is recognizing it in a manner similar to these units of accounting. The Company receives reimbursement payments for research and development services provided and manufacturing services for Company materials provided to ZIOPHARM during the ECC. Subject to certain expense allocations, ZIOPHARM will pay the Company a percentage of the quarterly net profits derived from the sale of products developed from the ECC, as defined and amended in the agreement.

ZIOPHARM is responsible for conducting preclinical and clinical development of product candidates, as well as for other aspects of commercialization or manufacturing of product candidates. The term of the ECC commenced in January 2011 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by ZIOPHARM upon 90 days written notice to the Company. In March 2015, in conjunction with the worldwide License and Collaboration Agreement ("Merck Agreement") with Ares Trading, a subsidiary of the biopharmaceutical business of Merck KGaA, and ZIOPHARM discussed below, the Company and ZIOPHARM amended their existing ECC. The amendment modifies the scope of the ECC in connection with the Merck Agreement and provides that the Company will pay to ZIOPHARM 50% of all payments received for upfront fees, milestones and royalties under the Merck Agreement.

In September 2015, the Company entered into its second ECC with ZIOPHARM ("ZIOPHARM ECC 2"). Pursuant to the ECC, ZIOPHARM received a license to the Company's technology platform to develop and commercialize novel biotherapeutics for the treatment of patients with graft-versus-host disease, or GvHD. Upon execution of ZIOPHARM ECC 2, the Company received a technology access fee of $10,000. The Company received reimbursement payments for research and development services provided pursuant to the agreement during the ECC and manufacturing services for Company materials provided to ZIOPHARM during the ECC. In December 2017, the Company and ZIOPHARM mutually agreed to terminate ZIOPHARM ECC2 and accordingly, the Company recognized the remaining balance of the deferred revenue associated with ZIOPHARM ECC2 totaling $28,943.

In June 2016, the Company amended each of its two existing collaboration agreements with ZIOPHARM and as a result the rate of the royalty which the Company is entitled to receive on certain products commercialized pursuant to the agreements was reduced from 50% to 20%. As consideration for execution of the amendments, ZIOPHARM issued the Company 100,000 shares of ZIOPHARM's Series 1 Preferred Stock valued at $120,000. The Company allocated the consideration received to each ECC based on the cumulative value of upfront and milestone payments previously received pursuant to that ECC. Because the Company has remaining performance obligations under each of the ZIOPHARM ECCs, the Company recorded the initial fair value received as deferred revenue and recognizes this amount straight-line over the remaining performance period for each ZIOPHARM ECC. No other financially significant terms of the ZIOPHARM ECCs were changed as a result of the amendments. See Note 7 for additional discussion of the terms of the preferred stock and the accounting treatment.

Oragenics Collaborations

In June 2012, the Company entered into an ECC with Oragenics, a publicly traded company focused on becoming the world leader in novel antibiotics against infectious diseases and a related party. Pursuant to the ECC, at the transaction effective date, Oragenics received a license to the Company's technology platform within the field of lantibiotics for the treatment of infectious diseases in humans and companion animals as defined more specifically in the agreement. Upon execution of the ECC, the Company received a technology access fee of 439,243 shares of Oragenics' common stock valued at $6,588 as upfront consideration. In November 2017, the Company amended the ECC agreement with Oragenics, and as a result, the Company is entitled to up to $35,000 of potential one-time payments for certain regulatory milestones. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC and manufacturing services for Company materials provided to Oragenics during the ECC. Oragenics will pay the Company 25% of the quarterly profits derived from the sale of products developed from the ECC, as defined in the agreement.

Oragenics is responsible for funding the further development of lantibiotics toward the goal of commercialization, conducting preclinical and clinical development of product candidates, as well as for other aspects of commercialization or manufacturing of the product candidates. The term of the ECC commenced in June 2012 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Oragenics upon 90 days written notice to the Company.

In September 2013, the Company entered into its second ECC with Oragenics ("Oragenics ECC 2"). Pursuant to Oragenics ECC 2, at the transaction effective date, Oragenics received a license to the Company's technology platform to develop and commercialize probiotics, specifically the direct administration to humans of genetically modified probiotics for the treatment of diseases of the oral cavity, throat, sinus and esophagus as defined more specifically in the agreement. Upon execution of Oragenics ECC 2, the Company received a technology access fee of 134,800 shares of Oragenics' common stock valued at $3,503 and a $1,956 convertible promissory note maturing on or before December 31, 2013 as upfront consideration. Prior to the maturity date, Oragenics had the right to convert the promissory note into shares of Oragenics' common stock subject to its shareholders' approval. The conversion price was equal to the closing price of Oragenics' common stock on the last trading day immediately prior to the date of conversion. In December 2013, Oragenics converted the promissory note into 69,824 shares of Oragenics' common stock. In September 2015, Oragenics and the Company mutually agreed to terminate Oragenics ECC 2 and accordingly, the Company recognized the remaining balance of the deferred revenue associated with the upfront payment.

In June 2015, the Company entered into its third ECC with Oragenics ("Oragenics ECC 3"). Pursuant to Oragenics ECC 3, at the transaction effective date, Oragenics received a license to the Company's technology platform within the field of biotherapeutics for use in certain treatments of oral mucositis and other diseases and conditions of the oral cavity, throat, and esophagus. Upon execution of Oragenics ECC 3, the Company received a technology access fee of a $5,000 convertible promissory note maturing on or before December 31, 2015 as upfront consideration. Prior to the maturity date, Oragenics had the right to convert the promissory note into shares of Oragenics' common stock, subject to its shareholders' approval. In December 2015, Oragenics converted the promissory note into 338,100 shares of Oragenics' common stock. The Company is also entitled to up to $22,000 of potential payments for development and commercial milestones for each Oragenics product developed from Oragenics ECC 3 and up to $10,000 of potential one-time payments for certain regulatory milestones under Oragenics ECC 3. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC and manufacturing services for Company materials provided to Oragenics during Oragenics ECC 3. Oragenics will pay the Company royalties as a percentage in the low-teens of net sales derived from the sale of products developed from Oragenics ECC 3, as defined in the agreement. In November 2017, the Company amended the Oragenics ECC 3 agreement, and as a result, the Company is entitled to an additional $5,500 of potential payments for development and commercial milestones for each Oragenics product developed from Oragenics ECC 3.

Oragenics is responsible for funding the further development of Oragenics ECC 3 products towards the goal of commercialization, conducting preclinical and clinical development of product candidates, as well as for other aspects of commercialization or manufacturing of the product candidates. The term of Oragenics ECC 3 commenced in June 2015 and may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Oragenics upon 90 days written notice to the Company.

All Oragenics share data noted above reflect a 1-for-10 reverse stock split of Oragenics' common stock effective January 19, 2018.

Fibrocell Science Collaborations

In October 2012, the Company entered into an ECC ("Fibrocell ECC 1") with Fibrocell Science, Inc. ("Fibrocell"), a publicly traded cell and gene therapy company focused on diseases affecting the skin and connective tissue and a related party. Pursuant to the ECC, at the transaction effective date, Fibrocell received a license to the Company's technology platform to develop and commercialize genetically modified and non-genetically modified autologous fibroblasts and autologous dermal cells in the United States of America. Upon execution of the ECC, the Company received a technology access fee of 439,173 shares of Fibrocell's common stock valued at $7,576 as upfront consideration. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC and manufacturing services for Company materials provided to Fibrocell during the ECC. On a quarterly basis, Fibrocell will pay the Company royalties of 7% of net sales up to $25,000 and 14% of net sales above $25,000 on each product developed from the ECC, as defined in the agreement. If Fibrocell uses the Company's technology platform to improve the production of a current or new Fibrocell product not developed from the ECC, Fibrocell will pay the Company quarterly royalties equal to 33% of the cost of goods sold savings generated by the improvement, as defined in the agreement.

Fibrocell is responsible for conducting preclinical and clinical development of product candidates associated with Fibrocell ECC 1, as well as for other aspects of commercialization and manufacturing of the product candidates. The term of the ECC commenced in October 2012 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Fibrocell upon 90 days written notice to the Company.

In June 2013, the Company and Fibrocell entered into an amendment to the Fibrocell ECC 1. The amendment expanded the field of use defined in the ECC agreement. Under the terms of the amendment to the Fibrocell ECC 1, the Company received 414,594 shares of Fibrocell's common stock valued at $7,612 as a supplemental technology access fee. The Company allocated this additional consideration to the appropriate unit of accounting and is recognizing it consistent with the unit of accounting.

In January 2014, the Company and Fibrocell entered into a second amendment to the Fibrocell ECC 1. The second amendment further expanded the field of use defined in the ECC agreement. Under the terms of the second amendment to the Fibrocell ECC 1, the Company received 341,530 shares of Fibrocell's common stock valued at $5,225 as a supplemental technology access fee. The Company allocated this additional consideration to the appropriate unit of accounting. In September 2015, Fibrocell and the Company mutually agreed to terminate the second amendment to the ECC and accordingly, the Company recognized the remaining balance of deferred revenue associated with the related upfront payment.

In December 2015, the Company entered into a second ECC with Fibrocell ("Fibrocell ECC 2"). Pursuant to the ECC, at the transaction effective date, Fibrocell received a license to the Company's technology platform to develop and commercialize genetically-modified fibroblasts to treat chronic inflammatory and degenerative diseases of the joint, including arthritis and related conditions. Upon execution of the ECC, the Company received a technology access fee of $10,000. The Company is also entitled to (i) up to $30,000 of potential one-time payments for certain development and regulatory milestones for the first product developed under Fibrocell ECC 2, (ii) up to $30,000 of potential payments for certain regulatory milestones for each additional product developed under Fibrocell ECC 2, and (iii) up to $22,500 of potential payments for certain sales milestones for each product developed under Fibrocell ECC 2. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC and manufacturing services for Company materials provided to Fibrocell during the ECC. Fibrocell will pay the Company royalties as a percentage in the low double-digits of net sales derived from the sale of products developed from Fibrocell ECC 2, as defined in the agreement.

Fibrocell is responsible for conducting preclinical and clinical development of product candidates associated with Fibrocell ECC 2, as well as for other aspects of commercialization and manufacturing of the product candidates. The term of the ECC commenced in December 2015 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Fibrocell upon 90 days written notice to the Company.

All Fibrocell share data noted above reflect a 1-for-3 reverse stock split of Fibrocell's common stock effective March 10, 2017.

Genopaver Collaboration

In March 2013, the Company entered into an ECC with Genopaver, LLC ("Genopaver"), an affiliate of Third Security and a related party. Genopaver was formed for the purpose of entering into the ECC and developing and commercializing products in the field of the fermentative production of alkaloids through genetically modified cell-lines and substrate feeds for use as active pharmaceutical ingredients or as commercially sold intermediates in the manufacture of active pharmaceutical ingredients. Upon execution of the ECC, the Company received a technology access fee of $3,000 as upfront consideration. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC. Genopaver will pay the Company royalties as a percentage in the lower-double digits on the quarterly gross profits of product sales from products developed under the ECC, as defined in the agreement. Genopaver is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in March 2013 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Genopaver upon 90 days written notice to the Company.

AquaBounty Collaboration

In February 2013, the Company entered into an ECC with AquaBounty, a majority-owned consolidated subsidiary. The Company will be reimbursed for research and development services as provided for in the ECC agreement. In the event of product sales from a product developed from the ECC, the Company will receive 16.66% of quarterly gross profits for each product, as defined in the agreement. All revenues and expenses related to this ECC are eliminated in consolidation.

S & I Ophthalmic Collaboration

In September 2013, the Company entered into an ECC with S & I Ophthalmic, a joint venture between the Company and Sun Pharmaceutical Subsidiary, an indirect subsidiary of Sun Pharmaceutical, an international specialty pharmaceutical company focused on chronic diseases, and a related party. The ECC granted S & I Ophthalmic an exclusive license to the Company's technology platform to develop and commercialize therapies in humans for the treatment of ocular diseases defined more specifically in the agreement. The Company was reimbursed for research and development services pursuant to the agreement and manufacturing services for Company materials provided to S & I Ophthalmic during the ECC. The term of the ECC commenced in September 2013. In December 2017, the Company and Sun Pharmaceutical Subsidiary mutually agreed to terminate the ECC and dissolve the joint venture.

OvaXon Collaboration

In December 2013, the Company entered into an ECC with OvaXon, a joint venture between the Company and OvaScience, a life sciences company focused on infertility treatments, and a related party. The ECC grants OvaXon an exclusive license to the Company's technology platform to create new applications for improving human and animal health. OvaScience also licensed certain technology to OvaXon pursuant to a separate license agreement. The Company will be reimbursed for research and development services and manufacturing services as provided for in the ECC agreement. The term of the ECC commenced in December 2013 and continues until terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by OvaXon upon 90 days written notice to the Company. See additional discussion in Note 22.

Intrexon Energy Partners Collaboration

In March 2014, the Company entered into an ECC with Intrexon Energy Partners, a joint venture between the Company and certain investors and a related party. The ECC grants Intrexon Energy Partners an exclusive license to the Company's technology platform to optimize and scale-up the Company's methane bioconversion platform for the production of certain fuels and lubricants. Upon execution of the ECC, the Company received a technology access fee of $25,000 as upfront consideration. The Company will be reimbursed for research and development services as provided for in the ECC agreement. The term of the ECC commenced in March 2014 and continues until March 2034 unless terminated prior to that date by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Intrexon Energy Partners upon 90 days written notice to the Company.

Persea Bio Collaboration

In December 2014, the Company entered into an ECC with Persea Bio, LLC ("Persea Bio"), an affiliate of Third Security and a related party. Persea Bio was formed for the purpose of entering into the ECC and developing and commercializing a food program, as defined in the agreement. Upon effectiveness of the ECC, the Company received a technology access fee of $5,000 as upfront consideration. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC. Persea Bio will pay the Company royalties as a percentage in the lower-double digits on the quarterly gross profits of product sales from products derived from the ECC, as defined in the agreement. Persea Bio is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in December 2014 and continues until terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Persea Bio upon 90 days written notice to the Company.

Merck Licensing Agreement

In March 2015, the Company signed the Merck Agreement with Ares Trading and ZIOPHARM through which the parties established a collaboration for the research and development and commercialization of certain products for the prophylactic, therapeutic, palliative or diagnostic use for cancer in humans. Pursuant to the Merck Agreement, the Company received a technology access fee of $115,000 as upfront consideration, of which $57,500 was paid to ZIOPHARM in accordance with the terms of the agreement. Upon the selection of the first two targets by Ares Trading, the Company received $10,000 in equal quarterly installments over two years. The Company is entitled to receive a further $5,000 for each additional target selected by Ares Trading. The Company is also entitled to up to $413,000 of potential payments for substantive and non-substantive development and commercial milestones for each product, and royalties ranging from the lower-single digits to the low-teens of the net sales derived from the sale of products developed under the Merck Agreement. The Company may also receive up to $50,000 of further cash fees upon certain technical milestones as provided for in the agreement. The term of the Merck Agreement commenced in May 2015 and may be terminated by either party in the event of a material breach as defined in the

agreement and may be terminated voluntarily by Ares Trading upon 90 days written notice to the Company. The Company will pay to ZIOPHARM 50% of all payments received for upfront fees, milestones, and royalties under the Merck Agreement.

Thrive Agrobiotics Collaboration

In September 2015, the Company entered into an ECC with Thrive Agrobiotics, Inc. ("Thrive Agrobiotics"), an affiliate of Harvest and a related party. Thrive Agrobiotics was formed for the purpose of entering into the ECC and developing and commercializing products to improve the overall growth and feed efficiency in piglets. Upon execution of the ECC, the Company received a technology access fee in the form of equity in Thrive Agrobiotics valued at $1,667 as upfront consideration. The Company is also entitled to up to $5,500 of potential payments for development and commercial milestones for each product developed under the ECC. The Company receives reimbursement payments for research and development services provided pursuant to the agreement during the ECC. Thrive Agrobiotics will pay the Company royalties as a percentage in the lower-double digits on the quarterly gross profits of product sales from products developed under the ECC, as defined in the agreement. Thrive Agrobiotics is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in September 2015 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Thrive Agrobiotics upon 90 days written notice to the Company.

Intrexon Energy Partners II Collaboration

In December 2015, the Company entered into an ECC with Intrexon Energy Partners II, a joint venture between the Company and certain investors and a related party. Pursuant to the ECC, Intrexon Energy Partners II received an exclusive license to the Company's technology platform to optimize and scale-up the Company's methane bioconversion platform for the production of 1,4-butanediol (BDO), a key chemical intermediate that is used to manufacture spandex, polyurethane, plastics, and polyester. Upon execution of the ECC, the Company received a technology access fee of $18,000 and is entitled to reimbursement of research and development services as provided for in the ECC agreement. The term of the ECC commenced in December 2015 and continues until December 2035; termination prior to that date may be initiated (i) by either party in the event of certain material breaches defined in the agreement or (ii) may be terminated voluntarily by Intrexon Energy Partners II upon 90 days written notice to the Company.

Exotech Bio Collaboration

In March 2016, the Company entered into an ECC with Exotech Bio, Inc. ("Exotech Bio"), an affiliate of Harvest and a related party. Exotech Bio was formed for the purpose of entering into the ECC and developing and commercializing products using exosomes carrying a RNA payload designed to kill, suppress, or render immune-visible a cancer cell. Upon execution of the ECC, the Company received a technology access fee in the form of equity in Exotech Bio valued at $5,000 as upfront consideration. The Company is also entitled to up to $52,500 of potential payments for substantive and non-substantive development and commercial milestones for each product developed under the ECC. The Company receives reimbursement payments for research and development services provided pursuant to the ECC. Exotech Bio will pay the Company royalties as a percentage in the lower double-digits on the quarterly net sales of products developed under the ECC, as defined in the agreement. Exotech Bio is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in March 2016 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Exotech Bio upon 90 days written notice to the Company.

Relieve Genetics Collaboration

In March 2016, the Company entered into an ECC with Relieve Genetics, Inc. ("Relieve Genetics"), an affiliate of Harvest and a related party. Relieve Genetics was formed for the purpose of entering into the ECC and developing and commercializing products using a viral vector expressing interleukin-10 for the treatment of chronic neuropathic pain resultant from cancer in humans. Upon execution of the ECC, the Company received a technology access fee in the form of equity in Relieve Genetics valued at $4,333 as upfront consideration. The Company is also entitled to up to $52,500 of potential payments for substantive and non-substantive development and commercial milestones for each product developed under the ECC. The Company receives reimbursement payments for research and development services provided pursuant to the ECC. Relieve Genetics will pay the Company royalties as a percentage in the lower double-digits on the quarterly net sales of products developed under the ECC, as defined in the agreement. Relieve Genetics is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in March 2016 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Relieve Genetics upon 90 days written notice to the Company.

Intrexon T1D Partners Collaboration

In March 2016, the Company entered into an ECC with Intrexon T1D Partners, a joint venture between the Company and certain investors and a related party. Pursuant to the ECC, Intrexon T1D Partners received an exclusive license to the Company's technology platform to develop and commercialize products to treat type 1 diabetes. Upon execution of the ECC, the Company received a technology access fee of $10,000 and is entitled to reimbursement of research and development services as provided for in the ECC agreement. The term of the ECC commenced in March 2016 and continues until March 2036; termination prior to that date may be initiated (i) by either party in the event of certain material breaches defined in the agreement or (ii) may be terminated Intrexon T1D Partners upon 90 days written notice to the Company.

AD Skincare Collaboration

In June 2016, the Company entered into an ECC with AD Skincare, Inc. ("AD Skincare"), an affiliate of Harvest and a related party. AD Skincare was formed for the purpose of entering into the ECC and developing an advanced topical delivery system to improve the efficacy of biologically active ingredients aimed at improving signs of aging human skin. Upon execution of the ECC, the Company received a technology access fee in the form of equity in AD Skincare valued at $4,333 as upfront consideration. The Company is also entitled to up to $2,000 of potential payments for substantive and non-substantive development milestones for each product developed under the ECC, as well as up to $17,000 in one-time commercial milestones. The Company receives reimbursement payments for research and development services provided pursuant to the ECC. AD Skincare will pay the Company royalties as a percentage in the low double-digits on the quarterly net sales of products developed under the ECC, as defined in the agreement. AD Skincare is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in June 2016 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by AD Skincare upon 90 days written notice to the Company.

Genten Therapeutics Collaboration

In September 2016, the Company entered into an ECC with Genten Therapeutics, Inc. ("Genten Therapeutics"), an affiliate of Harvest and a related party. Genten Therapeutics was formed for the purpose of entering into the ECC and developing and commercializing products using the Company's technology for expression of gluten peptides, alone or in combination with immunomodulatory cytokines, to reestablish immune tolerance for patients with celiac disease. Upon execution of the ECC, the Company received a technology access fee in the form of a $1,500 cash payment and equity in Genten Therapeutics valued at $3,000 as upfront consideration. The Company is entitled to receive additional equity interests in Genten Therapeutics upon the first instance of the achievement of a certain non-substantive development milestone. The Company is also entitled to up to $82,000 of potential payments for substantive and non-substantive development and commercial milestones for each product developed under the ECC. The Company receives reimbursement payments for research and development services provided pursuant to the ECC. Genten Therapeutics will pay the Company royalties as a percentage in the lower double-digits on the quarterly net sales of products developed under the ECC, as defined in the agreement. Genten Therapeutics is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in September 2016 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by Genten Therapeutics upon 90 days written notice to the Company.

CRS Bio Collaboration

In September 2016, the Company entered into an ECC with CRS Bio, Inc. ("CRS Bio"), an affiliate of Harvest and a related party. CRS Bio was formed for the purpose of entering into the ECC and developing and commercializing products through targeted delivery of antibodies for treatment of chronic rhinosinusitis with and without nasal polyps, by utilizing the Company's technology to block inflammatory mediators in the nasal passage, leading to improved breathing and, importantly, patients' quality of life. Upon execution of the ECC, the Company received a technology access fee in the form of equity in CRS Bio valued at $2,100. The Company is entitled to receive additional equity interests in CRS Bio upon the first instance of the achievement of a certain non-substantive development milestone. The Company is also entitled to up to $75,000 of potential payments for substantive and non-substantive development and commercial milestones for each product developed under the ECC. The Company receives reimbursement payments for research and development services provided pursuant to the ECC. CRS Bio will pay the Company royalties as a percentage in the lower double-digits on the quarterly net sales of products developed under the ECC, as defined in the agreement. CRS Bio is responsible for the development and commercialization of the product candidates. The term of the ECC commenced in September 2016 and continues until terminated pursuant to the ECC agreement. The ECC may be terminated by either party in the event of certain material breaches defined in the agreement and may be terminated voluntarily by CRS Bio upon 90 days written notice to the Company.

Deferred Revenue

Deferred revenue primarily consists of consideration received for upfront and milestone payments in connection with the Company's collaborations and licensing agreements, prepayments for research and development services performed for collaborators and licensees, and prepayments for product and service revenues. Deferred revenue consists of the following:

	December 31,	
	2017	2016
Upfront and milestone payments	$ 230,531	$ 297,867
Prepaid research and development services	1,052	6,015
Prepaid product and service revenues	4,681	5,554
Other	133	706
Total	$ 236,397	$ 310,142
Current portion of deferred revenue	$ 42,870	$ 53,364
Long-term portion of deferred revenue	193,527	256,778
Total	$ 236,397	$ 310,142

The following table summarizes the remaining balance of deferred revenue associated with upfront and milestone payments for each significant collaboration and licensing agreement.

	December 31,	
	2017	2016
ZIOPHARM Oncology, Inc.	$ 90,496	$ 138,809
Oragenics, Inc.	6,719	7,766
Fibrocell Science, Inc.	16,607	19,026
Genopaver, LLC	1,704	1,977
Intrexon Energy Partners, LLC	15,625	18,125
Persea Bio, LLC	3,500	4,000
Ares Trading S.A.	40,789	47,178
Intrexon Energy Partners II, LLC	13,833	15,833
Intrexon T1D Partners, LLC	8,435	8,653
Harvest start-up entities (1)	18,400	20,208
Other	14,423	16,292
Total	$ 230,531	$ 297,867

(1) As of December 31, 2017 and December 31, 2016, the balance of deferred revenue for collaborations with Harvest start-up entities includes Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; Relieve Genetics, Inc.; AD Skincare, Inc.; Genten Therapeutics, Inc.; and CRS Bio, Inc.

6. Short-term and Long-term Investments

The Company's investments are classified as available-for-sale. The following table summarizes the amortized cost, gross unrealized gains and losses and fair value of available-for-sale investments as of December 31, 2017:

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Aggregate Fair Value
U.S. government debt securities	$ 6,000	$ —	$ (2)	$ 5,998
Certificates of deposit	275	—	—	275
Total	$ 6,275	$ —	$ (2)	$ 6,273

The following table summarizes the amortized cost, gross unrealized gains and losses and fair value of available-for-sale investments as of December 31, 2016:

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Aggregate Fair Value
U.S. government debt securities	$ 180,412	$ 5	$ (94)	$ 180,323
Certificates of deposit	272	—	—	272
Total	$ 180,684	$ 5	$ (94)	$ 180,595

For more information on the Company's method for determining the fair value of its assets, see Note 2 – "Fair Value of Financial Instruments".

As of December 31, 2017, all of the available-for-sale investments were due within one year based on their contractual maturities.

Changes in market interest rates and bond yields cause certain investments to fall below their cost basis, resulting in unrealized losses on investments. The unrealized losses of the Company's investments were primarily a result of unfavorable changes in interest rates subsequent to the initial purchase of these investments and are not significant as of December 31, 2017.

As of December 31, 2017 and 2016, the Company did not consider any of its investments to be other-than-temporarily impaired. When evaluating its investments for other-than-temporary impairment, the Company reviews factors such as the length of time and extent to which fair value has been below its cost basis, the financial condition of the issuer, the Company's ability and intent to hold the security and whether it is more likely than not that it will be required to sell the investment before recovery of its cost basis.

7. Investments in Preferred Stock

Investment in ZIOPHARM Preferred Stock

In June 2016, the Company received 100,000 shares of Series 1 Preferred Stock (the "Preferred Shares") of ZIOPHARM with a per share stated value of $1,200, as consideration for amending their two previously existing ECC agreements (Note 5). A summary of the terms of the Preferred Shares follows.

Conversion. The Preferred Shares shall automatically convert into shares of ZIOPHARM common stock upon the date the first approval in the United States of (i) a ZIOPHARM product, as defined in and developed under one of the ECC agreements, or (ii) a product, as defined and developed under the License and Collaboration Agreement with Ares Trading and ZIOPHARM, is publicly announced (the "Conversion Event Date"). The Preferred Shares shall convert into a number of shares of ZIOPHARM common stock equal to the stated value of such Preferred Share, divided by the greater of: (i) the volume weighted average closing price of ZIOPHARM's common stock over the twenty trading days ending on the Conversion Event Date or (ii) $1.00. The number of converted shares is subject to certain limitations defined in the amended and restated Certificate of Designation, Preferences, and Rights of Series 1 Preferred Stock (the "A&R Certificate of Designation").

Dividend Rights. The Company shall receive a monthly dividend, payable in additional Preferred Shares, equal to $12.00 per Preferred Share held per month divided by the stated value of the Preferred Shares, which is referred to as the PIK Dividend. For any Preferred Shares that are not converted on the Conversion Event Date, the rate of PIK Dividend on these unconverted Preferred Shares will automatically increase from $12.00 to $24.00 per Preferred Share per month.

Voting Rights. The Preferred Shares do not have any voting rights except for certain protective voting rights defined in the A&R Certificate of Designation.

Liquidation Rights. In the event of any voluntary or involuntary liquidation, dissolution or winding up of ZIOPHARM or a deemed liquidation event, as defined in the A&R Certificate of Designation, including a change of control or the sale, lease transfer, or exclusive license of all or substantially all of ZIOPHARM's assets, the holders of the Preferred Shares shall be entitled to receive a portion of all funds to be distributed in proportion to the holders' proportionate share of ZIOPHARM's common stock on an as-converted to common stock basis (the "Series 1 Liquidation Amount"). For purposes of calculating the Series 1 Liquidation Amount, if such liquidation event occurs prior to the Conversion Event Date, each Preferred Share shall be deemed to be convertible into the number of shares of ZIOPHARM's common stock equal to (i) the stated value of each

Preferred Share, divided by (ii) the volume weighted average price of ZIOPHARM's common stock for the twenty day period ending on the date of the public announcement of the liquidation event. In addition, ZIOPHARM may elect to redeem the Preferred Shares in connection with or following a deemed liquidation event at a price per share equal to the Series 1 Liquidation Amount.

The investment in ZIOPHARM preferred stock is categorized as Level 3 as there are significant unobservable inputs and the Preferred Shares are not traded on a public exchange. The fair value of the investment in ZIOPHARM preferred stock is estimated using a probability-weighted expected return ("PWERM") model. The key inputs used in the PWERM model are (i) estimating the future returns for conversion of the Preferred Shares for both product approval and a change in control of ZIOPHARM (the "conversion events") using market data of the change in value for guideline companies as a result of these conversion events; (ii) estimating the expected date and likelihood of each conversion event; and (iii) discounting these estimated future returns using a discount rate for the Preferred Shares considering industry debt issuances originated by public funds and venture capital rates of return. A significant change in unobservable inputs discussed above could result in a significant impact on the fair value of the Company's investment in ZIOPHARM preferred stock. The fair value of the Company's investment in ZIOPHARM preferred stock, including additional Preferred Shares received as dividends, was $160,832 and $129,545 as of December 31, 2017 and 2016, respectively. During the years ended December 31, 2017 and 2016, the Company received 13,460 shares and 6,184 shares, respectively, of additional Preferred Shares and recognized $16,717 and $7,421, respectively, of dividend income in the accompanying consolidated statements of operations.

Investment in Fibrocell Preferred Stock

In March 2017, Fibrocell sold Series A Convertible Preferred Stock (the "Convertible Preferred Shares") convertible into shares of Fibrocell common stock and warrants to purchase shares of Fibrocell common stock to certain institutional and accredited investors, including the Company and affiliates of Third Security. The Company paid $1,161 in exchange for 1,161 Convertible Preferred Shares and warrants to acquire 498,843 shares of Fibrocell common stock, reflective of the 1-for-3 reverse stock split of Fibrocell's common stock effective March 10, 2017. The Convertible Preferred Shares are convertible at any time at the election of the Company and accrue dividends at 4% per annum, compounded quarterly, increasing the stated value of the shares. The investment in Fibrocell preferred stock is categorized as Level 3 as there are significant unobservable inputs and the Convertible Preferred Shares are not traded on a public exchange. The fair value of the investment in Fibrocell preferred stock is estimated using a conversion plus dividend approach utilizing the trading value of the underlying common stock and an estimated premium for the preferred stock dividend and other preferences. Market price volatility of Fibrocell's common stock and a significant change in the estimated preferred stock premium could result in a significant impact to the fair value of the investment in Fibrocell preferred stock. As of December 31, 2017, the fair value of the Company's investment in Fibrocell preferred stock was $393. See Note 18 for additional discussion of the warrants.

Investment in Oragenics Preferred Stock

In November 2017, concurrent with Oragenics closing a preferred stock private placement, the Company exchanged a promissory note, including accrued interest, purchased from Oragenics in May 2017 and receivables due from Oragenics totaling $3,385 for Oragenics Series C preferred stock ("Series C Preferred Stock"). The Series C Preferred Stock is non-voting and non-convertible and is redeemable in whole or part at any time by Oragenics in cash. The Series C Preferred Stock accrues an annual 12% dividend payable in additional Series C Preferred Stock through May 10, 2019, and after such date, the annual dividend increases to 20%. Additionally, the Company and Oragenics amended certain future payment terms under its ECCs (Note 5). As of December 31, 2017, based on the most recent financial information available on Oragenics, the Company concluded that there was no value to its investment in Oragenics preferred stock.

Changes in the Fair Value of Investments in Preferred Stock

The following table summarizes the changes in the Level 3 investments in preferred stock during the years ended December 31, 2017 and 2016.

	2017	2016
Beginning balance	$ 129,545	$ —
Receipt of preferred stock as consideration for amendments to collaboration agreements	—	120,000
Purchase of preferred stock	766	—
Conversion of receivables to preferred stock	3,385	—
Dividend income from investments in preferred stock	16,756	7,421
Net unrealized appreciation in the fair value of the investments in preferred stock	10,773	2,124
Ending balance	$ 161,225	$ 129,545

8. Fair Value Measurements

The carrying amount of cash and cash equivalents, restricted cash, receivables, prepaid expenses and other current assets, accounts payable, accrued compensation and benefits, other accrued liabilities, and related party payables approximate fair value due to the short maturity of these instruments.

The following table presents the placement in the fair value hierarchy of financial assets that are measured at fair value on a recurring basis, including the items for which the fair value option has been elected, as of December 31, 2017:

	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	December 31, 2017
Assets				
U.S. government debt securities	$ —	$ 5,998	$ —	$ 5,998
Equity securities	10,537	4,563	—	15,100
Preferred stock	—	—	161,225	161,225
Other	—	850	—	850
Total	$ 10,537	$ 11,411	$ 161,225	$ 183,173

The following table presents the placement in the fair value hierarchy of financial assets that are measured at fair value on a recurring basis, including the items for which the fair value option has been elected, as of December 31, 2016:

	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	December 31, 2016
Assets				
U.S. government debt securities	$ —	$ 180,323	$ —	$ 180,323
Equity securities	15,544	7,978	—	23,522
Preferred stock	—	—	129,545	129,545
Other	—	1,917	—	1,917
Total	$ 15,544	$ 190,218	$ 129,545	$ 335,307

The method used to estimate the fair value of the Level 1 assets in the tables above is based on observable market data as these equity securities are publicly-traded. The method used to estimate the fair value of the Level 2 short-term and long-term investments in the tables above is based on professional pricing sources for identical or comparable instruments, rather than

direct observations of quoted prices in active markets. The method used to estimate the fair value of the Level 2 equity securities in the tables above is based on the quoted market price of the publicly-traded security, adjusted for a discount for lack of marketability. The methods used to estimate the fair value of the Level 3 assets are discussed in Note 7.

There were no transfers between levels of the fair value hierarchy during the year ended December 31, 2017.

The carrying values of the Company's long term debt approximates fair value due to the length of time to maturity and/or the existence of interest rates that approximate prevailing market rates. The Company's contingent consideration liabilities (Notes 3 and 4) are measured on a recurring basis and were $585 and $2,081 as of December 31, 2017 and 2016, respectively. These fair value measurements were based on significant inputs not observable in the market and thus represented a Level 3 measurement. A significant change in unobservable inputs could result in a significant impact on the fair value of the Company's contingent consideration liabilities. The contingent consideration liabilities are remeasured to fair value at each reporting date until the contingency is resolved, and those changes in fair value are recognized in earnings. The changes in the fair value of the Level 3 liabilities during the years ended December 31, 2017 and 2016 were as follows:

	2017	2016
Beginning balance	$ 2,081	$ —
Acquisition date fair value of contingent consideration liability	585	3,660
Payment of contingent consideration (Note 4)	—	(1,583)
Change in fair value of contingent consideration recognized in selling, general and administrative expenses	(2,081)	4
Ending balance	$ 585	$ 2,081

9. Inventory

Inventory consists of the following:

	December 31,	
	2017	2016
Supplies, embryos and other production materials	$ 2,673	$ 1,835
Work in process	4,767	5,466
Livestock	11,040	11,752
Feed	2,013	2,086
Total inventory	$ 20,493	$ 21,139

10. Property, Plant and Equipment, Net

Property, plant and equipment consist of the following:

	December 31,	
	2017	2016
Land and land improvements	$ 11,767	$ 10,904
Buildings and building improvements	18,183	8,123
Furniture and fixtures	2,515	2,176
Equipment	65,863	44,392
Leasehold improvements	25,277	15,105
Breeding stock	3,832	3,893
Computer hardware and software	10,128	6,844
Trees	6,642	2,772
Construction and other assets in progress	14,113	4,513
	158,320	98,722
Less: Accumulated depreciation and amortization	(45,646)	(34,050)
Property, plant and equipment, net	$ 112,674	$ 64,672

Depreciation expense was $11,951, $9,387 and $7,872 for the years ended December 31, 2017, 2016 and 2015, respectively.

Included in the table above is $14,219 of land, buildings, and equipment related to a 2017 asset acquisition of a land-based aquaculture facility to be used in the production of AquAdvantage salmon in Indiana.

11. Goodwill and Intangible Assets, Net

The changes in the carrying amount of goodwill for the years ended December 31, 2017 and 2016, are as follows:

	2017	2016
Beginning balance	$ 157,175	$ 165,169
Acquisitions	4,850	—
Impairment	(13,823)	—
Foreign currency translation adjustments	5,087	(7,994)
Ending balance	$ 153,289	$ 157,175

For the year ended December 31, 2017, the Company recorded a $13,823 goodwill impairment charge, which primarily relates to AquaBounty. During the Company's annual goodwill impairment test, the Company determined, based on the price per share received by AquaBounty in its recent underwritten public offering (Note 22), it was more-likely-than-not that the fair value of the AquaBounty reporting unit was less than its carrying amount. As a result, the Company compared the carrying amount of the AquaBounty reporting unit to the fair value and determined the carrying amount exceeded the fair value resulting in a $13,001 goodwill impairment charge for the excess carrying value. The Company did not recognize any goodwill impairment charges during the years ended December 31, 2016 or 2015, and there were no accumulated impairment charges as of December 31, 2016.

Intangible assets consist of the following as of December 31, 2017:

	Weighted Average Useful Life (Years)	Gross Carrying Amount	Accumulated Amortization	Net
Patents, developed technologies and know-how	15.9	$ 263,615	$ (44,954)	$ 218,661
Customer relationships	6.5	10,700	(6,383)	4,317
Trademarks	9.3	6,800	(2,567)	4,233
In-process research and development		5,666	—	5,666
Total		$ 286,781	$ (53,904)	$ 232,877

Intangible assets consist of the following as of December 31, 2016:

	Gross Carrying Amount	Accumulated Amortization	Net
Patents, developed technologies and know-how	$ 236,401	$ (29,748)	$ 206,653
Customer relationships	10,700	(4,672)	6,028
Trademarks	6,800	(1,792)	5,008
Covenant not to compete	370	(339)	31
In-process research and development	7,895	—	7,895
Total	$ 262,166	$ (36,551)	$ 225,615

The balance of in-process research and development includes certain in-process research and development technology acquired in the Company's acquisition of Oxitec in September 2015, and amortization will begin once certain regulatory approvals have been obtained for the in-process programs. In 2017, the Company decided to forgo further development for certain of its in-process research and development assets and, as a result, recorded an impairment charge of $2,950.

Amortization expense was $19,194, $15,185 and $9,871 for the years ended December 31, 2017, 2016 and 2015, respectively. Estimated aggregate amortization expense for definite lived intangible assets is expected to be as follows:

2018	$ 19,258
2019	18,935
2020	18,833
2021	18,645
2022	17,646
Thereafter	133,894
Total	$ 227,211

12. Lines of Credit and Long Term Debt

Lines of Credit

Trans Ova has a $5,000 revolving line of credit with First National Bank of Omaha which matures on May 1, 2018. The line of credit bears interest at the greater of 2.95% above the London Interbank Offered Rate or 3.00% and the actual rate was 4.32% as of December 31, 2017. As of December 31, 2017, there was no outstanding balance. The amount available under the line of credit is based on eligible accounts receivable and inventory up to the maximum principal amount. The line of credit is collateralized by certain of Trans Ova's assets and contains certain restricted covenants that include maintaining minimum tangible net worth and working capital and maximum allowable annual capital expenditures. Trans Ova was in compliance with these covenants as of December 31, 2017.

Exemplar has a $700 revolving line of credit with American State Bank which matures on October 30, 2018. The line of credit bears interest at 5.25% per annum. As of December 31, 2017, there was an outstanding balance of $233.

Long Term Debt

Long term debt consists of the following:

	December 31,	
	2017	**2016**
Notes payable	$ 5,010	$ 5,453
Royalty-based financing	2,132	1,896
Other	895	599
Long term debt	8,037	7,948
Less current portion	502	386
Long term debt, less current portion	$ 7,535	$ 7,562

Trans Ova has a note payable to American State Bank which matures in April 2033 and has an outstanding principal balance of $4,872 as of December 31, 2017. Trans Ova pays monthly installments of $39, which includes interest at 3.95%. The note payable is collateralized by certain of Trans Ova's real estate and non-real estate assets.

AquaBounty has a royalty-based financing grant from the Atlantic Canada Opportunities Agency, a Canadian government agency, to provide funding of a research and development project. The total amount available under the award was $2,288, which AquaBounty claimed over a five year period. All amounts claimed by AquaBounty must be repaid in the form of a 10% royalty on any products commercialized out of this research and development project until fully paid. Because the timing of commercialization is subject to additional regulatory considerations, the timing of repayment is uncertain. As of the date of the acquisition by Intrexon in March 2013, AquaBounty had claimed $1,952 of the available funds and this amount was recorded at its acquisition date fair value of $1,107. The Company accretes the difference of $845 between the face value of amounts drawn and the acquisition date fair value over the expected period of repayment. Subsequent to the acquisition date, AquaBounty claimed the remaining balance available under the grant, resulting in total long term debt of $2,132 as of December 31, 2017.

Future maturities of long term debt are as follows:

2018	$ 502
2019	401
2020	372
2021	832
2022	360
Thereafter	3,438
Total	$ 5,905

The AquaBounty royalty-based financing grant is not included in the table above due to the uncertainty of the timing of repayment.

13. Income Taxes

The components of loss before income taxes are presented below:

	Year Ended December 31,		
	2017	**2016**	**2015**
Domestic	$ (71,343)	$ (157,067)	$ (69,287)
Foreign	(58,357)	(37,084)	(17,691)
Loss before income taxes	$ (129,700)	$ (194,151)	$ (86,978)

The components of income tax expense (benefit) are presented below:

	Year Ended December 31,		
	2017	**2016**	**2015**
U.S. federal income taxes:			
Current	$ 27	$ (17)	$ 22
Deferred	(523)	1,396	1,732
Foreign income taxes:			
Current	(379)	(393)	(123)
Deferred	(2,269)	(5,177)	(1,003)
State income taxes:			
Deferred	264	314	388
Income tax expense (benefit)	$ (2,880)	$ (3,877)	$ 1,016

Income tax expense (benefit) for the years ended December 31, 2017, 2016 and 2015 differed from amounts computed by applying the applicable U.S. federal corporate income tax rate of 34% to loss before income taxes as a result of the following:

	2017	**2016**	**2015**
Computed statutory income tax benefit	$ (44,098)	$ (66,011)	$ (29,573)
State and provincial income tax benefit, net of federal income taxes	(3,294)	(7,905)	(3,157)
Nondeductible stock based compensation	4,147	3,321	3,182
Nondeductible officer compensation	476	—	2,433
Gain on dividend distribution of AquaBounty common stock	3,965	—	—
Impairment of goodwill	4,700	—	—
Research and development tax incentives	(1,166)	(6,350)	(348)
Acquisition and internal restructuring transaction costs	354	571	883
Provisional impact of the Tax Act	85,288	—	—
Enacted changes in foreign tax rates and foreign tax reforms	2,138	—	(961)
U.S.-foreign rate differential	5,410	3,463	620
Other, net	(64)	1,485	(98)
	57,856	(71,426)	(27,019)
Change in valuation allowance for deferred tax assets	(60,736)	67,549	28,035
Total income tax expense (benefit)	$ (2,880)	$ (3,877)	$ 1,016

The tax effects of temporary differences that comprise the deferred tax assets and liabilities as of December 31, 2017 and 2016, are as follows:

	2017	2016
Deferred tax assets		
Allowance for doubtful accounts	$ 1,300	$ 1,676
Inventory	489	447
Equity securities and investments in affiliates	17,510	31,729
Accrued liabilities and long-term debt	3,131	4,168
Stock-based compensation	26,936	8,460
Deferred revenue	61,785	68,056
Research and development tax credits	11,385	10,396
Net operating and capital loss carryforwards	111,453	144,502
Total deferred tax assets	233,989	269,434
Less: Valuation allowance	215,582	256,165
Net deferred tax assets	18,407	13,269
Deferred tax liabilities		
Property, plant and equipment	237	406
Intangible assets	33,790	29,870
Total deferred tax liabilities	34,027	30,276
Net deferred tax liabilities	$ (15,620)	$ (17,007)

Activity within the valuation allowance for deferred tax assets during the years ended December 31, 2017, 2016 and 2015 was as follows:

	2017	2016	2015
Valuation allowance at beginning of year	$ 256,165	$ 190,174	$ 161,660
Increase (decrease) in valuation allowance as a result of			
Mergers and acquisitions, net	—	(1,416)	1,228
Current year operations	26,619	67,549	28,035
Adoption of ASU 2016-09	17,843	—	—
Provisional impact of the Tax Act	(87,473)	—	—
Changes in foreign tax rates and foreign tax reforms	1,327	—	—
Foreign currency translation adjustment	1,101	(142)	(749)
Valuation allowance at end of year	$ 215,582	$ 256,165	$ 190,174

In assessing the realizability of deferred tax assets, management considers whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. Management considers the scheduled reversal of deferred tax liabilities, projected future taxable income and tax planning strategies in making this assessment. Due to the Company and its subsidiaries' histories of net losses incurred from inception, any corresponding net domestic and certain foreign deferred tax assets have been fully reserved as the Company and its subsidiaries cannot sufficiently be assured that these deferred tax assets will be realized. The components of the deferred tax assets and liabilities as of the date of the mergers and acquisitions by the Company prior to consideration of the valuation allowance are substantially similar to the components of deferred tax assets presented herein.

The Company's past issuances of stock and mergers and acquisitions have resulted in ownership changes as defined in Section 382 of the Internal Revenue Code of 1986, as amended ("Section 382"). As a result, utilization of portions of the net operating losses may be subject to annual limitations, however as of December 31, 2017, all such limited losses applicable to Intrexon, other than losses inherited via acquisition, have been fully utilized. As of December 31, 2017, approximately $33,590 of the Company's domestic net operating losses were inherited via acquisition, including $13,376 acquired via the acquisition of GenVec, and are limited based on the value of the target at the time of the transaction.

As of December 31, 2017, the Company has loss carryforwards for U.S. federal income tax purposes of approximately $244,274 available to offset future taxable income and federal and state research and development tax credits of $7,737, prior to consideration of annual limitations that may be imposed under Section 382. These carryforwards will begin to expire in 2022. The Company's direct foreign subsidiaries have foreign loss carryforwards of approximately $151,423, most of which do not expire.

The Company does not record deferred taxes on the undistributed earnings of its direct foreign subsidiaries because it does not expect the temporary differences related to those unremitted earnings to reverse in the foreseeable future. As of December 31, 2017, the Company's direct foreign subsidiaries had accumulated deficits of approximately $65,052. Future distributions of accumulated earnings of the Company's direct foreign subsidiaries may be subject to U.S. income and foreign withholding taxes. The Company is evaluating this accounting assertion in light of the Tax Act.

The Company does not file a consolidated income tax return with AquaBounty. As of December 31, 2017, AquaBounty has loss carryforwards for federal and foreign income tax purposes of approximately $28,209 and $15,653, respectively, and foreign tax credits of approximately $2,832 available to offset future taxable income, prior to consideration of annual limitations that may be imposed under Section 382 or analogous foreign provisions. These carryforwards will begin to expire in 2018. As a result of the Company's ownership in AquaBounty passing 50% in 2013, an annual Section 382 of approximately $900 per year will apply to domestic losses and credits carried forward by AquaBounty from prior years, which are also subject to prior Section 382 limitations.

The Company recorded a net provisional income tax benefit of $2,185 upon enactment of the Tax Act, which is comprised of several items. Amounts related to the remeasurement of most of the Company's domestic deferred tax assets as a result of the U.S. corporate rate change to 21% as part of the Tax Act are $87,473, which was fully offset by a reduction in the Company's valuation allowance. The Company's net U.S. deferred tax liability that is not offset by a valuation allowance was similarly written down, and the Company recorded a provisional deferred tax benefit of $1,730. The Company also recorded a provisional current tax benefit of $455 related to the expected refundability of accumulated corporate alternative minimum tax credits. The Company has provisionally estimated its transition tax exposure to be zero, as any accumulated earnings in foreign subsidiaries are offset by accumulated deficits in other foreign subsidiaries.

The provisional amounts recorded are subject to further refinement within the measurement period prescribed by SAB 118. As a result, the recorded amounts are subject to change, possibly materially, due to, among other things, changes in interpretations of the Tax Act, any legislative action to address questions that arise because of the Tax Act, any changes in accounting standards for income taxes or related interpretations in response to the Tax Act, or any updates or changes to estimates the Company utilized to provisionally compute the transition impact.

Additionally, in December 2017, Belgium enacted significant tax reform measures, the most significant of which to the Company is the limitation on the utilization of accumulated losses in years after 2017. After that date, loss carryforwards can only be used to offset 70% of taxable income that exceeds a certain threshold. As a result, the Company recorded adjustments to its net deferred tax assets and valuation allowances. These adjustments resulted in a net deferred tax liability of $2,307, which was recorded as a component of deferred tax expense for the year ended December 31, 2017.

The Company and its subsidiaries do not have material unrecognized tax benefits as of December 31, 2017. The Company does not anticipate significant changes in the amount of unrecognized tax benefits in the next 12 months. The Company's tax returns for years 2004 and forward are subject to examination by federal or state tax authorities due to the carryforward of unutilized net operating losses and research and development tax credits.

14. Shareholders' Equity

Issuances of Common Stock

In December 2017, the Company entered into a securities purchase agreement with an affiliate of Third Security for the private placement of 1,207,980 shares of the Company's common stock for gross proceeds of $13,686.

In August 2015, the Company closed a public offering of 5,609,756 shares of its common stock, the net proceeds of which were $218,193, after deducting underwriting discounts of $11,500 and offering expenses paid by the Company of approximately $306, all of which were capitalized.

In January 2015, the Company closed a public offering of 4,312,500 shares of its common stock, including 555,556 shares of common stock purchased by affiliates of Third Security. The net proceeds of the offering were $110,041, after deducting

underwriting discounts and commissions of $6,086 and offering expenses paid by the Company of approximately $311, all of which were capitalized.

Dividends to Shareholders

In January 2017, the Company distributed to its shareholders 1,776,557 shares of AquaBounty common stock valued at $22,385. The distribution constituted a dividend to shareholders of record as of January 9, 2017. In connection with the distribution and pursuant to the terms of the Company's equity incentive plans, the conversion terms of all outstanding options for shares of the Company's common stock as of January 9, 2017 were adjusted to reflect the value of the distribution with respect to shares of the Company's common stock by decreasing the exercise prices and increasing the number outstanding options. This adjustment resulted in 46,766 additional outstanding options at a weighted average exercise price of $31.11.

In June 2015, the Company distributed to its shareholders 17,830,305 shares of ZIOPHARM common stock, representing all of the equity interests of ZIOPHARM held by the Company at the time of the distribution and resulting in a realized gain of $81,401. The distribution constituted a dividend to shareholders of record as of June 4, 2015. In connection with the distribution, pursuant to the terms of the Company's equity incentive plans, the conversion terms of all outstanding options for shares of the Company's common stock as of June 4, 2015 were adjusted to reflect the value of the distribution with respect to shares of the Company's common stock by decreasing the exercise prices and increasing the number of shares. This adjustment resulted in 312,795 additional outstanding options at a weighted average exercise price of $25.40.

Components of Accumulated Other Comprehensive Loss

The components of accumulated other comprehensive loss are as follows:

	December 31,	
	2017	**2016**
Unrealized loss on investments	$ (2)	$ (89)
Loss on foreign currency translation adjustments	(15,552)	(36,113)
Total accumulated other comprehensive loss	$ (15,554)	$ (36,202)

15. Share-Based Payments

The Company records the fair value of stock options issued to employees and non-employees as of the grant date as stock-based compensation expense. Stock-based compensation expense for employees and non-employees is recognized over the requisite service period, which is typically the vesting period. Stock-based compensation costs included in the consolidated statements of operations are presented below:

	Year Ended December 31,		
	2017	**2016**	**2015**
Cost of products	$ 116	$ 81	$ 95
Cost of services	322	274	354
Research and development	9,336	9,251	8,614
Selling, general and administrative	31,802	32,596	29,604
Total	$ 41,576	$ 42,202	$ 38,667

Intrexon Stock Option Plans

In April 2008, Intrexon adopted the 2008 Equity Incentive Plan (the "2008 Plan") for employees and nonemployees pursuant to which Intrexon's board of directors granted share based awards, including stock options, to officers, key employees and nonemployees. Upon the effectiveness of the 2013 Omnibus Incentive Plan (the "2013 Plan"), no new awards may be granted under the 2008 Plan. As of December 31, 2017, there were 453,371 stock options outstanding under the 2008 Plan.

Intrexon adopted the 2013 Plan for employees and nonemployees pursuant to which Intrexon's board of directors may grant share-based awards, including stock options, shares of common stock, and other share-based awards, to employees, officers,

consultants, advisors, and nonemployee directors. The 2013 Plan became effective upon the closing of the Company's initial public offering in August 2013, and as of December 31, 2017, there were 18,000,000 shares authorized for issuance under the 2013 Plan, of which 10,929,376 stock options were outstanding and 4,747,496 shares were available for grant.

Stock options may be granted with an exercise price equal to or greater than the stock's fair market value at the date of grant. Stock options may be granted with an exercise price less than the stock's fair market value at the date of grant if the stock options are replacement options in accordance with certain U.S. Treasury regulations. Virtually all stock options have ten-year terms and vest four years from the date of grant.

Stock option activity was as follows:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (Years)
Balances at December 31, 2014	8,323,544	$ 22.59	8.64
Granted	5,051,500	45.82	
Adjustment due to dividend (Note 14)	312,795	25.40	
Exercised	(1,029,291)	(15.16)	
Forfeited	(1,610,335)	(26.75)	
Expired	(4,685)	(28.29)	
Balances at December 31, 2015	11,043,528	32.66	8.49
Granted	4,644,860	29.39	
Exercised	(1,210,840)	(15.83)	
Forfeited	(2,760,809)	(40.34)	
Expired	(76,356)	(37.81)	
Balances at December 31, 2016	11,640,383	31.25	8.21
Granted	3,920,950	21.47	
Adjustment due to dividend (Note 14)	46,766	31.11	
Exercised	(149,429)	(6.37)	
Forfeited	(3,797,105)	(28.37)	
Expired	(278,818)	(33.18)	
Balances at December 31, 2017	11,382,747	28.99	7.32
Exercisable at December 31, 2017	5,306,697	29.96	6.14

Total unrecognized compensation costs related to unvested awards as of December 31, 2017 were $68,999, and are expected to be recognized over a weighted-average period of approximately two years.

The weighted average grant date fair value of options granted during 2017, 2016 and 2015 was $12.19, $16.28 and $25.96, respectively. The aggregate intrinsic value of options exercised during 2017, 2016 and 2015 was $2,429, $22,704 and $24,675, respectively. The aggregate intrinsic value of options is calculated as the difference between the exercise price of the underlying options and the fair value of Intrexon's common stock for those shares where the exercise price was lower than the fair value of Intrexon's common stock on the date of exercise.

The following table summarizes additional information about stock options outstanding as of December 31, 2017:

	Options Outstanding				Options Exercisable			
Range of Exercise Prices	Number of Options	Weighted Average Exercise Price	Weighted Average Remaining Life (Years)	Aggregate Intrinsic Value	Number of Options	Weighted Average Exercise Price	Weighted Average Remaining Life (Years)	Aggregate Intrinsic Value
$ 2.64 — $ 9.30	453,371	$ 7.06	3.94	$ 2,020	453,371	$ 7.06	3.94	$ 2,020
$12.50 — $ 21.38	3,158,121	20.58	8.74	—	456,942	19.52	7.13	—
$21.43 — $ 28.81	3,399,721	25.55	6.91	—	1,804,401	25.86	5.69	—
$28.88 — $ 40.99	2,751,716	32.07	6.70	—	1,732,250	31.51	6.32	—
$41.41 — $ 65.08	1,619,818	53.52	7.42	—	859,733	53.07	7.38	—
	11,382,747	$ 28.99	7.32	$ 2,020	5,306,697	$ 29.96	6.14	$ 2,020

The following table summarizes additional information about stock options outstanding as of December 31, 2016:

	Options Outstanding				Options Exercisable			
Range of Exercise Prices	Number of Options	Weighted Average Exercise Price	Weighted Average Remaining Life (Years)	Aggregate Intrinsic Value	Number of Options	Weighted Average Exercise Price	Weighted Average Remaining Life (Years)	Aggregate Intrinsic Value
$ 2.65 — $ 9.34	562,951	$ 6.23	4.13	$ 10,172	525,755	$ 6.01	3.97	$ 9,615
$15.21 — $ 27.19	2,785,705	23.47	8.54	4,797	684,704	21.07	7.29	2,237
$27.21 — $ 29.68	3,147,242	29.30	7.53	—	1,400,707	29.35	7.31	—
$29.70 — $ 42.22	3,590,423	32.89	9.09	—	345,274	37.06	6.85	—
$43.99 — $ 65.34	1,554,062	54.40	8.43	—	461,595	53.06	8.33	—
	11,640,383	$ 31.25	8.21	$ 14,969	3,418,035	$ 28.09	6.88	$ 11,852

Intrexon currently uses authorized and unissued shares to satisfy share award exercises.

In October 2015, the compensation committee and the independent members of Intrexon's board of directors approved a compensation arrangement whereby the Company's Chief Executive Officer ("CEO") would receive a monthly salary. Previously, the CEO did not receive compensation for his services as an employee of the Company other than through his participation in the Company's Annual Executive Incentive Plan which became effective January 1, 2015. Pursuant to the compensation agreement, the CEO receives a base salary of $200 per month payable in fully vested shares of Intrexon common stock with such shares subject to a three-year lock-up on resale. The monthly number of shares of common stock is calculated based on the closing price on the last trading day of each month and the shares are issued pursuant to the terms of a Restricted Stock Unit Agreement ("RSU Agreement") which was executed between Intrexon and the CEO pursuant to the terms of the 2013 Plan. The RSU Agreement became effective in November 2015 and had an initial term of twelve months. The independent members of Intrexon's board of directors, with the recommendation of the compensation committee of the board of directors, subsequently approved extensions of the RSU Agreement through March 31, 2018, all of which are on the same terms as the original RSU Agreement. The fair value of the shares issued as compensation for services is included in selling, general, and administrative expenses in the Company's consolidated statements of operations for the years ended December 31, 2017, 2016 and 2015, and totaled $1,908, $1,861, and $314, respectively.

AquaBounty Stock Option Plans

In March 2016, AquaBounty's board of directors adopted the AquaBounty 2016 Equity Incentive Plan ("AquaBounty 2016 Plan") to replace the AquaBounty 2006 Equity Incentive Plan ("AquaBounty 2006 Plan"). The AquaBounty 2016 Plan provides for the issuance of incentive stock options, non-qualified stock options and awards of restricted and direct stock purchases to directors, officers, employees, and consultants of AquaBounty. The AquaBounty 2016 Plan was approved by AquaBounty's shareholders at its annual meeting in April 2016. Upon the effectiveness of the AquaBounty 2016 Plan, no new awards may be granted under the AquaBounty 2006 Plan.

As of December 31, 2017, there were 227,203 options outstanding under both AquaBounty plans, of which 192,748 were exercisable, at a weighted average exercise price of $9.39 per share. As of December 31, 2016, there were 185,591 options outstanding under these plans, of which 181,766 were exercisable, at a weighted average exercise price of $7.89 per share.

16. License Agreement

In January 2015, the Company and ZIOPHARM jointly entered into a license agreement with the University of Texas System Board of Regents on behalf of the University of Texas MD Anderson Cancer Center ("MD Anderson") whereby the Company received an exclusive license to certain research and development technologies owned and licensed by MD Anderson, including technologies relating to novel chimeric antigen receptor (CAR) T-cell therapies, as well as co-licenses and non-exclusive licenses to certain other related technologies. ZIOPHARM received access to these technologies pursuant to the terms of the Company's ECC with ZIOPHARM. The Company issued 2,100,085 shares of its common stock valued at $59,579 to MD Anderson as consideration, which is included in research and development expenses in the accompanying consolidated statement of operations for the year ended December 31, 2015. Subject to certain exceptions, the license agreement expires on the last to occur of (i) the expiration of all patents licensed thereunder, or (ii) the twentieth anniversary of the date of the license agreement.

In connection with the license agreement, the Company, ZIOPHARM, and MD Anderson entered into a research and development agreement which governs certain operational activities between the parties and pursuant to which ZIOPHARM provided funding for certain research and development activities of MD Anderson for a period of three years, in an amount between $15,000 and $20,000 per year. The Company and ZIOPHARM reimburse MD Anderson for out of pocket expenses for maintaining patents covering the licensed technologies.

17. Commitments and Contingencies

Operating Leases

The Company leases certain facilities and equipment under noncancelable operating leases. The equipment leases are renewable at the option of the Company. As of December 31, 2017, future minimum lease payments under operating leases having initial or remaining noncancelable lease terms in excess of one year are as follows:

2018	$	7,964
2019		9,115
2020		9,186
2021		8,299
2022		7,279
Thereafter		26,044
Total	$	67,887

Rent expense, including other facility expenses, was $11,064, $8,593 and $8,610 in 2017, 2016 and 2015, respectively.

The Company maintains subleases for certain of its facilities. Rental income under sublease agreements was $137, $1,051 and $1,486 for the years ended December 31, 2017, 2016 and 2015, respectively. Future rental income is expected to be $104 in 2018, $120 in 2019, $55 in 2020, $56 in 2021, $58 in 2022, and $310 thereafter.

Purchase Commitments

As of December 31, 2017, the Company had outstanding contractual purchase commitments of $15,802, which primarily relate to amounts that will be paid in 2018, 2019, and 2020 upon delivery of commercial non-browning apple trees.

Contingencies

In March 2012, Trans Ova was named as a defendant in a licensing and patent infringement suit brought by XY, LLC ("XY") alleging that certain of Trans Ova's activities breached a 2004 licensing agreement and infringed on patents that XY allegedly owned. Trans Ova filed a number of counterclaims in the case. In Colorado District Court, the matter proceeded to a jury trial in January 2016. The jury determined that XY and Trans Ova had each breached the licensing agreement and that Trans Ova had infringed XY's patents. In April 2016, the court issued its post-trial order, awarding $528 in damages to Trans Ova and

$6,066 in damages to XY. The order also provided Trans Ova with a compulsory license to XY's technology, subject to an ongoing royalty obligation. Both parties appealed the court's order, which appeal is pending before the Court of Appeals for Federal Circuit. Since the inception of the 2004 agreement, Trans Ova has remitted payments to XY pursuant to the terms of that agreement and has recorded these payments in cost of services in the consolidated statements of operations for the respective periods. For the period from inception of the 2004 agreement through the court's April 2016 order, aggregate royalty and license payments were $3,170, of which $2,759 had not yet been deposited by XY. For the year ended December 31, 2016, the Company recorded litigation expense of $4,228, which is included in selling, general and administrative expenses on the accompanying consolidated statement of operations and represents the excess of the net damages awarded to XY, including prejudgment interest, over the liability previously recorded by Trans Ova for uncashed checks previously remitted to XY. In August 2016, Trans Ova deposited the net damages amount, including prejudgment interest, into the court's treasury, to be held until the appeals process is complete and final judgment amounts are determined. As of December 31, 2017, this amount is included in restricted cash on the accompanying consolidated balance sheet. In December 2016, Trans Ova elected to void the outstanding checks discussed above, and these amounts have been reclassified to other accrued liabilities on the accompanying consolidated balance sheets as of December 31, 2017 and 2016. Depending on the outcome of an appeal decision, the damages awarded to either party could decrease, increase, or be eliminated. The appeal decision may also remand to the Colorado District Court all, or a portion, of the issues being appealed. In December 2016, XY filed a complaint for patent infringement and trade secret misappropriation against Trans Ova in the District Court of Waco, Texas. Since the claims in this 2016 complaint directly relate to the 2012 licensing dispute and patent issues, Trans Ova filed and was granted a motion for change of venue to Colorado District Court. Trans Ova also filed a motion to dismiss, from which the Court recently dismissed nine of the twelve counts of the complaint. Presently, three counts for patent infringement remain pending. Trans Ova and the Company could elect to enter into a settlement agreement in order to avoid the further costs and uncertainties of litigation, to modify the court-ordered license to XY's technologies, or to recover monetary damages stemming from Trans Ova's counterclaims for antitrust violations by XY and its parent company, Inguran.

In May 2016, two putative shareholder class action lawsuits, captioned *Hoffman v. Intrexon Corporation et al.* and *Gibrall v. Intrexon Corporation et al.*, were filed in the U.S. District Court for the Northern District of California on behalf of purchasers of Intrexon's common stock between May 12, 2015 and April 20, 2016 (the "Class Period"). In July 2016, the court consolidated the lawsuits and appointed a lead plaintiff. The consolidated amended complaint names as defendants Intrexon and certain of Intrexon's current and former officers (the "Defendants"). It alleges, among other things, that the Defendants made materially false and/or misleading statements during the Class Period with respect to the Company's business, operations, and prospects in violation of Sections 10(b) and 20(a) of the Securities Exchange Act of 1934, as amended. The plaintiffs' claims are based in part upon allegations in a report published in April 2016 on the Seeking Alpha financial blog. The plaintiffs seek compensatory damages, interest and an award of reasonable attorneys' fees and costs. The Defendants moved to dismiss the case. On February 24, 2017, the court granted the Defendants' motion to dismiss the lawsuit on the grounds that the plaintiff failed to state a claim, while granting the plaintiff leave to amend. The plaintiff subsequently notified the court that it would seek to appeal the court's ruling rather than amend its complaint. On April 26, 2017, the court entered final judgment in the case. Notice of appeal was filed by the plaintiff on May 26, 2017. On October 26, 2017, the plaintiff filed a voluntary motion to dismiss the case, which the court of appeals granted on November 1, 2017.

In July 2016, a putative shareholder derivative action captioned *Basile v. Kirk et al.* was filed in the Circuit Court of Fairfax County, Virginia, against certain of the Company's directors, the Company's CEO, and Third Security, and naming the Company as a nominal defendant. The complaint alleges causes of action for breaches of fiduciary duty and unjust enrichment relating to the entry by the Company into the Services Agreement with Third Security. The plaintiff seeks, among other things, damages in an unspecified amount, disgorgement of improper benefits, appropriate equitable relief, and an award of attorney fees and other costs and expenses. The complaint is substantially similar to two separate demands made by shareholders concerning the Services Agreement and Mr. Kirk's compensation. The board of directors of the Company appointed a Special Litigation Committee ("SLC") consisting of independent directors to investigate the claims and allegations made in the derivative action and in the two shareholder demands and to decide on behalf of the Company whether the claims and allegations should be pursued. The *Basile* case was stayed pending the report of the SLC. In November 2016, the SLC completed its review and evaluation and unanimously determined that the claims were without merit because the compensation arrangements were the result of an informed and disinterested decision-making process and were fair to the Company, and that prosecution of the asserted claims was not in the best interest of Intrexon or its shareholders. Based upon the determination of the SLC, on February 24, 2017, the Company moved to dismiss the court action pursuant to Virginia statute. On June 8, 2017, the court granted the Company's motion to dismiss while granting the plaintiff leave to amend. On August 30, 2017, the plaintiff filed a consent motion for leave to amend along with the amended shareholder derivative complaint. The Company moved to dismiss the amended complaint on October 6, 2017. On January 25, 2018, the court granted the Company's motion and dismissed the plaintiff's amended complaint with prejudice.

In addition to the shareholder demands above, in June and July 2016, two shareholders made separate demands under Virginia law demanding that the Company file suit against certain of its current officers and directors for alleged breaches of fiduciary duty and other claims. The demands were based upon and asserted the allegations previously published in April 2016 in the Seeking Alpha financial blog. In July 2016, the Company's board of directors authorized the SLC to expand its review to include all such allegations. In February 2017, the SLC completed its review and evaluation and unanimously determined that there was no basis for any of the allegations, that the Company's officers and directors did not breach their fiduciary duties or any other applicable law, and that prosecution of the asserted claims was not in the best interest of Intrexon or its shareholders. Following the SLC's determination, in March 2017, one of the putative shareholders filed a derivative complaint captioned *Luger v. Kirk et al.* in the Circuit Court of Fairfax County, Virginia. The Company is a nominal defendant in this action, and other defendants include certain of the Company's directors, the Company's CEO, and Third Security. The complaint alleges causes of action for breaches of fiduciary duty and unjust enrichment relating to the entry by the Company into the Services Agreement with Third Security, Mr. Kirk's compensation, and certain allegations contained in the April 2016 Seeking Alpha financial blog piece. Based on the determination of the SLC and a review of applicable law, the Company intends to defend the lawsuit vigorously; however, there can be no assurance regarding the ultimate outcome of this case.

The Division of Enforcement of the U.S. Securities and Exchange Commission ("SEC") is conducting an investigation which the Company believes concerns certain issues raised by the foregoing matters. The Company has met with the SEC staff and is voluntarily cooperating with their investigation. The Company's board of directors has authorized the SLC to monitor the Company's interaction with the SEC staff.

The Company may become subject to other claims and assessments from time to time in the ordinary course of business. Such matters are subject to many uncertainties and outcomes are not predictable with assurance. The Company accrues liabilities for such matters when it is probable that future expenditures will be made and such expenditures can be reasonably estimated. As of December 31, 2017 and 2016, the Company does not believe that any such matters, individually or in the aggregate, will have a material adverse effect on the Company's business, financial condition, results of operations, or cash flows.

18. Related Party Transactions

Third Security and Affiliates

The Company's CEO and Chairman of the board of directors is also the Senior Managing Director and CEO of Third Security and owns 100% of the equity interests of Third Security. In November 2015, the independent members of Intrexon's board of directors, with the recommendation of the audit committee of the board of directors, approved the execution of a Services Agreement ("Services Agreement") with Third Security pursuant to which Third Security provides the Company with certain professional, legal, financial, administrative, and other support services necessary to support the Company and its CEO. As consideration for providing these services, Third Security is entitled to a fee of $800 per month to be paid in the form of fully-vested shares of the Company's common stock. The number of shares of common stock is calculated based on the closing price of the Company's common stock on the 15th day of each month. The payments made by the Company under the Services Agreement constitute, in the aggregate, an award under the 2013 Plan and are subject to the terms of the 2013 Plan (Note 15). The Services Agreement had a term of one year, can be terminated by the Company at any time, and may be extended only by agreement of the parties, including approval of a majority of the independent members of Intrexon's board of directors. The independent members of Intrexon's board of directors, with the recommendation of the audit committee of the board of directors, subsequently approved extensions of the Services Agreement through January 1, 2019. For the years ended December 31, 2017, 2016 and 2015, the Company issued 500,650 shares, 337,163 shares, and 48,678 shares, respectively, with values of $8,704, $8,571, and $1,375, respectively, to Third Security as payment for services pursuant to the Services Agreement. In addition to the foregoing Services Agreement, the Company reimburses Third Security for certain out-of-pocket expenses incurred on the Company's behalf, and the total expenses incurred by the Company under this arrangement was $409, $309, and $428 for the years ended December 31, 2017, 2016 and 2015, respectively.

See also Note 15 regarding compensation arrangements between the Company and its CEO.

In October 2017, the Company entered into a Preferred Stock Equity Facility ("Preferred Stock Facility") with an affiliate of Third Security ("Third Security Affiliate"). Under the Preferred Stock Facility, the Company may, from time to time at its sole and exclusive option, issue and sell to the Third Security Affiliate, up to $100,000 of newly issued Series A Redeemable Preferred Stock ("Series A Preferred Stock"). Any issued Series A Preferred Stock is non-voting, accrues dividends of 8% per annum and, subject to limited exceptions, is senior to Intrexon's common stock with respect to the rights to the payment of dividends and on parity with the common stock with respect to the distribution of assets in the event of any liquidation, dissolution or winding up or change of control of Intrexon. Any issued Series A Preferred Stock is convertible into common stock only following receipt of shareholder approval by the Company, including a majority of the shares voted by those

shareholders unaffiliated with Mr. Kirk (the "Shareholder Approval"), subject to any necessary regulatory approvals. Following receipt of the Shareholder Approval and receipt of any necessary regulatory approvals, any issued Series A Preferred Stock is convertible into Intrexon common stock based on a conversion price using the 20-day volume-weighted average market price as of market closing on the fifth business day prior to the mailing of the proxy statement soliciting the Shareholder Approval, subject to adjustment for certain stock splits and similar events. The Company has agreed to take all reasonable steps necessary to seek Shareholder Approval on or before the date of its annual meeting of shareholders in 2019. Any issued Series A Preferred Stock is redeemable at the election of the Company at any time, or at the election of the Third Security Affiliate after December 31, 2020. The Preferred Stock Facility will expire on the earliest to occur of: (i) the date on which the Third Security Affiliate has purchased shares of Series A Preferred Stock in the aggregate amount of $100,000, (ii) April 30, 2019, (iii) the date of the Shareholder Approval, and (iv) the mutual agreement of the parties. To date, the Company has not utilized the Preferred Stock Facility.

See additional discussion regarding Third Security's participation in the Company's equity offerings at Notes 14 and 22.

The Company also subleases certain administrative offices to Third Security. The significant terms of the lease mirror the terms of the Company's lease with the landlord, and the Company recorded sublease income of $43 for each of the years ended December 31, 2017, 2016 and 2015.

Transactions with ECC Parties

In addition to entities controlled by Third Security, any entity in which the Company holds equity securities, including securities received as upfront or milestone consideration, and which also are party to a collaboration with the Company are considered to be related parties.

In December 2017, the Company purchased certain property and equipment comprising the pilot plant production facility for its energy programs for $2,812 from Intrexon Energy Partners. The Company intends to use the pilot plant to support the collaborations with Intrexon Energy Partners and Intrexon Energy Partners II and its own research programs.

The Company holds a promissory note convertible into shares of Fibrocell common stock ("convertible note") and warrants to purchase shares of Fibrocell common stock. As of December 31, 2017 and 2016, the value of the convertible note and warrants totaled $575 and $1,642, respectively, and is included in other assets on the accompanying consolidated balance sheets. In July 2015, the Company purchased 125,290 shares of common stock of Fibrocell at $17.40 per share. The share data reflect a 1-for-3 reverse stock split of Fibrocell's common stock effective March 10, 2017.

In June 2016, the Company purchased 226,142 shares of Oragenics common stock at $5.20 per share. The share data reflect a 1-for-10 reverse stock split of Oragenics' common stock effective January 19, 2018.

In March 2015, the Company purchased 27,879 shares of common stock of AmpliPhi Biosciences Corporation ("AmpliPhi") and 6,969 warrants for $2,300. The share and warrant data reflect a 1-for-10 reverse stock split of AmpliPhi's common stock effective April 24, 2017. Of the total purchase price, $1,979 was allocated to the value of the shares of common stock and $321 was allocated to the value of the warrants. In December 2016, the Company sold all of its investment in AmpliPhi common stock, resulting in a realized loss of $4,098, which is included in unrealized and realized depreciation in fair value of equity securities on the consolidated statement of operations for the year ended December 31, 2016.

In February 2015, the Company purchased $12,600 of ZIOPHARM common stock. See Note 14 for additional discussion related to the Company's investment in ZIOPHARM.

Other Related Parties

In June 2015, the Company entered into an agreement with Harvest, an investment fund sponsored by Harvest Capital Strategies, LLC, and a related party based on ownership in the fund by affiliates of Third Security. Harvest was established to invest in life science research and development start-up opportunities that the Company offered to Harvest with exclusive rights of first-look and first negotiation. Based on this agreement, Harvest established six new collaboration entities, each of which entered into an ECC with the Company in a designated field. The terms of such ECCs were negotiated between the Company and Harvest. As consideration for providing exclusive rights of first-look and first negotiation for start-up opportunities, the Company received a portion of the management fee collected by the fund sponsor of Harvest. These fees are included in other income in the accompanying consolidated statements of operations and totaled $1,839, $2,483, and $1,349 for the years ended December 31, 2017, 2016 and 2015, respectively. In September 2017, the commitment period for Harvest was terminated and,

as a result, the agreement with Harvest terminated. The termination of the agreement had no effect on the existing collaborations with Harvest-controlled entities.

19. Net Loss per Share

The following table presents the computation of basic and diluted net loss per share:

	2017	2016	2015
Historical net loss per share:			
Numerator:			
Net loss attributable to Intrexon	$ (117,018)	$ (186,612)	$ (84,493)
Denominator:			
Weighted average shares outstanding, basic and diluted	119,998,826	117,983,836	111,066,352
Net loss attributable to Intrexon per share, basic and diluted	$ (0.98)	$ (1.58)	$ (0.76)

The following potentially dilutive securities as of December 31, 2017, 2016, and 2015, have been excluded from the above computations of diluted weighted average shares outstanding for the years then ended as they would have been anti-dilutive:

	December 31,		
	2017	2016	2015
Options	11,382,747	11,640,383	11,043,528
Warrants	133,264	—	194,719
Total	11,516,011	11,640,383	11,238,247

20. Quarterly Financial Information (Unaudited)

The following information has been derived from unaudited consolidated statements that, in the opinion of management, include all recurring adjustments necessary for a fair statement of such information.

	Three Months Ended			
	March 31, 2017	June 30, 2017	September 30, 2017	December 31, 2017 (1)
Total revenues	$ 53,504	$ 54,433	$ 46,016	$ 77,028
Operating loss	(31,381)	(35,270)	(44,747)	(26,492)
Net loss	(32,377)	(19,662)	(40,836)	(33,945)
Net loss attributable to Intrexon	(31,399)	(18,664)	(39,689)	(27,266)
Net loss attributable to Intrexon per share, basic and diluted	$ (0.26)	$ (0.16)	$ (0.33)	$ (0.23)

	Three Months Ended			
	March 31, 2016	June 30, 2016	September 30, 2016	December 31, 2016
Total revenues	$ 43,438	$ 52,501	$ 48,985	$ 46,002
Operating loss	(40,533)	(23,222)	(28,821)	(32,590)
Net loss	(65,320)	(50,031)	(30,011)	(44,912)
Net loss attributable to Intrexon	(64,429)	(49,064)	(28,982)	(44,137)
Net loss attributable to Intrexon per share, basic and diluted	$ (0.55)	$ (0.42)	$ (0.24)	$ (0.37)

(1) During the fourth quarter of 2017, the Company recognized the remaining balance of deferred revenue associated with ZIOPHARM ECC2 upon the parties' mutual agreement to terminate (Note 5). The Company also recorded goodwill

impairment charges primarily related to the AquaBounty reporting unit and an impairment charge related to certain of its in-process research and development assets (Note 11).

21. Defined Contribution Plans

The Company sponsors defined contribution plans covering employees who meet certain eligibility requirements. The Company makes contributions to the plans in accordance with terms specified in the plan agreement. The Company's contributions to the plans were $2,367, $1,857 and $1,157 in 2017, 2016 and 2015, respectively.

22. Subsequent Events

In January 2018, the Company closed a public offering of 6,900,000 shares of its common stock, including 1,000,000 shares of common stock purchased by affiliates of Third Security. The net proceeds of the offering were $82,242, after deducting underwriting discounts of $3,688 and estimated offering expenses of approximately $320, all of which were capitalized.

In January 2018, Intrexon purchased $5,000 of additional AquaBounty common stock through an underwritten public offering, reducing its ownership stake from approximately 58% to approximately 53%.

In February 2018, OvaScience provided their notice of termination of the ECC between them and the Company, to be effective in May 2018 in accordance with the ECC agreement. As a result, the Company will recognize the remaining balance of the deferred revenue associated with this ECC agreement totaling $3,183 in 2018. The Company and OvaScience are in discussions regarding dissolving the OvaXon joint venture and terminating the related ECC agreement.

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ZIOPHARM Oncology, Inc.

Financial Statements

December 31, 2015, 2014 and 2013

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Stockholders of
ZIOPHARM Oncology, Inc.
Boston, Massachusetts

We have audited the accompanying balance sheets of ZIOPHARM Oncology, Inc. as of December 31, 2015 and 2014, and the related statements of operations, changes in stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2015. ZIOPHARM Oncology, Inc's management is responsible for these financial statements. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of ZIOPHARM Oncology, Inc. as of December 31, 2015 and 2014, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2015, in conformity with accounting principles generally accepted in the United States of America.

/s/ RSM US LLP

Boston, Massachusetts
February 24, 2016

ZIOPHARM Oncology, Inc.

BALANCE SHEETS

(in thousands, except share and per share data)

	December 31, 2015	December 31, 2014
ASSETS		
Current assets:		
Cash and cash equivalents	$ 140,717	$ 42,803
Receivables	446	145
Prepaid expenses and other current assets	11,358	1,139
Total current assets	152,521	44,087
Property and equipment, net	581	531
Deposits	128	128
Other non current assets	494	491
Total assets	$ 153,724	$ 45,237
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 2,008	$ 2,004
Accrued expenses	8,906	7,182
Deferred revenue - current portion	6,861	1,360
Deferred rent - current portion	348	280
Total current liabilities	18,123	10,826
Deferred revenue, net of current position	47,917	—
Deferred rent, net of current position	313	570
Total liabilities	66,353	11,396
Commitments and contingencies (note 8)		
Stockholders' equity:		
Common stock, $0.001 par value; 250,000,000 shares authorized; 131,718,579 and 104,452,105 shares issued and outstanding at December 31, 2015 and 2014, respectively	132	104
Additional paid-in capital - common stock	579,939	406,349
Accumulated Deficit	(492,700)	(372,612)
Total stockholders' equity	87,371	33,841
Total liabilities and stockholders' equity	$ 153,724	$ 45,237

The accompanying notes are an integral part of these financial statements.

ZIOPHARM Oncology, Inc.

STATEMENTS OF OPERATIONS

(in thousands, except share and per share data)

	For the Year Ended December 31,		
	2015	**2014**	**2013**
Collaboration Revenue	$ 4,332	$ 1,373	$ 800
Operating expenses:			
Research and development	106,785	32,706	42,852
General and administrative	17,647	12,166	15,661
Total operating expenses	124,432	44,872	58,513
Loss from operations	(120,100)	(43,499)	(57,713)
Other income (expense), net	12	(5)	(579)
Change in fair value of warrants	—	11,723	1,185
Net loss	$ (120,088)	$ (31,781)	$ (57,107)
Basic and diluted net loss per share	$ (0.96)	$ (0.31)	$ (0.66)
Weighted average common shares outstanding used to compute basic and diluted net loss per share	125,416,084	101,130,710	85,943,175

The accompanying notes are an integral part of these financial statements.

ZIOPHARM Oncology, Inc.

STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY

(in thousands, except share and per share data)

	Common Stock		Additional Paid-in Capital Common Stock	Additional Paid-in Capital Warrants	Accumulated Deficit	Total Stockholders' Equity/
	Shares	Amount				
Balance at December 31, 2012	83,236,840	$ 83	$ 325,177	$ 6,909	$ (283,724)	$ 48,445
Stock-based compensation	—	—	3,507	—	—	3,507
Issuance of common stock, net of commission and expenses of $3,678	16,445,000	16	53,864	—	—	53,880
Exercise of warrants to purchase common stock	112,808	—	396	(196)	—	200
Exercise of employee stock options	570,168	1	955	—	—	956
Issuance of restricted common stock	75,272	—	—	—	—	—
Repurchase of shares of restricted common stock	(116,723)	—	(498)	—	—	(498)
Cancelled of restricted stock	(163,747)	—	—	—	—	—
Expired warrants	—	—	3,110	(3,110)	—	—
Net loss	—	—	—	—	(57,107)	(57,107)
Balance at December 31, 2013	100,159,618	100	386,511	3,603	(340,831)	49,383

The accompanying notes are an integral part of these financial statements.

ZIOPHARM Oncology, Inc.

STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY (Cont.)

(in thousands, except share and per share data)

	Common Stock		Additional Paid-in Capital Common Stock	Additional Paid-in Capital Warrants	Accumulated Deficit	Total Stockholders' Equity/
	Shares	Amount				
Stock-based compensation	—	—	4,743	—	—	4,743
Exercise of warrants to purchase common stock	3,747,254	4	13,963	(3,313)	—	10,654
Exercise of employee stock options	613,138	—	1,386	—	—	1,386
Issuance of restricted common stock	66,828	—	—	—	—	—
Repurchase of shares of restricted common stock	(112,333)	—	(544)	—	—	(544)
Cancelled of restricted stock	(22,400)	—	—	—	—	—
Expired warrants	—	—	290	(290)	—	—
Net loss	—	—	—	—	(31,781)	(31,781)
Balance at December 31, 2014	104,452,105	$ 104	$ 406,349	$ —	$ (372,612)	$ 33,841

The accompanying notes are an integral part of these financial statements.

ZIOPHARM Oncology, Inc.

STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY (Cont.)

(in thousands, except share and per share data)

	Common Stock		Additional Paid-in Capital Common Stock	Additional Paid-in Capital Warrants	Accumulated Deficit	Total Stockholders' Equity/
	Shares	Amount				
Stock-based compensation	—	—	7,997	—	—	7,997
Exercise of employee stock options	2,519,267	3	4,566	—	—	4,568
Issuance of restricted common stock	1,590,574	2	(2)	—	—	—
Repurchase of shares of restricted common stock	(61,819)	—	(518)	—	—	(518)
Repurchase of common stock	(3,711)	—	(34)	—	—	(34)
Issuance of common stock, net of commissions and expenses of $6,305	11,500,000	12	94,309	—	—	94,320
Issuance of common stock in licensing agreement	11,722,163	12	67,273	—	—	67,285
Net loss	—	—	—	—	(120,088)	(120,088)
Balance at December 31, 2015	131,718,579	$ 132	$ 579,939	$ —	$ (492,700)	$ 87,371

The accompanying notes are an integral part of these financial statements.

ZIOPHARM Oncology, Inc.

STATEMENTS OF CASH FLOWS

(in thousands)

	For the Year Ended December 31,		
	2015	**2014**	**2013**
Cash flows from operating activities:			
Net loss	$ (120,088)	$ (31,781)	$ (57,107)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	357	462	738
Stock-based compensation	7,997	4,743	3,507
Change in fair value of warrants		(11,723)	(1,185)
Common stock issued in exchange for license agreement	67,285	—	—
Loss on disposal of fixed assets	—	—	585
Change in operating assets and liabilities:			
(Increase) decrease in:			
Receivables	(301)	—	(87)
Prepaid expenses and other current assets	(10,214)	809	4,964
Other noncurrent assets	(3)	37	477
Increase (decrease) in:			
Accounts payable	4	1,582	(1,087)
Accrued expenses	1,724	827	(10,159)
Deferred revenue	53,418	(1,373)	(800)
Deferred rent	(189)	(213)	625
Other noncurrent liabilities	—	(20)	20
Net cash used in operating activities	(10)	(36,650)	(59,509)
Cash flows from investing activities:			
Purchases of property and equipment	(412)	(193)	(132)
Proceeds from sale of property and equipment	—	—	1
Net cash used in investing activities	(412)	(193)	(131)
Cash flows from financing activities:			
Proceeds from exercise of stock options	4,568	1,386	956
Payments to employees for repurchase of restricted common stock	(518)	(544)	(498)
Proceeds from exercise of warrants	—	10,600	200
Repurchase of common stock	(34)	—	—
Proceeds from issuance of common stock, net	94,320	—	53,880
Net cash provided by financing activities	98,336	11,442	54,538
Net decrease in cash and cash equivalents	97,914	(25,401)	(5,102)
Cash and cash equivalents, beginning of period	42,803	68,204	73,306
Cash and cash equivalents, end of period	$ 140,717	$ 42,803	$ 68,204
Supplementary disclosure of cash flow information:			
Cash paid for interest	$ —	$ —	$ —
Cash paid for income taxes	$ —	$ —	$ —
Supplementary disclosure of noncash investing and financing activities:			
Exercise of equity-classified warrants to common shares	$ —	$ 692	$ 196
Issuance of common stock in license agreement	$ 67,285		

The accompanying notes are an integral part of these financial statements.

Exercise of liability-classified warrants to common shares	$ —	$ 54	$ —

The accompanying notes are an integral part of these financial statements.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

1. Organization

ZIOPHARM Oncology, Inc., which is referred to as "ZIOPHARM" or the "Company", is a biopharmaceutical company seeking to acquire, develop and commercialize, on its own or with commercial partners, a diverse portfolio of cancer therapies that address unmet medical needs.

The Company's operations to date have consisted primarily of raising capital and conducting research and development. The Company's fiscal year ends on December 31.

The Company has operated at a loss since its inception in 2003 and has minimal revenues. The Company anticipates that losses will continue for the foreseeable future. At December 31, 2015, the Company's accumulated deficit was approximately $492.7 million. Given its current development plans, the Company anticipates cash resources will be sufficient to fund operations into the fourth quarter of 2017. The Company's ability to continue operations after its current cash resources are exhausted depends on its ability to obtain additional financing or to achieve profitable operations, as to which no assurances can be given. Cash requirements may vary materially from those now planned because of changes in the Company's focus and direction of its research and development programs, competitive and technical advances, patent developments, regulatory changes or other developments. Additional financing will be required to continue operations after the Company exhausts its current cash resources and to continue its long-term plans for clinical trials and new product development. There can be no assurance that any such financing can be obtained by the Company, or if obtained, what the terms thereof may be, or that any amount that the Company is able to raise will be adequate to support the Company's working capital requirements until it achieves profitable operations.

2. Financings

On February 3, 2015, the Company entered into an underwriting agreement with J.P. Morgan Securities LLC, as representative of the several underwriters named therein, relating to the issuance and sale of 10,000,000 shares of its common stock. The price to the public in the offering was $8.75 per share, and the underwriters agreed to purchase the shares from the Company pursuant to the underwriting agreement at a purchase price of $8.225 per share. Under the terms of the underwriting agreement, the Company also granted the underwriters an option, exercisable for 30 days, to purchase up to an additional 1,500,000 shares of common stock at a purchase price of $8.225 per share. The offering was made pursuant to the Company's effective registration statement on Form S-3 (SEC File No. 333-201826) previously filed with the SEC, and a prospectus supplement thereunder. The underwriters purchased the 10,000,000 shares and the additional 1,500,000 shares on February 9 and February 17, 2015, respectively. The net proceeds from the offering were approximately $94.3 million after deducting underwriting discounts and estimated offering expenses paid by the Company.

On October 23, 2013, the Company entered into an underwriting agreement with J. P. Morgan Securities LLC, as representative of the several underwriters named therein, relating to the issuance and sale of 14,300,000 shares of its common stock. The price to the public in the offering was $3.50 per share, and the underwriters agreed to purchase the shares from the Company pursuant to the underwriting agreement at a purchase price of $3.29 per share. Under the terms of the underwriting agreement, the Company also granted the underwriters an option, exercisable for 30 days, to purchase up to an additional 2,145,000 shares of common stock at a purchase price of $3.29 per share, and the underwriters elected to exercise such option in full. The offering was made pursuant to the Company's effective registration statement on Form S-3 (SEC File No. 333-177793) previously filed with the SEC, and a prospectus supplement thereunder. The underwriters purchased the 14,300,000 shares and the additional 2,145,000 shares on October 29, 2013. The net proceeds from the offering were approximately $53.9 million after deducting underwriting discounts and estimated offering expenses paid by the Company.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

3. Summary of Significant Accounting Policies

Basis of Presentation

The accompanying financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America ("U.S. GAAP").

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Although the Company regularly assesses these estimates, actual results could differ from those estimates. Changes in estimates are recorded in the period in which they become known.

The Company's most significant estimates and judgments used in the preparation of our financial statements are:

- Clinical trial expenses;
- Collaboration agreements;
- Fair value measurements for stock based compensation and warrants; and
- Income taxes.

Subsequent Events

The Company evaluated all events and transactions that occurred after the balance sheet date through the date of this filing. During this period, the Company did not have any material subsequent events that impacted its financial statements or disclosures.

Cash and Cash Equivalents

Cash equivalents consist primarily of demand deposit accounts and deposits in short-term U.S. treasury money market mutual funds. Cash equivalents are stated at cost, which approximates fair market value.

Concentrations of Credit Risk

Financial instruments which potentially subject the Company to concentrations of credit risk consist principally of cash and cash equivalents. The Company maintains cash accounts in commercial banks, which may, at times, exceed federally insured limits. The Company has not experienced any losses in such accounts. The Company believes it is not exposed to any significant credit risk on cash and cash equivalents.

Property and Equipment

Property and equipment are recorded at cost. Expenditures for maintenance and repairs are charged to expense while the costs of significant improvements are capitalized. Depreciation is provided using the straight-line method over the following estimated useful lives of the related assets, which is between three and five years. Upon retirement or sale, the cost of the assets disposed of and the related accumulated depreciation are eliminated from the balance sheets and related gains or losses are reflected in the statements of operations.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

3. Summary of Significant Accounting Policies (Continued)

Restricted Cash

Restricted cash of $388 thousand, which is restricted as collateral for the Company's facility leases and $104 thousand that is restricted as collateral for a line of credit is included in other assets.

Long-Lived Assets

The Company reviews the carrying values of its long-lived assets for possible impairment whenever events or changes in circumstances indicate that the carrying amounts of the assets may not be recoverable. Any long-lived assets held for disposal are reported at the lower of their carrying amounts or fair values less costs to sell.

Warrants

The Company applied the accounting standard which provided guidance in assessing whether an equity-based financial instrument is indexed to an entity's own stock for purposes of determining whether a financial instrument should be treated as a derivative. In applying the methodology the Company concluded that certain warrants issued by the Company had terms that did not meet the criteria to be considered indexed to the Company's own stock and therefore were classified as liabilities in the Company's balance sheet. The liability classified warrants were subject to re-measurement at each balance sheet date and any change in fair value was recognized as a component of "Other income, net" in the accompanying Statement of Operations. Fair value was measured using the binomial valuation model. All warrants expired in December 2014.

Fair Value Measurements

The Company has certain financial assets and liabilities recorded at fair value which have been classified as Level 1, 2 or 3 within the fair value hierarchy as described in the accounting standards for fair value measurements.

- Level 1—Quoted prices in active markets for identical assets or liabilities.
- Level 2—Inputs other than Level 1 that are observable, either directly or indirectly, such as quoted prices for similar assets or liabilities; quoted prices in markets that are not active; or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.
- Level 3—Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

Assets and liabilities measured at fair value on a recurring basis as of December 31, 2015 and 2014 are as follows:

($ in thousands)	Fair Value Measurements at Reporting Date Using			
Description	Balance as of December 31, 2015	Quoted Prices in Active Markets for Identical Assets/Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Cash equivalents	$ 137,405	$ 137,405	$ —	$ —

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

3. Summary of Significant Accounting Policies (Continued)

($ in thousands)	Fair Value Measurements at Reporting Date Using			
Description	Balance as of December 31, 2014	Quoted Prices in Active Markets for Identical Assets/Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Cash equivalents	$ 37,290	$ 37,290	$ —	$ —

The cash equivalents consist primarily of short term U.S. treasury money market mutual funds which are actively traded.

Revenue Recognition from Collaboration Agreements

The Company has primarily generated revenue through collaboration arrangements with strategic partners for the development and commercialization of product candidates. The Company recognizes revenue for each unit of accounting when evidence of an arrangement exists, delivery has occurred or services have been rendered, the seller's price to the buyer is fixed or determinable and collectability is reasonably assured

The Company's collaboration agreements may provide for various types of payments, including upfront payments, funding of research and development, milestone payments, licensing fees and product royalties. The specifics of the Company's significant agreements are detailed in Note 8, Commitments and Contingencies.

The Company considers a variety of factors in determining the appropriate method of accounting for its collaboration agreements, including whether multiple deliverables can be separated and accounted for individually as separate units of accounting. Where there are multiple deliverables within a collaboration agreement that cannot be separated and therefore are combined into a single unit of accounting, revenues are deferred and recognized over the estimated period of performance, which is typically the development term. If the deliverables can be separated, the Company applies the relevant revenue recognition guidance to each individual deliverable. The specific methodology for the recognition of the underlying revenue is determined on a case-by-case basis according to the facts and circumstances applicable to each agreement. Generally, the Company has accounted for its collaboration agreements as a single unit of accounting.

Milestone payments are recognized as revenue upon achievement of the milestone only if (1) the milestone payment is non-refundable, (2) substantive effort is involved in achieving the milestone and (3) the amount of the milestone is reasonable in relation to the effort expended or the risk associated with achievement of the milestone. If any of these conditions are not met, the milestone payment is deferred and recognized as revenue over the estimated remaining period of performance under the contract as the Company completes its performance obligations. Royalties are recognized as earned in accordance with the terms of various research and collaboration agreements.

Research and Development Costs

Research and development expenditures are charged to the statement of operations as incurred. Such costs include proprietary research and development activities, purchased research and development, and expenses associated with research and development contracts, whether performed by the Company or contracted with independent third parties.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

3. Summary of Significant Accounting Policies (Continued)

Income Taxes

Income taxes are accounted for under the liability method. Deferred tax assets and liabilities are recognized for the estimated future tax consequences of temporary differences between the financial statement carrying amounts and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the year in which the temporary differences are expected to be recovered or settled. The Company evaluates the realizability of its deferred tax assets and establishes a valuation allowance when it is more likely than not that all or a portion of deferred tax assets will not be realized.

The Company accounts for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. The evaluation of uncertain tax positions is based on factors including, but not limited to, changes in tax law, the measurement of tax positions taken or expected to be taken in tax returns, the effective settlement of matters subject to audit, new audit activity and changes in facts or circumstances related to a tax position. The Company evaluates this tax position on an annual basis. The Company also accrues for potential interest and penalties, related to unrecognized tax benefits in income tax expense (see Note 10, Income Taxes).

Accounting for Stock-Based Compensation

Stock-based compensation cost is measured at the grant date, based on the estimated fair value of the award, and is recognized as expense over the employee's requisite service period. Stock-based compensation expense is based on the number of awards ultimately expected to vest and is therefore reduced for an estimate of the awards that are expected to be forfeited prior to vesting. Consistent with prior years, the Company uses the Black-Scholes option pricing model which requires estimates of the expected term option holders will retain their options before exercising them and the estimated volatility of the Company's common stock price over the expected term.

The Company recognizes the full impact of its share-based employee payment plans in the statements of operations for each of the years ended December 31, 2015, 2014, and 2013 and did not capitalize any such costs on the balance sheets. The Company recognized $5.3 million, $3.7 million, and $2.3 million of compensation expense related to vesting of stock options during the years ended December 31, 2015, 2014, and 2013, respectively. In the years ended December 31, 2015, 2014, and 2013, the Company recognized $2.7 million, $1.0 million, and $1.2 million of compensation expense, respectively, related to vesting of restricted stock (see Note 12, Stock Option Plan). In the years ended December 31, 2015, 2014, and 2013, the Company recognized $8.0 million, $4.7 million, and $3.5 million of compensation expense, respectively, related to vesting of all employee and director awards. The following table presents share-based compensation expense included in the Company's Statements of Operations:

	Year ended December 31,		
(in thousands)	**2015**	**2014**	**2013**
Research and development	$ 1,403	$ 1,416	$ 792
General and administrative	6,594	3,327	2,715
Share based employee compensation expense before tax	7,997	4,743	3,507
Income tax benefit	—	—	—
Net share based employee compensation expense	$ 7,997	$ 4,743	$ 3,507

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

3. Summary of Significant Accounting Policies (Continued)

The fair value of each stock option is estimated at the date of grant using the Black-Scholes option pricing model. The estimated weighted-average fair value of stock options granted to employees in 2015, 2014, and 2013 was approximately $10.47, $3.58, and $2.51 per share, respectively. Assumptions regarding volatility, expected term, dividend yield and risk-free interest rate are required for the Black-Scholes model. The volatility assumption is based on the Company's historical experience. The risk-free interest rate is based on a U.S. treasury note with a maturity similar to the option award's expected life. The expected life represents the average period of time that options granted are expected to be outstanding. The Company calculated expected term using the simplified method described in SEC Staff Accounting Bulletin, or SAB, No. 107 and No. 110 as it continues to meet the requirements promulgated in SAB No. 110. The assumptions for volatility, expected life, dividend yield and risk-free interest rate are presented in the table below:

	2015	2014	2013
Weighted average risk-free interest rate	1.46 - 1.93%	1.74 - 2.11%	1.00 - 2.10%
Expected life in years	6	6	6
Expected volatility	79.13 - 86.81%	85.22 - 94.55%	83.40 - 95.96%
Expected dividend yield	—	—	—

Net Loss Per Share

Basic net loss per share is computed by dividing net loss by the weighted average number of common shares outstanding for the period. The Company's potentially dilutive shares, which include outstanding common stock options, unvested restricted stock and warrants, have not been included in the computation of diluted net loss per share for any of the periods presented as the result would be antidilutive. Such potential common shares at December 31, 2015, 2014, and 2013 consist of the following:

	December 31,		
	2015	2014	2013
Stock options	3,481,468	6,505,664	6,747,303
Unvested restricted stock	1,586,388	144,508	352,865
Warrants	—	—	10,539,767
	5,067,856	6,650,172	17,639,935

New Accounting Pronouncements

In August 2014, the FASB issued ASU 2014-15, *Presentation of Financial Statements—Going Concern* (Subtopic 205-40) in which management should evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the entity's ability to continue as a going concern within one year after the date that the financial statements are issued (or within one year after the date that the financial statements are available to be issued when applicable). When management identifies conditions or events that raise substantial doubt about an entity's ability to continue as a going concern, management should consider whether its plans that are intended to mitigate those relevant conditions or events will alleviate the substantial doubt. This update is effective for annual periods beginning after December 15, 2016, and early application is permitted for any annual or interim period thereafter.

In May 2014, the FASB issued ASU 2014-09, *Revenue from Contracts with Customers* (Topic 606), which clarifies the principles for recognizing revenue and develops a common revenue standard for U.S. GAAP and

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

3. Summary of Significant Accounting Policies (Continued)

IFRS. This standard removes inconsistencies and weaknesses between U.S. GAAP and IFRS in revenue requirements, provides a more robust framework for addressing revenue issues, improves comparability of revenue recognition practices across entities, industries, jurisdictions, and capital markets, provides more useful information to users of financial statements through improved disclosure requirements, and simplifies the preparation of financial statements by reducing the number of requirements to which an entity must refer. This update is effective for annual periods beginning after December 15, 2017, including interim periods within that reporting period and early application is not permitted. The Company is still evaluating this standard and its impact on our financial position or results of operations.

4. Restructuring

The Company underwent restructuring activities during the year ended December 31, 2013 which included a reduction in workforce and office space, resulting in sublease agreements in Boston and New York. As a result, the Company incurred restructuring charges of $1.7 million, $0.6 million was included in general and administrative expenses and $1.1 million was included in research and development expenses. The Company also incurred charges for exit and disposal activities from the Boston and New York sublease agreements which resulted in an aggregate loss of $0.8 million recorded in general and administrative expenses, and a loss on the disposal of fixed assets of $0.6 million, recorded in Other income in the Statement of Operations for the year ended December 31, 2013.

On October 17, 2013, the Company entered into a sublease agreement to lease 7,259 square feet in its New York office to a subtenant. The Company remains primarily liable to pay rent on the original lease. Accordingly, the Company recorded a loss on the sublease in the amount of $729 thousand for the year ended December 31, 2013, representing the remaining contractual obligation of $2.3 million, less $1.6 million in payments from our subtenant. The Company retired assets in this subleased area as a result of this sublease with a net book value of $392 thousand, and recorded a loss on disposal of fixed assets for the same amount for the year ended December 31, 2013.

On August 30, 2013, the Company entered into a sublease agreement to lease 5,249 square feet in our Boston office to a subtenant. The Company remains primarily liable to pay rent on the original lease. The Company recorded a loss on the sublease in the amount of $42 thousand for the year ended December 31, 2013, representing the remaining contractual obligation of $367 thousand, less $325 thousand in payments from our subtenant. The Company retired assets in this subleased area as a result of this sublease with a net book value of $194 thousand, and recorded a loss on disposal of fixed assets. The company previously held a security deposit of $20 thousand in accordance with the sublease, which was recorded in other non-current assets and other liabilities on the balance sheet for the year ended December 31, 2013. This sublease tenant vacated the lease in October 2014. On May 22, 2015, the Company subleased previously vacant office space in the Boston Office for approximately $105 thousand for the period of June 2015 through August 2016. We expect to receive a total of $44 thousand in the next year from our subtenant in the Boston Office.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

5. Property and Equipment, net

Property and equipment, net, consists of the following:

	December 31,	
(in thousands)	**2015**	**2014**
Office and computer equipment	$ 1,105	$ 1,094
Software	886	874
Leasehold improvements	990	927
Manufacturing equipment	572	251
	3,553	3,146
Less: accumulated depreciation	(2,972)	(2,615)
Property and equipment, net	$ 581	$ 531

Depreciation and amortization charged to the Statement of Operations for the years ended December 31, 2015, 2014, and 2013 was: $358 thousand, $462 thousand and, $738 thousand, respectively.

6. Accrued Expenses

Accrued expenses consist of the following:

	December 31,	
(in thousands)	**2015**	**2014**
Clinical consulting services	$ 2,331	$ 2,802
Preclinical services	3,976	2,027
Employee compensation	1,453	768
Professional services	317	422
Payroll taxes and benefits	289	417
Manufacturing services	253	308
Accrued vacation	221	212
Other consulting services	66	226
Total	$ 8,906	$ 7,182

7. Related Party Transactions

On January 6, 2011, the Company entered into an Exclusive Channel Partner Agreement, which is referred to as the Channel Agreement, with Intrexon Corporation, or Intrexon (see Note 8, Commitments and Contingencies). A director of the Company, Randall J. Kirk, is the CEO, a director, and the largest stockholder of Intrexon.

On March 27, 2015, the Company and Intrexon entered into a Second Amendment to Exclusive Channel Partner Agreement amending the Channel Agreement, which is referred to as the ECP Amendment. The ECP Amendment modified the scope of the parties' collaboration under the Channel Agreement in connection with the worldwide License and Collaboration Agreement, or the Ares Trading Agreement, which the Company and Intrexon entered into with Ares Trading S.A., or Ares Trading, on March 27, 2015. The ECP Amendment provided that Intrexon will pay to the Company fifty percent of all payments that Intrexon receives for upfronts, milestones and royalties under the Ares Trading Agreement (see Note 8, Commitments and Contingencies). The Amendment also reduces Intrexon's aggregate commitment under a Stock Purchase Agreement that the parties

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

7. Related Party Transactions (Continued)

executed in connection with the initial Channel Agreement to purchase the Company's common stock from $50.0 million to $43.5 million, which has been satisfied.

On January 13, 2015, the Company, together with Intrexon, entered into a license agreement with MD Anderson, which is referred to as the MD Anderson License. Pursuant to the MD Anderson License, the Company and Intrexon hold an exclusive, worldwide license to certain technologies owned and licensed by MD Anderson including technologies relating to novel CAR+ T cell therapies arising from the laboratory of Laurence Cooper, M.D., Ph.D., the Chief Executive Officer of the Company, formerly a professor of pediatrics at MD Anderson and now currently a visiting scientist under that institution's policies, as well as either co-exclusive or non-exclusive licenses under certain related technologies. In partial consideration for entering into the MD Anderson License, the Company issued MD Anderson an aggregate of 11,722,163 shares of common stock for which the Company incurred a $67.3 million charge. The Company has determined that the rights acquired in the MD Anderson License represent in-process research and development with no alternative future use. As a result of the common stock issued to MD Anderson in connection with this transaction, MD Anderson became a beneficial holder of more than five percent of the Company's common stock. (see Note 8, Commitments and Contingencies). During the year ending December 31, 2015, the Company made three quarterly payments totaling an aggregate of $11.25 million under this arrangement.

On February 3, 2015, Intrexon purchased 1,440,000 shares of common stock in the Company's public offering (see Note 2, Financings) upon the same terms as others that participated in the offering.

On June 29, 2015, the Company re-purchased 3,711 shares of common stock from Intrexon, at a discount of 5% to the closing price of the Company's common stock on the date of purchase, which represented fractional shares that resulted from Intrexon's special stock dividend of the Company's shares to Intrexon's shareholders, for $34 thousand. On January 8, 2016, the Company purchased a remaining 168 shares from Intrexon for $2 thousand.

During the years ended December 31, 2015, 2014 and 2013, the Company expensed $16.3 million, $12.0 million, and $7.8 million, respectively, for services performed by Intrexon. As of December 31, 2015 and 2014 the Company has recorded $4.6 million and $1.9 million in current liabilities, respectively, for amounts due to Intrexon.

On September 28, 2015, the Company, entered into a new Exclusive Channel Collaboration Agreement, or the GvHD Agreement, with Intrexon, whereby the Company will use Intrexon's technology directed towards *in vivo* expression of effectors to research, develop and commercialize products for use in the treatment or prevention of graft-versus-host disease, or GvHD (see Note 8, Commitments and Contingencies). The Company paid Intrexon a technology access fee of $10 million in cash in October 2015 and will reimburse Intrexon for all research and development costs. Subject to certain expense allocations and other offsets provided in the ECC Agreement, the ECC Agreement also provides for equal sharing of the profits derived from the sale of the Products (see Note 8, Commitments and Contingencies).

8. Commitments and Contingencies

Operating Leases

Prior to December 31, 2012, the Company entered into an operating lease in New York, NY for office space. In accordance with this agreement, the Company entered into a letter of credit in the amount of $388 thousand, naming the Company's landlord as beneficiary. In January 2012, the Company amended the lease agreement, adding additional office space. The collateral for the letter of credit is restricted cash and recorded in other non-

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

current assets on the balance sheet as of December 31, 2015 and 2014. The lease for office space in New York, NY expires in October 2018.

On October 17, 2013, the Company entered into a sublease agreement to lease all of its New York office space to a subtenant. The Company remains primarily liable to pay rent on the original lease. The Company recorded a loss on the sublease in the amount of $729 thousand for the year ended December 31, 2013, representing the remaining contractual obligation of $2.3 million, less $1.6 million in payments from its subtenant. The Company retired assets as a result of this sublease with a net book value of $392 thousand, and recorded a loss on disposal of fixed assets for the same amount for the year ended December 31, 2013. The Company continues to maintain the $388 thousand letter of credit in respect of the New York office space.

Prior to December 31, 2012, the Company entered into separate operating lease agreements for various spaces in a building in Boston, MA. In June 2012, the Company re-negotiated a master lease for the entire Boston office space that incorporated all three lease agreements under the same master agreement expiring in August 2016. As of December 31, 2015 and 2014, a total security deposit of $127 thousand is included in deposits on the balance sheet.

On August 30, 2013, the Company entered into a sublease agreement to lease a portion of its Boston office to a subtenant. The Company remains liable to pay rent on the original lease. The Company recorded a loss on the sublease in the amount of $42 thousand for the year ended December 31, 2013, representing the remaining contractual obligation of $367 thousand, less $325 thousand in payments from its subtenant. This sublease tenant vacated the leased premises in October 2014. At December 31, 2014, the Company applied the $20 thousand deposit received from the sublease tenant against its outstanding rent obligation. On March 31, 2015, the Company recorded a loss of $167 thousand on the first floor sublease. On May 22, 2015, the Company subleased the vacant office space for approximately $105 thousand for the period of June 2015 through August 2016, and the tenant provided a security deposit of $17 thousand. Since the prior lease obligation has been fully expensed, rent received from the tenant will reduce current rent expense.

Future net minimum lease payments under operating leases as of December 31, 2015 are as follows (in thousands):

2016	$	1,139
2017		928
2018		851
2019		427
2020 and beyond		712
		4,057
Less: contractual sublease income		(962)
Future minimum lease payments, net	$	3,095

Total rent expense was approximately $1.0 million, $1.2 million, and $1.0 million for the years ended December 31, 2015, 2014, and 2013.

The Company records rent expense on a straight-line basis over the term of the lease. Accordingly, the Company has recorded a liability for deferred rent at December 31, 2015 and 2014 of $661 thousand ($348 thousand current and $313 long-term) and 2014 of $850 thousand ($280 thousand current and $570 long-term) respectively, which is recorded in deferred rent on the balance sheet.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

License Agreements

Exclusive Channel Partner Agreement with Intrexon Corporation for the Cancer Programs

On January 6, 2011, the Company entered into an Exclusive Channel Partner Agreement, or the Channel Agreement, with Intrexon that governs a "channel partnering" arrangement in which the Company uses Intrexon's technology to research, develop and commercialize products in which DNA is administered to humans for expression of anti-cancer effectors for the purpose of treatment or prophylaxis of cancer, which the Company collectively refers to as the Cancer Program. This Channel Agreement establishes committees comprised of representatives of the Company and Intrexon that govern activities related to the Cancer Program in the areas of project establishment, chemistry, manufacturing and controls, clinical and regulatory matters, commercialization efforts and intellectual property.

The Channel Agreement grants the Company a worldwide license to use patents and other intellectual property of Intrexon in connection with the research, development, use, importing, manufacture, sale, and offer for sale of products involving DNA administered to humans for expression of anti-cancer effectors for the purpose of treatment or prophylaxis of cancer, which is collectively referred to as the ZIOPHARM Products. Such license is exclusive with respect to any clinical development, selling, offering for sale or other commercialization of ZIOPHARM Products, and otherwise is non-exclusive. Subject to limited exceptions, the Company may not sublicense these rights without Intrexon's written consent.

Under the Channel Agreement, and subject to certain exceptions, the Company is responsible for, among other things, the performance of the Cancer Program, including the development, commercialization and certain aspects of manufacturing of ZIOPHARM Products. Intrexon is responsible for establishing manufacturing capabilities and facilities for the bulk manufacture of products developed under the Cancer Program, certain other aspects of manufacturing and costs of discovery-stage research with respect to platform improvements and costs of filing, prosecution and maintenance of Intrexon's patents.

Subject to certain expense allocations and other offsets provided in the Channel Agreement, the Company will pay Intrexon on a quarterly basis 50% of net profits derived in that quarter from the sale of ZIOPHARM Products, calculated on a ZIOPHARM Product-by- ZIOPHARM Product basis. The Company has likewise agreed to pay Intrexon on a quarterly basis 50% of revenue obtained in that quarter from a sublicensor in the event of a sublicensing arrangement. In addition, in partial consideration for each party's execution and delivery of the Channel Agreement, the Company entered into a stock purchase agreement with Intrexon.

Upon termination of the Channel Agreement, the Company may continue to develop and commercialize any ZIOPHARM Product that, at the time of termination:

- Is being commercialized by the Company;
- Has received regulatory approval;
- Is a subject of an application for regulatory approval that is pending before the applicable regulatory authority; or
- Is the subject of at least an ongoing Phase 2 clinical trial (in the case of a termination by Intrexon due to an uncured breach or a voluntary termination by the Company), or an ongoing Phase 1 clinical trial in the field (in the case of a termination by the Company due to an uncured breach or a termination by Intrexon following an unconsented assignment by the Company or its election not to pursue development of a Superior Therapy (as defined in the Channel Agreement)).

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

The Company's obligation to pay 50% of net profits or revenue described above with respect to these "retained" products will survive termination of the Channel Agreement.

On March 27, 2015, the Company and Intrexon entered into an Exclusive Channel Partner Amendment, or ECP Amendment, amending the Channel Agreement. The ECP Amendment modifies the scope of the parties' collaboration under the Channel Agreement in connection with the Ares Trading Agreement discussed below. Pursuant to the ECP Amendment, the chimeric antigen receptor T cell products to be developed and commercialized pursuant to the Ares Trading Agreement shall be included within the Intrexon/ZIOPHARM collaboration under the Channel Agreement. The ECP Amendment provides that Intrexon will pay to the Company fifty percent of all payments Intrexon receives for upfronts, milestones and royalties under the Ares Trading Agreement.

Exclusive Channel Collaboration Agreement with Intrexon Corporation for Graft-Versus-Host Disease

On September 28, 2015, the Company, entered into a new Exclusive Channel Collaboration Agreement, or the GvHD Agreement, with Intrexon, whereby the Company will use Intrexon's technology directed towards *in vivo* expression of effectors to research, develop and commercialize products for use in the treatment or prevention of graft-versus-host disease, or GvHD. The exclusive collaboration, or the GvHD Program, will focus on the pursuit of the following engineered cell therapy strategies, used either separately or in combination, for the targeted treatment of GvHD: (i) the infusion of regulatory T cells expressing membrane-bound and/or soluble interleukin-2 and (ii) the deployment of orally delivered, genetically modified *L. lactis* that express interleukin-2 to modulate immune function. The GvHD Agreement establishes committees comprised of Company and Intrexon representatives that will govern activities related to the GvHD Program in the areas of project establishment, chemistry, manufacturing and controls, clinical and regulatory matters, commercialization activities and intellectual property.

The GvHD Agreement grants the Company a worldwide license to use specified patents and other intellectual property of Intrexon in connection with the research, development, use, importing, manufacture, sale, and offer for sale of products developed under the GvHD Program, or the Products. Such license is exclusive with respect to any clinical development, selling, offering for sale or other commercialization of the Products, and otherwise is non-exclusive. Subject to limited exceptions, the Company may not sublicense the rights described without Intrexon's written consent.

Under the GvHD Agreement, and subject to certain exceptions, the Company is responsible for, among other things, the performance of the GvHD Program including development, commercialization and certain aspects of manufacturing of the Products. Among other things, Intrexon is responsible for the costs of establishing manufacturing capabilities and facilities for the bulk manufacture of the Products, certain other aspects of manufacturing, costs of discovery-stage research with respect to platform improvements and costs of filing, prosecution and maintenance of Intrexon's patents.

The Company paid Intrexon a technology access fee of $10 million in cash in October 2015 and will reimburse Intrexon for all research and development costs. Subject to certain expense allocations and other offsets provided in the GvHD Agreement, the GvHD Agreement also provides for equal sharing of the profits derived from the sale of the Products.

During the first 24 months after September 28, 2015, the GvHD Agreement may be terminated by (i) either party in the event of a material breach by the other, except for the failure of the other party to use diligent efforts or to

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

comply with any diligence obligations set forth in the GvHD Agreement and (ii) Intrexon under certain circumstances if the Company assigns its rights under the GvHD Agreement without Intrexon's consent. Following such twenty-four month period, Intrexon may also terminate the GvHD Agreement if the Company elects not to pursue the development of the GvHD Program identified by Intrexon that is a "Superior Therapy," as such term is defined in the GvHD Agreement. Also following such period, the Company may voluntarily terminate the GvHD Agreement upon 90 days' written notice to Intrexon.

Upon termination of the GvHD Agreement, the Company may continue to develop and commercialize any Product that, at the time of termination:

- is being commercialized by the Company,
- has received regulatory approval,
- is a subject of an application for regulatory approval that is pending before the applicable regulatory authority, or
- is the subject of at least an ongoing Phase 2 clinical trial (in the case of a termination by Intrexon due to a Company uncured breach or a voluntary termination by the Company), or an ongoing Phase 1 clinical trial (in the case of a termination by the Company due to an Intrexon uncured breach or a termination by Intrexon following an unconsented assignment by the Company or the Company's election not to pursue development of a Superior Therapy).

The Company's obligation to pay 50% of net profits or revenue with respect to these "retained" products will survive termination of the GvHD Agreement.

The Company has determined that the rights acquired in the GvHD Agreement represent in-process research and development with no alternative future use. Accordingly, the Company recorded a charge of $10.0 million to research and development expense in 2015.

License Agreement—The University of Texas MD Anderson Cancer Center

On January 13, 2015, the Company, together with Intrexon, entered into a License Agreement, or the MD Anderson License, with The University of Texas MD Anderson Cancer Center, or MD Anderson. Pursuant to the MD Anderson License, the Company and Intrexon hold an exclusive, worldwide license to certain technologies owned and licensed by MD Anderson including technologies relating to novel chimeric antigen receptor (CAR) T cell therapies, non-viral gene transfer systems, genetic modification and/or propagation of immune cells and other cellular therapy approaches, Natural Killer, or NK Cells and T cell receptors, or TCR's arising from the laboratory of Laurence Cooper, M.D., Ph.D., who became the Chief Executive Officer of the Company on May 7, 2015 and was formerly a tenured professor of pediatrics at MD Anderson and now currently a visiting scientist under that institution's policies, as well as either co-exclusive or non-exclusive licenses under certain related technologies.

Pursuant to the terms of the MD Anderson License, MD Anderson received consideration consisting of $50 million in shares of the Company's common stock (or 10,124,561 shares), and $50 million in shares of Intrexon's common stock, in each case based on a trailing 20 day volume weighted average of the closing price of the Company's and Intrexon's common stock ending on the date prior to the announcement of the entry into the MD Anderson License, collectively referred to as the License Shares, pursuant to the terms of the License Shares Securities Issuance Agreement described below. The License Shares were issued to MD Anderson on March 11, 2015 pursuant to the terms of the MD Anderson License.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

On January 9, 2015, in order to induce MD Anderson to enter into the MD Anderson License on an accelerated schedule, the Company and Intrexon entered into a letter agreement, or the Letter Agreement, pursuant to which MD Anderson received consideration of $7.5 million in shares of the Company's common stock (or 1,597,602 shares), and $7.5 million in shares of Intrexon's common stock, in each case based on a trailing 20 day volume weighted average of the closing price of the Company's and Intrexon's common stock ending on the date prior to the execution of the Letter Agreement, collectively referred to as the Incentive Shares, in the event that the MD Anderson License was entered into on or prior to 8:00 am Pacific Time on January 14, 2015. The Incentive Shares were issued to MD Anderson on March 11, 2015 pursuant to the terms of the Incentive Shares Securities Issuance Agreement described below.

On August 17, 2015, the Company, Intrexon and MD Anderson entered into a research and development agreement, or the Research and Development Agreement, to formalize the scope and process for the transfer by MD Anderson, pursuant to the terms of the MD Anderson License, of certain existing research programs and related technology rights, as well as the terms and conditions for future collaborative research and development of new and ongoing research programs.

Pursuant to the Research and Development Agreement, the Company, Intrexon and MD Anderson have agreed to form a joint steering committee that will oversee and manage the new and ongoing research programs. As provided under the MD Anderson License, the Company will provide funding for research and development activities in support of the research programs under the Research and Development Agreement for a period of three years and in an amount of no less than $15 million and no greater than $20 million per year. During the year ended December 31, 2015, the Company made three quarterly payments totaling an aggregate of $11.25 million under this arrangement. As of December 31, 2015, MD Anderson has used $911 thousand to offset costs incurred pursuant to the MD Anderson License and the Research and Development Agreement. The net balance of $10.3 million is included in other current assets at December 31, 2015.

The term of the MD Anderson License expires on the last to occur of (a) the expiration of all patents licensed thereunder, or (b) the twentieth anniversary of the date of the License; provided, however, that following the expiration of the term of the MD Anderson License, the Company and Intrexon shall then have a fully-paid up, royalty free, perpetual, irrevocable and sublicensable license to use the licensed intellectual property thereunder. After ten years from the date of the MD Anderson License and subject to a 90-day cure period, MD Anderson will have the right to convert the MD Anderson License into a non-exclusive license if the Company and Intrexon are not using commercially reasonable efforts to commercialize the licensed intellectual property on a case-by-case basis. After five years from the date of the MD Anderson License and subject to a 180-day cure period, MD Anderson will have the right to terminate the MD Anderson License with respect to specific technology(ies) funded by the government or subject to a third party contract if the Company and Intrexon are not meeting the diligence requirements in such funding agreement or contract, as applicable. MD Anderson may also terminate the agreement with written notice upon material breach by the Company and Intrexon, if such breach has not been cured within 60 days of receiving such notice. In addition, the MD Anderson License will terminate upon the occurrence of certain insolvency events for both the Company and Intrexon and may be terminated by the mutual written agreement of the Company, Intrexon and MD Anderson.

In connection with the License and the issuance of the License Shares and the Incentive Shares, on January 13, 2015, the Company and MD Anderson entered into a Registration Rights Agreement, or the Registration Rights Agreement, pursuant to which the Company agreed to file a "resale" registration statement, or the Registration Statement, registering the resale of the License Shares, the Incentive Shares and any other shares of the Company's common stock held by MD Anderson on the date that the Registration Statement is filed Under the

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

Registration Rights Agreement, the Company is obligated to maintain the effectiveness of the Registration Statement until all securities therein are sold or are otherwise can be sold pursuant to Rule 144, without any restrictions. A prospectus supplement under the Company's already effective registration statement on Form S-3 (File No. 333-201826), was filed on April 1, 2015 in satisfaction of the Company's obligations under the Registration Rights Agreement.

The Company has determined that the rights acquired in the MD Anderson License represent in process research and development with no alternative future use. Accordingly, the Company recorded a charge of $67.3 million to research and development expense, as included in the statement of operations for the year ended December 31, 2015, representing the fair value of the 11,722,163 shares of its common stock on the date the MD Anderson License was executed.

Ares Trading License and Collaboration Agreement

On March 27, 2015, the Company and Intrexon signed a worldwide License and Collaboration Agreement, or the Ares Trading Agreement, with Ares Trading S.A. or "Ares Trading", a subsidiary of the biopharmaceutical business of Merck KGaA, Darmstadt, Germany, through which the parties established a collaboration for the research and development and commercialization of certain products for the prophylactic, therapeutic, palliative or diagnostic use for cancer in humans.

Under the collaboration, Ares Trading will elect CAR-T targets, of which two have been selected during 2015, and for which Ares Trading will provide certain research funding. The Company is responsible for certain research and development expenditures. Once these candidates reach investigational new drug (IND) stage, the programs will be transferred to Ares Trading for clinical development and commercialization. The Company expects to perform multiple preclinical development programs, each consisting of the development of one product candidate, pursuant to the agreement. The Company and Intrexon will also independently conduct research and development on other CAR-T candidates, with Ares Trading having the opportunity during clinical development to opt-in.

Intrexon is entitled to receive $5.0 million payable in equal quarterly installments over two years for each identified product candidate, which will be used to fund discovery work. The Company will be responsible for costs exceeding the quarterly installments and all other costs of the preclinical research and development.

Ares Trading paid a non-refundable upfront fee of $115.0 million to Intrexon as consideration for entry into the Ares Trading Agreement. Pursuant to the ECP Amendment, the Company was entitled to receive 50% of the upfront fee, or $57.5 million, which we received from Intrexon in July 2015.

The Ares Trading Agreement provides for up to $413.0 million of potential payments for certain development and commercial milestones for each product candidate, and royalties ranging from the lower-single digits to the low-teens of net sales derived from the sale of products developed under agreement. The Ares Trading Agreement also provides for up to $50.0 million of payments upon the achievement of certain technical milestones. Intrexon will pay 50% of all milestone and royalty payments that it receives under the Ares Trading Agreement to the Company pursuant to the ECP Amendment.

The term of the Ares Trading Agreement commenced in May 2015 and may be terminated by either party in the event of a material breach as defined in the agreement and may be terminated voluntarily by Ares Trading upon 90 days written notice to the Company.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

The Company considered FASB Accounting Standards Codification 605-25, *Multiple-Element Arrangements*, in evaluating the appropriate accounting for the Ares Trading Agreement. In accordance with this guidance, the Company identified the license and research and development services as the Company's deliverables in the arrangement. The Company concluded that the license does not have standalone value from the research and development services. Accordingly, the Ares Trading Agreement is accounted for by the Company as a single unit of accounting. The $57.5 million upfront payment received by the Company was recorded as deferred revenue and is being recognized over the estimated period of performance of the research and development services currently estimated to be 9 years, beginning with the commencement of the research and development services. During the twelve months ended December 31, 2015, the Company recognized $3.2 million of revenue related to the Ares Trading Agreement. The remaining balance of deferred revenue associated with the upfront payment was $54.3 million, of which $6.4 million is current and $47.9 million is classified as long term at December 31, 2015.

License Agreements with DEKK-Tec, Inc. and Southern Research Institute

On October 15, 2004, the Company entered into a license agreement with DEKK-Tec, Inc., or DEKK-Tec, pursuant to which it was granted an exclusive, worldwide license for palifosfamide. All of the Company's rights and obligations under the DEKK-Tec license agreement was assigned to Predictive Therapeutics, Ltd., in the first quarter of 2016, with the exception of the Company's obligation under a stock option to acquire 13,808 shares of the Company's common stock at an exercise price of $0.02 per share, which remains outstanding in accordance with the terms.

On February 5, 2007, the Company exercised an option to enter into an exclusive license agreement with Southern Research Institute, or SRI, for certain isophosphoramide mustard analogs. Under the license agreement, the Company was required to remit minimum annual royalty payments of $25 thousand until the first commercial sale of a licensed product. These payments were made for the years ended December 31, 2015, 2014, and 2013. All of the Company's remaining obligations under the SRI license agreement were assigned to Predictive Therapeutics, Ltd., in the first quarter of 2016.

License Agreement with Predictive Therapeutics, Ltd.

On November 12, 2015, the Company entered into a License Agreement with Predictive Therapeutics, Ltd., or Predictive. Pursuant to the License Agreement, the Company granted Predictive an exclusive license to develop and commercialize palifosfamide.

In exchange, the Company received an upfront payment of $250 thousand and is entitled to receive additional payments of up to $12.8 million in development-and sales-based milestones, single digit royalty payments on net sales of palifosfamide, once commercialized, and a percentage of any sublicense revenues generated by Predictive. Predictive will be responsible for all costs related to the development, manufacturing and commercialization of palifosfamide.

The $250 thousand upfront payment received in November 2015 is being amortized over the period of the Company's research and development effort related to transitional services. There are certain deliverables that are included in the License Agreement including transfer of intellectual property and prior research and development results, which are estimated by management to be completed by June 30, 2016. Accordingly, the Company has recorded $50 thousand in revenue during the twelve months ended December 31, 2015. The remaining deferred revenue balance of $200 thousand at December 31, 2015 has been classified as current. In accordance with the License Agreement with Predictive, the Company is no longer obligated to continue their

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NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

research and development efforts beyond the transitional services. In the first quarter of 2016, all of the Company's rights and obligations under the DEKK-Tec and SRI license agreements were assigned to Predictive Therapeutics, Ltd., with the exception of the Company's obligation to DEKK-Tec under a stock option to acquire 13,808 shares of the Company's common stock at an exercise price of $0.02 per share, which remains outstanding in accordance with the terms.

Patent and Technology License Agreement—The University of Texas MD Anderson Cancer Center and the Texas A&M University System.

On August 24, 2004, the Company entered into a patent and technology license agreement with MD Anderson, which the Company refers to, collectively, as the Licensors. Under this agreement, the Company was granted an exclusive, worldwide license to rights (including rights to U.S. and foreign patent and patent applications and related improvements and know-how) for the manufacture and commercialization of two classes of organic arsenicals (water- and lipid-based) for human and animal use. The class of water-based organic arsenicals includes darinaparsin.

The Company issued options to purchase 50,222 shares outside of the Company's stock option plans following the successful completion of certain clinical milestones, of which 37,666 have vested. The remaining 12,556 shares will vest upon enrollment of the first patient in a multi-center pivotal clinical trial i.e. a human clinical trial intended to provide the substantial evidence of efficacy necessary to support the filing of an approvable New Drug Application, or NDA. In addition, the Licensors are entitled to receive certain milestone payments. The Company may be required to make additional payments upon achievement of certain other milestones in varying amounts which on a cumulative basis could total up to an additional $4.5 million. In addition, the Licensors are entitled to receive single digit percentage royalty payments on sales from a licensed product and will also be entitled to receive a portion of any fees that the Company may receive from a possible sublicense under certain circumstances.

Collaboration Agreement with Solasia Pharma K.K.

On March 7, 2011, the Company entered into a License and Collaboration Agreement with Solasia Pharma K.K., or Solasia. Pursuant to the License and Collaboration Agreement, the Company granted Solasia an exclusive license to develop and commercialize darinaparsin in both IV and oral forms and related organic arsenic molecules, in all indications for human use in a pan- Asian/Pacific territory comprised of Japan, China, Hong Kong, Macau, Republic of Korea, Taiwan, Singapore, Australia, New Zealand, Malaysia, Indonesia, Philippines and Thailand.

As consideration for the license, the Company received an upfront payment of $5.0 million to be used exclusively for further clinical development of darinaparsin outside of the pan-Asian/Pacific territory, and will be entitled to receive additional payments of up to $32.5 million in development-based milestones and up to $53.5 million in sales-based milestones. The Company will also be entitled to receive double digit royalty payments from Solasia based upon net sales of licensed products in the applicable territories, once commercialized, and a percentage of sublicense revenues generated by Solasia. Under the License and Collaboration Agreement, the Company provided Solasia with drug product to conduct clinical trials. These transfers were accounted for as a reduction of research and development costs and an increase in collaboration receivables. The agreement provides that Solasia will be responsible for the development and commercialization of darinaparsin in the pan-Asian/Pacific territory.

On July 31, 2014, the Company entered into an amendment and restatement of the License and Collaboration Agreement granting Solasia an exclusive worldwide license to develop and commercialize darinaparsin, and

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

8. Commitments and Contingencies (Continued)

related organoarsenic molecules, in both intravenous and oral forms in all indications for human use. In exchange, the Company will be eligible to receive from Solasia development-and sales-based milestones, a royalty on net sales of darinaparsin, once commercialized, and a percentage of any sublicense revenues generated by Solasia.

Solasia will be responsible for all costs related to the development, manufacturing and commercialization of darinaparsin. The Company's Licensors, as defined in the agreement, will receive a portion of all milestone and royalty payments made by Solasia to the Company in accordance with the terms of the Company's license agreement with the Licensors.

The $5.0 million upfront payment received in March 2011 is being amortized over the period of the Company's research and development effort. The Company originally estimated this period to be 75 months. In accordance with the amended and restated License and Collaboration Agreement with Solasia, the Company is no longer obligated to continue their research and development efforts in connection with the upfront payment. However, there are certain deliverables that are included in the amended and restated License and Collaboration Agreement including transfer of intellectual property and prior research and development results, which were originally estimated by management to be completed by March 31, 2015 when the amended and restated License and Collaboration Agreement was signed in July 2014. Management subsequently reassessed the period of performance related to the remaining transitional services to be completed under the amended and restated License and Collaboration Agreement and determined that the services are now expected to be completed by March 31, 2016. Accordingly, the Company has recorded $1.1 million in revenue during the twelve months ended December 31, 2015. The remaining deferred revenue balance of $272 thousand at December 31, 2015 has been classified as current.

License Agreement with Baxter Healthcare Corporation

On November 3, 2006, the Company entered into a definitive Asset Purchase Agreement for indibulin and a License Agreement to proprietary nanosuspension technology with affiliates of Baxter Healthcare S.A. The purchase included the entire indibulin intellectual property portfolio as well as existing drug substance and capsule inventories. The terms of the Asset Purchase Agreement included an upfront cash payment and an additional payment for existing inventory. During each of the years ended December 31, 2015, 2014, and 2013, the installment of $250 thousand were paid and expensed.

CRO Services Agreement with Novella Clinical, Inc.

On December 4, 2008, the Company entered into a Master Clinical Research Organization Services Agreement with Novella Clinical, Inc., or Novella, under which Novella provides clinical research organization, or CRO, services in support of the Company's clinical trials. The work order for the newest trial being conducted by Novella was signed on November 2, 2012. Novella was entitled to cumulative payments of up to $790 thousand under these arrangements, which is payable in varying amounts upon Novella achieving specified milestones.

On August 18, 2014 and November 6, 2014, the Company signed two respective amendments of the Master Clinical Research Organization Services Agreement with Novella. The amendments reflect the removal of data management, statistical and clinical study report services, as well as a change in the timeline and scope of clinical trial support. During the year ended December 31, 2014, three clinical milestones were met and expensed totaling $236 thousand. The remaining milestone of $10 thousand was met and expensed during the quarter ended March 31, 2015. There are no remaining obligations under this agreement.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

9. Warrants

The Company has issued both warrants that are accounted for as liabilities and warrants that are accounted for as equity instruments.

The Company follows accounting standards that provide guidance in assessing whether an equity-issued financial instrument is indexed to an entity's own stock for purposes of determining whether a financial instrument should be treated as a derivative and classified as a liability. Accounting standards require that liability classified warrants be recorded at their fair value at each financial reporting period and the resulting gain or loss be recorded as other income (expense) in the Statements of Operations. Fair value is measured using the binomial valuation model.

Liability-Classified Warrants

In connection with a December 2009 public offering, the Company issued warrants to purchase an aggregate of 8,206,520 shares of common stock, including the investor warrants and 464,520 warrants issued to the Underwriters. The warrants had a 5 year term and expired in December 2014. Subject to certain exceptions, these warrants provided anti-dilution protection in the event the Company should subsequently issue common stock or common stock equivalents at a price less than the exercise price of the warrants then in effect.

The Company assessed whether the Warrants required accounting as derivatives. The Company determined that the warrants were not indexed to the Company's own stock in accordance with FASB Accounting Standards Codification, *Derivatives and Hedging* (Topic 815). As such, the Company concluded the warrants did not meet the scope exception for determining whether the instruments required accounting as derivatives and should be classified in liabilities.

On December 31, 2013, the liability-classified warrants were valued at $11.8 million using a Binomial/Monte Carlo valuation model. The decrease in the fair value of the warrant liabilities of $1.2 million for the year ended December 31, 2013 was recorded as Other income, net in the Statements of Operations. In December 2014, the company recognized a gain of $195 thousand on the expiration of liability-classified warrants.

The following pricing assumptions were used in the Binomial/Monte Carlo valuation model at December 31, 2013:

	December 31, 2013
Risk-free interest rate	0.13%
Expected life in years	0.94
Expected volatility	80%
Expected dividend yield	—

In connection with its 2009 private placement, the Company issued warrants to purchase an aggregate of 2,910,954 shares of common stock (including 138,617 warrants issued to the placement agents) which were exercisable immediately. The warrants had an exercise price of $2.04 per share and a 5 year term. The fair value of the warrants was estimated at $4.2 million using a Black-Scholes model with the following assumptions: expected volatility of 105%, risk free interest rate of 2.41%, expected life of 5 years and no dividends. The fair value of the warrants was recorded in the equity section of the balance sheet. In October 2009, 136,986 of these warrants were exercised.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

9. Warrants (Continued)

During 2013 135,346 warrants were exercised for 112,808 shares of common stock. Of these warrants, all 135,346 were equity-classified; there were no liability-classified warrants exercised.

During 2014 4,004,907 warrants were exercised for 3,725,277 shares of common stock. Of these warrants, 2,249,062 were equity-classified and 1,755,845 were liability-classified warrants. Additionally, 12,329 equity-classified warrants and 6,479,231 liability-classified warrants expired without being exercised.

All remaining warrants have expired during the year ended December 31, 2014 and none are outstanding as of December 31, 2015.

10. Income Taxes

There is no provision for income taxes because the Company has incurred operating losses since inception. The reported amount of income tax expense for the years differs from the amount that would result from applying domestic federal statutory tax rates to pretax losses primarily because of the changes in the valuation allowance. Significant components of the Company's deferred tax assets at December 31, 2015 and 2014 are as follows:

	December 31,	
(in thousands)	**2015**	**2014**
Net operating loss carryforwards	$ 96,215	$ 79,050
Start-up and organizational costs	64,942	38,562
Research and development credit carryforwards	29,564	26,112
Stock compensation	1,997	1,181
Capitalized acquisition costs	10,429	11,376
Deferred revenue	2,695	534
Depreciation	251	208
Other	1,673	1,547
	207,766	158,570
Less valuation allowance	(207,766)	(158,570)
Effective tax rate	$ —	$ —

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amount of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. At December 31, 2015, the Company has aggregate net operating loss carryforwards for federal tax purposes of approximately $251 million available to offset future federal taxable income to the extent permitted under the Internal Revenue Code, or IRC, expiring in varying amounts through 2034. Additionally, the Company has approximately $29 million of research and development credits at December 31, 2015, expiring in varying amounts through 2034, which may be available to reduce future taxes.

Under the IRC Section 382, certain substantial changes in the Company's ownership may limit the amount of net operating loss carryforwards that can be utilized in any one year to offset future taxable income. The net operating loss carryforwards for the year ended December 31, 2015 includes approximately $10.2 million resulting from excess tax deductions from stock options. Pursuant to ASC 740, the deferred tax asset relating to excess tax benefits generated from exercises of stock options was not recognized for financial statement purposes.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

10. Income Taxes (Continued)

Section 382 of the IRC provides limits to which a corporation that has undergone a change in ownership (as defined) can utilize any net operating loss, or NOL, and general business tax credit carryforwards it may have. The Company commissioned an analysis to determine whether Section 382 could limit the use of its carryforwards in this manner. After completing the analysis, it was determined an ownership change had occurred in February 2007. As a result of this change, the Company's NOL's and general business tax credits from February 23, 2007 and prior would be completely limited under IRC Section 382. The deferred tax assets related to NOL's and general business credits have been reduced by $11.2 million and $636 thousand, respectively, as a result of the change. The Company updated the IRC Section 382 analysis through December 31, 2014. It was determined a change of ownership occurred on February 28, 2011. The Company's NOL's were not further limited as a result of the change.

The Company has provided a valuation allowance for the full amount of these net deferred tax assets, since it is more likely than not that these future benefits will not be realized. However, these deferred tax assets may be available to offset future income tax liabilities and expenses. The valuation allowance increased by $49.2 million in 2015 primarily due to net operating loss carryforwards and the increase in research and development credits.

Income taxes using the federal statutory income tax rate differ from the Company's effective tax rate primarily due to the change in the valuation allowance on deferred tax assets.

A reconciliation of income tax expense (benefit) at the statutory federal income tax rate and income taxes as reflected in the financial statements is as follows:

	Year Ended December 31,		
(in thousands)	**2015**	**2014**	**2013**
Federal income tax at statutory rates	34 %	34 %	34 %
State income tax, net of federal tax benefit	5 %	2 %	4 %
Research and development credits	3 %	3 %	9 %
Stock compensation	-1 %	-4 %	-2 %
Other	0 %	-4 %	1 %
Increase in valuation allowance	-41 %	-31 %	-46 %
Effective tax rate	0 %	0 %	0 %

The Company adopted ASC740, "Accounting for Uncertain Tax Positions" on January 1, 2007. ASC740 clarifies the accounting for uncertainty in income taxes recognized in an enterprise's financial statements in accordance with FASB Statement No. 109, "Accounting for Income Taxes." ASC 740 prescribes a recognition threshold and measurement of a tax position taken or expected to be taken in a tax return. The Company did not establish any

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

10. Income Taxes (Continued)

additional reserves for uncertain tax liabilities upon adoption of ASC 740. A summary of the company's adjustments to its uncertain tax positions in the years ended December 31, 2015, 2014, and 2013 are as follows:

(in thousands)		
Balance at December 31, 2012	$	275
Increase/Decrease for tax positions related to the current year		—
Increase/Decrease for tax positions related to prior years		(37)
Decrease for settlements with applicable taxing authorities		—
Decrease for lapses of statute of limitations		—
Balance at December 31, 2013	$	238
Increase/Decrease for tax positions related to the current year		—
Increase/Decrease for tax positions related to prior years		—
Decrease for settlements with applicable taxing authorities		—
Decrease for lapses of statute of limitations		—
Balance at December 31, 2014	$	238
Increase/Decrease for tax positions related to the current year		—
Increase/Decrease for tax positions related to prior years		—
Decreases for settlements with applicable taxing authorities		—
Decrease for previous year's lapses of statute of limitations		(20)
Decrease for impact of §382 limitations		(218)
Decrease for lapses of statute of limitations		—
Balance at December 31, 2015	$	—

The Company has not recognized any interest and penalties in the statement of operations because of the Company's net operating losses and tax credits that are available to be carried forward. When necessary, the Company will account for interest and penalties related to uncertain tax positions as part of its provision for federal and state income taxes. The Company does not expect the amounts of unrecognized benefits will change significantly within the next twelve months.

The Company is currently open to audit under the statute of limitations by the Internal Revenue Service and state jurisdictions for the years ended December 31, 1999 through 2015.

11. Preferred Stock and Stockholders' Equity

On April 26, 2006, the date of the Company's annual stockholders meeting that year, the shareholders approved the adoption of an Amended and Restated Certificate of Incorporation pursuant to which the Company has 280,000,000 shares of authorized capital stock, of which 250,000,000 shares are designated as common stock (par value $.001 per share), and 30,000,000 shares are designated as preferred stock (par value $.001 per share), which the Company refers to as the Preferred Stock.

Common Stock

On October 29, 2013, pursuant to an underwriting agreement between the Company and J. P. Morgan Securities LLC, as representative of the several underwriters named therein, the Company completed the sale of an aggregate 16,445,000 shares of the Company's common stock at a price of $3.50 per share in a public offering. The total gross proceeds resulting from this public offering were approximately $57.6 million, before deducting selling commissions and expenses (see Note 2, Financings).

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

11. Preferred Stock and Stockholders' Equity (Continued)

On February 3, 2015, the Company entered into an underwriting agreement with J.P. Morgan Securities LLC, as representative of the several underwriters named therein, relating to the issuance and sale of 10,000,000 shares of our common stock. The price to the public in the offering was $8.75 per share, and the underwriters agreed to purchase the shares from the Company pursuant to the underwriting agreement at a purchase price of $8.225 per share. Under the terms of the underwriting agreement, the Company also granted the underwriters an option, exercisable for 30 days, to purchase up to an additional 1,500,000 shares of common stock at a purchase price of $8.225 per share. The offering was made pursuant to the Company's effective registration statement on Form S-3 (SEC File No. 333-201826) previously filed with the SEC, and a prospectus supplement thereunder. The underwriters purchased the 10,000,000 shares and the additional 1,500,000 shares on February 9 and 17, 2015, respectively. The net proceeds from the offering were approximately $94.3 million after deducting underwriting discounts and estimated offering expenses paid by the Company.

On January 13, 2015, the Company, together with Intrexon, entered into the MD Anderson License. Pursuant to the terms of the MD Anderson License, MD Anderson received consideration of 11,722,163 shares of the Company's common stock (see Note 8, Commitments and Contingencies).

Preferred Stock

The Company's Board of Directors are authorized to designate any series of Preferred Stock, to fix and determine the variations in relative rights, preferences, privileges and restrictions as between and among such series.

12. Stock Option Plan

The Company adopted the 2003 Stock Option Plan, or the 2003 Plan, in 2003, and it was approved by the Company's stockholders on December 21, 2004. Upon approval of the 2012 Equity Incentive Plan, no additional stock awards may be granted under the 2003 Plan.

The Company adopted the 2012 Equity Incentive Plan, or the 2012 Plan, in May 2012, under which the Company initially reserved for the issuance of 4,000,000 shares of its common stock. The 2012 Plan was approved by the Company's stockholders on June 20, 2012. On June 18, 2014, the date of the Company's annual stockholders meeting, the Company's stockholders approved an amendment to the 2012 Plan increasing the total shares reserved by 5,000,000 shares, for a total of 9,000,000 shares.

As of December 31, 2015, the Company had outstanding options issued to its employees to purchase up to 2,420,801 shares of the Company's common stock, to its directors to purchase up to 927,500 shares of the Company's common stock, as well as options to consultants in connection with services rendered to purchase up to 133,167 shares of the Company's common stock.

Stock options to employees generally vest ratably over three years and have contractual terms of ten years. Stock options to directors generally vest ratably over one or three years and have contractual terms of ten years. Stock options are valued using the Black-Scholes option pricing model and compensation is recognized based on such fair value over the period of vesting on a straight-line basis. The Company has also reserved an aggregate of 26,364 additional shares for issuance under options granted outside of the 2003 Stock Option Plan.

Proceeds from the option exercises during the years ended December 31, 2015, 2014, and 2013 amounted to $4.6 million, $1.4 million and $956 thousand respectively. The intrinsic value of these options amounted to $23.8 million, $2.6 million and $1.4 million for years ended December 31, 2015, 2014 and 2013, respectively.

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

12. Stock Option Plan (Continued)

Transactions under the Plan for the years ending December 31, 2015, 2014, and 2013 were as follows:

(in thousands, except share and per share data)	Number of Shares	Weighted-Average Exercise Price	Weighted-Average Contractual Term (Years)	Aggregate Intrinsic Value
Outstanding, December 31, 2012	7,147,303	$ 4.11		
Granted	2,649,900	3.28		
Exercised	(570,168)	1.68		
Cancelled	(2,479,732)	4.58		
Outstanding, December 31, 2013	6,747,303	3.81		
Granted	1,099,300	4.95		
Exercised	(613,138)	2.26		
Cancelled	(727,801)	4.54		
Outstanding, December 31, 2014	6,505,664	4.07		
Granted	427,800	10.47		
Exercised	(3,249,160)	3.95		
Cancelled	(202,835)	4.36		
Outstanding, December 31, 2015	3,481,469	$ 4.96	6.98	$ 12,601
Vested and unvested expected to vest at December 31, 2015	3,443,414	$ 4.24	5.84	$ 12,463
Options exercisable, December 31, 2015	2,120,834	$ 4.24	5.84	$ 8,622
Options exercisable, December 31, 2014	3,781,162	$ 4.10	5.80	$ 4,130
Options available for future grant	2,768,230			

At December 31, 2015, total unrecognized compensation costs related to non-vested stock options outstanding amounted to $5.3 million. The cost is expected to be recognized over a weighted-average period of 1.55 years.

Restricted Stock

In May, June and December 2015, the Company issued 1,000,000, 50,000 and 403,083 shares of restricted stock to its employees, respectively, which vest ratably in annual installments over three years, commencing on the first anniversary of the grant date. In September and December 2015, the Company issued 4,186 and 133,305 shares of restricted stock to its non-employee directors, which vest in their entirety at December 31, 2015 and on the one year anniversary of the grant date respectively. In December 2014, the Company issued 66,828 shares of restricted stock to its non-employee directors, which vest in their entirety on the one year anniversary of the grant date. In December 2013, the Company issued 75,272 shares of restricted stock to its non-employee directors, which vested in their entirety on the one year anniversary of the grant date.

In September and December 2015, the Company repurchased 7,669 and 16,709 shares at average prices of $11.57 and $8.31, respectively to cover payroll taxes. In January, February and December 2014, the Company repurchased 16,031, 14,600 and 81,702 shares at average prices of $4.37, $4.40 and $5.04 per share, respectively, to cover payroll taxes. In January, March, May and December 2013, the Company repurchased 52,018, 5,400, 2,623, and

ZIOPHARM Oncology, Inc.

NOTES TO FINANCIAL STATEMENTS

12. Stock Option Plan (Continued)

56,683 shares at average prices of $4.28, $4.50, $1.65 and $4.37 per share, respectively, to cover payroll taxes. A summary of the status of non-vested restricted stock as of December 31, 2015, 2014 and 2013 is as follows:

	Number of Shares	Weighted-Average Grant Date Fair Value
Non-vested, December 31, 2012	733,739	$ 4.37
Granted	75,272	4.34
Vested	(292,399)	4.31
Cancelled	(163,747)	4.42
Non-vested, December 31, 2013	352,865	4.38
Granted	66,828	5.07
Vested	(253,835)	4.38
Cancelled	(21,350)	4.41
Non-vested, December 31, 2014	144,508	4.70
Granted	1,590,574	9.01
Vested	(148,694)	4.88
Cancelled	—	—
Non-vested, December 31, 2015	1,586,388	$ 9.00

As of December 31, 2015, there was $12.1 million of total unrecognized stock-based compensation expense related to non-vested restricted stock arrangements. The expense is expected to be recognized over a weighted-average period of 1.73 years.

13. Employee Benefit Plan

The Company sponsors a qualified 401(k) Retirement Plan under which employees are allowed to contribute certain percentages of their pay, up to the maximum allowed under Section 401(k) of the IIRC. The Company may make contributions to this plan at its discretion. The Company contributed approximately $47 thousand, $79 thousand, and $139 thousand to this plan during the years ended December 31, 2015, 2014, and 2013, respectively.

14. Selected Quarterly Information (Unaudited)

(in thousands, except per share amount)

Year Ended December 31, 2015	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Revenue	$ 272	$ 272	$ 1,869	$ 1,919
Total operating expenses	78,499	14,497	20,035	11,401
Loss from operations	(78,227)	(14,225)	(18,166)	(9,482)
Change in fair value of warrants	—	—	—	—
Net (loss)	(78,231)	(14,211)	(18,170)	(9,476)
Loss per share, basic and diluted	$ (0.69)	$ (0.11)	$ (0.14)	$ (0.07)

Year Ended December 31, 2014	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Revenue	$ 200	$ 200	$ 633	$ 340
Total operating expenses	9,984	11,377	12,575	10,936
Loss from operations	(9,784)	(11,177)	(11,942)	(10,596)
Change in fair value of warrants	82	5,600	5,847	194
Net (loss)	(9,711)	(5,576)	(6,093)	(10,401)
Loss per share, basic and diluted	$ (0.10)	$ (0.06)	$ (0.06)	$ (0.09)

Exhibit 10.2K

Form of Officer Grant

INTREXON CORPORATION
AMENDED AND RESTATED
2013 OMNIBUS INCENTIVE PLAN, AS AMENDED

Restricted Stock Unit Agreement

THIS RESTRICTED STOCK UNIT AGREEMENT (this "Agreement") dated as of _____ ___, 20___, between Intrexon Corporation, a Virginia corporation (the "Company"), and _____ (the "Participant"), is made pursuant and subject to the provisions of the Company's Amended and Restated 2013 Omnibus Incentive Plan, as amended (the "Plan"), a copy of which is attached hereto. All terms used herein that are defined in the Plan have the same meaning given them in the Plan.

1. *Grant of Restricted Stock Units*. Pursuant to the Plan, the Company, on [Date of Grant] (the "Date of Grant"), granted to the Participant, subject to the terms and conditions of the Plan and subject further to the terms and conditions set forth herein, the right to receive [Number of shares] of Common Stock (the "Award") subject to the terms and conditions of the Plan. This Award represents an unsecured promise of the Company to deliver, and the right of the Participant to receive, shares of Common Stock at the time and on the terms and conditions set forth herein. As a holder of this Award, the Participant has only the rights of a general unsecured creditor of the Company.

2. *Terms and Conditions*. This Award is subject to the following terms and conditions:

(a) *Vesting of Shares*.

(i) *In General*. Except as otherwise provided below, this Award shall become vested and nonforfeitable with respect to 25% of the shares subject to the Award on each of the first four (4) anniversaries of the Date of Grant, with respect to the number of shares of Common Stock set forth above, provided, the Participant has been continuously employed by the Company or an Affiliate from the Date of Grant until such time.

(ii) *Change in Control*. Notwithstanding the foregoing, in the event a Change in Control occurs and no provision is made for the continuance, assumption on substitution of the Award by the Company or its successor (or a parent company) in a Change in Control, then the Award shall become vested in full on the Control Change Date, provided the Participant has remained continuously employed by, or providing service to, the Company or any Affiliate from the Date of Grant until such time.

(iii) *Death or Disability.* Notwithstanding the foregoing, this Award also shall become vested in full in the event the Participant's employment or service with the Company and its Affiliates is terminated as a result of the Participant's death or Disability.

(iv) *Terms of Payment.* The shares of Common Stock that are vested and issuable to Participant shall be issued and delivered to Participant no later than thirty (30) days after the date on which the portion of the Award vests (each such date, a "Share Issuance Date"). If a Share Issuance Date falls during a period when, pursuant to applicable law, regulations, NYSE rules or the Company's internal policies or agreements with third parties, the Company is not permitted to issue such shares of Common Stock, such shares of Common Stock shall be issued and delivered to Participant no later than the third business day following the conclusion of such period.

(v) *Anti-Hedging/Pledging and Insider Trading Policy*. All shares of Common Stock issued and delivered under this Award shall be subject to any anti-pledging and/or anti-hedging policies the Company may adopt from time to time and shall be subject to the Company's Policy Relating to Insider Trading of Securities and Confidential Information, as amended from time to time.

(b) *Transferability*. Except as provided herein, this Award is nontransferable, other than by will or the laws of descent and distribution, and during the Participant's lifetime, may be transferred by the Participant to immediate family members or trusts or other entities on behalf of the Participant and/or immediate family members or for charitable donations. Any such transfer will be permitted only if (i) the Participant does not receive any consideration for the transfer and (ii) the Committee expressly approves the transfer. Any transferee to whom this Award is transferred shall be bound by the same terms and conditions that

governed the Award during the time it was held by the Participant (which terms and conditions shall still be read from the perspective of the Participant); *provided, however,* that the transferee may not transfer the Award except by will or the laws of descent and distribution. Any such transfer shall be evidenced by an appropriate written document that the Participant executes and the Participant shall deliver a copy thereof to the Committee on or prior to the effective date of the transfer. No right or interest of the Participant or any transferee in the Award shall be liable for, or subject to, any lien, obligation or liability of the Participant or any transferee. For clarity, this Section 2(b) refers only to the right to receive the shares of Common Stock underlying this Award and not the vested shares of Common Stock.

3. *Forfeiture of the Award*.

(a) The portion of the Award that is not vested and payable pursuant to Section 2(a) as of the date of termination of the Participant's employment by, or service with, the Company or an Affiliate will be forfeited automatically at the close of business on that date.

(b) In no event may any portion of the Award become vested and payable, in whole or in part, after forfeiture pursuant to Section 3(a) above.

4. *Shareholder Rights*. The Participant shall not have any rights as a shareholder with respect to shares of Common Stock subject to this Award until issuance of the shares of Common Stock. The Company may include on any certificates or notations representing shares of Common Stock issued pursuant to this Award such legends referring to any representations, restrictions or any other applicable statements as the Company, in its discretion, shall deem appropriate.

5. *Agreement to Terms of the Plan and Agreement*. The Participant has received a copy of the Plan, has read and understands the terms of the Plan and this Agreement, and agrees to be bound by their terms and conditions.

6. *Withholding of Taxes*. The Company's obligation to deliver the shares of Common Stock, or, if applicable, cash, upon vesting of the Award is subject to the Participant's satisfaction of any applicable federal, state and local income and employment tax and withholding requirements in a manner and form satisfactory to the Company. The Company, to the extent applicable law permits, may allow the Participant to pay such withholding amounts (i) by surrendering (actually or by attestation) shares of Common Stock that the Participant already owns (but only for the minimum required withholding), (ii) by means of a "net withholding" procedure, (iii) by such other medium of payment as the Company in its discretion shall authorize or (iv) by any combination of the allowable methods of payment set forth herein.

7. *Tax Consequences*. The Participant acknowledges (i) that there may be adverse tax consequences upon acquisition or disposition of the shares of Common Stock issuable pursuant to this Agreement and (ii) that Participant should consult a tax adviser prior to such acquisition or disposition. The Participant is solely responsible for determining the tax consequences of the Award and for satisfying the Participant's tax obligations with respect to the Award (including, but not limited to, any income or excise tax as resulting from the application of Code Sections 409A or 4999), and the Company shall not be liable if the Award is subject to Code Sections 409A or 4999.

8. *Fractional Shares*. Fractional shares shall not be issuable hereunder, and when any provision hereof may entitle the Participant to a fractional share such fractional share shall be disregarded.

9. *Change in Capital Structure*. The terms of this Agreement shall be adjusted in accordance with the terms and conditions of the Plan as the Committee determines is equitably required in the event the Company effects one or more stock dividends, stock splits, subdivisions or consolidations of shares or other similar changes in capitalization.

10. *Notice*. Any notice or other communication given pursuant to this Agreement, or in any way with respect to this Agreement, shall be in writing and shall be personally delivered or mailed by United States registered or certified mail, postage prepaid, return receipt requested, to the following addresses:

If to the Company: Intrexon Corporation
20374 Seneca Meadows Parkway
Germantown, MD 20876
Attention: Chief Legal Officer

If to the Participant: _____
_____
_____
_____

11. *No Right to Continued Employment or Service*. Neither the Plan, the granting of the Award nor any other action taken pursuant to the Plan or this Agreement constitutes or is evidence of any agreement or understanding, expressed or implied, that the Company shall retain the Participant as an employee or other service provider for any period of time or at any particular rate of compensation.

12. *Binding Effect*. Subject to the limitations stated above and in the Plan, this Agreement shall be binding upon and inure to the benefit of the legatees, distributees, and personal representatives of the Participant and the successors of the Company.

13. *Conflicts*. In the event of any conflict between the provisions of the Plan and the provisions of this Agreement, the provisions of the Plan shall govern. All references herein to the Plan shall mean the Plan as in effect on the date hereof.

14. *Counterparts*. This Agreement may be executed in a number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one in the same instrument.

15. *Miscellaneous*. The parties agree to execute such further instruments and take such further actions as may be necessary to carry out the intent of the Plan and this Agreement. This Agreement and the Plan shall constitute the entire agreement of the parties with respect to the subject matter hereof.

16. *Section 409A.* Notwithstanding any other provision of this Agreement, it is intended that payments hereunder will not be considered deferred compensation within the meaning of Section 409A of the Code. For purposes of this Agreement, all rights to payments hereunder shall be treated as rights to receive a series of separate payments and benefits to the fullest extent allowed by Section 409A of the Code. Payments hereunder are intended to satisfy the exemption from Section 409A of the Code for "short-term deferrals." Notwithstanding the preceding, neither the Company nor any Affiliate shall be liable to the Participant or any other person if the Internal Revenue Service or any court or other authority having jurisdiction over such matter determines for any reason that any payments hereunder are subject to taxes, penalties or interest as a result of failing to be exempt from, or comply with, Section 409A of the Code. The Company shall delay the issuance of shares under this Award to the extent necessary to comply with Section 409A(a)(2)(B)(i) of the Code (relating to payments of deferred compensation to specified employees of certain publicly traded companies).

17. *Governing Law*. This Agreement shall be governed by the laws of the Commonwealth of Virginia, except to the extent federal law applies.

IN WITNESS WHEREOF, the Company has caused this Agreement to be signed by a duly authorized officer, and the Participant has affixed his signature hereto.

COMPANY:

INTREXON CORPORATION

By: _____

Name:

Title:

PARTICIPANT:

_____

[Name]

Exhibit 10.2L

Form of Director Annual Grant

INTREXON CORPORATION
AMENDED AND RESTATED
2013 OMNIBUS INCENTIVE PLAN, AS AMENDED

Restricted Stock Unit Agreement

THIS RESTRICTED STOCK UNIT AGREEMENT (this "Agreement") dated as of _____ ___, 20___, between Intrexon Corporation, a Virginia corporation (the "Company"), and _____ (the "Participant"), is made pursuant and subject to the provisions of the Company's Amended and Restated 2013 Omnibus Incentive Plan, as amended (the "Plan"), a copy of which is attached hereto. All terms used herein that are defined in the Plan have the same meaning given them in the Plan.

1. *Grant of Restricted Stock Units*. Pursuant to the Plan, the Company, on [Date of Grant] (the "Date of Grant"), granted to the Participant, subject to the terms and conditions of the Plan and subject further to the terms and conditions set forth herein, the right to receive, [Number of shares with a fair market value of $125,000] (the "Award") subject to the terms and conditions of the Plan, this Award represents an unsecured promise of the Company to deliver, and the right of the Participant to receive, shares of Common Stock at the time and on the terms and conditions set forth herein. As a holder of this Award, the Participant has only the rights of a general unsecured creditor of the Company.

2. *Terms and Conditions*. This Award is subject to the following terms and conditions:

(a) *Expiration Date.* This Award expires following the one year anniversary of the Date of Grant (the "Expiration Date"), unless terminated or settled sooner as described herein, and after delivery of all shares of Common Stock that Participant is entitled to receive.

(b) *Vesting of Shares*.

(i) *In General*. Except as otherwise provided below, this Award shall become vested and nonforfeitable on the one year anniversary of the Date of Grant, with respect to the number of shares of Common Stock set forth above, provided, the Participant has been continuously employed by, or providing services to, the Company or an Affiliate from the Date of Grant until such time.

(ii) *Change in Control.* Notwithstanding the foregoing, in the event a Change in Control occurs, then the Award shall become vested in full on the Control Change Date, provided the Participant has remained continuously employed by, or providing service to, the Company or any Affiliate from the Date of Grant until such time.

(iii) *Death or Disability.* Notwithstanding the foregoing, this Award also shall become vested in full in the event the Participant's employment or service with the Company and its Affiliates is terminated as a result of the Participant's death or Disability.

(iv) *Terms of Payment.* The shares of Common Stock that are vested and issuable to Participant shall be issued and delivered to Participant no later than fifteen (15) days after the end of the calendar month in which the Award vests (the "Share Issuance Date"). If the Share Issuance Date falls during a period when, pursuant to applicable law, regulations, NYSE rules or the Company's internal policies or agreements with third parties, the Company is not permitted to issue such shares of Common Stock, such shares of Common Stock shall be issued and delivered to Participant no later than the third business day following the conclusion of such period.

(v) *Anti-Hedging/Pledging and Insider Trading Policy*. All shares of Common Stock issued and delivered under this Award shall be subject to any anti-pledging and/or anti-hedging policies the Company may adopt from time to time and shall be subject to the Company's Policy Relating to Insider Trading of Securities and Confidential Information, as amended from time to time.

(c) *Transferability*. Except as provided herein, this Award is nontransferable, other than by will or the laws of descent and distribution, and during the Participant's lifetime, may be transferred by the Participant to immediate family members or trusts

or other entities on behalf of the Participant and/or immediate family members or for charitable donations. Any such transfer will be permitted only if (i) the Participant does not receive any consideration for the transfer and (ii) the Committee expressly approves the transfer. Any transferee to whom this Award is transferred shall be bound by the same terms and conditions that governed the Award during the time it was held by the Participant (which terms and conditions shall still be read from the perspective of the Participant); *provided, however,* that the transferee may not transfer the Award except by will or the laws of descent and distribution. Any such transfer shall be evidenced by an appropriate written document that the Participant executes and the Participant shall deliver a copy thereof to the Committee on or prior to the effective date of the transfer. No right or interest of the Participant or any transferee in the Award shall be liable for, or subject to, any lien, obligation or liability of the Participant or any transferee. For clarity, this Section 2(c) refers only to the right to receive the shares of Common Stock underlying this Award and not the vested shares of Common Stock.

3. *Forfeiture of the Award*.

(a) Notwithstanding any other provision of this Award, any amounts that have not become vested and payable prior to the Expiration Date shall expire and may not become earned and payable after such time. Additionally, any amounts that have not become vested and payable on or before the termination of the Participant's employment by, or service with, the Company or an Affiliate shall expire and may not become vested and payable after such time.

(b) The portion of the Award that is not vested and payable pursuant to Section 2(b) as of the date of termination of the Participant's employment by, or service with, the Company or an Affiliate will be forfeited automatically at the close of business on that date.

(c) In no event may any portion of the Award become vested and payable, in whole or in part, after forfeiture pursuant to Sections 3(a) or (b) above.

4. *Shareholder Rights*. The Participant shall not have any rights as a shareholder with respect to shares of Common Stock subject to this Award until issuance of the shares of Common Stock. The Company may include on any certificates or notations representing shares of Common Stock issued pursuant to this Award such legends referring to any representations, restrictions or any other applicable statements as the Company, in its discretion, shall deem appropriate.

5. *Agreement to Terms of the Plan and Agreement*. The Participant has received a copy of the Plan, has read and understands the terms of the Plan and this Agreement, and agrees to be bound by their terms and conditions.

6. *Withholding of Taxes*. The Company's obligation to deliver the shares of Common Stock, or, if applicable, cash, upon vesting of the Award is subject to the Participant's satisfaction of any applicable federal, state and local income and employment tax and withholding requirements in a manner and form satisfactory to the Company. The Company, to the extent applicable law permits, may allow the Participant to pay such withholding amounts (i) by surrendering (actually or by attestation) shares of Common Stock that the Participant already owns (but only for the minimum required withholding), (ii) by means of a "net withholding" procedure, (iii) by such other medium of payment as the Company in its discretion shall authorize or (iv) by any combination of the allowable methods of payment set forth herein.

7. *Tax Consequences*. The Participant acknowledges (i) that there may be adverse tax consequences upon acquisition or disposition of the shares of Common Stock issuable pursuant to this Agreement and (ii) that Participant should consult a tax adviser prior to such acquisition or disposition. The Participant is solely responsible for determining the tax consequences of the Award and for satisfying the Participant's tax obligations with respect to the Award (including, but not limited to, any income or excise tax as resulting from the application of Code Sections 409A or 4999), and the Company shall not be liable if the Award is subject to Code Sections 409A or 4999.

8. *Fractional Shares*. Fractional shares shall not be issuable hereunder, and when any provision hereof may entitle the Participant to a fractional share such fractional share shall be disregarded.

9. *Change in Capital Structure*. The terms of this Agreement shall be adjusted in accordance with the terms and conditions of the Plan as the Committee determines is equitably required in the event the Company effects one or more stock dividends, stock splits, subdivisions or consolidations of shares or other similar changes in capitalization.

10. *Notice*. Any notice or other communication given pursuant to this Agreement, or in any way with respect to this Agreement, shall be in writing and shall be personally delivered or mailed by United States registered or certified mail, postage prepaid, return receipt requested, to the following addresses:

If to the Company:	Intrexon Corporation 20374 Seneca Meadows Parkway Germantown, MD 20876 Attention: Chief Legal Officer
If to the Participant:	_____ _____ _____ _____

11. *No Right to Continued Employment or Service*. Neither the Plan, the granting of the Award nor any other action taken pursuant to the Plan or this Agreement constitutes or is evidence of any agreement or understanding, expressed or implied, that the Company shall retain the Participant as an employee or other service provider for any period of time or at any particular rate of compensation.

12. *Binding Effect*. Subject to the limitations stated above and in the Plan, this Agreement shall be binding upon and inure to the benefit of the legatees, distributees, and personal representatives of the Participant and the successors of the Company.

13. *Conflicts*. In the event of any conflict between the provisions of the Plan and the provisions of this Agreement, the provisions of the Plan shall govern. All references herein to the Plan shall mean the Plan as in effect on the date hereof.

14. *Counterparts*. This Agreement may be executed in a number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one in the same instrument.

15. *Miscellaneous*. The parties agree to execute such further instruments and take such further actions as may be necessary to carry out the intent of the Plan and this Agreement. This Agreement and the Plan shall constitute the entire agreement of the parties with respect to the subject matter hereof.

16. *Section 409A.* Notwithstanding any other provision of this Agreement, it is intended that payments hereunder will not be considered deferred compensation within the meaning of Section 409A of the Code. For purposes of this Agreement, all rights to payments hereunder shall be treated as rights to receive a series of separate payments and benefits to the fullest extent allowed by Section 409A of the Code. Payments hereunder are intended to satisfy the exemption from Section 409A of the Code for "short-term deferrals." Notwithstanding the preceding, neither the Company nor any Affiliate shall be liable to the Participant or any other person if the Internal Revenue Service or any court or other authority having jurisdiction over such matter determines for any reason that any payments hereunder are subject to taxes, penalties or interest as a result of failing to be exempt from, or comply with, Section 409A of the Code.

17. *Governing Law*. This Agreement shall be governed by the laws of the Commonwealth of Virginia, except to the extent federal law applies.

IN WITNESS WHEREOF, the Company has caused this Agreement to be signed by a duly authorized officer, and the Participant has affixed his signature hereto.

COMPANY:

INTREXON CORPORATION

By: _____

Name:

Title:

PARTICIPANT:

_____

[Name]

Exhibit 10.4A

FIRST AMENDMENT TO EXCLUSIVE CHANNEL COLLABORATION AGREEMENT

THIS FIRST AMENDMENT (the "Amendment") is entered into as of this 21st day of July, 2016 and serves to amend the Exclusive Channel Collaboration Agreement entered into by and between Intrexon Corporation ("Intrexon") and Oragenics, Inc. ("Oragenics") on June 5, 2012 (the "Agreement"). All capitalized terms not defined herein shall have the meaning set forth in the Agreement.

WHEREAS, Intrexon has expertise in and owns or controls proprietary technology relating to the identification, design and production of genetically modified cells and DNA vectors, and the control of expression of proteins and bioactive RNA species; and

WHEREAS, pursuant to the Agreement, Oragenics is currently Intrexon's exclusive channel collaborator with the right to use Intrexon technology to research, develop and commercialize products for use in a specific Field (as defined in the Agreement); and

WHEREAS, Oragenics and Intrexon now mutually desire to broaden the scope of its rights under the Agreement in order to research, develop and commercialize products for use in an expanded Field as more fully described below.

NOW THEREFORE, in consideration of the foregoing and the covenants and promises contained herein, the Parties hereby agree to amend the Agreement pursuant to Section 12.7 thereof as follows:

1. Section 1.20 of the Agreement is hereby replaced in its entirety with the following:
   "1.20 "Field" means, irrespective of whether such requires regulatory approval (a) the direct administration to humans or other animals of a Lantibiotic as an active pharmaceutical ingredient in drug products for the prevention or treatment of infectious disease, and/or (b) the direct administration to humans or other animals of *Streptococcus mutans* that is genetically modified to express a Lantibiotic *in vivo* as an active pharmaceutical ingredient in drug products for the prevention or treatment of infectious disease."

2. Oragenics hereby represents and warrants to Intrexon that, as of the date of this Amendment:
   a. Corporate Power. Oragenics is duly organized and validly existing under the laws of Florida and has full corporate power and authority to enter into this Amendment and to carry out the provisions hereof.
   b. Due Authorization. Oragenics is duly authorized to execute and deliver this Amendment and to perform its obligations hereunder, and the person executing this Amendment on Oragenics' behalf has been duly authorized to do so by all requisite corporate action.
3. Intrexon hereby represents and warrants to Oragenics that, as of the date of this Amendment:
   a. Corporate Power. Intrexon is duly organized and validly existing under the laws of Virginia and has full corporate power and authority to enter into this Amendment and to carry out the provisions hereof.
   b. Due Authorization. Intrexon is duly authorized to execute and deliver this Amendment and to perform its obligations hereunder, and the person executing this Amendment on Intrexon's behalf has been duly authorized to do so by all requisite corporate action.
4. All other terms and conditions of the Agreement remain in full force and effect.

[Signature Page Follows]

IN WITNESS WHEREOF, the parties hereto have duly executed this First Amendment to Exclusive Channel Collaboration Agreement by authorized representatives as of the date written above.

INTREXON CORPORATION

By: /s/ Jeffrey Perez
Name: Jeffrey Perez
Title: SVP, Intellectual Property Affairs

ORAGENICS, INC.

By: /s/ Alan F. Joslyn
Name: Alan F. Joslyn
Title: Chief Executive Officer

Exhibit 10.4B

SECOND AMENDMENT TO EXCLUSIVE CHANNEL COLLABORATION AGREEMENT

This **SECOND AMENDMENT TO EXCLUSIVE CHANNEL COLLABORATION AGREEMENT** (the "**Amendment**") is effective as of November 8, 2017 (the "**Second Amendment Effective Date**") by and between **INTREXON CORPORATION**, a Virginia corporation with offices at 20374 Seneca Meadows Parkway, Germantown, MD 20876 ("**Intrexon**") and **ORAGENICS, INC.,** a Florida corporation having its principal place of business at 4902 Eisenhower Boulevard, Suite 125, Tampa, FL 33634, U.S.A. ("**Oragenics**"). Intrexon on the one hand and Oragenics on the other hand may be referred to herein individually as a "**Party**", and collectively as the "**Parties**."

RECITALS

A. WHEREAS Intrexon and Oragenics are parties to that certain Exclusive Channel Collaboration Agreement, effective June 5, 2012, as amended by that certain First Amendment to Exclusive Channel Collaboration Agreement, effective July 21, 2016 (the "**Agreement**"), pursuant to which Intrexon appointed Oragenics as their exclusive channel collaborator for developing and commercializing certain products in an exclusive field as defined by the Agreement;

B. WHEREAS Intrexon and Oragenics now mutually desire to further amend the Agreement;

D. NOW, THEREFORE, Intrexon and Oragenics agree to amend the terms of the Agreement as provided below, effective as of the Second Amendment Effective Date.

1. GENERALLY

1.1 Capitalized terms present within this Amendment that are not proper names or titles, that are not conventionally capitalized, or that are not otherwise defined within this Amendment shall have the meaning set forth in the Agreement.

1.2 Intrexon and Oragenics, in conjunction with and contemporaneously with this Amendment, have entered into an Amendment to the Stock Issuance Agreement of even date herewith (the "**Stock Amendment**"), which Stock Amendment amends the Stock Issuance Agreement by and between Intrexon and Oragenics, effective June 5, 2012 (the "**Stock Agreement**").

2. AMENDMENTS TO THE AGREEMENT

2.1 Definitions.

(a) Section 1.12 of the Agreement "**Costs of Goods Sold**", Section 1.41 of the Agreement "**Manufacturing Costs**" and Section 1.50 of the Agreement "**Product Profit**" are hereby deleted in their entirety and each replaced with "Reserved".

(b) The following is added as a new third sentence to Section 1.14 of the Agreement "**Diligent Efforts**":

> Oragenics' obligation to use Diligent Efforts under this Agreement shall be deemed satisfied if from the Second Amendment Effective Date until the end of 2018, Oragenics has budgeted one million two hundred thousand United States dollars ($1,200,000) for manufacturing and support activities related to, and including the conduct of the required toxicology studies for the OG716 IND filing.

2.2 Sublicensing. The following is added as a new third sentence to the introductory paragraph of Section 3.2 of the Agreement:

> The parties shall agree, in connection with any such sublicense not covered under Sections 3.2(a) through 3.2(c) below, on the applicable Sublicensing Revenue Rate (as defined herein) with respect to such sublicense.

2.3 Milestones. Section 5.2 of the Agreement is hereby replaced in its entirety with the following Section 5.2:

> **5.2 Milestones.**
>
> **(a) Oragenics Milestones**. Upon the first instance of attainment of certain commercialization milestone events by an Oragenics Product (whether such attainment is achieved by Oragenics or by a permitted sublicensee), Oragenics has agreed to pay Intrexon milestone payments as set forth in the Equity

Agreement. The milestone payments are each payable in cash (subject to Section 5.2(b)) by wire transfer to the account specified by Intrexon. The specific milestone payments due to Intrexon upon achievement of each milestone event are set forth in the Equity Agreement.

(b) Product Sublicense Milestones. If (A) a commercialization milestone event occurs that gives rise to a right for Intrexon to receive a payment from Oragenics under Section 5.2(a), (B) that milestone event is achieved by an Oragenics Product licensed to a Product Sublicensee under a respective Product Sublicense, and (C) Oragenics is due to receive a milestone payment from the Product Sublicensee for achievement of that same (or substantially similar) milestone event by the sublicensed Oragenics Product under the respective Product Sublicense, then Intrexon may elect at its own discretion to waive that particular milestone payment from Oragenics for that particular commercialization milestone event and instead designate the amount of the payment due to Oragenics from the Product Sublicensee for achievement of that same (or substantially similar) milestone event as Sublicensing Revenue for which Intrexon will be entitled to receive revenue sharing under Section 5.4(b). If it so elects under this Section 5.2(b), Intrexon must notify Oragenics in writing of its waiver of that particular milestone payment and election to share the milestone payment due from the Product Sublicensee as Sublicensing Revenue at least five (5) business days prior to the deadline for Oragenics to make a payment for the waived milestone payment. The actual receipt by Intrexon of its full share of the Product Sublicensee milestone payment as Sublicensing Revenue will be a condition subsequent to making final any waiver of Intrexon's rights to receive the particular milestone payment otherwise due from Oragenics under Section 5.2(a). Oragenics will pay Intrexon any amount due under this Section 5.2(b) within the later of (i) six (6) months from underlying commercialization milestone event, or (ii) ten (10) days following the date stipulated in the underlying Product Sublicense for Oragenics to receive the milestone payment.

2.4 Equity Agreement Controls. Section 5.3 of the Agreement is hereby replaced in its entirety with the following new Section 5.3:

5.3 Equity Agreement Controls. All cash payments to Intrexon shall be in accordance with the terms and conditions of the Equity Agreement, which Equity Agreement shall control to the extent it may conflict with Sections 5.1 through 5.2 of this Agreement.

2.5 Revenue Sharing. Section 5.4 of the Agreement is hereby replaced in its entirety with the following new Section 5.4:

5.4 Revenue Sharing.

(a) No later than thirty (30) days after each calendar quarter in which there is positive Net Sales arising from the sale of any Oragenics Product in the Field in the Territory, Oragenics shall pay a royalty to Intrexon of ten percent (10%) of such Net Sales, on an Oragenics Product-by-Oragenics Product basis. Commencing with the Effective Date, in the event that no Net Sales occur for a particular Oragenics Product in any calendar quarter, neither Oragenics nor Intrexon shall owe any payments hereunder with respect to such Oragenics Product.

(b) No later than thirty (30) days after each calendar quarter in which Oragenics or any Oragenics Affiliate receives Sublicensing Revenue, Oragenics shall pay to Intrexon a percentage of such Sublicensing Revenue equal to the applicable Sublicensing Revenue Rate. "**Sublicensing Revenue Rate**" means a percentage of Sublicensing Revenue applicable to a proposed sublicense by Oragenics as follows: (a) with respect to any sublicense of a Lantibiotics Oragenics Product (including new indications thereof), any revenues Oragenics receives from a Product Sublicensee under a Product Sublicense that are not a percentage of Product Sublicensee's Net Sales of Oragenics Products, and any amounts recovered under Section 6.3(f), the Sublicensing Revenue Rate shall be twenty five percent (25%); and (b) with respect to any other sublicense, the Sublicensing Revenue Rate shall be determined in accordance with Section 3.2.

2.6 Payment Reports and Records Retention. Section 5.6 of the Agreement is hereby replaced in its entirety with the following new Section 5.6:

5.6 Payment Reports and Records Retention. Within thirty (30) days after the end of each calendar quarter during which Net Sales have been generated or during which Sublicensing Revenue has been received, Oragenics shall deliver to Intrexon a written report that shall contain at a minimum for the applicable calendar quarter:

(a) gross sales of each Oragenics Product (on a country-by-country basis);

(b) itemized calculation of Net Sales, showing all applicable deductions;

(c) itemized calculation of Sublicensing Revenue, including any offsets claimed for Third Party license costs;

(d) the amount of the payment (if any) due pursuant to Section 5.4(a) and/or 5.4(b);

(e) the amount of the payment (if any) made or made due by the achievement of an applicable commercialization milestone event during the present calendar quarter;

(f) the amount of taxes, if any, withheld to comply with any applicable law; and

(g) the exchange rates used in any of the foregoing calculations.

For three (3) years after each sale or other commercial use of Oragenics Product, after incurring any component item Oragenics incorporated into its calculation of Sublicensing Revenues, payments in accord with Section 5.2(b), or Net Sales as reported to Intrexon, Oragenics shall keep (and shall ensure that its Affiliates and, if applicable, (sub)licensees shall keep) complete and accurate records of such sales, commercial use, or component item in sufficient detail to confirm the accuracy of the payment calculations hereunder.

3. MISCELLANEOUS

3.1 Full Force and Effect. This Amendment amends the terms of the Agreement and is deemed incorporated into the Agreement. The provisions of the Agreement as amended remain in full force and effect.

3.2 Entire Agreement. This Amendment, together with the Agreement, the Stock Agreement, and the Stock Amendment, constitutes the entire agreement, both written and oral, between the Parties with respect to the subject matter hereof, and any and all prior agreements with respect to the subject matter hereof, either written or oral, expressed or implied, are superseded hereby, merged and canceled, and are null and void and of no effect.

3.3 Counterparts. This Amendment may be executed in one or more counterparts, each of which will be an original and all of which together will constitute one instrument.

[Remainder of Page Intentionally Left Blank; Signature Page Follows]

IN WITNESS WHEREOF, Intrexon and Oragenics have executed this Amendment by their respective duly authorized representatives as of the Second Amendment Effective Date.

INTREXON CORPORATION		**ORAGENICS, INC.**	
By:	/s/ Donald P. Lehr	By:	/s/ Alan Joslyn
Name:	Donald P. Lehr	Name:	Alan Joslyn
Title:	Chief Legal Officer	Title:	Chief Executive Officer

Exhibit 21.1

List of Subsidiaries of Intrexon Corporation

Domestic	
ActoBio Therapeutics, Inc.	Delaware
ActoBio Therapeutics Holdings, Inc.	Delaware
AquaBounty Farms, Inc.	Delaware
AquaBounty Technologies, Inc.	Delaware
Biological & Popular Culture, Inc.	Delaware
EnviroFlight, LLC	Delaware
Exemplar Genetics, LLC	Iowa
Fruit Orchard Holdings, Inc.	Delaware
GenVec, Inc.	Delaware
ILH Holdings, Inc.	Delaware
Intrexon AB, Co.	Delaware
Intrexon CEU, Inc.	Delaware
Intrexon Crop Protection, Inc.	Virginia
Intrexon EF Holdings, Inc.	Delaware
Intrexon Energy Partners, LLC	Delaware
Intrexon Energy Partners II, LLC	Delaware
Intrexon Environmental Medicine Partners, LLC	Delaware
Intrexon Produce Holdings, Inc.	Delaware
Intrexon T1D Partners, LLC	Delaware
Intrexon UK Holdings, Inc.	Delaware
MabLogix, LLC	Delaware
OvaXon, LLC	Delaware
Precigen, Inc.	Delaware
Preogentus, L.C.	Iowa
Trans Ova Genetics, L.C.	Iowa
Unicell Bio International, LLC	Delaware
ViaGen, L.C.	Iowa
Xogenex LLC	Delaware
XON Cells, Inc.	Nevada
International	
ActoBio Laboratories Belgium BVBA *(besloten vennootschap met beperkte aansprakelijkheid)*	Belgium
AQUA Bounty Canada Inc.	Canada
Aqua Bounty Farms Chile Limitada	Chile
AquaBounty Brasil Participações Ltda.	Brazil
AquaBounty Panama, S. de R.L.	Panama
ER Cell LLC	Russia
Fruit Orchard Holdings Mexico	Mexico
Intrexon ActoBiotics NV *(naamloze vennootschap)*	Belgium
Intrexon Laboratories Hungary, KFT *(korlátolt felelõsségû társaság)*	Hungary
Intrexon UK Insect Holdings Inc.	United Kingdom
Mosquito Technologies Limited Mexico	Mexico

Okanagan Specialty Fruits Inc.	British Columbia
Oxitec, Ltd	United Kingdom
Oxitec Australia Pty, Ltd.	Australia
Oxitec Sdn Bhd	Malaysia
Oxitec Cayman Limited	Cayman Islands
Oxitec (Singapore) PTE. Limited	Singapore
Oxitec do Brasil Tecnologia de Insetos Ltda	Brazil
Precision Biological Innovations SRL	Costa Rica

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (Nos. 333-190614, 333-196840, 333-205642, 333-213065, and 333-219874) and Form S-3 (No. 333-220326) of Intrexon Corporation of our report dated March 1, 2018, relating to the consolidated financial statements and the effectiveness of internal controls over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

Raleigh, North Carolina
March 1, 2018

Exhibit 23.2

CONSENT OF INDEPENDENT REGISTERED ACCOUNTING FIRM

We consent to the incorporation by reference in the Registration Statements (Nos. 333-190614, 333-196840, 333-205642, 333-213065, and 333-219874) on Form S-8 and Registration Statement (No. 333-220326) on Form S-3 of Intrexon Corporation of our report dated February 24, 2016, relating to the financial statements of ZIOPHARM Oncology, Inc. for the year ended December 31, 2015 appearing in the Annual Report on Form 10-K of Intrexon Corporation for the year ended December 31, 2017.

/s/ RSM US LLP

Boston, Massachusetts
March 1, 2018

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Randal J. Kirk, certify that:

1. I have reviewed this Annual Report on Form 10-K of Intrexon Corporation;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 1, 2018

/s/ RANDAL J. KIRK

Randal J. Kirk
Chairman and Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Rick L. Sterling, certify that:

1. I have reviewed this Annual Report on Form 10-K of Intrexon Corporation;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 1, 2018

/s/ RICK L. STERLING

Rick L. Sterling
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO SECTION 906
OF THE SARBANES-OXLEY ACT OF 2002

I, Randal J. Kirk, Chairman and Chief Executive Officer of Intrexon Corporation (the "Company"), do hereby certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to the best of my knowledge:

- the Annual Report on Form 10-K of the Company for the year ended December 31, 2017 (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

- the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 1, 2018

/s/ RANDAL J. KIRK

Randal J. Kirk
Chairman and Chief Executive Officer
(Principal Executive Officer)

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

This certification accompanies the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Registrant under the Securities Act of 1933 or the Securities Exchange Act of 1934 (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO SECTION 906
OF THE SARBANES-OXLEY ACT OF 2002

I, Rick L. Sterling, Chief Financial Officer of Intrexon Corporation (the "Company"), do hereby certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to the best of my knowledge:

- the Annual Report on Form 10-K of the Company for the year ended December 31, 2017 (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

- the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 1, 2018

/s/ RICK L. STERLING

Rick L. Sterling
Chief Financial Officer
(Principal Financial Officer)

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

This certification accompanies the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Registrant under the Securities Act of 1933 or the Securities Exchange Act of 1934 (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.