FORM 10-Q

INTREXON CORP - XON

Filed: May 09, 2019 (period: March 31, 2019)

Quarterly report with a continuing view of a company's financial position

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

FORM 10-Q

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

For the quarterly period ended March 31, 2019

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, Maryland	**20876**
(Address of principal executive offices)	**(Zip Code)**

(301) 556-9900

(Registrant's telephone number, including area code)

(Former name, former address and former fiscal year, if changed since last report date)

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 ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted 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 such files). Yes ☒ No ☐

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

Large accelerated filer	☒	Accelerated filer	☐
Non-accelerated filer	☐	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 ☒

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, no par value	XON	Nasdaq Global Select Market

As of April 30, 2019, 160,764,358 shares of common stock, no par value per share, were outstanding.

INTREXON CORPORATION

FORM 10-Q
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Special Note Regarding Forward-Looking Statements

This Quarterly 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 Quarterly 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 independently or with our collaborators;
- 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, regulations and policies;
- our ability and the ability of our collaborators and licensees to adapt to changes in laws, regulations and policies and to secure any necessary regulatory approvals to commercialize any products developed by us or under our ECCs, license agreements and JVs;
- the ability of our collaborators and licensees to protect our intellectual property and other proprietary rights and technologies;
- our ability and 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 us, 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 or investigations that we currently face or may face in the future;
- our expectations related to the use of proceeds from our public offerings and other financing efforts; and

- our estimates regarding expenses, future revenue, capital requirements, and need for additional financing.

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 Quarterly 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 Quarterly Report, particularly in Part II, 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 Quarterly Report, the documents that we reference in this Quarterly Report, our Annual Report on Form 10-K for the year ended December 31, 2018, the other reports we have filed with the Securities and Exchange Commission, or SEC, and the documents that we have filed as exhibits to our filings with the 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. FINANCIAL INFORMATION

Item 1. Consolidated Financial Statements

Intrexon Corporation and Subsidiaries
Consolidated Balance Sheets
(Unaudited)

(Amounts in thousands, except share data)	March 31, 2019	December 31, 2018
Assets		
Current assets		
Cash and cash equivalents	$ 106,544	$ 102,768
Restricted cash	—	6,987
Short-term investments	75,090	119,688
Equity securities	187	384
Receivables		
Trade, net	19,859	21,195
Related parties, net	2,444	4,129
Other, net	2,578	2,754
Inventory	19,896	21,447
Prepaid expenses and other	5,577	6,131
Total current assets	232,175	285,483
Equity securities, noncurrent	1,602	1,798
Property, plant and equipment, net	136,357	128,874
Intangible assets, net	125,868	129,291
Goodwill	150,755	149,585
Investments in affiliates	17,627	18,859
Right-of-use assets	43,099	—
Other assets	2,381	2,287
Total assets	$ 709,864	$ 716,177

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

Intrexon Corporation and Subsidiaries
Consolidated Balance Sheets
(Unaudited)

(Amounts in thousands, except share data)	March 31, 2019	December 31, 2018
Liabilities and Total Equity		
Current liabilities		
Accounts payable	$ 12,601	$ 13,420
Accrued compensation and benefits	7,784	10,687
Other accrued liabilities	14,096	20,620
Deferred revenue, including $8,024 and $6,945 from related parties as of March 31, 2019 and December 31, 2018, respectively	17,149	15,554
Lines of credit	277	466
Current portion of long-term debt	564	559
Current portion of lease liabilities	4,778	—
Related party payables	2,173	256
Total current liabilities	59,422	61,562
Long-term debt, net of current portion, including $55,515 and $55,290 to related parties as of March 31, 2019 and December 31, 2018, respectively	214,010	211,235
Deferred revenue, net of current portion, including $50,620 and $52,227 from related parties as of March 31, 2019 and December 31, 2018, respectively	54,042	54,210
Lease liabilities, net of current portion	40,185	—
Deferred tax liabilities, net	6,720	7,213
Other long-term liabilities	662	3,235
Total liabilities	375,041	337,455
Commitments and contingencies (Note 16)		
Total equity		
Common stock, no par value, 200,000,000 shares authorized as of March 31, 2019 and December 31, 2018; 160,615,416 and 160,020,466 shares issued and outstanding as of March 31, 2019 and December 31, 2018, respectively	—	—
Additional paid-in capital	1,732,608	1,722,012
Accumulated deficit	(1,391,254)	(1,330,545)
Accumulated other comprehensive loss	(28,325)	(28,612)
Total Intrexon shareholders' equity	313,029	362,855
Noncontrolling interests	21,794	15,867
Total equity	334,823	378,722
Total liabilities and total equity	$ 709,864	$ 716,177

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Operations
(Unaudited)

(Amounts in thousands, except share and per share data)	**Three Months Ended March 31, 2019**	**2018**
Revenues		
Collaboration and licensing revenues, including $3,812 and $16,640 from related parties during the three months ended March 31, 2019 and 2018, respectively	$ 5,970	$ 19,848
Product revenues	4,857	7,152
Service revenues	11,383	12,247
Other revenues	1,125	419
Total revenues	23,335	39,666
Operating Expenses		
Cost of products	8,290	8,530
Cost of services	7,092	6,783
Research and development	33,062	37,267
Selling, general and administrative	33,594	39,737
Total operating expenses	82,038	92,317
Operating loss	(58,703)	(52,651)
Other Income (Expense), Net		
Unrealized and realized appreciation (depreciation) in fair value of equity securities and preferred stock, net	70	(1,096)
Interest expense	(4,311)	(99)
Interest and dividend income	1,364	5,470
Other income (expense), net	506	(659)
Total other income (expense), net	(2,371)	3,616
Equity in net loss of affiliates	(1,640)	(2,460)
Loss before income taxes	(62,714)	(51,495)
Income tax benefit	578	4,086
Net loss	$ (62,136)	$ (47,409)
Net loss attributable to the noncontrolling interests	1,427	1,244
Net loss attributable to Intrexon	$ (60,709)	$ (46,165)
Net loss attributable to Intrexon per share, basic and diluted	$ (0.40)	$ (0.36)
Weighted average shares outstanding, basic and diluted	152,948,058	127,693,336

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Comprehensive Loss
(Unaudited)

	Three Months Ended March 31,	
(Amounts in thousands)	**2019**	**2018**
Net loss	$ (62,136)	$ (47,409)
Other comprehensive income (loss):		
Unrealized gain on investments	47	2
Gain on foreign currency translation adjustments	285	5,860
Comprehensive loss	(61,804)	(41,547)
Comprehensive loss attributable to the noncontrolling interests	1,382	1,303
Comprehensive loss attributable to Intrexon	$ (60,422)	$ (40,244)

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Shareholders' and Total Equity
(Unaudited)

(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, 2018	160,020,466	$ —	$1,722,012	$ (28,612)	$(1,330,545)	$ 362,855	$ 15,867	$ 378,722
Stock-based compensation expense	—	—	8,990	—	—	8,990	64	9,054
Shares issued upon vesting of restricted stock units and for exercises of stock options and warrants	286,637	—	57	—	—	57	250	307
Shares issued for accrued compensation	150,908	—	1,102	—	—	1,102	—	1,102
Shares issued as payment for services	157,405	—	831	—	—	831	—	831
Shares issued in public offerings, net of issuance costs	—	—	—	—	—	—	6,611	6,611
Adjustments for noncontrolling interests	—	—	(384)	—	—	(384)	384	—
Net loss	—	—	—	—	(60,709)	(60,709)	(1,427)	(62,136)
Other comprehensive income	—	—	—	287	—	287	45	332
Balances at March 31, 2019	160,615,416	$ —	$1,732,608	$ (28,325)	$(1,391,254)	$ 313,029	$ 21,794	$ 334,823

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Shareholders' and Total Equity
(Unaudited)

(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, 2017	122,087,040	$ —	$1,397,005	$ (15,554)	$ (847,820)	$ 533,631	$ 12,914	$ 546,545
Cumulative effect of adoption of ASC 606	—	—	—	(104)	26,611	26,507	—	26,507
Stock-based compensation expense	—	—	11,340	—	—	11,340	22	11,362
Shares issued upon vesting of restricted stock units and for exercises of stock options and warrants	21,722	—	74	—	—	74	250	324
Shares issued as payment for services	230,614	—	2,941	—	—	2,941	—	2,941
Shares and warrants issued in public offerings, net of issuance costs	6,900,000	—	82,374	—	—	82,374	5,616	87,990
Adjustments for noncontrolling interests	—	—	(818)	—	—	(818)	818	—
Net loss	—	—	—	—	(46,165)	(46,165)	(1,244)	(47,409)
Other comprehensive income (loss)	—	—	—	5,921	—	5,921	(59)	5,862
Balances at March 31, 2018	129,239,376	$ —	$1,492,916	$ (9,737)	$ (867,374)	$ 615,805	$ 18,317	$ 634,122

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Cash Flows
(Unaudited)

(Amounts in thousands)	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018
Cash flows from operating activities		
Net loss	$ (62,136)	$ (47,409)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	6,577	8,382
Loss on disposal of assets, net	493	316
Unrealized and realized (appreciation) depreciation on equity securities and preferred stock, net	(70)	1,096
Noncash dividend income	(12)	(4,883)
Amortization of premiums (discounts) on investments, net	(352)	—
Equity in net loss of affiliates	1,640	2,460
Stock-based compensation expense	9,054	11,362
Shares issued as payment for services	831	2,941
Provision for bad debts	64	218
Accretion of debt discount and amortization of deferred financing costs	2,213	—
Deferred income taxes	(508)	(4,074)
Other noncash items	247	127
Changes in operating assets and liabilities:		
Receivables:		
Trade	1,306	1,856
Related parties	1,584	4,729
Other	642	(215)
Inventory	1,381	231
Prepaid expenses and other	(322)	1,062
Right-of-use assets	1,462	—
Other assets	13	(47)
Accounts payable	(1,237)	(764)
Accrued compensation and benefits	(1,788)	4,851
Other accrued liabilities	(6,129)	(2,473)
Deferred revenue	1,330	(9,623)
Lease liabilities	(1,433)	—
Related party payables	1,916	(165)
Other long-term liabilities	—	134
Net cash used in operating activities	(43,234)	(29,888)

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Cash Flows
(Unaudited)

(Amounts in thousands)	Three Months Ended March 31, 2019	2018
Cash flows from investing activities		
Maturities of investments	45,000	6,000
Proceeds from sales of equity securities	418	—
Investments in affiliates	(370)	(5,510)
Return of investment in affiliate	—	2,598
Purchases of property, plant and equipment	(11,523)	(10,774)
Proceeds from sale of assets	67	230
Net cash provided by (used in) investing activities	33,592	(7,456)
Cash flows from financing activities		
Proceeds from issuance of shares and warrants in public offerings, net of issuance costs	6,611	87,990
Advances from lines of credit	1,408	1,239
Repayments of advances from lines of credit	(1,597)	(1,151)
Proceeds from long-term debt, net of issuance costs	376	—
Payments of long-term debt	(178)	(140)
Proceeds from stock option and warrant exercises	307	324
Net cash provided by financing activities	6,927	88,262
Effect of exchange rate changes on cash, cash equivalents, and restricted cash	(504)	914
Net increase (decrease) in cash, cash equivalents, and restricted cash	(3,219)	51,832
Cash, cash equivalents, and restricted cash		
Beginning of period	110,182	75,545
End of period	$ 106,963	$ 127,377

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

Intrexon Corporation and Subsidiaries
Consolidated Statements of Cash Flows
(Unaudited)

(Amounts in thousands)	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018
Supplemental disclosure of cash flow information		
Cash paid during the period for interest	$ 77	$ 82
Cash paid during the period for income taxes	30	20
Significant noncash financing and investing activities		
Purchases of property and equipment included in accounts payable and other accrued liabilities	$ 2,531	$ 2,016
Purchases of equipment financed through debt	—	76

The following table provides a reconciliation of the cash, cash equivalents, and restricted cash balances as of March 31, 2019 and December 31, 2018 as shown above:

	March 31, 2019	December 31, 2018
Cash and cash equivalents	$ 106,544	$ 102,768
Restricted cash	—	6,987
Restricted cash included in other assets	419	427
Cash, cash equivalents, and restricted cash	$ 106,963	$ 110,182

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

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

1. Organization

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 directly or through collaborations and joint ventures. Intrexon's primary domestic operations are in California, Florida, Maryland, and Virginia, and its primary international operations are in Hungary. There have been no commercialized products derived from Intrexon's collaborations to date.

Precigen, Inc. ("Precigen"), a dedicated discovery and clinical stage biopharmaceutical company advancing the next generation of gene and cellular therapies using precision technology to target urgent and intractable diseases in immuno-oncology, autoimmune disorders, and infectious diseases, is a wholly owned subsidiary of Intrexon with primary operations in Maryland.

ActoBio Therapeutics, Inc. ("ActoBio") is pioneering a new class of microbe-based biopharmaceuticals that enable expression and local delivery of disease-modifying therapeutics and is a wholly owned subsidiary of Intrexon with primary operations in Belgium.

Trans Ova Genetics, L.C. ("Trans Ova"), Progentus, L.C. ("Progentus"), and ViaGen, L.C. ("ViaGen"), providers of advanced reproductive technologies, including services and products sold to cattle breeders and other producers, genetic preservation, and cloning technologies, are wholly owned subsidiaries with primary operations in Iowa, Maryland, Missouri, New York, 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 Brazil and the United Kingdom.

Intrexon Produce Holdings, Inc. ("IPHI") is a wholly owned subsidiary of Intrexon. Okanagan Specialty Fruits, Inc. ("Okanagan"), a company that developed and received regulatory approval for the world's first non-browning apple without the use of any artificial 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.

Exemplar Genetics, LLC ("Exemplar"), a provider of genetically engineered swine for medical and genetic research, is a wholly owned subsidiary with primary operations in Iowa.

As of March 31, 2019, Intrexon owned approximately 44% of AquaBounty Technologies, Inc. ("AquaBounty"), a company focused on improving productivity in commercial aquaculture and whose common stock is listed on the NASDAQ Stock Market. Because Intrexon maintained contractual rights to control AquaBounty's board of directors as of March 31, 2019, the consolidated financial statements of AquaBounty are included in the accompanying consolidated financial statements of Intrexon. See Note 19 for additional discussion of Intrexon's ownership interest in AquaBounty.

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

2. Summary of Significant Accounting Policies

Basis of Presentation

The accompanying interim consolidated financial statements are unaudited and have been prepared in accordance with accounting principles generally accepted in the United States of America ("U.S. GAAP"). Certain information and footnote disclosures normally included in the Company's annual financial statements have been condensed or omitted. These interim consolidated financial statements, in the opinion of management, reflect all normal recurring adjustments necessary for fair statement of the Company's financial position as of March 31, 2019 and results of operations and cash flows for the interim periods ended March 31, 2019 and 2018. The year-end consolidated balance sheet data was derived from the Company's audited financial statements but does not include all disclosures required by U.S. GAAP. These interim financial results are not necessarily indicative of the results to be expected for the year ending December 31, 2019, or for any other future annual or interim period. The accompanying interim unaudited consolidated financial statements should be read in conjunction with the audited consolidated financial statements and related notes thereto included in the Company's Annual Report on Form 10-K for the year ended December 31, 2018.

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

Liquidity and Going Concern

The Company has incurred operating losses since its inception and management expects operating losses and negative cash flows to continue for the foreseeable future and, as a result, the Company will require additional capital to fund its operations and execute its business plan. As of March 31, 2019, the Company had $181,634 in cash, cash equivalents and short-term investments which is not sufficient to fund the Company's planned operations through one year after the date the interim unaudited consolidated financial statements are issued, and accordingly, there is substantial doubt about the Company's ability to continue as a going concern. The analysis used to determine the Company's ability to continue as a going concern does not include cash sources outside of the Company's direct control that management expects to be available within the next twelve months.

The Company may not be able to obtain sufficient additional funding through monetizing certain of its existing assets, entering into new license and collaboration agreements, issuing additional equity or debt instruments or any other means, and if it is able to do so, they may not be on satisfactory terms. The Company's ability to raise additional capital in the equity and debt markets, should the Company choose to do so, is dependent on a number of factors, including, but not limited to, the market demand for the Company's common stock, which itself is subject to a number of business risks and uncertainties, as well as the uncertainty that the Company would be able to raise such additional capital at a price or on terms that are favorable to the Company. Should the Company not be able to secure additional funding through these means, the Company may have to engage in any or all of the following activities: (i) shift the Company's internal investments from subsidiaries and platforms whose potential for value creation is longer-term to near-term opportunities; (ii) sell certain of our operating subsidiaries to third parties; (iii) reduce operating expenditures for third-party contractors, including consultants, professional advisors, and other vendors; and (iv) reduce or delay capital expenditures, including non-essential facility expansions, lab equipment, and information technology projects. These actions may have a material adverse impact on the Company's ability to achieve certain of its planned objectives. Even if the Company is able to source additional funding, it may be forced to significantly reduce its operations if its business prospects do not improve. If the Company is unable to source additional funding, it may be forced to shut down operations altogether. These interim unaudited consolidated financial statements have been prepared on a going concern basis and do not include any adjustments to the amounts and classification of assets and liabilities that may be necessary in the event the Company can no longer continue as a going concern.

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"), all of which are related parties, 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. See additional discussion related to certain of the Harvest start-up entities in Note 3.

The Company accounts for its investment in Oragenics, Inc. ("Oragenics"), one of its collaborators and a related party, using the fair value option. Oragenics was considered an equity method investment until September 30, 2018, by which point the Company's ownership level had significantly decreased. See Note 17 for additional discussion regarding Oragenics. Unrealized depreciation in the fair value of the Company's investment in Oragenics common stock was $751 for the three months ended March 31, 2018.

Summarized financial data as of March 31, 2019 and December 31, 2018 and for the three months ended March 31, 2019 and 2018, for the Company's equity method investments are shown in the following tables.

	March 31, 2019	December 31, 2018
Current assets	$ 10,753	$ 17,485
Noncurrent assets	32,935	31,274
Total assets	43,688	48,759
Current liabilities	3,766	4,226
Net assets	$ 39,922	$ 44,533

	Three Months Ended March 31,	
	2019	2018
Revenues	$ 98	$ 67
Operating expenses	5,377	8,610
Operating loss	(5,279)	(8,543)
Other, net	4	14
Net loss	$ (5,275)	$ (8,529)

Variable Interest Entities

As of March 31, 2019 and December 31, 2018, the Company determined that certain of its collaborators and joint ventures as well as Harvest were variable interest entities ("VIE" or "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 March 31, 2019 and December 31, 2018 were $19,913 and $21,219, respectively, which represents the Company's maximum risk of loss related to the identified VIEs.

Operating Leases

The Company adopted Financial Accounting Standards Board ("FASB") Accounting Standards Codification ("ASC") Topic 842, *Leases* ("ASC 842"), effective January 1, 2019. Under ASC 842, the Company determines if an arrangement is a lease at inception. Operating leases are included as right-of-use assets ("ROU Assets") and lease liabilities on the consolidated balance sheets. The Company has elected not to recognize ROU Assets or lease liabilities for leases with lease terms of one year or less.

ROU Assets and lease liabilities are recognized based on the present value of the future minimum lease payments over the lease term at commencement date. For leases that contain fixed non-lease payments, the Company accounts for the lease and non-lease components as a single lease component. Variable lease payments, which primarily include payments for non-lease components such as maintenance costs, are excluded from the ROU Assets and lease liabilities and are recognized in the period in which the obligation for those payments is incurred. As most of the Company's operating leases do not provide an implicit interest rate, the Company uses its incremental borrowing rate, which is the estimated rate the Company would be required to pay for a collateralized borrowing equal to the total lease payments over the term of the lease, at commencement date in determining the present value of future payments. The initial measurement of the ROU Asset also includes any lease payments made and excludes lease incentives. The lease term for all of the Company's leases includes the noncancelable period of the lease, plus any additional periods covered by either a Company option to extend, or not to terminate, the lease that the Company is reasonably certain to exercise. Lease expense is recognized on a straight-line basis over the lease term.

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 March 31, 2019 and December 31, 2018, the Company had $17,377 and $16,839, respectively, of long-lived assets in foreign countries. The Company recognized revenues derived in foreign countries totaling $2,265 and $4,203 for the three months ended March 31, 2019 and 2018, 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

The Company adopted ASC 842 on January 1, 2019 using the modified retrospective method as of the adoption date without restating prior periods. In addition, the Company has elected to use the package of practical expedients which allows the Company to not have to reassess whether expired or existing contracts contain leases under the new definition of a lease or the lease classification for expired or existing leases under ASC 842. As a result of the adoption of ASC 842, the Company recorded ROU Assets and lease liabilities of approximately $43,500 and $45,500, respectively, as of January 1, 2019. The difference between the ROU Assets and lease liabilities primarily represents the balance of deferred rent as of December 31, 2018 that resulted from historical straight-lining of operating leases expense, which was reclassified upon adoption to reduce the measurement of the ROU Assets.

In June 2018, the FASB issued Accounting Standards Update ("ASU") 2018-07, *Compensation-Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting* ("ASU 2018-07"). The provisions of ASU 2018-07 expand the scope of ASC Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. The Company adopted this standard effective January 1, 2019, and there was no material impact to the accompanying consolidated financial statements.

Recently Issued Accounting Pronouncements

In October 2018, the FASB issued ASU 2018-18, *Collaborative Arrangements (Topic 808): Clarifying the Interaction between Topic 808 and Topic 606* ("ASU 2018-18"). The provisions of ASU 2018-18 clarify when certain transactions between collaborative arrangement participants should be accounted for under ASC Topic 606, *Revenue from Contracts with Customers* ("ASC 606"), and incorporates unit-of-account guidance consistent with ASC 606 to aid in this determination. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2019, with early adoption permitted, and is effective for the Company for the year ending December 31, 2020. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

In October 2018, the FASB issued ASU 2018-17, *Consolidation (Topic 810): Targeted Improvements to Related Party Guidance for Variable Interest Entities* ("ASU 2018-17"). The provisions of ASU 2018-17 modify the guidance under ASC Topic 810 related to the evaluation of indirect interests held through related parties under common control when determining whether fees paid to decision makers and service providers are variable interests. Indirect interests held through related parties that are under common control are no longer considered to be the equivalent of direct interests in their entirety and instead should be considered on a proportional basis. This guidance more closely aligns with accounting of how indirect interests held through related parties under common control are considered for determining whether a reporting entity must consolidate a VIE. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2019, with early adoption permitted, and is effective for the Company for the year ending December 31, 2020. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

In August 2018, the FASB issued ASU 2018-15, *Intangibles-Goodwill and Other-Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract* ("ASU 2018-15"). The provisions of ASU 2018-15 clarify the accounting for implementation costs of a hosting arrangement that is a service contract. The new standard requires an entity (customer) in a hosting arrangement that is a service contract to follow existing internal-use software guidance to determine which implementation costs to capitalize as an asset related to the service contract and which costs to expense. Capitalized implementation costs of a hosting arrangement that is a service contract should be amortized over the term of the hosting arrangement, which might extend beyond the noncancelable period if there are options to extend or terminate. ASU 2018-15 also specifies the financial statement presentation of capitalized implementation costs and related amortization, in addition to required disclosures for material capitalized implementation costs related to hosting arrangements that are service contracts. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2019, with early adoption permitted, and is effective for the Company for the year ending December 31, 2020. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

In August 2018, the FASB issued ASU 2018-13, *Fair Value Measurements (Topic 820): Disclosure Framework-Changes to the Disclosure Requirements for Fair Value Measurements* ("ASU 2018-13"). The provisions of ASU 2018-13 modify the disclosures related to recurring and nonrecurring fair value measurements. Disclosures related to the transfer of assets between Level 1 and Level 2 hierarchies have been eliminated and various additional disclosures related to Level 3 fair value measurements have been added, modified or removed. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2019, but entities are permitted to early adopt either the entire standard or only the provisions that eliminate or modify the requirements. This standard is effective for the Company for the year ending December 31, 2020. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

In June 2016, the FASB issued ASU 2016-13, *Financial Instruments-Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments* ("ASU 2016-13"). The provisions of ASU 2016-13 modify the impairment model to utilize an expected loss methodology in place of the currently used incurred loss methodology, and requires a consideration of a broader range of reasonable and supportable information to inform credit loss estimates. The guidance is effective for annual periods and interim periods within those annual periods beginning after December 15, 2019, with early adoption permitted, and is effective for the Company for the year ending December 31, 2020. The Company is currently evaluating the impact that the implementation of this standard will have on the Company's consolidated financial statements.

3. Mergers and Acquisitions

Asset Acquisition of Certain Harvest Entities

In September 2018, the Company, through its wholly owned subsidiary ActoBio, issued $30,000 of convertible promissory notes to Harvest, a related party, to acquire Harvest's ownership in CRS Bio, Inc., Genten Therapeutics, Inc., and Relieve Genetics, Inc. (collectively the "Harvest entities"). The Company also received $15,500 cash in the transaction from the acquisition of the Harvest entities. Prior to the transaction, the Company held a noncontrolling interest in the Harvest entities, with a combined carrying value for all entities of $4,303, and accounted for its ownership using the equity method of accounting. Following the transaction, the Company owns 100% of the equity interests of the Harvest entities including the rights that had been previously licensed to the Harvest entities by the Company. The Harvest entities did not meet the definition of a business and accordingly, the transaction was accounted for as an asset acquisition.

By reacquiring the rights previously licensed to the Harvest entities, the Company was relieved from its obligations under the original exclusive channel collaborations ("ECCs") and therefore wrote off deferred revenue of $10,078 in September 2018 as part of the transaction. The remaining value acquired of $8,721 was considered in-process research and development related to the reacquired rights under the ECCs and expensed immediately.

See Note 11 for additional discussion of the convertible promissory notes.

4. Investments in Joint Ventures

Intrexon Energy Partners

In March 2014, the Company and certain investors (the "IEP Investors"), including an affiliate of Third Security, LLC ("Third Security"), a related party, entered into a Limited Liability Company Agreement that 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 March 31, 2019, the Company's remaining commitment was $4,568. 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 $(479) and $(656) as of March 31, 2019 and December 31, 2018, 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 that 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 that 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 $(265) and $(50) as of March 31, 2019 and December 31, 2018, respectively, and is included in other accrued liabilities 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"). 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. Through March 31, 2019, the Company and Darling have made subsequent capital contributions of $17,000 each.

The Company's investment in New EnviroFlight was $15,829 and $16,720 as of March 31, 2019 and December 31, 2018, 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 that 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 that 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 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, committed to make additional capital contributions of up to $5,000, at the request of Intrexon T1D Partners' board of managers, which consisted of two members appointed by the Company and three members appointed by a majority of the T1D Investors. The Company satisfied its commitment in 2018.

In November 2018, the Company, together with its wholly owned subsidiary ActoBio, issued 1,933,737 shares of Intrexon common stock valued at $18,970 to the T1D Investors to acquire their ownership interest in Intrexon T1D Partners. Following the transaction, the Company owns 100% of the membership interests in Intrexon T1D Partners, including the rights that had been previously licensed to Intrexon T1D Partners by the Company in the ECC. Intrexon T1D Partners did not meet the definition of a business, and accordingly, the transaction was accounted for as an asset acquisition. By reacquiring the rights previously licensed to Intrexon T1D Partners, the Company was relieved from its obligations under the original ECC and therefore wrote off $8,517 of deferred revenue in November 2018 as part of the transaction. The remaining value of $10,453 was considered in-process research and development related to the reacquired rights under the ECC and expensed immediately.

5. Collaboration and Licensing Revenue

The Company's collaborations and licensing agreements provide for multiple promises to be satisfied by the Company and typically include a license to the Company's technology platforms, participation in collaboration committees, and performance of certain research and development services. Based on the nature of the promises in the Company's collaboration and licensing agreements, the Company typically combines most of its promises into a single performance obligation because the promises are highly interrelated and not individually distinct. At contract inception, the transaction price is typically the upfront payment received and is allocated to the single performance obligation. The Company has determined the transaction price should be recognized as revenue based on its measure of progress under the agreement primarily based on inputs necessary to fulfill the performance obligation.

The Company recognizes the reimbursement payments received for research and development services in the period when the services are performed. At inception of each collaboration, the Company determines whether any milestone payments are probable and can be included in the transaction price. The milestone payments are typically not considered probable at inception and are therefore constrained. Royalties related to product sales will be recognized when sales have occurred since the royalties relate directly to the technology license granted in the agreement.

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 table summarizes the amounts recorded as revenue in the consolidated statements of operations for each significant counterparty to a collaboration or licensing agreement for the three months ended March 31, 2019 and 2018.

	Three Months Ended March 31,	
	2019	2018
ZIOPHARM Oncology, Inc.	$ 1,166	$ 5,377
Ares Trading S.A.	—	2,423
Oragenics, Inc.	203	125
Intrexon T1D Partners, LLC	—	1,328
Intrexon Energy Partners, LLC	977	1,197
Intrexon Energy Partners II, LLC	504	378
Genopaver, LLC	294	1,315
Fibrocell Science, Inc.	383	293
Persea Bio, LLC	(1,272)	209
Harvest start-up entities (1)	2,723	3,197
Other	992	4,006
Total	$ 5,970	$ 19,848

(1) For the three months ended March 31, 2019 and 2018, revenues recognized from collaborations with Harvest start-up entities include: Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; and AD Skincare, Inc. For the three months ended March 31, 2018, revenues recognized from collaborations with Harvest start-up entities also include Genten Therapeutics, Inc. and CRS Bio, Inc.

There have been no significant changes to the agreements with our collaborators and licensees in the three months ended March 31, 2019.

Deferred Revenue

Deferred revenue primarily consists of consideration received for the Company's collaboration and licensing agreements. Deferred revenue consists of the following:

	March 31, 2019	December 31, 2018
Collaboration and licensing agreements	$ 65,135	$ 63,284
Prepaid product and service revenues	3,157	2,933
Other	2,899	3,547
Total	$ 71,191	$ 69,764
Current portion of deferred revenue	$ 17,149	$ 15,554
Long-term portion of deferred revenue	54,042	54,210
Total	$ 71,191	$ 69,764

The following table summarizes the remaining balance of deferred revenue associated with upfront and milestone payments for each significant counterparty to a collaboration or licensing agreement as of March 31, 2019 and December 31, 2018, including the estimated remaining performance period as of March 31, 2019.

	Average Remaining Performance Period (Years)	March 31, 2019	December 31, 2018
ZIOPHARM Oncology, Inc.	0.5	$ 628	$ 1,214
Oragenics, Inc.	5.2	5,669	5,810
Intrexon Energy Partners, LLC	5.0	9,659	10,267
Intrexon Energy Partners II, LLC	5.7	13,556	14,060
Genopaver, LLC	5.0	1,238	1,175
Fibrocell Science, Inc.	5.9	17,192	17,519
Persea Bio, LLC	5.8	4,070	2,697
Harvest start-up entities (1)	5.9	7,260	7,644
Other	2.0	5,800	2,898
Total		$ 65,072	$ 63,284

(1) As of March 31, 2019 and December 31, 2018, the balance of deferred revenue for collaborations with Harvest start-up entities includes: Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; and AD Skincare, Inc.

6. Short-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 March 31, 2019:

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Aggregate Fair Value
U.S. government debt securities	$ 74,752	$ —	$ (14)	$ 74,738
Certificates of deposit	352	—	—	352
Total	$ 75,104	$ —	$ (14)	$ 75,090

The following table summarizes the amortized cost, gross unrealized gains and losses, and fair value of available-for-sale investments as of December 31, 2018:

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Aggregate Fair Value
U.S. government debt securities	$ 119,401	$ —	$ (61)	$ 119,340
Certificates of deposit	348	—	—	348
Total	$ 119,749	$ —	$ (61)	$ 119,688

As of March 31, 2019, 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 were not significant as of March 31, 2019.

As of March 31, 2019 and December 31, 2018, 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. 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.

Assets

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, at March 31, 2019:

	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	March 31, 2019
Assets				
U.S. government debt securities	$ —	$ 74,738	$ —	$ 74,738
Equity securities	1,474	315	—	1,789
Other	—	508	248	756
Total	$ 1,474	$ 75,561	$ 248	$ 77,283

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, at December 31, 2018:

	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	December 31, 2018
Assets				
U.S. government debt securities	$ —	$ 119,340	$ —	$ 119,340
Equity securities	1,626	556	—	2,182
Other	—	468	191	659
Total	$ 1,626	$ 120,364	$ 191	$ 122,181

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 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 Company owns preferred stock in certain of its collaborators, and these investments are classified as Level 3 within the fair value hierarchy. The methods used to estimate the fair value of these Level 3 assets are discussed in Note 17. The following table summarizes the changes in the Level 3 investments in preferred stock during the three months ended March 31, 2019.

	Three Months Ended March 31, 2019
Beginning balance	$ 191
Dividend income from investments in preferred stock	12
Net unrealized appreciation in the fair value of the investments in preferred stock	45
Ending balance	$ 248

There were no transfers of assets between levels of the fair value hierarchy during the three months ended March 31, 2019.

Liabilities

The carrying values of the Company's long-term debt, excluding the 3.50% convertible senior notes due 2023 (the "Convertible Notes") as discussed below, approximates fair value due to the length of time to maturity and/or the existence of interest rates that approximate prevailing market rates.

The calculated fair value of the Convertible Notes (Note 11) was approximately $122,000 and $141,000 as of March 31, 2019 and December 31, 2018, respectively, and is based on the most recent third-party trade of the instrument as of the balance sheet date. The fair value of the Convertible Notes is classified as Level 2 within the fair value hierarchy as there is not an active market for the Convertible Notes, however, third-party trades of the instrument are considered observable inputs. The Convertible Notes are reflected at amortized cost on the accompanying consolidated balance sheets, which was $150,314 and $148,101 as of March 31, 2019 and December 31, 2018, respectively.

The Company's contingent consideration liabilities are measured on a recurring basis and were $585 at March 31, 2019 and December 31, 2018. 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 contingencies are resolved, and those changes in fair value are recognized in earnings. There were no changes in the fair value of the Level 3 liabilities during the three months ended March 31, 2019.

8. Inventory

Inventory consists of the following:

	March 31, 2019	December 31, 2018
Supplies, embryos and other production materials	$ 4,729	$ 4,729
Work in process	3,186	4,391
Livestock	10,051	10,167
Feed	1,930	2,160
Total inventory	$ 19,896	$ 21,447

9. Property, Plant and Equipment, Net

Property, plant and equipment consist of the following:

	March 31, 2019	December 31, 2018
Land and land improvements	$ 12,475	$ 12,490
Buildings and building improvements	20,387	20,371
Furniture and fixtures	1,891	1,891
Equipment	76,716	74,555
Leasehold improvements	31,271	28,289
Breeding stock	4,603	4,582
Computer hardware and software	11,852	11,697
Trees	12,076	11,910
Construction and other assets in progress	24,123	18,880
	195,394	184,665
Less: Accumulated depreciation and amortization	(59,037)	(55,791)
Property, plant and equipment, net	$ 136,357	$ 128,874

Depreciation expense was $3,573 and $3,456 for the three months ended March 31, 2019 and 2018, respectively.

10. Goodwill and Intangible Assets, Net

The changes in the carrying amount of goodwill for the three months ended March 31, 2019 are as follows:

Balance at December 31, 2018	$ 149,585
Foreign currency translation adjustments	1,170
Balance at March 31, 2019	$ 150,755

The Company had $13,823 of accumulated impairment losses as of March 31, 2019 and December 31, 2018.

Intangible assets consist of the following as of March 31, 2019:

	Gross Carrying Amount	Accumulated Amortization	Net
Patents, developed technologies and know-how	$ 151,887	$ (37,671)	$ 114,216
Customer relationships	10,700	(7,783)	2,917
Trademarks	6,800	(3,535)	3,265
In-process research and development	5,470	—	5,470
Total	$ 174,857	$ (48,989)	$ 125,868

Intangible assets consist of the following as of December 31, 2018:

	Gross Carrying Amount	Accumulated Amortization	Net
Patents, developed technologies and know-how	$ 152,482	$ (35,133)	$ 117,349
Customer relationships	10,700	(7,565)	3,135
Trademarks	6,800	(3,341)	3,459
In-process research and development	5,348	—	5,348
Total	$ 175,330	$ (46,039)	$ 129,291

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.

Amortization expense was $3,004 and $4,926 for the three months ended March 31, 2019 and 2018, respectively.

11. 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 that matures on June 1, 2019. 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 5.44% as of March 31, 2019. As of March 31, 2019, 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 March 31, 2019.

Exemplar has a $700 revolving line of credit with American State Bank that matures on October 30, 2019. The line of credit bears interest at 5.75% per annum. As of March 31, 2019, there was an outstanding balance of $277.

Long-Term Debt

Long-term debt consists of the following:

	March 31, 2019	December 31, 2018
Convertible debt	$ 205,829	$ 203,391
Notes payable	4,435	4,551
Royalty-based financing	2,151	2,085
Other	2,159	1,767
Long-term debt	214,574	211,794
Less current portion	564	559
Long-term debt, less current portion	$ 214,010	$ 211,235

Convertible Debt

Intrexon Convertible Notes

In July 2018, Intrexon completed a registered underwritten public offering of $200,000 aggregate principal amount of Convertible Notes and issued the Convertible Notes under an indenture (the "Base Indenture") between Intrexon and The Bank of New York Mellon Trust Company, N.A., as trustee, as supplemented by the First Supplemental Indenture (together with the Base Indenture, the "Indenture"). Intrexon received net proceeds of $193,958 after deducting underwriting discounts and offering expenses of $6,042.

The Convertible Notes are senior unsecured obligations of Intrexon and bear interest at a rate of 3.50% per year, payable semiannually in arrears on January 1 and July 1 of each year beginning on January 1, 2019. The Convertible Notes mature on July 1, 2023, unless earlier repurchased or converted. The Convertible Notes are convertible into cash, shares of Intrexon's common stock or a combination of cash and shares, at Intrexon's election. The initial conversion rate of the Convertible Notes is 58.6622 shares of Intrexon common stock per $1,000 principal amount of Convertible Notes (equivalent to an initial conversion price of approximately $17.05 per share of common stock). The conversion rate is subject to adjustment upon the occurrence of certain events, but will not be adjusted for any accrued and unpaid interest. In addition, following certain corporate events that occur prior to the maturity date as defined in the Indenture, Intrexon will increase the conversion rate for a holder who elects to convert its Convertible Notes in connection with such a corporate event in certain circumstances. Prior to April 1, 2023, the holders may convert the Convertible Notes at their option only upon the satisfaction of the following circumstances:

- During any calendar quarter commencing after the calendar quarter ending on September 30, 2018, if the last reported sales price of Intrexon's common stock for at least 20 trading days (whether or not consecutive) during the last 30 consecutive trading days of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price on each applicable trading day;

- During the five business day period after any five consecutive trading day period in which the trading price, as defined in the Indenture, for the Convertible Notes is less than 98% of the product of the last reported sales price of Intrexon's common stock and the conversion rate for the Convertible Notes on each such trading day; or

- Upon the occurrence of specified corporate events as defined in the Indenture.

None of the above events allowing for conversion prior to April 1, 2023 occurred during the three months ended March 31, 2019. On or after April 1, 2023 until June 30, 2023, holders may convert their Convertible Notes at any time. Intrexon may not redeem the Notes prior to the maturity date.

If Intrexon undergoes a fundamental change, as defined in the Indenture, holders of the Convertible Notes may require Intrexon to repurchase for cash all or any portion of their Convertible Notes at a fundamental change repurchase price equal to 100% of the principal amount of the Convertible Notes to be repurchased, plus accrued and unpaid interest to, but excluding, the fundamental change repurchase date. The Indenture contains customary events of default, as defined in the agreement, and, if any of the events occur, could require repayment of a portion or all of the Convertible Notes, including accrued and unpaid interest. Additionally, the Indenture provides that Intrexon shall not consolidate with or merge with or into, or sell, convey, transfer or lease all or substantially all of its properties and assets to, another entity, unless (i) the surviving entity is organized under the laws of the United States and such entity expressly assumes all of Intrexon's obligations under the Convertible Notes and the Indenture; and (ii) immediately after such transaction, no default or event of default has occurred and is continuing under the Indenture.

The net proceeds received from the issuance of the Convertible Notes were initially allocated between long-term debt, the liability component, at $143,723 and additional paid-in capital, the equity component, at $50,235. Additional paid-in capital was further reduced by $13,367 of deferred taxes resulting from the difference between the carrying amount and the tax basis of the Convertible Notes that is created by the equity component, which resulted in deferred tax benefit recognized from the reversal of valuation allowances on the then current year domestic operating losses in the same amount. As of March 31, 2019, the outstanding principal balance on the Convertible Notes was $200,000 and the carrying value of long-term debt was $150,314. The effective interest rate on the Convertible Notes, including amortization of the long-term debt discount and debt issuance costs, is 11.02%. As of March 31, 2019, the unamortized long-term debt discount and debt issuance costs totaled $49,686.

Total interest expense related to the Convertible Notes was $3,963 for the three months ended March 31, 2019, which consists of $1,750 interest expense to be paid in cash and $2,213 of non-cash interest expense. Accrued cash interest of $1,750 is included in other accrued liabilities on the accompanying consolidated balance sheet as of March 31, 2019.

ActoBio Convertible Notes

In September 2018, ActoBio issued $30,000 of convertible promissory notes (the "ActoBio Notes") to a related party in conjunction with an asset acquisition with Harvest (Note 3). The ActoBio Notes have a maturity date of September 6, 2020, accrue interest at 3.0% compounded annually, are convertible into shares of ActoBio common stock at any time by the holder, and are automatically convertible in shares of ActoBio common stock upon the closing of certain financing events as defined in the ActoBio Notes. If the ActoBio Notes have not been converted to ActoBio common stock by the maturity date, ActoBio can pay the principal and accrued interest in cash or with shares of Intrexon common stock at its election. There are no embedded features that are required to be separated from the debt host and accounted for separately, so the ActoBio Notes were recorded at $30,000. Interest expense for the three months ended March 31, 2019 was $225. As of March 31, 2019, the carrying value of the ActoBio Notes, including accrued interest, was $30,515.

Intrexon and Precigen Convertible Note

In December 2018, in conjunction with the Securities Purchase, Assignment and Assumption Agreement with Ares Trading S.A. ("Ares Trading"), Intrexon and Precigen jointly and severally issued a $25,000 convertible note (the "Merck Note") to Ares Trading in exchange for cash. The Merck Note has a maturity date of June 28, 2021 and will be converted to Intrexon common stock on the first trading day following maturity if not otherwise converted prior to that date. Prior to maturity, Ares Trading may convert the Merck Note, at their election, into (i) Intrexon common stock at any time, (ii) Intrexon common stock upon the Company's closing of qualified financing as defined in the agreement, (iii) Precigen equity upon Precigen closing a qualified financing as defined in the agreement, and (iv) Precigen common stock upon the closing of a qualified initial public offering ("IPO") of Precigen common stock. In the event of a conversion upon a qualified IPO, the conversion price will be 90% of the IPO price. In the event Ares Trading elects to convert the Merck Note into Precigen equity, the Merck Note accrues interest at a rate of 5% per year ("PIK interest") and will be converted with the outstanding principal. The Company determined that the potential PIK interest and IPO conversion discount represented embedded derivatives requiring bifurcation from the debt host but had no significant value as of March 31, 2019 and December 31, 2018.

Notes Payable

Trans Ova has a note payable to American State Bank that matures in April 2033 and has an outstanding principal balance of $4,382 as of March 31, 2019. 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.

Royalty-based Financing

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. AquaBounty claimed all amounts available under the grant, resulting in total long-term debt of $2,151 as of March 31, 2019. 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.

Future Maturities

Future maturities of long-term debt are as follows:

2019	$	418
2020		31,148
2021		25,452
2022		464
2023		201,512
2024		445
Thereafter		2,670
Total	$	262,109

The AquaBounty royalty-based financing grant is not included in the table above due to the uncertainty of the timing of repayment.

12. Income Taxes

Tax provisions for interim periods are calculated using an estimate of actual taxable income or loss for the respective period, rather than estimating the Company's annual effective income tax rate, as the Company is currently unable to reliably estimate its income for the full year. For the three months ended March 31, 2019, the Company had U.S. taxable loss of approximately $91,600. For the three months ended March 31, 2019, the Company recognized $70 of current foreign income tax benefit. For the three months ended March 31, 2018, the Company had U.S. taxable income of approximately $35,100 and recorded $113 of current domestic income tax expense. For the three months ended March 31, 2018, the Company recognized $125 of current foreign income tax benefit. For the three months ended March 31, 2019, the Company recorded deferred tax benefit of $508. For the three months ended March 31, 2018, the Company recorded deferred tax benefit of $4,074. The Company's net deferred tax assets, excluding certain deferred tax liabilities totaling $6,720, are offset by a valuation allowance due to the Company's history of net losses combined with an inability to confirm recovery of the tax benefits of the Company's losses and other net deferred tax assets. 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.

As of March 31, 2019, the Company has loss carryforwards for U.S. federal income tax purposes of approximately $460,700 available to offset future taxable income, including approximately $208,200 generated after 2017, and federal and state research and development tax credits of approximately $8,300, prior to consideration of annual limitations that may be imposed under Section 382 of the Internal Revenue Code of 1986, as amended. Carryforwards generated prior to 2018 begin to expire in 2022. As of March 31, 2019, the Company's direct foreign subsidiaries have foreign loss carryforwards of approximately $158,876, most of which do not expire.

13. Shareholders' Equity

Issuances of Intrexon Common Stock

In January 2018, Intrexon 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 $82,374, after deducting underwriting discounts of $3,688 and offering expenses of $188, all of which were capitalized.

Share Lending Agreement

Concurrently with the offering of the Convertible Notes (Note 11), Intrexon entered into a share lending agreement (the "Share Lending Agreement") with J.P. Morgan Securities LLC (the "Share Borrower") pursuant to which Intrexon loaned and delivered 7,479,431 shares of its common stock (the "Borrowed Shares") to the Share Borrower. The Share Lending Agreement will terminate, and the Borrowed Shares will be returned to Intrexon within five business days of such termination, upon (i) termination by the Share Borrower or (ii) the earliest to occur of (a) October 1, 2023 and (b) the date, if any, on which the Share Lending Agreement is either mutually terminated or terminated by one party upon a default by the other party. The Borrowed

Shares were offered and sold to the public at a price of $13.37 per share under a registered offering (the "Borrowed Shares Offering"). Intrexon did not receive any proceeds from the sale of the Borrowed Shares to the public. The Share Borrower or its affiliates received all the proceeds from the sale of the Borrowed Shares to the public. Affiliates of Third Security purchased all of the shares of common stock in the Borrowed Shares Offering.

The Share Lending Agreement was entered into at fair value and met the requirements for equity classification. Therefore, the value is netted against the issuance of the Borrowed Shares in additional paid-in capital. Additionally, the Borrowed Shares are not included in the denominator for loss per share attributable to Intrexon shareholders unless the Share Borrower defaults on the Share Lending Agreement.

Issuances of AquaBounty Common Stock

In March 2019, AquaBounty completed an underwritten public offering that resulted in net proceeds of $6,611 after deducting discounts, fees, and expenses. See Note 19 for additional discussion of issuances of AquaBounty common stock in 2019.

In January 2018, AquaBounty completed an underwritten public offering that resulted in net proceeds of $10,616 after deducting discounts, fees and expenses. As part of this offering, Intrexon purchased $5,000 of additional AquaBounty common stock. In October 2018, certain investors exercised warrants acquired from the January 2018 offering, resulting in additional net proceeds of $4,316, including $3,077 from Intrexon.

Components of Accumulated Other Comprehensive Loss

The components of accumulated other comprehensive loss are as follows:

	March 31, 2019	December 31, 2018
Unrealized loss on investments	$ (14)	$ (61)
Loss on foreign currency translation adjustments	(28,311)	(28,551)
Total accumulated other comprehensive loss	$ (28,325)	$ (28,612)

14. Share-Based Payments

The Company records the fair value of stock options and restricted stock units ("RSUs") issued to employees and nonemployees as of the grant date as stock-based compensation expense. Stock-based compensation expense for employees and nonemployees 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:

	Three Months Ended March 31,	
	2019	2018
Cost of products	$ 8	$ 25
Cost of services	65	77
Research and development	1,845	3,258
Selling, general and administrative	7,136	8,002
Total	$ 9,054	$ 11,362

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 March 31, 2019, there were 393,098 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 and shares of common stock, to employees, officers, consultants, advisors, and nonemployee directors. The 2013 Plan became effective in August 2013, and as of March 31, 2019, there were 20,000,000 shares authorized for issuance under the 2013 Plan, of which 11,312,743 stock options and 2,288,017 RSUs were outstanding and 2,561,296 shares were available for grant. In April 2019, Intrexon's board of directors approved, subject to shareholder approval at Intrexon's annual meeting in June 2019, an increase of 5,000,000 shares of common stock to be reserved for issuance under the 2013 Plan.

Stock option activity was as follows:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (Years)
Balances at December 31, 2018	11,093,063	$ 27.95	6.81
Granted	864,575	6.39	
Exercised	(17,811)	(3.17)	
Forfeited	(167,234)	(19.83)	
Expired	(66,752)	(25.26)	
Balances at March 31, 2019	11,705,841	26.53	6.07
Exercisable at March 31, 2019	8,061,580	28.86	5.18

RSU activity was as follows:

	Number of Restricted Stock Units	Weighted Average Grant Date Fair Value	Weighted Average Remaining Contractual Term (Years)
Balances at December 31, 2018	970,341	$ 13.82	1.43
Granted	1,737,410	7.03	
Vested	(419,734)	(11.60)	
Balances at March 31, 2019	2,288,017	9.07	1.98

Intrexon currently uses authorized and unissued shares to satisfy share award exercises.

The Company's Chief Executive Officer ("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 was calculated based on the closing price on the last trading day of each month and the shares were issued pursuant to the terms of a Restricted Stock Unit Agreement ("RSU Agreement") between Intrexon and the CEO pursuant to the terms of the 2013 Plan. The RSU Agreement, which is subject to renewal annually by the compensation committee of the board of directors of the Company, expired March 31, 2019. In April 2019, the Company entered into a new RSU agreement with its CEO through March 31, 2020. Under the new RSU agreement, the base salary and lock-up terms remained unchanged from the original RSU Agreement. However, the number of fully-vested shares of Intrexon common stock paid monthly will be calculated based on the volume weighted average of the price of Intrexon common stock over the 30 day period ending on the last calendar day of each month. 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 and totaled $486 for the three months ended March 31, 2019 and 2018.

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 March 31, 2019, there were 347,464 options outstanding under both AquaBounty plans, of which 326,382 were exercisable, at a weighted average exercise price of $6.98 per share.

15. Operating Leases

The Company leases certain facilities and equipment under operating leases. Leases with a lease term of twelve months or less are not recorded on the balance sheet, and expense for these leases is recognized on a straight-line basis over the term of the lease. The Company's leases have remaining terms of one to twenty years, some of which may include options to extend the lease and some of which may include options to terminate the lease within one year. The leases are renewable at the option of the Company and do not contain residual value guarantees, covenants, or other restrictions. The Company's finance leases are not material.

The components of lease costs were as follows:

	Three Months Ended March 31, 2019
Operating lease costs	$ 2,526
Short-term and variable lease costs	1,048
Lease costs	$ 3,574

Maturities of lease liabilities as of March 31, 2019 were as follows:

2019	$ 6,789
2020	10,120
2021	9,476
2022	8,684
2023	7,275
2024	7,135
Thereafter	27,348
Total	76,827
Present value adjustment	(31,864)
Total	$ 44,963
Current portion of operating lease liabilities	$ 4,778
Long-term portion of operating lease liabilities	40,185
Total	$ 44,963

Other information related to operating leases was as follows:

	Three Months Ended March 31, 2019
Supplemental Cash Flows Information	
Cash paid for operating lease liabilities	$ 2,656
Operating lease right-of-use assets added in exchange for new lease liabilities	1,004

	March 31, 2019
Weighted average remaining lease term (years)	9.16
Weighted average discount rate	11.29%

As of March 31, 2019, the Company had additional operating lease commitments that had not yet commenced of approximately $2,800 with lease terms of three to six years.

At December 31, 2018, future minimum lease payments under operating leases having initial or remaining noncancelable lease terms in excess of one year were as follows:

2019	$	9,182
2020		9,910
2021		9,127
2022		8,305
2023		7,229
Thereafter		34,157
Total	$	77,910

16. Commitments and Contingencies

Purchase Commitments

As of March 31, 2019, the Company had outstanding contractual purchase commitments of $16,542, which primarily relate to amounts that will be paid in 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. The matter proceeded to a jury trial in the United States District Court for the District of Colorado 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 the ability to continue to practice XY's technology, subject to an ongoing royalty obligation of 12.5% of gross proceeds on semen-sorting products, plus a 2% enhancement on products utilizing reverse-sorting. In addition, the Court assigned a $5.00 minimum royalty for a straw of sexed semen. Both parties appealed the district court's order. In May 2018, the Court of Appeals for the Federal Circuit denied Trans Ova's appeal of its claims for antitrust, breach of contract, and patent invalidity (except as to one patent, for which the Court affirmed invalidity in a separate, same-day ruling in a third-party case). The Court of Appeals for the Federal Circuit remanded the district court's calculation of the ongoing royalty and instructed the district court to re-calculate the ongoing royalty in light of post-verdict economic factors. In March 2019, the district court increased the royalty rate on Trans Ova's semen-sorting products to 18.75%. For the reverse-sorting enhancement, the Court applied a weighted, blended royalty of 12.63% to Trans Ova's entire in vitro fertilization services utilizing reverse-sorted semen. The court also changed the minimum royalty for a straw of sexed semen to $6.25 for a 2-million cell straw (prorated appropriately for straws of higher cell counts), and assigned a minimum royalty for a sexed embryo at $6.25 per embryo. The new royalty rates are applied from February 2016 (the end date of the trial).

Since the inception of the 2004 agreement, Trans Ova has remitted payments to XY pursuant to the terms of that agreement, or pursuant to the terms of the Court's April 2016 post-trial order, 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. In 2016, the Company recorded the expense of $4,228 representing 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 registry, to be held until the appeals process was complete and final judgment amounts were determined. These amounts were included in restricted cash and other accrued liabilities on the consolidated balance sheet as of December 31, 2018. After the appeal in December 2018, the Court subsequently released the funds held in its registry to XY in 2019. Thus, XY has received full payment for damages prior to February 2016, the date of the trial. As for post-trial damages, Trans Ova has remitted payment to XY every quarter based on the original royalty rates, though XY refused to cash those checks. Under the Court's March 2019 order resetting the royalty rates, Trans Ova recalculated any additional royalties owed from February 2016 to the present and will remit any underpayment to XY. During the three months ended March 31, 2019, $116 of royalty expense was recorded based on an estimate of the underpayment due to XY from February 2016 through December 2018 and is included in selling, general and administrative expenses on the accompanying consolidated statement of operations.

In December 2016, XY filed a complaint for patent infringement, trade secret misappropriation, and various state law claims against Trans Ova in the United States District Court for the Western District of Texas in Waco, Texas. Since the claims in the 2016 complaint directly relate to the parties' previous litigation, Trans Ova filed and was granted a motion to transfer the case to Colorado District Court. That Court subsequently dismissed nine of the complaint's twelve counts, including all five non-patent counts. The Court subsequently dismissed another patent count after ruling that the patent was invalid, leaving only two patent counts left in the case. In February 2019, a Wisconsin District Court invalidated one of the remaining patents, which XY had asserted against another competitor. That ruling prompted the Colorado District Court to stay the two remaining patent counts and enter final judgment against XY's ten other dismissed counts. The 2016 litigation is administratively closed, pending XY's appeal of the Court's rulings dismissing its various patent and non-patent causes of action.

Trans Ova shall continue to utilize XY's technology consistent with the determinations of the court proceedings. Nonetheless, these disputes remain subject to a number of uncertainties, including the outcome of appellate proceedings, the possibility of further claims by XY, and the impact of these matters on Trans Ova's ability to utilize the technology licensed from XY. Trans Ova and the Company could elect to enter into a settlement agreement in order to avoid the further costs and uncertainties of litigation.

The Company may become subject to other claims, assessments, and governmental investigations 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 March 31, 2019 and December 31, 2018, 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.

17. 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. 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. In April 2019, the independent members of Intrexon's board of directors, with the recommendation of the audit committee of the board of directors, approved an extension of the Services Agreement effective January 1, 2019 through January 1, 2020. Under the Services Agreement, 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 Intrexon common stock. Through 2018, the number of shares of common stock was calculated based on the closing price of the Company's common stock on the 15th day of each month. Beginning in 2019, the number of shares of common stock is calculated based on the volume weighted average of the closing price of the Company's common stock over the 30 day period ending on the 15th day of the calendar month when the applicable services are provided. 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 (Notes 14 and 19). For the three months ended March 31, 2019, the Company accrued $2,078 for services rendered pursuant to the Services Agreement and the shares are expected to be issued in the second quarter of 2019. This amount is included in related party payables in the accompanying consolidated balance sheet as of March 31, 2019. For the three months ended March 31, 2018, the Company issued 160,626 shares, valued at $2,041, 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 were $17 and $14 for the three months ended March 31, 2019 and 2018, respectively.

See also Note 14 regarding compensation arrangements between the Company and its CEO.

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 $22 and $21 for the three months ended March 31, 2019 and 2018, respectively.

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 that also are party to a collaboration with the Company are considered to be related parties.

In June 2016, the Company received 100,000 shares of Series 1 Preferred Stock (the "Preferred Shares") of ZIOPHARM Oncology, Inc. ("ZIOPHARM"), with a per share stated value of $1,200, as consideration for amending their two previously existing ECC agreements. The Company received a monthly dividend, paid in additional Preferred Shares, equal to $12.00 per Preferred Share held per month divided by the stated value of the Preferred Shares. In conjunction with the reacquisition of certain rights previously licensed to ZIOPHARM in October 2018, the Company returned to ZIOPHARM all of the Preferred Shares owned or accrued by the Company as of the effective date of the agreement. During the three months ended March 31, 2018, the Company received an additional 3,624 Preferred Shares and recognized $4,871 of dividend income in the accompanying consolidated statement of operations. Following the transaction in October 2018, ZIOPHARM is no longer considered a related party.

In March 2017, Fibrocell Science, Inc. ("Fibrocell"), one of the Company's collaborators, 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 99,769 shares of Fibrocell common stock. 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 March 31, 2019 and December 31, 2018, the fair value of the Company's investment in Fibrocell preferred stock totaled $248 and $191, respectively, and is included in other assets on the accompanying consolidated balance sheets.

The Company also holds a promissory note convertible into shares of Fibrocell common stock ("convertible note") and additional warrants to purchase shares of Fibrocell common stock. As of March 31, 2019 and December 31, 2018, the value of the convertible note and warrants totaled $156 and $120, respectively, and is included in other assets on the accompanying consolidated balance sheets.

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%. As of March 31, 2019 and December 31, 2018, 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.

During 2018, the Company mutually terminated each of its ECC agreements with Histogenics Corporation, OvaScience, Inc., and Synthetic Biologics, Inc. Upon termination of these ECCs, the Company recognized the remaining deferred revenue totaling $11,877, including $3,183 during the three months ended March 31, 2018.

18. Net Loss per Share

The following table presents the computation of basic and diluted net loss per share:

	Three Months Ended March 31,	
	2019	2018
Historical net loss per share:		
Numerator:		
Net loss attributable to Intrexon	$ (60,709)	$ (46,165)
Denominator:		
Weighted average shares outstanding, basic and diluted	152,948,058	127,693,336
Net loss attributable to Intrexon per share, basic and diluted	$ (0.40)	$ (0.36)

The following potentially dilutive securities as of March 31, 2019 and 2018, have been excluded from the above computations of diluted weighted average shares outstanding for the three months then ended as they would have been anti-dilutive:

	March 31,	
	2019	2018
Convertible debt	22,025,046	—
Options	11,705,841	11,546,434
Restricted stock units	2,288,017	1,052,182
Warrants	133,264	133,264
Total	36,152,168	12,731,880

19. Subsequent Events

In April 2019, AquaBounty completed an underwritten public offering that resulted in gross proceeds, including the partial exercise of the underwriters' option to purchase additional shares, of approximately $6,530. As a result of this transaction, Intrexon no longer has the contractual right to control AquaBounty's board of directors, and accordingly, the Company anticipates it will deconsolidate AquaBounty in the second quarter.

In April 2019, Intrexon's board of directors approved, subject to shareholder approval at Intrexon's annual meeting in June 2019, an amendment to its Amended and Restated Articles of Incorporation to increase the number of authorized shares of common stock from 200,000,000 to 400,000,000.

In April 2019, upon recommendation of the compensation committee, Intrexon's board of directors adopted the Intrexon Corporation 2019 Incentive Plan for Non-Employee Service Providers (the "2019 Plan"). The Company established the 2019 Plan to attract, retain, and motivate its non-employee service providers and to promote the success of its business by linking the personal interests of Intrexon's consultants, advisors, non-employee directors, and other non-employee service providers to those of its shareholders. The 2019 Plan permits the grant of stock options, stock appreciation rights, restricted stock awards, restricted stock units, incentive awards, other stock-based awards, and dividend equivalents. The Company is seeking the approval of the 2019 Plan at the annual meeting of shareholders in June 2019. If the shareholders approve the 2019 Plan, it will become effective on the date of the annual meeting, and Intrexon expects that further equity award grants to non-employee service providers, including under the Services Agreement with Third Security, will be made under the 2019 Plan.

Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following "Management's Discussion and Analysis of Financial Condition and Results of Operations" should be read in conjunction with the unaudited financial information and the notes thereto included in this Quarterly Report on Form 10-Q, or Quarterly Report, and our Annual Report on Form 10-K for the year ended December 31, 2018, or Annual Report.

The following discussion contains forward-looking statements that reflect our plans, estimates, and beliefs. Our actual results could differ materially from those discussed in the forward-looking statements and you are cautioned not to place undue reliance on forward-looking statements. Factors that could cause or contribute to these differences include those discussed below and elsewhere in this Quarterly Report, particularly in "Special Note Regarding Forward-Looking Statements" and "Risk Factors." The forward-looking statements included in this Quarterly Report are made only as of the date hereof.

Overview

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. 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.

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, and environment. 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.

In working with our subsidiaries, joint ventures, or 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.

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 exclusive channel collaborations, or ECCs. An ECC is an agreement with a collaborator to develop products based on technologies in a specifically defined field. 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.

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. For example, in October 2018, through our wholly owned subsidiary, Precigen Therapeutics, Inc., or Precigen, we entered into a license agreement, or the ZIOPHARM License Agreement, with ZIOPHARM Oncology, Inc., or ZIOPHARM, which terminated and replaced the terms of an ECC with ZIOPHARM. The ZIOPHARM License Agreement gives us development and commercialization control over certain products previously licensed to ZIOPHARM. Additionally, in December 2018, we reacquired the rights to use Chimeric Antigen Receptor T-cell (CAR-T) technologies that were previously licensed to Ares Trading S.A., or Ares Trading, a wholly owned subsidiary of Merck KGaA, collectively Merck KGaA.

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. For a discussion of our JVs, see the "Notes to the Consolidated Financial Statements (Unaudited) - Note 4" appearing elsewhere in this Quarterly Report. Additionally, we are increasing the resources that we are expending internally on early-stage proof-of-concept programs where we believe we can leverage our competitive edge in gene program creation and host cell and genome expertise. We are also seeking to partner our 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, we routinely consider ways to organize our business and the grouping of our assets to facilitate strategic opportunities. For example, in April 2019, we announced that we are working to align our operations into two units, Intrexon Health and Intrexon Bioengineering, in an effort to better deploy resources, realize inherent synergies and position us for growth with a core focus on healthcare.

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, 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 dedicated discovery and clinical stage biopharmaceutical company advancing the next generation of gene and cellular therapies using precision technology to target urgent and intractable diseases in immuno-oncology, autoimmune disorders, and infectious diseases. Precigen's technologies and technologies licensed from Intrexon enable Precigen to find innovative solutions for affordable biotherapeutics in a controlled manner. Precigen operates as an innovation engine, progressing a preclinical and clinical pipeline of well-differentiated unique therapies toward clinical proof-of-concept and commercialization.

ActoBio Therapeutics, Inc.

ActoBio Therapeutics, Inc., or ActoBio, is pioneering a new class of microbe-based 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. This approach is being developed to provide safer and more efficacious treatments than injectable biologicals. ActoBio, both independently and through an ECC, 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. Progentus, L.C., or Progentus, a wholly owned subsidiary of Trans Ova, is a provider of bovine embryos. ViaGen, L.C., or ViaGen, a wholly owned subsidiary of Trans Ova, is a provider of cloning technology for livestock 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, as well as enabling the production of cells and organs in its genetically engineered swine for regenerative medicine applications.

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 artificial 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 innovative solutions for controlling *Aedes aegypti*, a mosquito that is a known vector for the transmission of infectious disease including dengue fever, chikungunya, and Zika and, in conjunction with its collaborators, is pursuing solutions that target certain agricultural crop pests. Oxitec is pursuing regulatory and commercial approvals for its insect solutions in a number of countries, including the United States.

Primary majority-owned operating subsidiary

AquaBounty Technologies, Inc.

AquaBounty Technologies, Inc., or AquaBounty, is focusing on improving productivity in commercial aquaculture, including the development of the AquAdvantage Salmon, an Atlantic salmon that has been genetically enhanced to reach market size in less time than conventionally farmed Atlantic salmon and that is approved by the Food and Drug Administration. As of March 31, 2019, we owned approximately 44% of AquaBounty but still had the contractual right to control AquaBounty's board of directors. Following the closing of an underwritten public offering by AquaBounty in April 2019, we anticipate that we will deconsolidate AquaBounty as we will no longer have the contractual right to control AquaBounty's board of directors.

Mergers, acquisitions, and technology in-licensing

We may augment our suite of proprietary technologies through mergers or acquisitions of technologies, which would 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 "Notes to the Consolidated Financial Statements (Unaudited) - Note 3" appearing elsewhere in this Quarterly Report for further discussion of mergers, acquisitions or significant technology in-licensing activities.

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 and sales of products and services, 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.

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.

From time to time, we and certain collaborators may cancel the agreements or we may repurchase rights to the exclusive fields from collaborators, relieving us of any further performance obligations under the agreement. Upon such circumstances or when we determine no further performance obligations are required of us under an agreement, we may recognize any remaining deferred revenue as either collaboration revenue or as a reduction of in-process research and development expense, depending on the circumstances.

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. We recognize revenue when control of the promised product is transferred to the customer or when the promised service is completed.

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 our programs and programs within our collaborations, and the extent to which we or our collaborators bring products enabled by our technologies to market. We expect our collaboration revenues will decrease considerably as a result of a number of transactions in 2018 to reacquire rights to fields previously licensed to collaborators, after which we no longer expect to receive reimbursement of costs incurred by us for research and development services and will no longer recognize previously deferred revenues associated with the terminated collaboration. 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 or reacquired in-process research and development;
- 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 partners, 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 partner 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 partners, or costs incurred to develop our products and services, including clinical development costs, for the three months ended March 31, 2019 and 2018. 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 partners, or developing our product and services offerings.

	Three Months Ended March 31,	
	2019	2018
	(In thousands)	
Expansion or improvement of our platform technologies	$ 6,927	$ 3,794
Specific applications of our technologies in support of current and prospective partners	9,284	18,314
Development of our product and service offerings	10,811	8,012
Other	6,040	7,147
Total research and development expenses	$ 33,062	$ 37,267

We expect that our research and development expenses will increase as we 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 that we might assume through mergers and acquisitions or in-licensing of technologies.

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.

SG&A expenses may fluctuate in the future depending on the number and nature of transactions we may undertake with certain of our operations and subsidiaries. These fluctuations could be related to personnel, legal fees, outside consultants, and other professional services. SG&A expenses may increase as a result of ongoing operations that 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 statements of operations. As such, we bear the risk that fluctuations in the securities' share prices may significantly impact our results of operations.

Interest expense is expected to increase in future periods due to the noncash amortization of the long-term debt discount and debt issuance costs related to the 3.50% convertible senior notes due 2023, or the Convertible Notes, issued in July 2018.

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. Dividend income is expected to decrease in future periods because we returned our ZIOPHARM preferred shares to ZIOPHARM in October 2018 in conjunction with the reacquisition of certain rights previously licensed to ZIOPHARM.

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 Intrexon Enterprise Fund I, LP, or 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 three months ended March 31, 2019 and the three months ended March 31, 2018

The following table summarizes our results of operations for the three months ended March 31, 2019 and 2018, together with the changes in those items in dollars and as a percentage:

	Three Months Ended March 31,		Dollar Change	Percent Change
	2019	2018		
	(In thousands)			
Revenues				
Collaboration and licensing revenues (1)	$ 5,970	$ 19,848	$ (13,878)	(69.9)%
Product revenues	4,857	7,152	(2,295)	(32.1)%
Service revenues	11,383	12,247	(864)	(7.1)%
Other revenues	1,125	419	706	168.5 %
Total revenues	23,335	39,666	(16,331)	(41.2)%
Operating expenses				
Cost of products	8,290	8,530	(240)	(2.8)%
Cost of services	7,092	6,783	309	4.6 %
Research and development	33,062	37,267	(4,205)	(11.3)%
Selling, general and administrative	33,594	39,737	(6,143)	(15.5)%
Total operating expenses	82,038	92,317	(10,279)	(11.1)%
Operating loss	(58,703)	(52,651)	(6,052)	11.5 %
Total other income (expense), net	(2,371)	3,616	(5,987)	(165.6)%
Equity in loss of affiliates	(1,640)	(2,460)	820	(33.3)%
Loss before income taxes	(62,714)	(51,495)	(11,219)	21.8 %
Income tax benefit	578	4,086	(3,508)	(85.9)%
Net loss	(62,136)	(47,409)	(14,727)	31.1 %
Net loss attributable to noncontrolling interests	1,427	1,244	183	14.7 %
Net loss attributable to Intrexon	$ (60,709)	$ (46,165)	$ (14,544)	31.5 %

(1) Including $3,812 and $16,640 from related parties for the three months ended March 31, 2019 and 2018, respectively.

Collaboration and licensing revenues

The following table shows the collaboration and licensing revenues recognized for the three months ended March 31, 2019 and 2018, together with the changes in those items.

	Three Months Ended March 31,		
	2019	2018	Dollar Change
	(In thousands)		
ZIOPHARM Oncology, Inc.	$ 1,166	$ 5,377	$ (4,211)
Ares Trading S.A.	—	2,423	(2,423)
Oragenics, Inc.	203	125	78
Intrexon T1D Partners, LLC	—	1,328	(1,328)
Intrexon Energy Partners, LLC	977	1,197	(220)
Intrexon Energy Partners II, LLC	504	378	126
Genopaver, LLC	294	1,315	(1,021)
Fibrocell Science, Inc.	383	293	90
Persea Bio, LLC	(1,272)	209	(1,481)
Harvest start-up entities (1)	2,723	3,197	(474)
Other	992	4,006	(3,014)
Total	$ 5,970	$ 19,848	$ (13,878)

(1) For the three months ended March 31, 2019 and 2018, revenues recognized from collaborations with Harvest start-up entities include: Thrive Agrobiotics, Inc.; Exotech Bio, Inc.; and AD Skincare, Inc. For the three months ended March 31, 2018, revenues recognized from collaborations with Harvest start-up entities also include Genten Therapeutics, Inc. and CRS Bio, Inc.

Collaboration and licensing revenues decreased $13.9 million, or 70%, from the three months ended March 31, 2018 primarily due to the reacquisition of rights previously licensed to certain significant collaborators, including ZIOPHARM and Ares Trading, the result of which eliminated or substantially reduced revenues generated from those collaborations. The decline was also attributable to the mutual termination of our ECC with OvaScience, Inc. in March 2018.

Product revenues and gross margin

Product revenues decreased $2.3 million, or 32%, from the three months ended March 31, 2018. The decrease in product revenues was primarily due to lower customer demand for pregnant cows and cloned products. Gross margin on products declined in the current period as a result of fewer products sold and increased costs associated with new product offerings.

Service revenues and gross margin

Service revenues decreased $0.9 million, or 7%, from the three months ended March 31, 2018. The decrease in service revenues and gross margin thereon relates to fewer embryos produced per bovine in vitro fertilization cycle performed as a result of unfavorable production results.

Research and development expenses

Research and development expenses decreased $4.2 million, or 11%, from the three months ended March 31, 2018. Depreciation and amortization decreased $2.0 million primarily due to intangible assets that were impaired or abandoned in 2018. Salaries, benefits and other personnel costs decreased $1.3 million primarily due to the closing of one of our research and development facilities in Brazil in 2018.

Selling, general and administrative expenses

SG&A expenses decreased $6.1 million, or 16%, from the three months ended March 31, 2018. Salaries, benefits and other personnel costs decreased $4.8 million primarily due to decreased compensation expenses related to performance and retention incentives for SG&A employees as well as decreased share-based compensation expense as a result of certain 2014 stock option grants becoming fully vested in March 2018.

Total other income (expense), net

Total other income (expense), net, decreased $6.0 million, or 166%, from the three months ended March 31, 2018. This decrease was primarily attributable to a decrease in dividend income following the return of our investment in ZIOPHARM preferred stock to ZIOPHARM in October 2018 and an increase in interest expense associated with our Convertible Notes issued in July 2018.

Liquidity and capital resources

Sources of liquidity

We have incurred losses from operations since our inception, and as of March 31, 2019, we had an accumulated deficit of $1.4 billion. From our inception through March 31, 2019, we have funded our operations principally with proceeds received from private and public equity and debt offerings, cash received from our collaborators, and through product and service sales made directly to customers. As of March 31, 2019, we had cash and cash equivalents of $106.5 million and short-term investments of $75.1 million. Cash in excess of immediate requirements is typically 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 sales of products and services, reimbursement of research and development services performed by us, and from strategic transactions involving our subsidiaries.

Cash flows

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

	Three Months Ended March 31,	
	2019	**2018**
	(In thousands)	
Net cash provided by (used in):		
Operating activities	$ (43,234)	$ (29,888)
Investing activities	33,592	(7,456)
Financing activities	6,927	88,262
Effect of exchange rate changes on cash, cash equivalents, and restricted cash	(504)	914
Net increase (decrease) in cash, cash equivalents, and restricted cash	$ (3,219)	$ 51,832

Cash flows from operating activities:

During the three months ended March 31, 2019, our net loss was $62.1 million, which includes the following significant noncash expenses totaling $20.3 million: (i) $9.1 million of stock-based compensation expense, (ii) $6.6 million of depreciation and amortization expense, (iii) $2.2 million of accretion of debt discount and amortization of deferred financing costs, (iv) $1.6 million of equity in net loss of affiliates, and (v) $0.8 million of shares issued as payment for services. Additionally, we had a $1.3 million net increase in our operating assets and liabilities.

During the three months ended March 31, 2018, our net loss was $47.4 million, which includes the following significant noncash expenses totaling $26.3 million: (i) $11.4 million of stock-based compensation expense, (ii) $8.4 million of depreciation and amortization expense, (iii) $2.9 million of shares issued as payment for services, (iv) $2.5 million of equity in net loss of affiliates, and (v) $1.1 million of noncash net unrealized losses on our equity securities and preferred stock. These expenses were partially offset by $4.9 million of noncash dividend income. Additionally, we had a $0.4 million net increase in our operating assets and liabilities.

Cash outflows from operations increased $13.3 million over the three months ended March 31, 2018 due to increased expenses primarily for our clinical programs combined with the lack of reimbursement for research and development services we previously received under certain key collaborations which we reacquired in 2018.

Cash flows from investing activities:

During the three months ended March 31, 2019, we received proceeds of $45.0 million from the maturity of short-term investments and used $11.5 million for purchases of property, plant and equipment.

During the three months ended March 31, 2018, we received proceeds of $6.0 million from the maturity of short-term investments and $2.6 million from the return of the balance from an investment in an affiliate that was dissolved, and we used $10.8 million for purchases of property, plant and equipment and $5.5 million for investments in our JVs.

Cash flows from financing activities:

During the three months ended March 31, 2019, we received $6.6 million in net proceeds from a public financing in March.

During the three months ended March 31, 2018, we received $88.0 million in net proceeds from public financings in January.

Future capital requirements

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 that may incorporate new technologies;
- our ability to implement cost reductions;
- costs we might incur to reacquire previously licensed rights for our own development;
- 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;
- the value we receive, or the expenses we are able to reduce, in connection with asset dispositions, if any;
- strategic mergers and acquisitions, including upfront acquisition costs 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, 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. Our current stock price may make it more difficult to pursue equity financings and lead to substantial dilution if the price of our common stock does not increase. 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 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.

Our interim unaudited consolidated financial statements as of and for the three months ended March 31, 2019 have been prepared on the basis that we will continue as a going concern, which contemplates the realization of assets and satisfaction of liabilities in the normal course of business. Based on our balance of cash, cash equivalents and short-term investments of $181.6 million at March 31, 2019 and our recurring losses since inception, there is substantial doubt about our ability to continue as a going concern within one year after the date that our interim unaudited financial statements were issued. Our ability to continue as a going concern will depend on whether we are able to generate positive cash flows through equity or debt financings, strategic collaborations or equity investments in our subsidiaries or platforms, and the continuation of cash revenues from collaborators and customers of our products and services. The interim unaudited consolidated financial statements do not include any adjustments that might result from the outcome of this uncertainty, which could have a material adverse effect on our financial condition. In addition, if we are unable to continue as a going concern, we may be unable to meet our obligations under our existing debt facilities, which could result in an acceleration of our obligation to repay all amounts outstanding under those facilities, and we may be forced to liquidate our assets. In such a scenario, the values we receive for our assets in liquidation or dissolution could be significantly lower than the values reflected in our interim unaudited consolidated financial statements.

If we do not achieve our planned operating results, our ability to continue as a going concern would be jeopardized and we may need to take the following actions to support our liquidity needs in 2019:

- shift our internal investments from subsidiaries and platforms whose potential for value creation is longer-term to near-term opportunities;
- sell certain of our operating subsidiaries to third parties;
- reduce operating expenditures for third-party contractors, including consultants, professional advisors, and other vendors; and
- reduce or delay capital expenditures, including non-essential facility expansions, lab equipment, and information technology projects.

Implementing this plan could have a negative impact on our ability to continue our business as currently contemplated, including, without limitation, delays or failures in our ability to:

- maintain the diversity of our various portfolio offerings;
- develop and commercialize products within planned timelines or at planned scales; and
- invest in new research and development efforts.

Contractual obligations and commitments

The following table summarizes our significant contractual obligations and commitments as of March 31, 2019 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	$ 79,619	$ 10,909	$ 20,059	$ 16,057	$ 32,594
Purchase commitments	16,542	5,697	10,845	—	—
Convertible debt (1)	255,515	—	55,515	200,000	—
Cash interest payable on convertible debt	31,500	7,000	14,000	10,500	—
Long-term debt, excluding convertible debt	6,594	565	1,053	1,971	3,005
Contingent consideration	585	—	585	—	—
Total	$ 390,355	$ 24,171	$ 102,057	$ 228,528	$ 35,599

(1) The convertible debt may be converted to Intrexon common stock or to the common stock of one of our subsidiaries. See "Notes to the Consolidated Financial Statements (Unaudited) - Note 11" appearing elsewhere in this Quarterly Report for further discussion of these instruments.

In addition to the obligations in the table above, as of March 31, 2019 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 subject to certain conditions and limitations. As of March 31, 2019, our remaining capital contribution commitments to our JVs were $14.6 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 that incorporate their technologies. These agreements are generally subject to termination by us and therefore no amounts are included in the tables above. At March 31, 2019, we also had research and development commitments with third parties totaling $9.8 million that had not yet been incurred.

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% 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 $2.2 million on our consolidated balance sheet as of March 31, 2019. This amount is not included in the table above due to the uncertainty of the timing of repayment.

Net operating losses

As of March 31, 2019, we had net operating loss carryforwards of approximately $460.7 million for U.S. federal income tax purposes available to offset future taxable income, including $208.2 million generated after 2017, and U.S. federal and state research and development tax credits of approximately $8.3 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. Carryforwards generated prior to 2018 begin to expire in 2022. Our direct foreign subsidiaries have foreign loss carryforwards of approximately $158.9 million, most of which do not expire. Excluding certain deferred tax liabilities totaling $6.7 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 our net operating losses have been subject to limitations pursuant to Section 382. As of March 31, 2019, Intrexon has utilized all net operating losses subject to Section 382 limitations, other than those losses inherited via acquisitions. As of March 31, 2019, approximately $41.9 million of domestic net operating losses were inherited via acquisitions 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.

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 purchase commitments as mentioned above, as defined under Securities and Exchange Commission, or 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 generally accepted accounting principles in the United States, or 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.

There have been no material changes to our critical accounting policies from those described in "Management's Discussion and Analysis of Financial Condition and Results of Operations" included in our Annual Report.

Recent accounting pronouncements

For information with respect to recent accounting pronouncements and the impact of these pronouncements on our consolidated financial statements, see "Notes to the Consolidated Financial Statements (Unaudited) - Note 2" appearing elsewhere in this Quarterly Report.

Item 3. 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 that 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 investments of $181.6 million and $222.5 million as of March 31, 2019 and December 31, 2018, respectively. Our cash and cash equivalents and short-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

As of March 31, 2019, we owned 8,239,199 shares, or approximately 44%, of the common stock of AquaBounty, which is traded on the NASDAQ Stock Market. The fair value of our investment in AquaBounty as of March 31, 2019 and December 31, 2018, based on AquaBounty's quoted closing price on the NASDAQ Stock Market, was $18.0 million and $16.9 million, respectively. The fair value of our investment in AquaBounty as of March 31, 2019 would be approximately $19.8 million and $14.4 million, respectively, based on a hypothetical 10% increase or 20% decrease in the share price of AquaBounty. The fair value of our investment in AquaBounty as of December 31, 2018 would be approximately $18.6 million and $13.5 million, respectively, based on a hypothetical 10% increase or 20% decrease in the share price of AquaBounty.

Foreign currency exchange risk

We have international subsidiaries in a number of countries, including Belgium, Brazil, Canada, Hungary, and the United Kingdom. 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% change in foreign currency exchange rates applicable to our business would not have a material impact on our consolidated financial statements.

Item 4. Controls and Procedures

Pursuant to Rule 13a-15(b) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), we carried out an evaluation, under supervision and with the participation of our management, including our Chief Executive Officer ("CEO"), who is our principal executive officer, and our Chief Financial Officer ("CFO"), who is our principal financial officer, of the effectiveness of the design and operation of our disclosure controls and procedures (as defined under Rule 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered by this report. Based upon that evaluation, as of the end of the period covered by this report, our CEO and CFO concluded that our disclosure controls and procedures are effective to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act, is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms, and that such information is accumulated and communicated to our management, including our CEO and CFO, as appropriate, to allow timely decisions regarding required disclosure.

There has been no change in our internal control over financial reporting during the three months ended March 31, 2019, that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

PART II. OTHER INFORMATION

Item 1. Legal Proceedings

In March 2012, Trans Ova was named as a defendant in a licensing and patent infringement suit brought by XY, LLC, or 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. The matter proceeded to a jury trial in the United States District Court for the District of Colorado 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 $0.5 million in damages to Trans Ova and $6.1 million in damages to XY. The order also provided Trans Ova with the ability to continue to practice XY's technology, subject to an ongoing royalty obligation of 12.5% of gross proceeds on semen-sorting products, plus a 2% enhancement on products utilizing reverse-sorting. In addition, the Court assigned a $5.00 minimum royalty for a straw of sexed semen. Both parties appealed the district court's order. In May 2018, the Court of Appeals for the Federal Circuit denied Trans Ova's appeal of its claims for antitrust, breach of contract, and patent invalidity (except as to one patent, for which the Court affirmed invalidity in a separate, same-day ruling in a third-party case). The Court of Appeals for the Federal Circuit remanded the district court's calculation of the ongoing royalty and instructed the district court to re-calculate the ongoing royalty in light of post-verdict economic factors. In March 2019, the district court increased the royalty rate on Trans Ova's semen-sorting products to 18.75%. For the reverse-sorting enhancement, the Court applied a weighted, blended royalty of 12.63% to Trans Ova's entire in vitro fertilization services utilizing reverse-sorted semen. The court also changed the minimum royalty for a straw of sexed semen to $6.25 for a 2-million cell straw (prorated appropriately for straws of higher cell counts), and assigned a minimum royalty for a sexed embryo at $6.25 per embryo. The new royalty rates are applied from February 2016 (the end date of the trial).

Since the inception of the 2004 agreement, Trans Ova has remitted payments to XY pursuant to the terms of that agreement, or pursuant to the terms of the Court's April 2016 post-trial order, 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 $3.2 million, of which $2.8 million had not yet been deposited by XY. In 2016, we recorded the expense of $4.2 million, representing 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 registry, to be held until the appeals process was complete and final judgment amounts were determined. After the appeal in December 2018, the Court subsequently released the funds held in its registry to XY in 2019. Thus, XY has received full payment for damages prior to February 2016, the date of the trial. As for post-trial damages, Trans Ova has remitted payment to XY every quarter based on the original royalty rates, though XY refused to cash those checks. Under the Court's March 2019 order resetting the royalty rates, Trans Ova will recalculate any additional royalties owed from February 2016 to the present, and will remit any underpayment to XY, if applicable. During the three months ended March 31, 2019, $0.1 million of royalty expense was recorded based on an estimate of the underpayment due to XY from February 2016 through December 2018 and is included in SG&A expenses on the accompanying consolidated statement of operations appearing elsewhere in this Quarterly Report.

In December 2016, XY filed a complaint for patent infringement, trade secret misappropriation, and various state law claims against Trans Ova in the United States District Court for the Western District of Texas in Waco, Texas. Since the claims in the 2016 complaint directly relate to the parties' previous litigation, Trans Ova filed and was granted a motion to transfer the case to Colorado District Court. That Court subsequently dismissed nine of the complaint's twelve counts, including all five non-patent counts. The Court subsequently dismissed another patent count after ruling that the patent was invalid, leaving only two patent counts left in the case. In February 2019, a Wisconsin District Court invalidated one of the remaining patents, which XY had asserted against another competitor. That ruling prompted the Colorado District Court to stay the two remaining patent counts and enter final judgment against XY's ten other dismissed counts. The 2016 litigation is administratively closed, pending XY's appeal of the Court's rulings dismissing its various patent and non-patent causes of action.

Trans Ova shall continue to utilize XY's technology consistent with the determinations of the court proceedings. Nonetheless, these disputes remain subject to a number of uncertainties, including the outcome of appellate proceedings, the possibility of further claims by XY, and the impact of these matters on Trans Ova's ability to utilize the technology licensed from XY. Trans Ova and we could elect to enter into a settlement agreement in order to avoid the further costs and uncertainties of litigation.

We may become subject to other claims, assessments, and governmental investigations from time to time in the ordinary course of business. Such matters are subject to many uncertainties and outcomes are not predictable with assurance. We accrue liabilities for such matters when it is probable that future expenditures will be made and such expenditures can be reasonably estimated. As of March 31, 2019, we do not believe that any such matters, individually or in the aggregate, will have a material adverse effect on our business, financial condition, results of operations, or cash flows.

Item 1A. Risk Factors

As disclosed in "Item 1A. Risk Factors" in our Annual Report, there are a number of risks and uncertainties that may have a material effect on the operating results of our business and our financial condition. There are no additional material updates or changes to our risk factors since the filing of our Annual Report, except as follows:

Our efforts to realign our business may not be successful and could increase our capital requirements, increase our costs, or otherwise harm our operating results and financial condition.

Consistent with the ongoing evolution of our strategy, we routinely consider ways to organize our business and the grouping of our assets to facilitate strategic opportunities. As a result of these ongoing efforts, in April 2019, we announced that we are working to align our operations into two units, Intrexon Health and Intrexon Bioengineering, in an effort to better deploy resources, realize inherent synergies, and position us for growth with a core focus on healthcare. We believe financial discipline with a focus on partnering, asset sales and operating cost reductions will allow us to continue to hold significant operating capital. However, there is no assurance that we will be successful in realigning our business or achieving these benefits, that our capital requirements and costs will not increase in connection with or as a result of the realignment, or that we will not otherwise harm our operating results and financial condition. Furthermore, the implementation of this strategy and the evaluation and implementation of any leadership changes, including the recent departure of two of our executive officers, could lead to strategic and operational challenges, distractions of management from other key initiatives, impaired employee relations, inefficiencies or increased costs, any of which could adversely affect our business, financial condition, results of operations and cash flows.

In evaluating our risks, readers also should carefully consider the risk factors discussed in our Annual Report, which could materially affect our business, financial condition or operating results, in addition to the other information set forth in this report and in our other filings with the SEC.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds

None.

Item 3. Defaults on Senior Securities

None.

Item 4. Mine Safety Disclosures

Not applicable.

Item 5. Other Information

None.

Item 6. Exhibits

Exhibit No.	Description
10.1	Intrexon Corporation 2013 Amended and Restated Omnibus Incentive Plan, as amended, Restricted Stock Unit Agreement, by and between Intrexon Corporation and Randal J. Kirk, effective April 1, 2019.
10.2	Form of Continuing Employment Agreement.
10.3	Fourth Amendment to Services Agreement, by and between Intrexon Corporation and Third Security, LLC, dated as of April 19, 2019.
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.
101.0	Interactive Data File (Quarterly Report on Form 10-Q, for the quarterly period ended March 31, 2019, formatted in Inline XBRL (eXtensible Business Reporting Language)).
	Attached as Exhibit 101.0 to this Quarterly Report on Form 10-Q are the following documents formatted in XBRL: (i) the Consolidated Balance Sheets as of March 31, 2019 and December 31, 2018, (ii) the Consolidated Statements of Operations for the three months ended March 31, 2019 and 2018, (iii) the Consolidated Statements of Comprehensive Loss for the three months ended March 31, 2019 and 2018, (iv) the Consolidated Statements of Shareholders' and Total Equity for the three months ended March 31, 2019 and 2018, (v) the Consolidated Statements of Cash Flows for the three months ended March 31, 2019 and 2018, and (vi) the Notes to the Consolidated Financial Statements.

** Furnished herewith.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

Intrexon Corporation
(Registrant)

Date: May 9, 2019

By: /s/ Rick L. Sterling

Rick L. Sterling
Chief Financial Officer
(Principal Financial and Accounting Officer)

Exhibit 10.1

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 April 1, 2019, between Intrexon Corporation, a Virginia corporation (the "Company"), and Randal J. Kirk (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 April 1, 2019 (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, for each month during the term set forth herein, that number of shares of Common Stock of the Company ("Common Stock"), rounded down to the nearest whole share, whose fair market value equals Two Hundred Thousand Dollars ($200,000.00) as calculated below (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 March 31, 2020, twelve (12) months from the Date of Grant (the "Expiration Date") unless terminated 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 be considered "Service-Based" and shall become vested and nonforfeitable on the last business day of each month during the term of this Award, with respect to the number of shares of Common Stock set forth above, provided, in each case, the Participant has been continuously employed by, or providing services to, the Company (not including Affiliates of the Company) from the Date of Grant until such time.

(ii) *Terms of Payment.* The number of shares of the Common Stock that are to become vested and payable to the Participant in accordance with the terms of this Award shall be based upon the volume-weighted average of the price of the Common Stock (as calculated by Bloomberg) on the Nasdaq Global Select Market or such other exchange as the Common Stock may have been traded on (the "Nasdaq") over the thirty (30) day period ending on the last calendar day of the month with respect to which the Award is payable during the term of this Award (the "Share Value Calculation"). 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 with respect to which the Award is payable (the "Share Issuance Date"). If the Share Issuance Date falls during a period when, pursuant to applicable law, regulations, Nasdaq 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.

(iii) *Restrictions on Issuance*. Notwithstanding anything to the contrary contained herein, in no event shall the Company be required to issue and deliver to Participant any shares of the Common Stock the issuance of which would (i) require shareholder approval under Nasdaq rules, unless and until such shareholder approval has been obtained, or (ii) be in violation of or otherwise conflict with Section 6.03 of the Plan which limits the number of shares of Common Stock that can be granted to a grantee in any calendar year to one million (1,000,000) shares of Common Stock. If, based on the advice of counsel, the Company determines that it is unable to issue shares of Common Stock in accordance with the preceding sentence on the Share Issuance Date, but is able to issue shares of Common Stock within thirty (30) days after the Share Issuance Date, the Company shall deliver to Participant such shares of Common Stock no later than the third business day following the thirtieth (30th) day after the Share Issuance Date. If, based on the advice of counsel, the Company determines that it is unable to issue shares of Common Stock in accordance with the first sentence of this Section 2(b)(iii) within thirty (30) days after the Share Issuance Date, the Company shall deliver to Participant no later than the third business day following the thirtieth (30th) day after the Share Issuance Date an amount in cash equal to (i) Two Hundred Thousand Dollars ($200,000.00) minus (ii) the value of any portion of such payment that has been issued and delivered in shares of the Common Stock calculated by dividing the number of shares of Common Stock delivered by the applicable Share Value Calculation.

(iv) *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.

(d) *Lock-Up*. Participant agrees that for a period ending three years from the vesting of the Award, Participant will not without the prior written consent of the Company, (1) offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, or otherwise transfer or dispose of, directly or indirectly, any shares of Common Stock received upon vesting of this Award pursuant to this Agreement (the "Equity Securities), or publicly disclose the intention to make any offer, sale, pledge or disposition, (2) enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of the Equity Securities, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of Equity Securities, in cash or otherwise or (3) make any demand for or exercise any right with respect to the registration of any Equity Securities, in each case other than (A) transfers of Equity Securities as a bona fide gift or gifts, (B) transfers or dispositions of Equity Securities to any trust for the direct or indirect benefit of the undersigned or the immediate family of the undersigned in a transaction not involving a disposition for value, (C) transfers or dispositions of Equity Securities to any corporation, partnership, limited liability company or other entity all of the beneficial ownership interests of which are held by the undersigned or the immediate family of the undersigned in a transaction not involving a disposition for value, and (D) transfers or dispositions of Equity Securities by will, other testamentary document or intestate succession to the legal representative, heir, beneficiary or a member of the immediate family of the undersigned. Notwithstanding anything to the contrary, Participant may utilize any "net withholding" provision under the Plan with respect to the Equity Securities.

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 with the Company (not including Affiliates of the Company) 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 (not including Affiliates of the Company) 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:	Randal J. Kirk c/o Third Security LLC 1881 Grove Avenue Radford, Virginia 24141 Attention: Legal Department

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:	Donald P. Lehr
Title:	Chief Legal Officer

PARTICIPANT:

Randal J. Kirk

Exhibit 10.2

Continuing Employment Agreement

This Continuing Employment Agreement (this "**Agreement**") is made as of April 2, 2019 between Intrexon Corporation (the "**Company**") and [name] (the "**Employee**").

WHEREAS, the Employee is an employee of the Company and has been important in developing and expanding the business and operations of the Company, and possesses valuable knowledge and skills with respect to the Company;

WHEREAS, the Company wishes to encourage the Employee's continued employment with and dedication to the Company; and

WHEREAS, the parties desire to enter into this Agreement setting forth the terms and conditions for the payment of compensation to the Employee in the event of a termination of the Employee's employment during the term of this Agreement;

NOW, THEREFORE, in consideration of the foregoing, the mutual covenants and agreements of the parties contained herein and other good and valuable consideration, the receipt of which is hereby acknowledged, the parties agree as follows:

1. The Company's Obligations Upon Termination. Other than as specifically set forth or referenced in this Agreement, the Employee shall not be entitled to any compensation or other benefits on or after termination of employment.

(a) Death. If the Employee's employment ends as a result of death, the Company shall pay to the Employee's legal representative or estate, as applicable, the Accrued Benefits, and no other amount.

(b) Termination by the Company for Cause or Disability; Termination by the Employee without Good Reason. If the Company terminates the Employee's employment for Cause or because of Disability, or the Employee terminates Employee's employment other than for Good Reason, the Company shall pay to the Employee the Accrued Benefits, and no other amount.

(c) Termination by the Company without Cause; Termination by the Employee for Good Reason. If the Company terminates the Employee's employment other than for Cause or the Employee terminates the Employee's employment for Good Reason, then, in addition to the Accrued Benefits, the Company shall pay or provide to the Employee only the following amounts, which are referred to in this Agreement as the "**Severance Benefits**":

(i) The Company shall pay to the Employee a gross amount equal to eighteen (18) months of the Employee's then-current base salary (or, in the event of a material reduction of the Employee's base salary giving rise to Good Reason, the Employee's pre-reduction base salary).

(ii) If the Employee is eligible for and timely elects COBRA health care continuation coverage from the Company, the Company shall pay or reimburse the full premium cost of such coverage (at the same level of coverage that Employee had as of the Employee's termination date) until the earlier of (x) eighteen (18) months after the Employee's termination date; or (y) the time at which the Employee becomes eligible to receive health care coverage from a subsequent employer or otherwise becomes ineligible for COBRA health care continuation coverage from the Company.

(d) Deductions/Withholding. Any payments to the Employee pursuant to this Agreement shall be less applicable deductions and withholding as determined by the Company.

(e) Timing of Payment of Accrued Benefits. The Company shall pay to the Employee (or to the Employee's legal representative or estate if termination is because of death) the Accrued Benefits at the time such payments would otherwise be due under the Company's normal payroll practices, applicable Company policies or plans, and as provided by applicable law.

(f) Requirement of General Release; Timing of Payment of the Separation Payment. As a condition to receiving the Severance Benefits, the Employee must execute and deliver a general release of claims in a form acceptable to the Company (the "**Release**") within 60 days of the Employee's termination date, provided that all revocation periods applicable to the Release will have expired within 60 days of the Employee's termination date. The Severance Benefits shall be paid or provided over an eighteen (18) month period, in regular installments in accordance with the Company's general payroll practices, beginning on the first payroll period on or following the 60th day after the Employee's termination date, provided that the Release has become irrevocable prior to the first payment date.

(g) Section 409A Savings Provisions. It is intended that this Agreement and the payments and benefits provided under this Agreement shall comply with or be exempt from the requirements of Section 409A of the Internal Revenue Code of 1986, as amended and the regulations and other guidance issued thereunder (collectively, "**Section 409A**"). Notwithstanding any other provision of this Agreement, payment provided under this Agreement may only be made upon an event and in a manner that complies with Section 409A or an applicable exemption. Specifically, any taxable benefits or payments provided under this Agreement are intended to be separate payments that qualify for the "short term deferral" exception to Section 409A to the maximum extent possible, and to the extent they do not so qualify, are intended to qualify for the separation pay exceptions to Section 409A, to the maximum extent possible. Whenever any payment is to be made within a specified period of time under this Agreement, the exact timing of payment within such period shall be determined in the sole discretion of the Company. Notwithstanding anything to the foregoing, the Company makes no representations that the payments and benefits provided under this Agreement comply with Section 409A, and in no event shall the Company be liable for all or any portion of any taxes, penalties, interest, or other expenses that may be incurred by the Employee on account of non-compliance with Section 409A.

(i) Separation from Service. The Employee will be deemed to have a termination of employment for purposes of determining the timing of any payments or benefits hereunder that are classified as nonqualified deferred compensation only upon a "separation from service" within the meaning of Section 409A.

(ii) Specified Employee Provisions. Notwithstanding any other provision of this Agreement to the contrary, if at the time of the Employee's separation from service to the Company, (a) the Employee is a specified employee (within the meaning of Section 409A and using the identification methodology selected by the Company from time to time), and (b) the Company makes a good faith determination that an amount payable on account of such separation from service to the Employee constitutes nonqualified deferred compensation (within the meaning of Section 409A) the payment of which is required to be delayed pursuant to the six-month delay rule set forth in Section 409A in order to avoid taxes or penalties under Section 409A (the "**Delay Period**"), then the Company will not pay such amount on the otherwise scheduled payment date but will instead pay it in a lump sum on the first payroll period after such Delay Period (or the first payroll period following the Employee's death, if earlier), without interest thereon.

(iii) Expense Reimbursements. To the extent required by Section 409A, any amount that the Employee is entitled to be reimbursed under this Agreement will be reimbursed to the Employee as promptly as practical and in any event not later than the last day of the calendar year after the calendar year in which the expenses are incurred. Any right to reimbursement or in-kind benefits will not be subject to liquidation or exchange for another benefit, and the amount of expenses eligible for reimbursement, or in-kind benefits provided, during any taxable year will not affect the amount of expenses eligible for reimbursement, or in-kind benefits provided, in any other taxable year.

(h) No Further Obligations. Except as set forth in this Agreement, the Company shall have no further obligation to the Employee under this Agreement upon the termination of the Employee's employment.

2. Definitions.

(a) "**Accrued Benefits**" means (i) the Employee's base salary through the termination date not yet paid; (ii) any amounts or benefits owing to the Employee or to the Employee's beneficiaries under the then-applicable benefit plans of the Company; and (iii) any amounts owing to the Employee for reimbursement of expenses properly incurred by the Employee prior to the termination date and which are reimbursable in accordance with Company policy.

(b) "**Cause**" means any one of the following events: (1) material failure to observe and comply with any of the Company's material written policies, including without limitation its policies prohibiting harassment (sexual or otherwise) and discrimination and its policies regarding equal employment opportunity and maintenance of a drug-free work place, to the satisfaction of the Company; (2) continued failure to substantially perform material duties with the Company; (3) willful failure to carry out, or comply with, in any material respect any lawful and reasonable written directive of the Company, which is not cured within twenty (20) calendar days after receipt by the Employee of notice of such failure; (4) commission of any act or omission that results in, or that may reasonably be expected to result in, a conviction, plea of no contest or imposition of unadjudicated probation for any felony or any crime involving moral turpitude; (5) commission of any act or omission that results in the Employee's incarceration in a federal, state, or local jail or prison; (6) commission of any act of dishonesty, illegal conduct, fraud, embezzlement, misappropriation, material misconduct, or breach of fiduciary duty either (x) against the Company or any of its parent, subsidiary, or affiliate entities (collectively, "**Affiliates**") (or any predecessor thereto or successor thereof) or (y) which is or which is reasonably expected to be materially injurious to the Company or its Affiliates; or (7) material or willful breach of any agreement (including this Agreement) between the Employee and the Company, which is not cured within twenty (20) calendar days after receipt by the Employee of written notice of such breach.

(c) "**Disability**" means an impairment or other issue that prevents the Employee from substantially performing the duties and responsibilities of the Employee's employment for a period of more than three consecutive months or for periods aggregating more than twenty-six (26) weeks in any one-year period. The Employee agrees, that in the event of any dispute as to whether a Disability exists and if requested by the Company, to submit to a physical examination by a licensed physician selected by mutual agreement between the Company and the Employee, the cost of such examination to be paid by the Company. The written medical opinion of such physician shall be conclusive and binding upon the parties as to whether a Disability exists and the date when such Disability arose. This definition of "Disability" shall be interpreted and applied so as to comply with the provisions of the Americans with Disabilities Act (to the extent that it is applicable) and any applicable state or local laws.

(d) "**Good Reason**" means (1) a material diminution in the Employee's authority, duties or responsibilities; (2) a material reduction in the Employee's base salary (other than a general reduction in compensation applying to other similarly-situated employees of the Company); or (3) the relocation of the primary office from which the Employee is required to work to a location more than fifty (50) miles from the current office location where the Employee primarily works, which relocation increases the Employee's one-way commute. No event or condition shall constitute "Good Reason" unless the Employee provides the Company with written notice of the event or condition the Employee alleges to be Good Reason within thirty (30) days after such event or condition first occurs. The termination shall not become effective unless the Company fails to cure such event or condition constituting Good Reason within thirty (30) days following the Company's receipt of such notice. The Employee must terminate employment within thirty (30) days after the end of the cure period in order for the termination to be for Good Reason.

3. Restrictive Covenants.

(a) Confidentiality Agreement. As a condition of being eligible to receive the Severance Benefits, the Employee reaffirms and shall continue to comply with the Confidentiality and Proprietary Rights Agreement the Employee signed on [date] (the "**Confidentiality Agreement**").

(b) Non-Disparagement. During the Employee's employment and after it ends (regardless of the reason), the Employee shall not make to any person or entity any disparaging, defamatory, or derogatory statements or comments about the Company or any of its directors, officers, employees, products, or services.

(c) Survival of Provisions. The Employee's obligations contained in this Section 3 (including in the Confidentiality Agreement) shall survive the termination or expiration of the Employee's employment with the Company.

4. Miscellaneous.

(a) Governing Law. This Agreement shall be governed by and construed under the laws of Maryland, without regard to its conflicts of law principles. Suit to enforce any provision of this Agreement or to obtain any remedy with respect hereto may be brought in a court in the State of Maryland and for this purpose I expressly consent to the jurisdiction of said courts.

(b) Entire Agreement. This Agreement contains the entire understanding of the parties as to its subject matter, and terminates and supersedes any and all prior agreements and understandings between the parties with respect to that subject matter, whether oral or written. For the avoidance of doubt, other than as specified in this Agreement, the Employee is not entitled to any "severance" or similar payments from the Company, whether pursuant to another agreement, plan, or policy of the Company or otherwise. For the further avoidance of doubt, nothing in this Agreement terminates or supersedes the terms of the Confidentiality Agreement. This Agreement may not be modified in any respect except by a writing executed by each party hereto.

(c) Severability. In the event a court or other adjudicator of competent jurisdiction determines that any portion of this Agreement is invalid or unenforceable, only the portions that are invalid or unenforceable shall be stricken.

(d) Headings. Section headings in this Agreement are included for convenience of reference only and shall not constitute part of this Agreement for any other purpose.

(e) Counterparts and Digital Signature. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which taken together shall constitute one and the same instrument. In the event that any signature is delivered via e-mail transmission, such signature shall create a valid and binding obligation of the party executing (or on whose behalf such signature is executed) with the same force and effect as if such digital signature page were an original signature.

(f) Assignment. The Employee may not assign or transfer this Agreement or any rights or obligations hereunder. The Company may assign this Agreement without the written consent of the Employee.

(g) Confidentiality. The Employee shall not disclose or discuss this Agreement or its terms with any person, organization, or entity, other than the Employee's immediate family, accountants, or attorneys, and agrees that any subsequent disclosure by such parties will be deemed a disclosure by the Employee.

[*Signature Page Follows*]

IN WITNESS WHEREOF, the Company has caused this Agreement to be executed by its duly authorized officer and the Employee has hereunto signed this Agreement on the date first above written.

INTREXON CORPORATION

By: Randal J. Kirk
Title: Chief Executive Officer

EMPLOYEE

[Name]

Exhibit 10.3

FOURTH AMENDMENT TO SERVICES AGREEMENT

THIS FOURTH AMENDMENT TO THE SERVICES AGREEMENT (this "Amendment") is made and entered into as of the 18th day of April, 2019, by and between Third Security, LLC, a Virginia limited liability company ("THIRD SECURITY"), and Intrexon Corporation, a Virginia corporation ("INTREXON").

WHEREAS, THIRD SECURITY and INTREXON entered into that certain Services Agreement, dated as of November 1, 2015 (the "Agreement"), which Agreement was subsequently amended such that the Agreement would expire on January 1, 2017, unless earlier terminated or extended by agreement of the parties pursuant to Section 4 of the Agreement;

WHEREAS, the Agreement was subsequently amended such that the Agreement would expire on January 1, 2019; and

WHEREAS, as of the date hereof, THIRD SECURITY and INTREXON desire to amend the Agreement to extend the term of the Agreement to January 1, 2020 and to modify the calculation for determining the value of INTREXON common stock paid under the Agreement; and

WHEREAS, pursuant to Section 4 of the Agreement, this Amendment has been approved unanimously by the disinterested directors of the INTREXON Board of Directors.

NOW THEREFORE, in consideration of the mutual promises and covenants herein contained and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties to this Amendment, intending to be bound hereby, agree as follows:

1. **Defined Terms**. All capitalized terms used but not defined herein shall have the meanings assigned to such terms in the Agreement.

2. **Section 2**. Section 2 of the Agreement is hereby amended by deleting such section in its entirety and substituting the following in its stead:
   "2. **Charges for Services**. As consideration for the Services provided hereunder, INTREXON shall pay to THIRD SECURITY, on a monthly basis, such number of shares of Common Stock of INTREXON, rounded down to the nearest whole number, equal to a value of Eight Hundred Thousand Dollars ($800,000.00). Such value shall be based upon the volume-weighted average of the price of the Common Stock (as calculated by Bloomberg) of INTREXON on the Nasdaq Global Select Market or such other exchange as the Common Stock may have been traded on ("NASDAQ") over the thirty (30) day period ending on the 15th day of the calendar month during which the applicable Services are provided (the "Share Value Calculation") and shall be issued to THIRD SECURITY in accordance with Section 3 below."

3. **Section 3**. Section 3 of the Agreement is hereby amended by deleting such section in its entirety and substituting the following in its stead:
   "3. **Terms of Payment**.

   (a) The shares of Common Stock issuable to THIRD SECURITY pursuant to Section 2 above for the period from January 1, 2019 through April 30, 2019 shall be issued and delivered to THIRD SECURITY on May 1, 2019. Schedule A hereto sets forth the calculation of such shares. All other shares of Common Stock issuable to THIRD SECURITY pursuant to Section 2 above shall be issued and delivered to THIRD SECURITY no later than fifteen (15) days after the end of the calendar month during which the applicable Services are provided (the "Share Issuance Date"). If the Share Issuance Date falls during a period when, pursuant to applicable law, regulations, NASDAQ rules or INTREXON's internal policies or agreements with third parties, INTREXON is not permitted to issue such shares, such shares shall be issued and delivered to THIRD SECURITY no later than the third business day following the conclusion of such period.

(b) Notwithstanding anything to the contrary contained herein, in no event shall INTREXON be required to issue and deliver to THIRD SECURITY any shares of INTREXON Common Stock the issuance of which would (i) require stockholder approval under NASDAQ rules, unless and until such stockholder approval has been obtained, or (ii) be in violation of or otherwise conflict with Section 6.03 of the Plan. If, based on the advice of counsel, INTREXON determines that it is unable to issue shares of INTREXON Common Stock in accordance with the preceding sentence on the Share Issuance Date, but is able to issue shares of INTREXON Common Stock within thirty (30) days after the Share Issuance Date, INTREXON shall deliver to THIRD SECURITY such shares of INTREXON Common Stock no later than the third business day following the thirtieth (30th) day after the Share Issuance Date. If, based on the advice of counsel, INTREXON determines that it is unable to issue shares of INTREXON Common Stock in accordance with the first sentence of this Section 3(b) within thirty (30) days after the Share Issuance Date, INTREXON shall deliver to THIRD SECURITY no later than the third business day following the thirtieth (30th) day after the Share Issuance Date an amount in cash equal to (i) Eight Hundred Thousand Dollars ($800,000.00) minus (ii) the value of any portion of such payment that has been issued and delivered in shares of INTREXON Common Stock calculated by dividing the number of shares delivered by the applicable Share Value Calculation.

(c) All shares of Common Stock of INTREXON issued and delivered under this Agreement shall be subject to any anti-pledging and/or anti-hedging policies INTREXON may adopt from time to time, in each case as if Third Security were an executive officer of INTREXON.

(d) If this Agreement is terminated pursuant to Section 4 below, the number of shares of Common Stock of INTREXON to be issued and delivered by INTREXON to THIRD SECURITY in respect of Services provided for the month during which such termination occurred shall be equal to a value of Eight Hundred Thousand Dollars ($800,000.00), pro-rated through the date of termination of the Services. For purposes of this Section 3(d), such shares shall be issued and delivered to THIRD SECURITY in accordance with Section 3(a) and the value of such shares shall be based upon the applicable Share Value Calculation."

4. **Section 4**. Section 4 of the Agreement is hereby amended by deleting such section in its entirety and substituting the following in its stead:
"4. **Term of Agreement**. The term of this Agreement shall commence on November 1, 2015 and continue until January 1, 2020 unless earlier terminated by agreement of the parties hereto. The Agreement may be extended on a year-to-year basis by agreement of the Parties, with INTREXON's agreement conditioned on the unanimous approval of the independent directors of INTREXON's Board of Directors. Notwithstanding the foregoing, this Agreement shall become terminable (i) at any time by INTREXON upon delivery of written notice to THIRD SECURITY; and (ii) upon thirty (30) days' notice by THIRD SECURITY upon delivery of written notice to INTREXON. The obligations in Sections 4, 8, 9, 10 and 11 shall survive termination of this Agreement.

5. **No Further Amendments.** Except as specifically set forth herein, no amendments or modifications to the Agreement are hereby effected, and the Agreement shall remain in full force and effect.

6. **Counterparts**. This Amendment may be executed in any number of counterparts, each of which when so executed shall be deemed an original but all of which shall together constitute but one and the same instrument.

[*Signature page follows*]

IN WITNESS WHEREOF, the parties hereto have duly executed this Amendment as of the date first above written.

THIRD SECURITY, LLC		**INTREXON CORPORATION**	
By:	______________________	By:	______________________
Name:	Marcus E. Smith	Name:	Donald P. Lehr
Title:	Senior Managing Director and General Counsel	Title:	Chief Legal Officer

Schedule A

Calculation of Common Stock for the Period January 1, 2019 through April 30, 2019

Month	**30 day VWAP**	**Number of Shares**
January	$7.1926	111,225
February	$8.0541	99,328
March	$5.4734	146,161
April	$5.2665	151,903

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 quarterly report on Form 10-Q 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: May 9, 2019

/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 quarterly report on Form 10-Q 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: May 9, 2019

/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 Quarterly Report on Form 10-Q of the Company for the quarter ended March 31, 2019 (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: May 9, 2019

/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-Q 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-Q), 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 Quarterly Report on Form 10-Q of the Company for the quarter ended March 31, 2019 (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: May 9, 2019

/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-Q 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-Q), irrespective of any general incorporation language contained in such filing.