UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 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

o **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 000-52008

LUNA INNOVATIONS INCORPORATED
(Exact name of registrant as specified in its charter)

Delaware	**54-1560050**
(State or Other Jurisdiction of Incorporation or Organization)	**(I.R.S. Employer Identification Number)**

301 First Street SW, Suite 200
Roanoke, VA 24011
(Address of Principal Executive Offices)

(540) 769-8400
(Registrant's Telephone Number, Including Area Code)

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 o 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 o 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 o   Accelerated filer o

Non-accelerated filer ☒   Smaller reporting company ☒

Emerging growth company o

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. o

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

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

Title of each class	Trading Symbol	Name of each exchange on which registered
Common Stock, $0.001 par value per share	LUNA	The Nasdaq Stock Market LLC

Indicate the number of shares outstanding of each of the issuer's classes of common stock, as of the latest practicable date: As of May 9, 2019, there were 28,146,213 shares of the registrant's common stock outstanding.

LUNA INNOVATIONS INCORPORATED
QUARTERLY REPORT ON FORM 10-Q
FOR THE QUARTER ENDED MARCH 31, 2019

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PART I. FINANCIAL INFORMATION

ITEM 1. *FINANCIAL STATEMENTS*

Luna Innovations Incorporated
Consolidated Balance Sheets

	March 31, 2019	December 31, 2018
	(unaudited)	
Assets		
Current assets:		
Cash and cash equivalents	$ 24,580,006	$ 42,460,267
Accounts receivable, net	13,505,444	13,037,068
Receivable from sale of HSOR business	2,500,375	2,500,000
Contract assets	2,829,186	2,422,495
Inventory	9,996,054	6,873,742
Prepaid expenses and other current assets	1,087,416	935,185
Total current assets	54,498,481	68,228,757
Long-term contract assets	359,166	336,820
Property and equipment, net	3,845,748	3,627,886
Intangible assets, net	11,309,181	3,302,270
Goodwill	10,345,249	101,008
Other assets, net	3,205,983	1,995
Total assets	$ 83,563,808	$ 75,598,736
Liabilities and stockholders' equity		
Liabilities:		
Current liabilities:		
Current portion of long-term debt obligations	$ 247,726	$ 619,315
Current portion of capital lease obligations	—	40,586
Accounts payable	4,945,927	2,395,984
Accrued liabilities	8,599,225	6,597,458
Contract liabilities	2,792,119	2,486,111
Total current liabilities	16,584,997	12,139,454
Long-term deferred rent	—	1,035,974
Other long-term liabilities	2,970,879	—
Long-term capital lease obligations	—	68,978
Total liabilities	19,555,876	13,244,406
Commitments and contingencies		
Stockholders' equity:		
Preferred stock, par value $0.001, 1,321,514 shares authorized, issued and outstanding at March 31, 2019 and December 31, 2018	1,322	1,322
Common stock, par value $0.001, 100,000,000 shares authorized, 29,398,818 and 29,209,506 shares issued, 28,145,713 and 27,956,401 shares outstanding at March 31, 2019 and December 31, 2018, respectively	30,329	30,120
Treasury stock at cost, 1,253,105 shares at March 31, 2019 and December 31, 2018	(2,116,640)	(2,116,640)
Additional paid-in capital	86,355,322	85,744,750
Accumulated deficit	(20,262,401)	(21,305,222)
Total stockholders' equity	64,007,932	62,354,330
Total liabilities and stockholders' equity	$ 83,563,808	$ 75,598,736

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

Luna Innovations Incorporated
Consolidated Statements of Operations

	Three Months Ended March 31, 2019	2018
	(unaudited)	
Revenues:		
Technology development	$ 6,640,743	$ 4,636,776
Products and licensing	8,192,375	4,131,754
Total revenues	14,833,118	8,768,530
Cost of revenues:		
Technology development	4,816,146	3,353,501
Products and licensing	3,249,338	1,575,403
Total cost of revenues	8,065,484	4,928,904
Gross profit	6,767,634	3,839,626
Operating expense:		
Selling, general and administrative	6,207,318	3,333,490
Research, development and engineering	1,457,893	879,592
Total operating expense	7,665,211	4,213,082
Operating loss	(897,577)	(373,456)
Other income/(expense):		
Investment income	171,225	75,912
Other expense	(1,729)	(10,854)
Interest expense	(11,187)	(40,647)
Total other income	158,309	24,411
Loss from continuing operations before income taxes	(739,268)	(349,045)
Income tax benefit	(1,865,147)	(76,967)
Net income/(loss) from continuing operations	1,125,879	(272,078)
Income from discontinued operations, net of income tax of $0 and $78,363	—	420,754
Net income from discontinued operations	—	420,754
Net income	1,125,879	148,676
Preferred stock dividend	83,058	64,425
Net income attributable to common stockholders	$ 1,042,821	$ 84,251
Net income/(loss) per share from continuing operations:		
Basic	$ 0.04	$ (0.01)
Diluted	$ 0.03	$ (0.01)
Net income per share from discontinued operations:		
Basic	$ —	$ 0.02
Diluted	$ —	$ 0.02
Net income per share attributable to common stockholders:		
Basic	$ 0.04	$ —
Diluted	$ 0.03	$ —
Weighted average common shares and common equivalent shares outstanding:		
Basic	28,039,080	27,204,989
Diluted	33,479,935	27,204,989

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

Luna Innovations Incorporated
Consolidated Statements of Cash Flows

	Three Months Ended March 31, 2019	Three Months Ended March 31, 2018
	(unaudited)	
Cash flows provided by/(used in) operating activities		
Net income	$ 1,125,879	$ 148,676
Adjustments to reconcile net income to net cash provided by/(used in) operating activities		
Depreciation and amortization	617,309	307,852
Share-based compensation	342,765	94,606
Deferred taxes	(1,889,266)	—
Change in assets and liabilities		
Accounts receivable	1,052,571	(229,535)
Contract assets	(429,037)	221,386
Inventory	(527,849)	(110,095)
Other current assets	(41,549)	133,293
Accounts payable and accrued expenses	1,196,425	(1,456,154)
Contract liabilities	149,435	(1,650,363)
Net cash provided by/(used in) operating activities	1,596,683	(2,540,334)
Cash flows used in investing activities		
Acquisition of property and equipment	(215,251)	(129,720)
Intangible property costs	(60,639)	(113,108)
Acquisition of General Photonics Corporation	(19,004,250)	—
Net cash used in investing activities	(19,280,140)	(242,828)
Cash flows used in financing activities		
Payments on finance lease obligations	(6,763)	(13,611)
Payments of debt obligations	(375,000)	(458,333)
Repurchase of common stock	—	(306,041)
Proceeds from the exercise of options and warrants	184,959	22,288
Net cash used in financing activities	(196,804)	(755,697)
Net decrease in cash and cash equivalents	(17,880,261)	(3,538,859)
Cash and cash equivalents—beginning of period	42,460,267	36,981,533
Cash and cash equivalents—end of period	$ 24,580,006	$ 33,442,674
Supplemental disclosure of cash flow information		
Cash paid for interest	$ 12,062	$ 39,071
Cash paid for income taxes	$ —	$ 1,396
Non-cash investing and financing activities		
Contingent liability for business combination	900,000	—
Dividend on preferred stock, 19,823 shares of common stock issuable	$ 83,058	$ 64,425

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

Luna Innovations Incorporated
Notes to Unaudited Consolidated Financial Statements

1. Basis of Presentation and Significant Accounting Policies

Nature of Operations

Luna Innovations Incorporated (“we,” “Luna Innovations” or the “Company”), headquartered in Roanoke, Virginia, was incorporated in the Commonwealth of Virginia in 1990 and reincorporated in the State of Delaware in April 2003. We are a leader in advanced optical technology, providing high performance fiber optic test products for the telecommunications industry and distributed fiber optic sensing products for industries utilizing composite and other advanced materials, such as the automotive, aerospace, energy and infrastructure industries. Our distributed fiber optic sensing products help designers and manufacturers more efficiently develop new and innovative products by providing valuable information such as highly detailed stress, strain, and temperature measurements of a new design or manufacturing process. In addition, our distributed fiber optic sensing products are used to monitor the structural integrity or operational health of critical assets, including large civil structures such as bridges. Our communications test products accelerate the development of advanced fiber optic components and networks by providing fast and highly accurate characterization of components and networks. We also provide applied research services, typically under research programs funded by the U.S. government, in areas of advanced materials, sensing, and healthcare applications. Our business model is designed to accelerate the process of bringing new and innovative products to market. We use our in-house technical expertise across a range of technologies to perform applied research services for companies and for government funded projects. We continue to invest in product development and commercialization, which we anticipate will lead to increased product sales growth.

Unaudited Interim Financial Information

The accompanying unaudited consolidated interim financial statements have been prepared in accordance with accounting principles generally accepted in the United Stated of America (“U.S. GAAP”) for interim financial statements and Article 10 of Regulation S-X of the Securities Exchange Act of 1934, as amended. Accordingly, they do not include all of the information and footnotes required by U.S. GAAP for annual financial statements. The unaudited consolidated interim financial statements have been prepared on the same basis as the annual financial statements and in the opinion of management reflect all adjustments, consisting of only normal recurring accruals considered necessary to present fairly our financial position at March 31, 2019, results of operations for the three months ended March 31, 2019 and 2018, and cash flows for the three months ended March 31, 2019 and 2018. The results of operations for the three months ended March 31, 2019, are not necessarily indicative of the results that may be expected for the year ending December 31, 2019. The consolidated balance sheet as of December 31, 2018 was derived from our audited consolidated financial statements.

The consolidated interim financial statements, including our significant accounting policies, should be read in conjunction with the audited Consolidated Financial Statements and the notes thereto for the year ended December 31, 2018, included in our Annual Report on Form 10-K as filed with the Securities and Exchange Commission (“SEC”) on March 15, 2019.

Business Combinations

We apply the provisions of Accounting Standards Codification ("ASC") 805, *Business Combinations*, in the accounting for acquisitions. ASC 805 requires us to recognize separately from goodwill the assets acquired and the liabilities assumed at their acquisition date fair values. Goodwill as of the acquisition date is measured as the excess of consideration transferred over the net of the acquisition date fair values of the assets acquired and the liabilities assumed. While we use our best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as contingent consideration, where applicable, these estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, we record adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon the conclusion of the measurement period or final determination of the values of the assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recorded in our consolidated statements of operations. Accounting for business combinations requires management to make significant estimates and assumptions, especially at the acquisition date, including estimates for intangible assets, contractual obligations assumed, restructuring liabilities, pre-acquisition contingencies and contingent consideration, where applicable. Although we believe the assumptions and estimates we have made have been reasonable and appropriate, they are based in part on historical experience and information obtained from management of the acquired companies and are inherently uncertain. Critical estimates in valuing certain of the intangible assets we have acquired include: future expected cash flows from product sales; customer contracts and acquired technologies; expected costs to develop in-process research and development into commercially viable products and estimated cash flows from the projects when completed; and discount rates. Unanticipated events and circumstances may occur that may affect the accuracy or validity of such assumptions, estimates, or actual results.

Goodwill and Intangible Assets

Goodwill and intangible assets with indefinite lives are not amortized but are tested for impairment on an annual basis, as of October 1 of each year, or whenever events or changes in circumstances indicate that the carrying amount of these assets may not be recoverable. Purchased intangible assets with finite useful lives are amortized using the straight-line method over their estimated useful lives and reviewed for impairment as described above.

Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in the principal or most advantageous market in an orderly transaction between marketplace participants. Various valuation approaches can be used to determine fair value, each requiring different valuation inputs. The following hierarchy classifies the inputs used to determine fair value into three levels:

- Level 1—Quoted prices for identical instruments in active markets
- Level 2—Quoted prices for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active, and model-derived valuations in which all significant inputs and significant value drivers are observable in active markets
- Level 3—Valuations derived from valuation techniques in which one or more significant inputs or significant value drivers are unobservable

The carrying values of cash and cash equivalents, accounts receivable and accounts payable approximate fair value because of the short-term nature of these instruments. The carrying value of our debt approximates fair value, as we consider the floating interest rate on our credit facilities with Silicon Valley Bank ("SVB") to be at market for similar instruments. Certain non-financial assets and liabilities are measured at fair value on a nonrecurring basis in accordance with U.S. GAAP. This includes items such as non-financial assets and liabilities initially measured at fair value in a business combination and non-financial long-lived asset groups measured at fair value for an impairment assessment. In general, non-financial assets including intangible assets and property and equipment are measured at fair value when there is an indication of impairment and are recorded at fair value only when any impairment is recognized.

Net Income/(Loss) Per Share

Basic per share data is computed by dividing our net income/(loss) by the weighted average number of shares outstanding during the period. Diluted per share data is computed by dividing net income/(loss), if applicable, by the weighted average shares outstanding during the period increased to include, if dilutive, the number of additional common share equivalents that would have been outstanding if potential shares of common stock had been issued using the treasury stock method. Diluted per share data would also include the potential common share equivalents relating to convertible securities by application of the if-converted method.

The effects of 5.4 million common stock equivalents (which include outstanding warrant, preferred stock and stock options) are included for the diluted per share data for three months ended March 31, 2019. The effects of 4.0 million common stock equivalents are not included for the three months ended March 31, 2018, as they are anti-dilutive to earnings per share due to our net loss from continuing operations.

Recently Issued Accounting Pronouncements

In February 2016, the Financial Accounting Standards Board ("FASB") issued a new standard related to Leases, Accounting Standards Update ("ASU") No. 2016-02, *Leases (Topic 842)* and subsequent amendments, which replaced existing GAAP and requires lessees to recognize right-of-use ("ROU") assets and lease liabilities on the balance sheet for those leases classified as operating leases for greater transparency. The Company, using a modified retrospective adoption approach, is required to recognize and measure leases existing at the beginning of the adoption period, with certain practical expedients available.

The Company adopted the standard effective January 1, 2019. The standard allows a number of optional practical expedients to use for transition. The Company choose the certain practical expedients allowed under the transition guidance which permitted us to not to reassess any existing or expired contracts to determine if they contain embedded leases, to not to reassess our lease classification on existing leases, to account for lease and non-lease components as a single lease component for equipment leases, and whether initial direct costs previously capitalized would qualify for capitalization under FASB ASC 842. The new standard also provides practical expedients and recognition exemptions for an entity's ongoing accounting policy elections. The Company has elected the short-term lease recognition for all leases that qualify, which means that we do not recognize a ROU asset and lease liability for any lease with a term of twelve months or less.

The most significant impact of adopting the standard was the recognition of ROU assets and lease liabilities for operating leases on the Company's consolidated balance sheet but it did not have an impact on the Company's consolidated statements of operations or consolidated statements of cash flows. The cumulative effect of the changes made to our January 1, 2019 unaudited consolidated balance sheet as a result of the adoption of ASC 842 are as follows:

	Balance at December 31, 2018	Adjustment for ASC 842	Adjusted balance at January 1, 2019
Assets:			
Property and equipment, net	3,627,886	(26,004)	3,601,882
Other assets, net	1,995	3,471,643	3,473,638
Liabilities:			
Accrued liabilities	6,597,458	1,242,669	7,840,127
Current portion of capital lease obligations	40,586	(40,586)	—
Long-term deferred rent	1,035,974	(1,035,974)	—
Long-term operating lease liability	—	3,271,705	3,271,705
Long-term capital lease obligations	68,978	(68,978)	—
Long-term finance lease liability	—	76,803	76,803

Effective January 1, 2018, we adopted ASU No. 2016-15, *Statement of Cash Flows (Topic 230)*, which addresses eight specific cash flow issues with the objective of reducing the existing diversity in practice in how cash receipts and cash payments are presented in the statement of cash flows. The adoption of ASU No. 2016-15 did not have a significant impact on our consolidated financial statements.

In February 2018, the FASB issued ASU 2018-02: *Income Statement – Reporting Comprehensive Income (Topic 220)*. Under current accounting guidance, the income tax effects for changes in income tax rates and certain other transactions are recognized in income from continuing operations resulting in income tax effects recognized in accumulated other comprehensive income that do not reflect the current tax rate of the entity (“stranded tax effects”). The new guidance allows us the option to reclassify these stranded tax effects to accumulated deficit that relate to the change in the federal tax rate resulting from the passage of the Tax Cuts and Jobs Act. This update is effective for fiscal years beginning after December 15, 2018, including interim periods therein, and early adoption is permitted. We do not expect the adoption of this standard will have a significant impact on our consolidated financial statements.

In August 2018, the FASB issued ASU No. 2018-13, *Fair Value Measurement (Topic 820): Changes to the Disclosure Requirements for Fair Value Measurement.* which amends the disclosure requirements in ASC 820 by adding, changing, or removing certain disclosures. The ASU applies to all entities that are required under this guidance to provide disclosures about recurring or nonrecurring fair value measurements. These amendments are effective for all entities for fiscal years beginning after December 15, 2019 including interim periods within those fiscal years. We do not expect ASU 2018-13 will have a material impact on our consolidated financial statements.

2. Business Combinations

On October 15, 2018, we acquired substantially all of the assets, other than cash, of the United States operations of Micron Optics, Inc. ("MOI") for cash consideration of $5.5 million, of which $5.0 million was paid as of March 31, 2019, with the remaining $0.5 million reflected in accrued liabilities.

On March 1, 2019, we acquired the outstanding stock of General Photonics Corporation ("GP") for cash consideration of $19.0 million. Of the purchase price, $17.1 million was paid at closing and $1.9 million was placed into escrow for possible working capital adjustments to the purchase price and potential satisfaction of certain post-closing indemnification obligations. Additionally, we can become obligated to pay additional cash consideration of up to $1.0 million if certain revenue targets for the GP historical business are met for the twelve month period following the closing. We currently estimate the fair value of the contingent obligation to be $0.9 million. The purchase price is also subject to adjustment based upon the determination of final working capital as of the closing date compared to a target working capital valued specified in the stock purchase agreement.

For the period from the closing of the acquisition through March 31, 2019, we recognized revenue of $0.7 million and an operating loss of $0.2 million associated with the acquired operations of GP, as a result of $0.2 million in amortization expense for the acquired intangibles. We incurred $0.9 million of costs associated with the acquisition of GP during the three months ended March 31, 2019, which are included in selling, general and administrative expenses in our consolidated statements of operations. For the three months ended March 31, 2019, we recognized revenue of $2.7 million and operating income of $0.7 million associated with the acquired operations of MOI. We incurred $0.8 million of costs associated with the acquisition of MOI, previously included in our Annual Report on Form 10-K for the year ended December 31, 2018, as filed with the SEC on March 15, 2019.

These acquisitions have been accounted for under the acquisition method of accounting in accordance with ASC 805. Under the acquisition method of accounting, the total estimated purchase consideration is allocated to the acquired tangible and intangible assets and assumed liabilities based on their estimated fair values as of the acquisition date. Any excess of the fair value of the acquisition consideration over the identifiable assets acquired and liabilities assumed is recognized as goodwill. We have completed a preliminary allocation of the purchase consideration with the assistance of a third-party valuation expert. The following allocation of the purchase consideration of each acquisition is subject to revision as additional information becomes known in the future.

	Preliminary Allocation	
	MOI	GP
Accounts receivable	$ 1,742,693	$ 1,520,950
Inventory	1,435,606	2,698,000
Other current assets	69,951	763,873
Property and equipment	996,460	286,000
Identifiable intangible assets	1,650,000	8,200,000
Goodwill	101,008	10,315,490
Accounts payable and accrued expenses	(450,985)	(3,880,063)
Total purchase consideration	$ 5,544,733	$ 19,904,250

The preliminary identifiable intangible assets and their estimated useful lives were as follows:

	Estimated	Estimated Fair Value	
	Useful Life	MOI	GP
Developed technology	5 - 8 years	$ 1,200,000	$ 7,200,000
In process research and development	7 years	200,000	—
Trade names and trademarks	3 years	150,000	400,000
Customer base	7 - 15 years	100,000	600,000
		$ 1,650,000	$ 8,200,000

Developed technologies acquired primarily consist of MOI's technologies related to fiber optic sensing instruments, modules, and components and GP's technologies relating to the measurement and control of the polarization of light. The developed technologies were valued using the "multi-period excess earnings" method, under the income approach. The multi-period excess earnings method reflects the present value of the projected cash flows that are expected by the developed technologies less charges representing the contribution of other assets to those cash flows. Discount rates of 24.5% and 17% were used to discount the cash flows of MOI and GP, respectively, to present value.

In process research and development represents the fair value of incomplete MOI research and development projects that had not reached technological feasibility as of the closing date of the acquisition. In the future, the fair value of each such project at the closing date of the acquisition will be either amortized or impaired depending on whether the project is completed or abandoned. The fair value of in process research and development was determined using the multi-period excess earnings method. A discount rate of 29.5% was used to discount the cash flows to the present value.

Customer base represents the fair value of projected cash flows that will be derived from the sale of products to existing customers of MOI and GP as of the respective closing dates of their acquisitions. Customer relationships were valued using the "distributor" method, under the income approach. Under this premise, the margin of a distributor within the industry is deemed to be the margin attributable to customer relationships. This isolates the cash flows attributable to the customer relationships for which a market participant would be willing to pay. Discount rates of 24.5% and 16% were used to discount cash flows of MOI and GP, respectively, to present value.

Trade names and trademarks are considered a type of guarantee of a certain level of quality or performance represented by the MOI and GP brands. Trade names and trademarks were valued using the "relief from royalty" method of the income approach. This method is based on the assumption that in lieu of ownership, a market participant would be willing to pay a royalty in order to exploit the related benefits of this asset. Discount rates of 17% and 16% were used to discount the cash flows of MOI and GP, respectively, to the present value.

Goodwill represents the excess of consideration transferred over the net of the acquisition date fair values of the assets acquired and the liabilities assumed in connection with the acquisition. Goodwill generated from our business acquisitions was primarily attributable to expected synergies from future growth.

Pro forma consolidated results of operations

The following unaudited pro forma financial information presents combined results of operations for each of the periods presented as if the acquisitions of MOI and GP had been completed on January 1, 2018. The pro forma information includes adjustments to depreciation expense for property and equipment acquired, to amortize expense for the intangible assets acquired, and to eliminate the acquisition transaction expenses recognized in each period. Transaction-related expenses associated with the acquisition and excluded from the pro forma loss from continuing operations were $0.9 million and $0 for the three months ended March 31, 2019 and 2018, respectively. The pro forma data are for informational purposes only and are not necessarily indicative of the consolidated results of operations or the combined business had the acquisitions of MOI and GP actually occurred on January 1, 2018, or the results of future operations of the combined business. For instance, planned or expected operational synergies following the acquisition are not reflected in the pro forma information. Consequently, actual results will differ from the unaudited pro forma information presented below.

	Three Months Ended March 31,	
	2019	2018
Revenue	$ 16,862,410	$ 13,118,836
Income/(loss) from continuing operations	$ 2,337,820	$ (343,496)

3. Discontinued Operations

On July 31, 2018, we sold the assets and operations related to our optoelectronic components and subassemblies ("Opto") business, which was part of our Products and Licensing segment, to an unaffiliated third party for an initial purchase price up to $18.5 million, of which $17.5 million was received at closing and has been properly recorded in the financial statements with the remaining purchase price adjustment up to $1.0 million which is contingent upon the attainment of specified revenue targets during the eighteen months following the closing of the sale. The purchase price is subject to adjustment in the future based upon a determination of final working capital, as defined in the asset purchase agreement. The Opto business was a component of the operations of Advanced Photonix, Inc., which we acquired in May 2015, and represented all of our operations in our Camarillo, California and Montreal, Quebec facilities.

We have reported the results of operations of the Opto business as discontinued operations in our consolidated interim financial statements. We allocated a portion of the consolidated tax expense to discontinued operations based on the ratio of the discontinued business's loss before allocations.

The key components of net income from discontinued operations were as follows:

	Three Months Ended March 31, 2019	2018
	(unaudited)	
Net revenues	$ —	$ 3,424,642
Cost of revenues	—	2,238,150
Operating expenses	—	698,023
Other income	—	10,648
Income before income taxes	—	499,117
Allocated tax expense	—	78,363
Operating income from discontinued operations	—	420,754
Net income from discontinued operations	$ —	$ 420,754

For the three months ended March 31, 2018, cash flows provided by operating activities for discontinued operations was $0.1 million. For the three months ended March 31, 2018 cash flows used in investing activities for discontinued operations was $0.1 million.

5. Goodwill

The changes in the carrying value of goodwill during the three months ended March 31, 2019 were as follows:

Balance as of December 31, 2018	$ 101,008
Goodwill resulting from business combination - GP	10,315,490
Goodwill resulting from business combination - MOI [(1)]	(71,249)
Balance as of March 31, 2019	$ 10,345,249

[(1)] This is a measurement period adjustment.

6. Inventory

Inventory consists of finished goods, work-in-process and raw materials valued at the lower of cost (determined on the first-in, first-out basis) or market. We write down inventory for estimated obsolescence or unmarketable inventory in an amount equal to the difference between the cost of the inventory and the estimated market value based upon assumptions about future demand and market conditions.

Components of inventory were as follows:

	March 31, 2019	December 31, 2018
	(unaudited)	
Finished goods	$ 2,057,274	$ 1,339,832
Work-in-process	1,733,065	643,420
Raw materials	6,205,715	4,890,490
Total inventory	$ 9,996,054	$ 6,873,742

7. Accrued Liabilities

Accrued liabilities at March 31, 2019 and December 31, 2018 consisted of the following:

	March 31, 2019	December 31, 2018
	(unaudited)	
Accrued compensation	$ 4,864,146	$ 4,467,587
Income tax payable	296,134	236,636
Accrued professional fees	107,000	198,062
Deferred Rent	—	146,542
Current operating lease liability	1,374,060	—
Current finance lease liability	45,982	—
Royalties	84,535	302,428
Accrued interest	1,615	—
Accrued liabilities - other	1,282,770	404,752
Liability to related party	—	298,468
Working capital payable	542,983	542,983
Total accrued liabilities	$ 8,599,225	$ 6,597,458

8. Debt

Silicon Valley Bank Facility

We currently have a Loan and Security Agreement with SVB (the "Credit Facility") under which, as amended, we have a term loan with an original borrowing amount of $6.0 million (the “Original Term Loan”). The Original Term Loan is repayable in 48 monthly installments of $125,000, plus accrued interest payable monthly in arrears, and matured in May 2019. The Original Term Loan carries a floating annual interest rate equal to SVB’s prime rate then in effect plus 2%. We may prepay amounts due under the Original Term Loan at any time, subject to an early termination fee of up to 2% of the amount of prepayment.

In September 2015, we entered into the Waiver and Seventh Loan Modification Agreement, which provided an additional $1.0 million of available financing for purchases of equipment through December 31, 2015, which we fully borrowed in December 2015 (the "Second Term Loan" and, together with the Original Term Loan, the "Term Loans"). The Second Term Loan also bears interest at a floating prime rate plus 2% and is to be repaid in 35 monthly installments of $27,778 plus accrued interest.

The Credit Facility requires us to maintain a minimum cash balance of $4.0 million and to maintain at each month end a ratio of cash plus 60% of accounts receivable greater than or equal to 1.5 times the outstanding principal of the Term Loans. The Credit Facility also requires us to observe a number of additional operational covenants, including protection and registration of intellectual property rights, and certain customary negative covenants. As of March 31, 2019, we were in compliance with all covenants under the Credit Facility.

Amounts due under the Credit Facility are secured by substantially all of our assets, including intellectual property, personal property and bank accounts. In addition, the Credit Facility contains customary events of default, including nonpayment of principal, interest or other amounts, violation of covenants, material adverse change, an event of default under any subordinated debt documents, incorrectness of representations and warranties in any material respect, bankruptcy, judgments in excess of a threshold amount, and violations of other agreements in excess of a threshold amount. If any event of default occurs SVB may declare due immediately all borrowings under the Credit Facility and foreclose on the collateral. Furthermore, an event of default under the Credit Facility would result in an increase in the interest rate on any amounts outstanding. As of March 31, 2019, there were no events of default on the Credit Facility.

The aggregate balance under the Term Loans at March 31, 2019 and December 31, 2018, was $0.3 million and $0.6 million, respectively. The remaining Term Loan, with a balance of $0.3 million and $0.6 million as of March 31, 2019 and December 31, 2018, respectively, matured on May 1, 2019 and was paid in full. The effective rate of our Term Loan at March 31, 2019 was 7.5%.

The following table presents a summary of debt outstanding as of March 31, 2019 and December 31, 2018:

	March 31, 2019	December 31, 2018
	(unaudited)	
Silicon Valley Bank Term Loan	$ 250,000	$ 625,000
Less: unamortized debt issuance costs	2,274	5,685
Less: current portion	247,726	619,315
Total long-term debt	$ —	$ —

9. Leases

The Company has operating leases for our facilities, which have remaining terms ranging from 1 to 5 years. Most of our leases do not have an option to extend the lease period beyond the stated term unless the new term is agreed by both parties. They also do not have an early termination clause included. Our operating lease agreements do not contain any material restrictive covenants. Some of our operating lease agreements contain variable payment provisions that provide for rental increases based on consumer price indices. The change in rent expense resulting from changes in these indices are included within variable rent.

The Company also has finance leases for equipment which have remaining terms ranging from 1 to 4 years. These lease agreements are for general office equipment with a 5-year useful life. These lease agreements do not have an option to extend the lease beyond the stated terms nor do they have an early termination clause. These lease agreements do not have any variable payment provisions included.

As of March 31, 2019, the Company's lease components included in the consolidated balance sheet were as follows:

Lease component	Classification	March 31, 2019
Assets		
ROU assets - operating lease	Other assets	$ 3,142,208
ROU assets - finance lease	Other assets	27,738
Total ROU assets		$ 3,169,946
Liabilities		
Current operating lease liability	Accrued liabilities	$ 1,374,060
Current finance lease liability	Accrued liabilities	45,982
Long-term operating lease liability	Other liabilities	2,914,504
Long-term finance lease liability	Other liabilities	56,375
Total lease liabilities		$ 4,390,921

Rent expense is recognized on a straight-line basis over the life of the lease. Rent expense consists of the following:

	Three months ended March 31, 2019
Operating lease costs	$ 403,899
Variable rent costs	(36,161)
Total rent expense	$ 367,738

Future minimum lease payments under non-cancellable leases were as follows:

		March 31, 2019
2019 - remaining 9 months	$	1,218,577
2020		1,467,701
2021		640,800
2022		544,704
2023		544,704
2024 and beyond		544,704
Total future minimum lease payments	$	4,961,190
Less: Interest		672,626
Total operating lease liabilities	$	4,288,564
Current operating lease liability	$	1,374,060
Long-term operating lease liability		2,914,504
Total operating lease liabilities	$	4,288,564

Other information related to leases is as follows:

		Three months ended March 31, 2019
Finance lease cost:		
Amortization of right-of-use assets	$	12,808
Interest on lease liabilities		2,176
Total finance lease cost	$	14,984
Other information:		
Cash paid for amounts included in the measurement of lease liabilities:		
Operating cash flows from operating leases	$	403,899
Finance cash flows from finance leases	$	6,763
Right-of-use assets obtained in exchange for new operating lease liabilities		—
Right-of-use assets obtained in exchange for new finance lease liabilities	$	14,541
Weighted-average remaining lease term - operating leases		4.0
Weighted-average remaining lease term - finance leases		2.7
Weighted-average discount rate - operating leases		7%
Weighted-average discount rate - finance leases		7%

10. Capital Stock and Share-Based Compensation

We recognize share-based compensation expense based upon the fair value of the underlying equity award on the date of the grant. For restricted stock awards and restricted stock units, we recognize expense based upon the price of our underlying stock at the date of the grant. We have elected to use the Black-Scholes-Merton option pricing model to value any option or warrant awards granted. We recognize share-based compensation for such awards on a straight-line basis over the requisite service period of the awards. The risk-free interest rate is based on U.S. Treasury interest rates, the terms of which are consistent with the expected life of the stock options. The expected life is based upon historical experience of homogeneous groups within our company. We also assume an expected dividend yield of zero for all periods, as we have never paid a dividend on our common stock and do not have any plans to do so in the future.

Stock Options

A summary of the stock option activity for the three months ended March 31, 2019 is presented below:

	Options Outstanding				Options Exercisable		
	Number of Shares	Price per Share Range	Weighted Average Exercise Price	Aggregate Intrinsic Value (1)	Number of Shares	Weighted Average Exercise Price	Aggregate Intrinsic Value (1)
Balance, January 1, 2018	3,108,868	$0.61 - $6.55	$ 2.26	$ 3,669,794	1,986,740	$ 1.81	$ 3,314,494
Granted	565,070	$3.21 - $3.37					
Exercised	(260,344)	$1.18 - $1.80					
Canceled	(1,469)	1.47					
Balance, March 31, 2019	3,412,125	$0.61 - $6.23	$ 2.48	$ 5,844,998	1,810,984	$ 1.91	$ 4,170,283

(1) The intrinsic value of an option represents the amount by which the market value of the stock exceeds the exercise price of the option of in-the-money options only. The aggregate intrinsic value is based on the closing price of our common stock on the Nasdaq Capital Market, as applicable, on the respective dates.

At March 31, 2019, the outstanding stock options to purchase an aggregate of 3.4 million shares had a weighted-average remaining contractual term of 6.4 years, and the exercisable stock options to purchase an aggregate of 1.8 million shares had a weighted-average remaining contractual term of 3.6 years. The fair value of shares underlying vested options was $7.6 million at March 31, 2019. The fair value of shares underlying options exercised during the three months ended March 31, 2019 was $400,470.

For the three months ended March 31, 2019 and 2018 we recognized $0.3 million and $0.1 million in share-based compensation expense, respectively, which is included in our selling, general and administrative expense in the accompanying consolidated interim financial statements. We expect to recognize $3.3 million in share-based compensation expense over the weighted-average remaining service period of 3.2 years for stock options outstanding as of March 31, 2019.

Restricted Stock and Stock Units

Historically, we have granted shares of restricted stock to certain employees that have vested in three equal annual installments on the anniversary dates of their grant. However, beginning in 2019, we altered our approach for these grants to replace the grant of restricted stock subject to time-based vesting with the grant of a combination of restricted stock units ("RSUs") subject to time-based vesting and performance-based vesting. Each RSU represents the contingent right to receive a single share of our common stock upon the vesting of the award. For the three months ended March 31, 2019, we issued an aggregate of 230,000 RSUs to certain employees. Of the RSUs issued during the three months ended March 31, 2019, 167,000 of such RSUs are subject to time-based vesting and are scheduled to vest in three equal annual installments on the anniversary dates of the grant. The remaining 63,000 RSUs are performance-based awards that will vest based on our achievement of long-term performance goals, in particular, based on our levels of 2021 revenue and operating income. The 63,000 shares issuable upon vesting of the performance-based RSUs represent the maximum payout under our performance-based awards, based upon 150% of our target performance for 2021 revenue and operating income (the payout of such awards based on target performance for 2021 revenue and operating income would be 42,000 shares). In the case of the time-based and performance-based RSUs, vesting is also subject to the employee's continuous service with us through vesting.

In addition, in conjunction with our 2018 Annual Meeting of Stockholders, we issued RSUs to certain members of our Board of Directors in respect of the annual equity compensation under our non-employee director compensation policy (other members of our Board of Directors elected to receive their annual equity compensation for Board service in the form of stock units under our Deferred Compensation Plan as described below). RSUs issued to our Board of Directors vest at the earlier of the one-year anniversary of their grant or the next annual stockholders' meeting.

During the three months ended March 31, 2019, no shares of restricted stock or RSUs vested.

The following table summarizes the value of our unvested restricted stock awards and restricted stock units:

	Number of Unvested Shares	Weighted Average Grant Date Fair Value	Aggregate Grant Date Fair Value of Unvested Shares
Balance, January 1, 2019	458,620	$ 2.56	$ 1,172,456
Granted	230,000	$ 2.97	683,430
Vested	—	—	—
Forfeitures	—	—	—
Balance, March 31, 2019	688,620	$ 2.70	$ 1,855,886

Non-employee Director Deferred Compensation Plan

We maintain a non-employee director deferred compensation plan (the “Deferred Compensation Plan”) that permits our non-employee directors to defer receipt of certain of the compensation that they receive for serving on our board and board committees. The Deferred Compensation Plan has historically permitted the participants to elect to defer cash fees to which they were entitled for board and committee service. For participating directors, in lieu of payment of cash fees, we credit their accounts under the Deferred Compensation Plan with a number of stock units based on the trading price of our common stock as of the date of the deferral. These stock units vest immediately, although the participating directors do not receive the shares represented by such units until a future qualifying event.

In December 2017, we amended and restated our Deferred Compensation Plan to also permit participating non-employee directors to elect, beginning in 2018, to defer the receipt of some or all of the equity compensation that they receive for board and committee service. Stock units representing this equity compensation vest at the earlier of the one year anniversary of their grant or the next annual stockholders' meeting.

The following is a summary of our stock unit activity under the Deferred Compensation Plan for the three months ended March 31, 2019:

	Number of Stock Units	Weighted Average Grant Date Fair Value per Share	Intrinsic Value Outstanding
Balance, January 1, 2019	507,290	$1.53	$ 1,699,422
Granted	9,104	3.35	
Forfeitures	—	—	
Converted	—	—	
Balance, March 31, 2019	516,394	$1.56	$ 2,153,363

As of March 31, 2019, 48,859 of the outstanding stock units had not yet vested.

The following table details our equity transactions during the three months ended March 31, 2019:

	Preferred Stock		Common Stock		Treasury Stock		Additional Paid-in Capital	Accumulated Deficit	Total
	Shares	$	Shares	$	Shares	$	$		
Balance at January 1, 2019, as previously reported	1,321,514	1,322	27,956,401	30,120	1,253,105	(2,116,640)	85,744,750	(21,305,222)	62,354,330
Exercise of stock options	—	—	189,312	189	—	—	184,769	—	184,958
Share-based compensation	—	—	—	—	—	—	342,765	—	342,765
Non-cash compensation	—	—	—	—	—	—	—	—	—
Stock dividends to Carilion Clinic(1)	—	—	—	20	—	—	83,038	(83,058)	—
Net Income	—	—	—	—	—	—	—	1,125,879	1,125,879
Purchase of treasury stock	—	—	—	—	—	—	—	—	—
Balance, March 31, 2019	1,321,514	1,322	28,145,713	30,329	1,253,105	(2,116,640)	86,355,322	(20,262,401)	64,007,932

(1) The stock dividends payable in connection with Carilion Clinic's Series A Preferred Stock will be issued subsequent to March 31, 2019. For the period from January 12, 2010, the original issue date of the Series A Preferred Stock, through March 31, 2019, the Series A Preferred Stock issued to Carilion has accrued $1,500,692 in dividends. The accrued and unpaid dividends as of March 31, 2019 will be paid by the issuance of 730,808 shares of our common stock upon Carilion's written request.

Stock Repurchase Program

In May 2016, our board of directors authorized us to repurchase up to $2.0 million of our common stock through May 31, 2017. As of May 31, 2017, we had repurchased a total of 205,500 shares for an aggregate purchase price of $0.2 million under this stock repurchase program, after which this stock repurchase program expired.

In September 2017, our board of directors re-instituted the stock repurchase program and authorized us to repurchase up to $2.0 million of our common stock through September 19, 2018. Our stock repurchase program did not obligate us to acquire any specific number of shares. Under the program, shares could be repurchased in privately negotiated or open market transactions, including under plans complying with Rule 10b5-1 under the Securities Exchange Act of 1934, as amended. As of September 19, 2018, we had repurchased a total of 565,629 shares for an aggregate purchase price of $1.1 million under this stock repurchase program, after which this stock repurchase program expired. We currently maintain all repurchased shares under these stock repurchase programs as treasury stock.

11. Revenue Recognition

Disaggregation of Revenue

Our operations are divided into two operating segments—"Technology Development" and "Products and Licensing". The Technology Development segment provides applied research to customers in our areas of focus. Our engineers and scientists collaborate with our network of government, academic and industry experts to identify technologies and ideas with promising market potential. We then compete to win fee-for-service contracts from government agencies and industrial customers who seek innovative solutions to practical problems that require new technology. The Technology Development segment derives its revenues primarily from services. The Products and Licensing segment derives its revenues from product sales, funded product development and technology licenses.

We disaggregate our revenue from contracts with customers by geographic locations, customer-type, contract type, timing of recognition, and major categories for each of our segments, as we believe it best depicts how the nature, amount, timing and uncertainty of our revenue and cash flows are affected by economic factors.

The details are listed in the table below for the periods ending March 31, 2019 and 2018:

	Three Months Ended March 31, 2019 (unaudited)			Three Months Ended March 31, 2018 (unaudited)		
	Technology Development	Products and Licensing	Total	Technology Development	Products and Licensing	Total
Total Revenue by Geographic Location						
United States	$ 6,640,743	$ 3,919,943	$ 10,560,686	$ 4,636,776	$ 2,441,496	$ 7,078,272
Asia	—	2,406,002	2,406,002	—	1,003,133	1,003,133
Europe	—	1,655,307	1,655,307	—	587,406	587,406
Canada, Central and South America	—	181,185	181,185	—	97,719	97,719
All Others	—	29,938	29,938	—	2,000	2,000
Total	$ 6,640,743	$ 8,192,375	$ 14,833,118	$ 4,636,776	$ 4,131,754	$ 8,768,530
Total Revenue by Major Customer Type						
Sales to the U.S. government	$ 6,475,448	$ 785,223	$ 7,260,671	$ 4,605,154	$ 10,357	$ 4,615,511
U.S. direct commercial sales and other	165,295	3,134,720	3,300,015	31,622	2,441,721	2,473,343
Foreign commercial sales & other	—	4,272,432	4,272,432	—	1,679,676	1,679,676
Total	$ 6,640,743	$ 8,192,375	$ 14,833,118	$ 4,636,776	$ 4,131,754	$ 8,768,530
Total Revenue by Contract Type						
Fixed-price contracts	$ 3,662,434	$ 8,192,375	$ 11,854,809	$ 2,231,654	$ 4,131,754	$ 6,363,408
Cost-type contracts	2,978,309	—	2,978,309	2,405,122	—	2,405,122
Total	$ 6,640,743	$ 8,192,375	$ 14,833,118	$ 4,636,776	$ 4,131,754	$ 8,768,530
Total Revenue by Timing of Recognition						
Goods transferred at a point in time	$ —	$ 7,595,593	$ 7,595,593	$ —	$ 3,964,349	$ 3,964,349
Goods/services transferred over time	6,640,743	596,782	7,237,525	4,636,776	167,405	4,804,181
Total	$ 6,640,743	$ 8,192,375	$ 14,833,118	$ 4,636,776	$ 4,131,754	$ 8,768,530
Total Revenue by Major Products/Services						
Technology development	$ 6,640,743	$ —	$ 6,640,743	$ 4,636,776	$ —	$ 4,636,776
Optical test and measurement systems	—	7,343,193	7,343,193	—	3,688,009	3,688,009
Other	—	849,182	849,182	—	443,745	443,745
Total	$ 6,640,743	$ 8,192,375	$ 14,833,118	$ 4,636,776	$ 4,131,754	$ 8,768,530

Contract Balances

Our contract assets consist of unbilled amounts for technology development contracts as well as custom product contracts. Also included in contract assets are royalty revenue and carrying amounts of right of returned inventory. Long-term contract assets include the fee withholding on cost reimbursable contracts that will not be billed within a year. Contract liabilities include excess billings, subcontractor accruals, warranty expense, extended warranty revenue, right of return refund, and customer deposits.

The following table shows the components of our contract balances as of March 31, 2019 and December 31, 2018:

	March 31, 2019	December 31, 2018
Contract assets	$ 3,188,352	$ 2,759,315
Contract liabilities	(2,792,119)	(2,486,111)
Net contract assets (liabilities)	$ 396,233	$ 273,204

Performance Obligations

Unfulfilled performance obligations represent amounts expected to be earned on executed contracts. Indefinite delivery and quantity contracts and unexercised options are not reported in total unfulfilled performance obligations. Unfulfilled performance obligations include funded obligations, which is the amount for which money has been directly authorized by the U.S. government and for which a purchase order has been received by a commercial customer, and unfunded obligations represent firm orders for which funding has not yet been appropriated. The approximate value of our Technology Development segment unfulfilled performance obligations was $25.9 million at March 31, 2019. We expect to satisfy 61% of the performance obligations in 2019, 32% in 2020 and the remainder by 2022. The approximate value of our Products and Licensing segment unfulfilled performance obligations was $15.0 million at March 31, 2019. We expect to satisfy 49% of the performance obligations in 2019, 21% in 2020 and the remainder by 2023.

12. Income Taxes

We and our subsidiaries file U.S. Federal income tax returns and income tax returns in various state, local and foreign jurisdictions.

Our quarterly tax provision, and our quarterly estimate of our annual effective tax rate, is subject to significant variation due to several factors, including the variability in accurately predicting our pre-tax and taxable income and the mix of jurisdictions to which they relate, changes in how we do business, changes in our stock price, tax law developments (including changes in statues, regulations, case law, and administrative practices), and relative changes of expenses or losses for which tax benefits are not recognized. Additionally, our effective tax rate can be more or less volatile based on the amount if pre-tax income or loss. For example, the impact of discrete items and non-deductible expenses on our effective tax rate is greater when our pre-tax income is lower.

For 2019, the anticipated effective income tax rate is expected to continue to differ from the Federal statutory rate of 21% primarily because of the partial release of the valuation allowance related to net operating loss carryforwards expected to be used to offset taxable income in the period and certain discrete items.

We consider both positive and negative evidence when evaluating the recoverability of our deferred tax assets ("DTAs"). The assessment is required to determine whether based on all available evidence, it is more likely than not (i.e. greater than a 50% probability) that all or some portion of the DTAs will be realized in the future. As of March 31, 2019, management has concluded a partial valuation allowance of the DTAs is necessary because of sufficient uncertainty in our ability to realize the benefit associated with such DTAs in the future.

13. Operating Segments

Our operations are divided into two operating segments—“Technology Development” and “Products and Licensing”.

The Technology Development segment provides applied research to customers in our areas of focus. Our engineers and scientists collaborate with our network of government, academic and industry experts to identify technologies and ideas with promising market potential. We then compete to win fee-for-service contracts from government agencies and industrial customers who seek innovative solutions to practical problems that require new technology. The Technology Development segment derives its revenues primarily from services.

The Products and Licensing segment derives its revenues from product sales, funded product development and technology licenses.

Through March 31, 2019, our Chief Executive Officer and his direct reports collectively represented our chief operating decision makers, and they evaluated segment performance based primarily on revenues and operating income or loss. The accounting policies of our segments are the same as those described in the summary of significant accounting policies (see Note 1 to our Financial Statements, “Organization and Summary of Significant Accounting Policies,” presented in our Annual Report on Form 10-K as filed with the SEC on March 15, 2019).

The table below presents revenues and operating income/(loss) for reportable segments:

	Three Months Ended March 31,	
	2019	2018
	(unaudited)	
Revenues:		
Technology development	$ 6,640,743	$ 4,636,776
Products and licensing	8,192,375	4,131,754
Total revenues	$ 14,833,118	$ 8,768,530
Technology development operating income/(loss)	$ 64,237	$ 99,234
Products and licensing operating income/(loss)	(961,815)	(14,983)
Total operating income/(loss)	$ (897,578)	$ 84,251
Depreciation, technology development	$ 98,395	$ 93,600
Depreciation, products and licensing	$ 158,990	$ 64,317
Amortization, technology development	$ 27,932	$ 37,206
Amortization, products and licensing	$ 331,992	$ 112,729

The table below presents assets for reportable segments:

	March 31, 2019	December 31, 2018
	(unaudited)	
Total segment assets:		
Technology development	$ 32,331,533	$ 34,823,525
Products and licensing	51,232,275	40,775,211
Total assets	$ 83,563,808	$ 75,598,736
Property plant and equipment, and intangible assets, technology development	$ 2,162,062	$ 2,103,711
Property plant and equipment, and intangible assets, products and licensing	$ 23,338,116	$ 4,927,453

The U.S. government accounted for 49% and 41% of total consolidated revenues for the three months ended March 31, 2019 and 2018, respectively.

International revenues (customers outside the United States) accounted for 29% and 22% of total consolidated revenues for the three months ended March 31, 2019 and 2018, respectively. No single country, outside of the United States, represented more than 10% of total revenues in the three months ended March 31, 2019 and 2018.

14. Contingencies and Guarantees

We are from time to time involved in certain legal proceedings in the ordinary course of conducting our business. While the ultimate liability pursuant to these actions cannot currently be determined, we believe it is not reasonably possible that these legal proceedings will have a material adverse effect on our financial position or results of operations.

In March 2018, we received a notice of claim (the "Claim") from Macom Technology Solutions, Inc. ("Macom"), who acquired our HSOR business in August 2017 pursuant to an asset purchase agreement. Under the asset purchase agreement, we agreed to indemnify Macom for certain matters, including, among other things, the collection of accounts receivable from certain major customers, and placed $4.0 million of the purchase price into an escrow account for the potential settlement of any valid indemnity claims. The notice of claim received from Macom totaled $2.0 million under various indemnity provisions. We have disputed Macom's assertion of right to payment for the matters described in the Claim. It is uncertain what amount, if any, will be owed in settlement of the Claim. As of March 31, 2019, $1.5 million of the escrow balance had been received with the remaining $2.5 million in the escrow account pending resolution of the dispute.

On July 31, 2018, we sold the assets associated with our Opto components business to an unaffiliated third party. The asset purchase agreement provides for additional consideration of up to $1.0 million contingent upon the achievement of a specified revenue level by the sold business during the 18 months following the sale. In addition, the asset purchase agreement provides for a potential adjustment to the consideration paid, either positive or negative, to the extent that working capital transferred to the buyer is greater or less than a specified target amount. There have been no amounts recorded in reference to the above matter in the financial statements as of March 31, 2019. It is uncertain what amount, if any, will be received or paid with respect to each of these potential adjustments.

We executed a non-cancelable purchase order totaling $0.5 million in the fourth quarter of 2017 and a non-cancelable purchase order totaling $1.1 million in the first quarter of 2018 for multiple shipments of tunable lasers to be delivered over an 18-month period. At March 31, 2019, approximately $0.3 million of these commitments remained and is expected to be delivered by July 30, 2019.

We have entered into indemnification agreements with our officers and directors, to the extent permitted by law, pursuant to which we have agreed to reimburse the officers and directors for legal expenses in the event of litigation and regulatory matters. The terms of these indemnification agreements provide for no limitation to the maximum potential future payments. We have a directors and officers insurance policy that may, in certain instances, mitigate the potential liability and payments.

ITEM 2. *MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS*

CAUTIONARY NOTE REGARDING FORWARD LOOKING STATEMENTS

This Quarterly Report on Form 10-Q, including the sections entitled "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Quantitative and Qualitative Disclosures About Market Risk" under Items 2 and 3, respectively, of Part I of this report, and the section entitled "Risk Factors" under Item 1A of Part II of this report, may contain forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended, and Section 27A of the Securities Act of 1933, as amended. All statements other than statements of historical fact are "forward-looking statements" for purposes of these statutes, including those relating to future events or our future financial performance. In some cases, you can identify these forward looking statements by words such as "intends," "will," "plans," "anticipates," "expects," "may," "might," "estimates," "believes," "should," "projects," "predicts," "potential" or "continue," or the negative of those words and other comparable words, and other words or terms of similar meaning in connection with any discussion of future operating or financial performance. Similarly, statements that describe our business strategy, goals, prospects, opportunities, outlook, objectives, plans or intentions are also forward-looking statements. These statements are only predictions and may relate to, but are not limited to, expectations of future operating results or financial performance, capital expenditures, introduction of new products, regulatory compliance and plans for growth and future operations, as well as assumptions relating to the foregoing.

These statements are based on current expectations and assumptions regarding future events and business performance and involve known and unknown risks, uncertainties and other factors that may cause actual events or results to be materially different from any future events or results expressed or implied by these statements. These factors include those set forth in the following discussion and within Item 1A "Risk Factors" of this Quarterly Report on Form 10-Q and elsewhere within this report.

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and the related notes to those statements included elsewhere in this report. In addition to historical financial information, the following discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions. Our actual results and timing of selected events may differ materially from those anticipated in these forward-looking statements as a result of many factors, including those discussed under "Risk Factors" and elsewhere in this report.

Overview of Our Business

We are a leader in advanced optical technology, providing high performance fiber optic test products for the telecommunications industry and distributed fiber optic sensing products for industries utilizing composite and other advanced materials, such as the automotive, aerospace, energy and infrastructure industries. Our distributed fiber optic sensing products help designers and manufacturers more efficiently develop new and innovative products by providing valuable information such as highly detailed stress, strain, and temperature measurements of a new design or manufacturing process. In addition, our distributed fiber optic sensing products are used to monitor the structural integrity or operational health of critical assets, including large civil structures such as bridges. Our communications test products accelerate the development of advanced fiber optic components and networks by providing fast and highly accurate characterization of components and networks. We also provide applied research services, typically under research programs funded by the U.S. government, in areas of advanced materials, sensing, and healthcare applications. Our business model is designed to accelerate the process of bringing new and innovative products to market. We use our in-house technical expertise across a range of technologies to perform applied research services for companies and for government funded projects. We continue to invest in product development and commercialization, which we anticipate will lead to increased product sales growth.

We are organized into two main business segments, the Products and Licensing segment and the Technology Development segment. Our Products and Licensing segment develops, manufactures and markets distributed fiber optic sensing products, as well as communications test products. We are continuing to develop and commercialize our fiber optic technology for sensing applications for aerospace, automotive, energy, and infrastructure as well as for test and measurement applications in the telecommunications and data communications industries. Our Products and Licensing segment revenues represented 55% and 47% of our total revenues for the three months ended March 31, 2019 and 2018, respectively. The approximate value of our Products and Licensing segment backlog was $15.0 million at March 31, 2019 and $5.8 million at December 31, 2018. The backlog at March 31, 2019 is expected to be recognized as revenue in the future as follows:

	2019	2020	2021	2022	2023 and beyond	Total
Products and Licensing	$ 7,442,894	$ 3,171,964	$ 1,571,597	$ 1,538,276	$ 1,323,423	$ 15,048,154

The Technology Development segment performs applied research principally in the areas of sensing and instrumentation, advanced materials and health sciences. This segment comprised 45% and 53% of our total revenues for the three months ended March 31, 2019 and 2018, respectively. Most of the government funding for our Technology Development segment is derived from the Small Business Innovation Research ("SBIR") program coordinated by the U.S. Small Business Administration ("SBA"). The Technology Development segment revenues have historically accounted for a large portion of our total revenues, and we expect that they will continue to represent a significant portion of our total revenues for the foreseeable future. The Technology Development segment revenues were $6.6 million and $4.6 million for the three months ended March 31, 2019 and 2018, respectively. Within the Technology Development segment, we have historically had a backlog of contracts for which work has been scheduled, but for which a specified portion of work has not yet been completed. We define backlog as the dollar amount of obligations payable to us under negotiated contracts upon completion of a specified portion of work that has not yet been completed, exclusive of revenues previously recognized for work already performed under these contracts, if any. Total backlog includes funded backlog, which is the amount for which money has been directly authorized by the U.S. government and for which a purchase order has been received by a commercial customer, and unfunded backlog, representing firm orders for which funding has not yet been appropriated. Indefinite delivery and quantity contracts and unexercised options are not reported in total backlog. The approximate value of our Technology Development segment backlog was $25.9 million at March 31, 2019 and $26.0 million at December 31, 2018. The backlog at March 31, 2019 is expected to be recognized as revenue in the future as follows:

Technology Development	2019	2020	2021	2022	2023 and beyond	Total
Funded	$ 14,622,934	$ 4,556,997	$ 1,506,077	$ 287,857	$ —	$ 20,973,865
Unfunded	$ 1,112,864	$ 3,830,142	$ —	$ —	$ —	$ 4,943,006

Revenues from product sales are mostly derived from the sales of our sensing and test and measurement products that make use of light-transmitting optical fibers, or fiber optics. We continue to invest in product development and commercialization, which we anticipate will lead to increased product sales growth. Although we have been successful in licensing certain technology in past years, we do not expect license revenues to represent a significant portion of future revenues. Over time, however, we do intend to gradually increase such revenues. In the long term, we expect that revenues from product sales will represent a larger portion of our total revenues and that as we develop and commercialize new products, these revenues will reflect a broader and more diversified mix of products.

On October 15, 2018, we acquired substantially all of the assets, other than cash, as well as specified liabilities of Micron Optics, Inc. ("MOI"), a leading provider of innovative optical components and laser-based measurement technology, whose sensing and measurement solutions are deployed in multiple industries, for total cash consideration of $5.0 million, including $4.0 million paid at closing and $1.0 million placed in escrow until the later of October 1, 2019 or the date that specified matters are resolved as agreed by us and MOI. Following closing of the transaction, the purchase price was increased by $0.5 million based upon the final determination of working capital of MOI as of the closing date compared to a target working capital amount specified in the asset purchase agreement.

On March 1, 2019, we acquired all of the outstanding stock of General Photonics Corporation ("GP"), a leading provider of innovative components, modules and test equipment focused on the generation, measurement and control of polarized light critical in fiber optic-based applications for aggregate consideration of $19.0 million. Of the purchase price, $17.1 million was paid at closing and $1.9 million was placed into escrow for possible working capital adjustments to the purchase price and potential satisfaction of certain post-closing indemnification obligations. Additionally, we can become obligated to pay additional cash consideration of up to $1.0 million if certain revenue targets for the GP historical business are met for the twelve months following the closing.

We may also grow our business in part through acquisitions of additional companies and complementary technologies, which could cause us to incur transaction expenses, amortization or write-offs of intangible assets and other acquisition-related expenses.

Description of Revenues, Costs and Expenses

Revenues

We generate revenues from technology development, product sales and commercial product development and licensing activities. We derive Technology Development segment revenues from providing research and development services to third parties, including government entities, academic institutions and corporations, and from achieving milestones established by some of these contracts and in collaboration agreements. In general, we complete contracted research over periods ranging from six months to three years, and recognize these revenues over the life of the contract as costs are incurred. The Technology Development segment revenues represented 45% and 53% of total revenues for the three months ended March 31, 2019 and 2018, respectively.

The Products and Licensing segment revenues reflect amounts that we receive from sales of our products or development of products for third parties and, to a lesser extent, fees paid to us in connection with licenses or sub-licenses of certain patents and other intellectual property, and represented 55% and 47% of our total revenues for the three months ended March 31, 2019 and 2018, respectively.

Cost of Revenues

Cost of revenues associated with our Technology Development segment revenues consists of costs associated with performing the related research activities including direct labor, amounts paid to subcontractors and overhead allocated to Technology Development segment activities.

Cost of revenues associated with our Products and Licensing segment revenues consists of license fees for use of certain technologies, product manufacturing costs including all direct material and direct labor costs, amounts paid to our contract manufacturers, manufacturing, shipping and handling, provisions for product warranties, and inventory obsolescence as well as overhead allocated to each of these activities.

Operating Expense

Operating expense consists of selling, general and administrative expenses, as well as expenses related to research, development and engineering, depreciation of fixed assets and amortization of intangible assets. These expenses also include compensation for employees in executive and operational functions including certain non-cash charges related to expenses from option grants, facilities costs, professional fees, salaries, commissions, travel expense and related benefits of personnel engaged in sales, product management and marketing activities, costs of marketing programs and promotional materials, salaries, bonuses and related benefits of personnel engaged in our own research and development beyond the scope and activities of our Technology Development segment, product development activities not provided under contracts with third parties, and overhead costs related to these activities.

Investment Income

Investment income consists of amounts earned on our cash equivalents. We sweep on a daily basis a portion of our cash on hand into a fund invested in U.S. government obligations.

Interest Expense

Interest expense is composed of interest paid under our term loans as well as interest accrued on our capital lease obligations.

Critical Accounting Policies and Estimates

Our discussion and analysis of our financial condition and results of operations are based on our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires us to make estimates, assumptions and judgments that affect the amounts reported in our financial statements and the accompanying notes. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. Actual results may differ from these estimates under different assumptions or judgments.

Our critical accounting policies are described in the Management’s Discussion and Analysis section and the notes to our audited consolidated financial statements previously included in our Annual Report on Form 10-K for the year ended December 31, 2018, as filed with the Securities and Exchange Commission ("SEC") on March 15, 2019.

In February 2016, the Financial Accounting Standards Board ("FASB") issued a new standard related to Leases, Accounting Standards Update ("ASU") No. 2016-02, *Leases (Topic 842)* and subsequent amendments, which replaced existing GAAP and requires lessees to recognize right-of-use ("ROU") assets and corresponding lease liabilities that depict the rights and obligations arising from a lease agreement. We implemented ASU 2016-02 on January 1, 2019 and elected certain practical expedients available under the ASU. As a result of the adoption, the Company recognized ROU assets totaling $3.5 million and lease liabilities totaling $4.5 million as of the adoption date. For additional information, see Note 1 to our Unaudited Consolidated Financial Statements - "Basis of Presentation and Significant Accounting Policies-Recently Issued Accounting Pronouncements" elsewhere in this Quarterly Report.

Results of Operations

Three Months Ended March 31, 2019 Compared to Three Months Ended March 31, 2018

Revenues

	Three Months Ended March 31,			
	2019	2018	$ Difference	% Difference
Revenues:				
Technology development	$ 6,640,743	$ 4,636,776	$ 2,003,967	43%
Products and licensing	8,192,375	4,131,754	4,060,621	98%
Total revenues	$ 14,833,118	$ 8,768,530	$ 6,064,588	69%

Revenues from our Technology Development segment for the three months ended March 31, 2019, increased $2.0 million, or 43%, to $6.6 million compared to $4.6 million for the three months ended March 31, 2018. The increase in Technology Development segment revenues continues a growth trend experienced over the past two years largely driven by successes in Phase 2 SBIR awards. The increase for the three months ended March 31, 2019, compared to the three months ended March 31, 2018, was realized primarily in our optical systems research and advanced materials groups. As Phase 2 contracts generally have a performance period of a year or more, we currently expect revenues to remain at a similar level for the near term.

Our Products and Licensing segment included revenues from sales of test and measurement systems, primarily representing sales of our ODiSI, Optical Vector Analyzer, and Optical Backscatter Reflectometer platforms, optical components and sub-assemblies and sales of Terahertz sensing systems. Following our acquisitions of MOI on October 15, 2018, and GP on March 1, 2019, our Products and Licensing segment also includes the fiber-optic based test equipment, components, and sub-assemblies of those operations. Products and Licensing segment revenues for the three months ended March 31, 2019 increased $4.1 million, or 98%, to $8.2 million compared to $4.1 million for the three months ended March 31, 2018. The increase for the three months ended March 31, 2019, compared to the three months ended March 31, 2018, resulted primarily from $2.7 million of revenues realized from the legacy business of MOI and $0.7 million of revenues realized from the legacy business of GP during the period. Continued growth in sales of our fiber-optic sensing products, including the ODiSI products directed toward the expanding use of composite materials and the need for improved means of testing their structural integrity, also contributed to this increase.

Cost of Revenues and Gross Profit

	Three Months Ended March 31,			
	2019	2018	$ Difference	% Difference
Cost of revenues:				
Technology development	$ 4,816,146	$ 3,353,501	$ 1,462,645	44%
Products and licensing	3,249,338	1,575,403	1,673,935	106%
Total cost of revenues	8,065,484	4,928,904	3,136,580	64%
Gross profit	$ 6,767,634	$ 3,839,626	$ 2,928,008	76%

The cost of Technology Development segment revenues for the three months ended March 31, 2019, increased $1.5 million, or 44%, to $4.8 million compared to $3.4 million for the three months ended March 31, 2018. The increase in cost of Technology Development segment revenues was attributable to additional headcount and the increased utilization of third-party analytical services to support the growth in our research contracts and was consistent with the rate of revenue growth for this business segment.

The cost of revenues associated with our Products and Licensing segment increased by $1.7 million, or 106%, to $3.2 million for the three months ended March 31, 2019, compared to $1.6 million for the three months ended March 31, 2018. This increase in cost of revenues resulted from $1.3 million of cost of revenues from the legacy businesses of MOI and GP as well as an increase in sales volume from our previous locations. Cost of revenues increased at a lower rate than our revenues increased due to the product mix. Our overall gross margin increased to 46% for the three months ended March 31, 2019, compared to 44% for the three months ended March 31, 2018 primarily as a result of our revenue mix, with Products and licensing segment sales representing a larger portion of our revenues during the three months ended March 31, 2019.

Operating Expense

	Three Months Ended March 31,			
	2019	2018	$ Difference	% Difference
Operating expense:				
Selling, general and administrative	$ 6,207,318	$ 3,333,490	$ 2,873,828	86%
Research, development and engineering	1,457,893	879,592	578,301	66%
Total operating expense	$ 7,665,211	$ 4,213,082	$ 3,452,129	82%

Our selling, general and administrative expense increased $2.9 million, or 86%, to $6.2 million for the three months ended March 31, 2019 compared to $3.3 million for the three months ended March 31, 2018. Selling, general and administrative expense increased primarily due to $1.1 million of expenses associated with the legacy business of MOI and GP for the three months ended March 31, 2019. Selling, general and administrative expenses for the three months ended March 31, 2019, also include $0.9 million in transaction-related expenses associated with the acquisition of GP.

Research, development and engineering expense increased $0.6 million, or 66%, to $1.5 million for the three months ended March 31, 2019, compared to $0.9 million for the three months ended March 31, 2018 due to $0.6 million of research, development and engineering expenses associated with the legacy businesses of MOI and GP during the three months ended March 31, 2019.

Investment Income

Investment income was $0.2 million for the three months ended March 31, 2019, compared to $0.1 million for the three months ended March 31, 2018. During the three months ended March 31, 2019 and 2018, we invested a portion of our cash in funds holding U.S. treasury instruments.

Income Tax Benefit

For the three months ended March 31, 2019, we recognized an income tax benefit from continuing operations of $1.9 million, compared to $0.1 million for the three months ended March 31, 2018. The increase in our income tax benefit in 2019 as compared to 2018 was due to a reduction in our deferred tax asset valuation allowances as a result of the acquisition of GP.

Net Loss From Continuing Operations

During the three months ended March 31, 2019, we recognized a loss from continuing operations before income taxes of $0.7 million compared to $0.3 million for the three months ended March 31, 2018. After tax, our net income from continuing operations was $1.1 million compared to a loss of $0.3 million for the three months ended March 31, 2019 and 2018, respectively.

Net Income From Discontinued Operations

For the three months ended March 31, 2018, our net income from discontinued operations of $0.4 million represented the operating results of our optoelectronic components business. There were no results from discontinued operations for the three months ended March 31, 2019.

Liquidity and Capital Resources

At March 31, 2019, our total cash and cash equivalents were $24.6 million.

We previously maintained a Loan and Security Agreement with Silicon Valley Bank ("SVB") under which we had two term loans with an aggregate original borrowing amount of $7.0 million. As of March 31, 2019, the aggregate outstanding principal balance of $0.3 million was made up of one remaining term loan, which matured on May 1, 2019 and has been repaid as of the date of filing this report. The second term loan matured on December 1, 2018. The term loans bore interest at a floating rate of prime plus 2%. As of March 31, 2019, we were in compliance with all covenants under the Loan and Security Agreement.

We believe that our cash balance as of March 31, 2019 will provide adequate liquidity for us to meet our working capital needs over the next twelve months. Additionally, we believe that should we have the need for increased capital spending to support our planned growth, we will be able to fund such growth through either third-party financing on competitive market terms or through our available cash.

Discussion of Cash Flows

Recent Activity

	Three Months Ended March 31,		
	2019	2018	$ Difference
Net cash provided by/(used in) operating activities	$ 1,596,683	$ (2,540,334)	$ 4,137,017
Net cash used in investing activities	(19,280,140)	(242,828)	(19,037,312)
Net cash used in financing activities	(196,804)	(755,697)	558,893
Net decrease in cash and cash equivalents	$ (17,880,261)	$ (3,538,859)	$ (14,341,402)

During the first three months of 2019, operations provided $1.6 million of cash. During the first three months of 2019, net cash provided by operating activities consisted of our net income of $1.1 million, which included non-cash charges for depreciation and amortization of $0.6 million and share-based compensation of $0.3 million, and a net cash inflow of $1.4 million from changes in working capital all partially reduced by changes in deferred taxes of $1.9 million. The changes in working capital included a decrease in accounts receivable of $1.1 million, and an increase in accounts payable and accrued expenses of $1.2 million, all partially offset by increases in contract assets of $0.4 million and inventory of $0.5 million.

During the first three months of 2018, the $2.5 million of net cash used in operating activities consisted of our net income of $0.1 million, which included operating income from discontinued operations of our optoelectronic segment that was sold in July 2018 of $0.4 million in addition to non-cash charges for depreciation and amortization of $0.3 million and share-based compensation of $0.1 million. Additionally, changes in working capital resulted in a net cash outflow of $3.1 million, principally driven by a reduction in contract liabilities of $1.7 million as a result of the payment of $1.6 million in outstanding claims for excess billed amounts on government research contracts. The changes in working capital also included a reduction in accounts payable and accrued expenses of $1.5 million, partially offset by an increase in inventory of $0.1 million.

Cash used in investing activities for the three months ended March 31, 2019 included $19.0 million to acquire the operations of GP, in addition to $0.2 million of fixed asset additions and $0.1 million of capitalized intellectual property costs. Cash used in investing activities for the three months ended March 31, 2018 consisted of $0.1 million of fixed asset additions and $0.1 million of capitalized intellectual property costs.

Net cash used in financing activities during the three months ended March 31, 2019 included long term debt repayments of $0.4 million, compared to $0.5 million of long-term debt repayments during the three months ended March 31, 2018. During the three months ended March 31, 2018 we also repurchased $0.3 million of our common stock on the open market. There were no common stock repurchases during the three months ended March 31, 2019. During the three months ended March 31, 2019 we received proceeds from the exercise of options and warrants of $0.2 million.

Off-Balance Sheet Arrangements

We have no material off-balance sheet arrangements as defined in Regulation S-K Item 303(a)(4)(ii).

ITEM 3. *QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK*

Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. We do not hold or issue financial instruments for trading purposes or have any derivative financial instruments. Our exposure to market risk is limited to interest rate fluctuations due to changes in the general level of U.S. interest rates.

Interest Rate Risk

We do not use derivative financial instruments as a hedge against interest rate fluctuations, and, as a result, interest income earned on our cash and cash equivalents and short-term investments is subject to changes in interest rates. However, we believe that the impact of these fluctuations does not have a material effect on our financial position due to the immediately available liquidity or short-term nature of these financial instruments.

We are exposed to interest rate fluctuations as a result of our term loans with SVB having a variable interest rate. We do not currently use derivative instruments to alter the interest rate characteristics of our debt. For the principal amount of $0.3 million outstanding under the term loans as of March 31, 2019, a change in the interest rate by one percentage point for one year would result in a change in our annual interest expense of $100.

Although we believe that this measure is indicative of our sensitivity to interest rate changes, it does not adjust for potential changes in our credit quality, composition of our balance sheet and other business developments that could affect our interest rate exposure. Accordingly, no assurances can be given that actual results would not differ materially from the potential outcome simulated by this estimate.

Foreign Currency Exchange Rate Risk

As of March 31, 2019, all payments made under our research contracts have been denominated in U.S. dollars. Our product sales to foreign customers are also generally denominated in U.S. dollars, and we generally do not receive payments in foreign currency. As such, we are not directly exposed to significant currency gains or losses resulting from fluctuations in foreign exchange rates.

ITEM 4. *CONTROLS AND PROCEDURES*

Evaluation of Disclosure Controls and Procedures

We maintain “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), which are controls and other procedures that are designed to provide reasonable assurance that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC’s rules and forms. Disclosure controls and procedures also include, without limitation, controls and procedures designed to provide reasonable assurance that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company’s management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure.

Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. In addition, the design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a control system, misstatements due to error or fraud may occur and not be detected.

Under the supervision and with the participation of our management, including our principal executive officer and our principal financial officer, we evaluated the effectiveness of the design and operation of our disclosure controls and procedures as of the end of the period covered by this Quarterly Report. Based on this evaluation, our principal executive officer and our principal financial officer have concluded that, as of March 31, 2019, our disclosure controls and procedures were effective.

Changes in Internal Control over Financial Reporting

No change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) occurred 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*

None.

ITEM 1A. *RISK FACTORS*

You should carefully consider the risks described below before deciding whether to invest in our common stock. The risks described below are not the only ones we face. Additional risks not presently known to us or that we currently believe are immaterial may also impair our business operations and financial results. If any of the following risks actually occurs, our business, financial condition or results of operations could be adversely affected. In such case, the trading price of our common stock could decline and you could lose all or part of your investment. Our filings with the SEC also contain forward-looking statements that involve risks or uncertainties. Our actual results could differ materially from those anticipated or contemplated by these forward-looking statements as a result of a number of factors, including the risks we face described below, as well as other variables that could affect our operating results. Past financial performance should not be considered to be a reliable indicator of future performance, and investors should not use historical trends to anticipate results or trends in future periods.

RISKS RELATING TO OUR BUSINESS GENERALLY

Our technology is subject to a license from Intuitive Surgical, Inc., which is revocable in certain circumstances. Without this license, we cannot continue to market, manufacture or sell our fiber-optic products.

As a part of the sale of certain assets to Intuitive Surgical, Inc. ("Intuitive") in 2014, we entered into a license agreement with Intuitive pursuant to which we received rights to use all of our transferred technology outside the field of medicine and in respect of our existing non-shape sensing products in certain non-robotic medical fields. This license back to us is revocable if after notice and certain time periods, we were to (i) challenge the validity or enforceability of the transferred patents and patent applications, (ii) commercialize our fiber optical shape sensing and localization technology in the field of medicine (except to perform on a development and supply project for Hansen Medical, Inc.), (iii) violate our obligations related to our ability to sublicense in the field of medicine or (iv) violate our confidentiality obligations in a manner that advantages a competitor in the field of medicine and not cure such violation. Maintaining this license is necessary for us to conduct our fiber-optic products business, both for our telecom products and our ODiSI sensing products. If this license were to be revoked by Intuitive, we would no longer be able to market, manufacture or sell these products which could have a material adverse effect on our operations.

We depend on third-party vendors for specialized components in our manufacturing operations, making us vulnerable to supply shortages and price fluctuations that could harm our business.

We primarily rely on third-party vendors for the manufacture of the specialized components used in our products. The highly specialized nature of our supply requirements poses risks that we may not be able to locate additional sources of the specialized components required in our business. For example, there are few manufacturers who produce the special lasers used in our optical test equipment. Our reliance on these vendors subjects us to a number of risks that could negatively affect our ability to manufacture our products and harm our business, including interruption of supply. Although we are now manufacturing tunable lasers in low-rate initial production, we expect our overall reliance on third-party vendors to continue. Any significant delay or interruption in the supply of components, or our inability to obtain substitute components or materials from alternate sources at acceptable prices and in a timely manner could impair our ability to meet the demand of our customers and could harm our business.

We depend upon outside contract manufacturers for a portion of the manufacturing process for some of our products. Our operations and revenue related to these products could be adversely affected if we encounter problems with these contract manufacturers.

Many of our products are manufactured internally. However, we also rely upon contract manufacturers to produce the finished portion of certain lasers. Our reliance on contract manufacturers for these products makes us vulnerable to possible capacity constraints and reduced control over delivery schedules, manufacturing yields, manufacturing quality control and costs. If the contract manufacturer for our products were unable or unwilling to manufacture our products in required volumes and at high quality levels or to continue our existing supply arrangement, we would have to identify, qualify and select an acceptable alternative contract manufacturer or move these manufacturing operations to internal manufacturing facilities. An alternative contract manufacturer may not be available to us when needed or may not be in a position to satisfy our quality or production requirements on commercially reasonable terms, including price. Any significant interruption in manufacturing our products would require us to reduce the supply of products to our customers, which in turn would reduce our revenue, harm our relationships with the customers of these products and cause us to forego potential revenue opportunities.

As a provider of contract research to the U.S. government, we are subject to federal rules, regulations, audits and investigations, the violation or failure of which could adversely affect our business.

We must comply with and are affected by laws and regulations relating to the award, administration and performance of U.S. government contracts. Government contract laws and regulations affect how we do business with our government customers and, in some instances, impose added costs on our business. A violation of a specific law or regulation could result in the imposition of fines and penalties, termination of our contracts or debarment from bidding on contracts. In some instances, these laws and regulations impose terms or rights that are more favorable to the government than those typically available to commercial parties in negotiated transactions. For example, the U.S. government may terminate any of our government contracts and, in general, subcontracts, at their convenience, as well as for default based on performance.

In addition, U.S. government agencies, including the Defense Contract Audit Agency and the Department of Labor, routinely audit and investigate government contractors. These agencies review a contractor’s performance under its contracts, cost structure and compliance with applicable laws, regulations and standards. The U.S. government also may review the adequacy of, and a contractor’s compliance with, its internal control systems and policies, including the contractor’s purchasing, property, estimating, compensation and management information systems. Any costs found to be improperly allocated to a specific contract will not be reimbursed, while such costs already reimbursed must be refunded. If an audit uncovers the inclusion of certain claimed costs deemed to be expressly unallowable, or improper or illegal activities, we may be subject to civil and criminal penalties and administrative sanctions, including termination of contracts, forfeiture of profits, suspension of payments, fines and suspension or prohibition from doing business with the U.S. government. In addition, our reputation could suffer serious harm if allegations of impropriety were made against us.

In addition to the risk of government audits and investigations, U.S. government contracts and grants impose requirements on contractors and grantees relating to ethics and business practices, which carry civil and criminal penalties including monetary fines, assessments, loss of the ability to do business with the U.S. government and certain other criminal penalties.

We may also be prohibited from commercially selling certain products that we develop under our Technology Development segment or related products based on the same core technologies if the U.S. government determines that the commercial availability of those products could pose a risk to national security. For example, certain of our wireless technologies have been classified as secret by the U.S. government and as a result we cannot sell them commercially. Any of these determinations would limit our ability to generate product sales and license revenues.

We rely and will continue to rely on contracts and grants awarded under the SBIR program for a significant portion of our revenues. A finding by the SBA that we no longer qualify to receive SBIR awards could adversely affect our business.

We compete as a small business for some of our government contracts. Our revenues derived from the SBIR program account for a significant portion of our consolidated total revenues, and contract research, including SBIR contracts, will remain a significant portion of our consolidated total revenues for the foreseeable future. For the three months ended March 31, 2019 and 2018, revenues generated under the SBIR program represented 43% and 50%, respectively, of our total revenues.

We may not continue to qualify to participate in the SBIR program or to receive new SBIR awards from federal agencies. In order to qualify for SBIR contracts and grants, we must meet certain size and ownership eligibility criteria. These eligibility criteria are applied as of the time of the award of a contract or grant. A company can be declared ineligible for a contract award as a result of a size challenge filed with the SBA by a competitor or a federal agency.

In order to be eligible for SBIR contracts and grants, under current SBA rules we must be more than 50% owned and controlled by individuals who are U.S. citizens or permanent resident aliens, and/or other small business concerns (each of which is more than 50% owned and controlled by individuals who are U.S. citizens or permanent resident aliens) or certain qualified investment companies. In the event our institutional ownership significantly increases, either because of increased buying by institutions or selling by individuals, we could lose eligibility for new SBIR contracts and grants.

Also, in order to be eligible for SBIR contracts and grants, the number of our employees, including those of any entities that are considered to be affiliated with us, cannot exceed 500. As of March 31, 2019, we had approximately 257 full-time employees. In determining whether we are affiliated with any other entity, the SBA may analyze whether another entity controls or has the power to control us. Carilion Clinic is our largest institutional stockholder. Since early 2011, a formal size determination by the SBA that focused on whether or not Carilion is or was our affiliate has been outstanding. Although we do not believe that Carilion has or had the power to control our company, we cannot assure you that the SBA will interpret its regulations in our favor on this question. If the SBA were to make a determination that we are or were affiliated with Carilion, we would exceed the size limitations, as Carilion has over 500 employees. In that case, we would lose eligibility for new SBIR contracts and grants and other awards that are set aside for small businesses based on the criterion of number of employees, and the relevant government agency would have the discretion to suspend performance on existing SBIR grants. The loss of our eligibility to receive SBIR awards would have a material adverse impact on our revenues, cash flows and our ability to fund our growth.

Moreover, as our business grows, it is foreseeable that we will eventually exceed the SBIR size limitations, in which case we may be required to seek alternative sources of revenues or capital.

A decline in government research contract awards or government funding for existing or future government research contracts, including SBIR contracts, could adversely affect our revenues, cash flows and ability to fund our growth.

Technology Development segment revenues, which consist primarily of government-funded research, accounted for 52% and 53% of our consolidated total revenues for the three months ended March 31, 2019 and 2018, respectively. As a result, we are vulnerable to adverse changes in our revenues and cash flows if a significant number of our research contracts and subcontracts were to be simultaneously delayed or canceled for budgetary, performance or other reasons. For example, the U.S. government may cancel these contracts at any time without cause and without penalty or may change its requirements, programs or contract budget, any of which could reduce our revenues and cash flows from U.S. government research contracts. Our revenues and cash flows from U.S. government research contracts and subcontracts could also be reduced by declines or other changes in U.S. defense, homeland security and other federal agency budgets. In addition, we compete as a small business for some of these contracts, and in order to maintain our eligibility to compete as a small business, we, together with any affiliates, must continue to meet size and revenue limitations established by the U.S. government.

Our contract research customer base includes government agencies, corporations and academic institutions. Our customers are not obligated to extend their agreements with us and may elect not to do so. Also, our customers' priorities regarding funding for certain projects may change and funding resources may no longer be available at previous levels.

In addition to contract cancellations and changes in agency budgets, our future financial results may be adversely affected by curtailment of or restrictions on the U.S. government's use of contract research providers, including curtailment due to government budget reductions and related fiscal matters or any legislation or resolution limiting the number or amount of awards we may receive. These or other factors could cause U.S. defense and other federal agencies to conduct research internally rather than through commercial research organizations or direct awards to other organizations, to reduce their overall contract research requirements or to exercise their rights to terminate contracts. Alternatively, the U.S. government may discontinue the SBIR program or its funding altogether. Also, SBIR regulations permit increased competition for SBIR awards from companies that may not have previously been eligible, such as those backed by venture capital operating companies, hedge funds and private equity firms. Any of these developments could limit our ability to obtain new contract awards and adversely affect our revenues, cash flows and ability to fund our growth.

Our failure to attract, train and retain skilled employees or members of our senior management and to obtain necessary security clearances for such persons or maintain a facility security clearance would adversely affect our business and operating results.

The availability of highly trained and skilled technical and professional personnel is critical to our future growth and profitability. Competition for scientists, engineers, technicians and professional personnel is intense and our competitors aggressively recruit key employees. In the past, we have experienced difficulties in recruiting and hiring these personnel as a result of the tight labor market in certain fields. Any difficulty in hiring or retaining qualified employees, combined with our growth strategy and future needs for additional experienced personnel, particularly in highly specialized areas such as nanomaterial manufacturing and fiber optic sensing technologies, may make it more difficult to meet all of our needs for these employees in a timely manner. Although we intend to continue to devote significant resources to recruit, train and retain qualified employees, we may not be able to attract and retain these employees, especially in technical fields in which the supply of experienced qualified candidates is limited, or at the senior management level. Any failure to do so would have an adverse effect on our business. Any loss of key personnel could have a material adverse effect on our ability to meet key operational objectives, such as timely and effective project milestones and product introductions, which in turn could adversely affect our business, results of operations and financial condition.

We provide certain services to the U.S. government that require us to maintain a facility security clearance and for certain of our employees and our board chairman to hold security clearances. In general, the failure for necessary persons to obtain or retain sufficient security clearances, any loss by us of a facility security clearance or any public reprimand related to security matters could result in a U.S. government customer terminating an existing contract or choosing not to renew a contract or prevent us from bidding on or winning certain new government contracts.

In addition, our future success depends in a large part upon the continued service of key members of our senior management team. We do not maintain any key-person life insurance policies on our officers. The loss of any members of our management team or other key personnel could seriously harm our business.

Our business is subject to the cyclical nature of the markets in which we compete and any future downturn may reduce demand for our products and revenue.

Many factors beyond our control affect our business, including consumer confidence in the economy, interest rates, fuel prices and the general availability of credit. The overall economic climate and changes in Gross National Product growth have a direct impact on some of our customers and the demand for our products. We cannot be sure that our business will not be adversely affected as a result of an industry or general economic downturn.

Our customers may reduce capital expenditures and have difficulty satisfying liquidity needs because of continued turbulence in the U.S. and global economies, resulting in reduced sales of our products and harm to our financial condition and results of operations.

In particular, our historical results of operations have been subject to substantial fluctuations, and we may experience substantial period-to-period fluctuations in future results of operations. Any future downturn in the markets in which we compete could significantly reduce the demand for our products and therefore may result in a significant reduction in revenue or increase the volatility of the price of our common stock. Our revenue and results of operations may be adversely affected in the future due to changes in demand from customers or cyclical changes in the markets utilizing our products.

In addition, the telecommunications industry has, from time to time, experienced, and may again experience, a pronounced downturn. To respond to a downturn, many service providers may slow their capital expenditures, cancel or delay new developments, reduce their workforces and inventories and take a cautious approach to acquiring new equipment and technologies from original equipment manufacturers, which would have a negative impact on our business. Weakness in the global economy or a future downturn in the telecommunications industry may cause our results of operations to fluctuate from quarter-to-quarter and year-to-year, harm our business, and may increase the volatility of the price of our common stock.

Customer acceptance of our products is dependent on our ability to meet changing requirements, and any decrease in acceptance could adversely affect our revenue.

Customer acceptance of our products is significantly dependent on our ability to offer products that meet the changing requirements of our customers, including telecommunication, military, medical and industrial corporations, as well as government agencies. Any decrease in the level of customer acceptance of our products could harm our business.

Our products must meet exacting specifications, and defects and failures may occur, which may cause customers to return or stop buying our products.

Our customers generally establish demanding specifications for quality, performance and reliability that our products must meet. However, our products are highly complex and may contain defects and failures when they are first introduced or as new versions are released. Our products are also subject to rough environments as they are integrated into our customer products for use by the end customers. If defects and failures occur in our products, we could experience lost revenue, increased costs, including warranty expense and costs associated with customer support, delays in or cancellations or rescheduling of orders or shipments, product returns or discounts, diversion of management resources or damage to our reputation and brand equity, and in some cases consequential damages, any of which would harm our operating results. In addition, delays in our ability to fill product orders as a result of quality control issues may negatively impact our relationship with our customers. We cannot assure you that we will have sufficient resources, including any available insurance, to satisfy any asserted claims.

Rapidly changing standards and regulations could make our products obsolete, which would cause our revenue and results of operations to suffer.

We design products to conform to our customers' requirements and our customers' systems may be subject to regulations established by governments or industry standards bodies worldwide. Because some of our products are designed to conform to current specific industry standards, if competing or new standards emerge that are preferred by our customers, we would have to make significant expenditures to develop new products. If our customers adopt new or competing industry standards with which our products are not compatible, or the industry groups adopt standards or governments issue regulations with which our products are not compatible, our existing products would become less desirable to our customers and our revenue and results of operations would suffer.

The markets for many of our products are characterized by changing technology which could cause obsolescence of our products, and we may incur substantial costs in delivering new products.

The markets for many of our products are characterized by changing technology, new product introductions and product enhancements, and evolving industry standards. The introduction or enhancement of products embodying new technology or the emergence of new industry standards could render existing products obsolete, and result in a write down to the value of our inventory, or result in shortened product life cycles. Accordingly, our ability to compete is in part dependent on our ability to continually offer enhanced and improved products.

The success of our new product offerings will depend upon several factors, including our ability to:

- accurately anticipate customer needs;
- innovate and develop new technologies and applications;
- successfully commercialize new technologies in a timely manner;
- price products competitively and manufacture and deliver products in sufficient volumes and on time; and
- differentiate our product offerings from those of our competitors.

Our inability to find new customers or retain existing customers could harm our business.

Our business is reliant on our ability to find new customers and retain existing customers. In particular, customers normally purchase certain of our products and incorporate them into products that they, in turn, sell in their own markets on an ongoing basis. As a result, the historical sales or these products have been dependent upon the success of our customers' products and our future performance is dependent upon our success in finding new customers and receiving new orders from existing customers.

In several markets, the quality and reliability of our products are a major concern for our customers, not only upon the initial manufacture of the product, but for the life of the product. Many of our products are used in remote locations for higher value assembly, making servicing of our products unfeasible. Any failure of the quality or reliability of our products could harm our business.

Customer demand for our products is difficult to accurately forecast and, as a result, we may be unable to optimally match production with customer demand, which could adversely affect our business and financial results.

We make planning and spending decisions, including determining the levels of business that we will seek and accept, production schedules, inventory levels, component procurement commitments, personnel needs and other resource requirements, based on our estimates of customer requirements. The short-term nature of commitments by many of our customers and the possibility of unexpected changes in demand for their products reduce our ability to accurately estimate future customer requirements. On occasion, customers may require rapid increases in production, which can strain our resources, cause our manufacturing to be negatively impacted by materials shortages, necessitate higher or more restrictive procurement commitments, increase our manufacturing yield loss and scrapping of excess materials, and reduce our gross margin. We may not have sufficient capacity at any given time to meet the volume demands of our customers, or one or more of our suppliers may not have sufficient capacity at any given time to meet our volume demands. Conversely, a downturn in the markets in which our customers compete can cause, and in the past have caused, our customers to significantly reduce or delay the amount of products ordered or to cancel existing orders, leading to lower utilization of our facilities. Because many of our costs and operating expenses are relatively fixed, reduction in customer demand due to market downturns or other reasons would have a negative effect on our gross margin, operating income and cash flow.

The results of our operations could be adversely affected by economic and political conditions and the effects of these conditions on our customers' businesses and levels of business activity.

Global economic and political conditions affect our customers' businesses and the markets they serve. A severe or prolonged economic downturn or a negative or uncertain political climate could adversely affect our customers' financial conditions and the timing or levels of business activity of our customers and the industries we serve. This may reduce the demand for our products or depress pricing for our products and have a material adverse effect on our results of operations. Changes in global economic conditions could also shift demand to products or services for which we do not have competitive advantages, and this could negatively affect the amount of business we are able to obtain. In addition, if we are unable to successfully anticipate changing economic and political conditions, we may be unable to effectively plan for and respond to those changes, and our business could be negatively affected as a result.

We have a history of losses, and because our strategy for expansion may be costly to implement, we may experience losses and may not maintain profitability or positive cash flow.

We have a history of net losses from operations and only recently generated positive net income from continuing operations of $1.2 million for the year ended December 31, 2018. We expect to continue to incur significant expenses as we pursue our strategic initiatives, including increased expenses for research and development, sales and marketing and manufacturing. We may also grow our business in part through acquisitions of additional companies and complementary technologies which could cause us to incur greater than anticipated transaction expenses, amortization or write-offs of intangible assets and other acquisition-related expenses. As a result, we may incur net losses in the future, and these losses could be substantial. At a certain level, continued net losses could impair our ability to comply with Nasdaq continued listing standards, as described further below.

Our ability to generate additional revenues and to become profitable will depend on our ability to execute our key growth initiative regarding the development, marketing and sale of sensing products, develop and commercialize innovative technologies, expand our contract research capabilities and sell the products that result from those development initiatives. We may not be able to sustain or increase our profitability on a quarterly or annual basis.

We may require additional capital to support and expand our business.

We intend to continue to make investments to support our business growth, including developing new products, enhancing our existing products, obtaining important regulatory approvals, enhancing our operating infrastructure, completing our development activities and building our commercial scale manufacturing facilities. To the extent that we are unable to become or remain profitable and to finance our activities from continuing operations, we may require additional funds to support these initiatives and to grow our business.

If we are successful in raising additional funds through issuances of equity or convertible debt securities, our existing stockholders could suffer significant dilution, including as the result of the issuance of warrants in connection with the financing, and any new equity securities we issue could have rights, preferences and privileges superior to those of our existing common stock. Furthermore, such financings may jeopardize our ability to apply for SBIR grants or qualify for SBIR contracts or grants, and our dependence on SBIR grants may restrict our ability to raise additional outside capital. If we raise additional funds through debt financings, these financings may involve significant cash payment obligations and covenants that restrict our ability to operate our business and make distributions to our stockholders.

If we are unable to obtain adequate financing or financing terms satisfactory to us when we require it, our ability to continue to support our business growth and to respond to business challenges could be significantly limited.

We face and will face substantial competition in several different markets that may adversely affect our results of operations.

We face and will face substantial competition from a variety of companies in several different markets. As we focus on developing marketing and selling fiber optic sensing products, we may also face substantial and entrenched competition in that market.

Many of our competitors have longer operating histories, greater name recognition, larger customer bases and significantly greater financial, sales and marketing, manufacturing, distribution, technical and other resources than we do. These competitors may be able to adapt more quickly to new or emerging technologies and changes in customer requirements. In addition, current and potential competitors have established or may establish financial or strategic relationships among themselves or with existing or potential customers or other third parties. Accordingly, new competitors or alliances among competitors could emerge and rapidly acquire significant market share. We cannot assure you that we will be able to compete successfully against current or new competitors, in which case our revenues may fail to increase or may decline.

Intense competition in our markets could result in aggressive business tactics by our competitors, including aggressively pricing their products or selling older inventory at a discount. If our current or future competitors utilize aggressive business tactics, including those described above, demand for our products could decline, we could experience delays or cancellations of customer orders, or we could be required to reduce our sales prices.

Shifts in product mix may result in declines in gross profit.

Our gross profit margins vary among our product platforms, and are generally highest on our test and measurement instruments. Our overall gross profit may fluctuate from period to period as a result of a variety of factors including shifts in product mix, the introduction of new products, and decreases in average selling prices for older products. If our customers decide to buy more of our products with low gross profit margins or fewer of our products with high gross profit margins, our total gross profits could be harmed.

Risks Relating to our Operations and Business Strategy

If we are unable to successfully integrate acquired businesses, it could have an adverse effect on our future results and the market price of our common stock.

In October 2018 we acquired the assets of Micron Optics, Inc., a leading provider of innovative optical components and laser-based equipment that advance the quality of optical measurements. In March 2019 we acquired General Photonics Corporation, a leading provider of innovative components, modules and test equipment focused on the generation, measurement and control of polarized light critical in fiber optic-based applications. In the future, we may continue to seek acquisition targets supporting our growth strategy. The success of an acquisition will depend, in large part, on sales of the acquired company's products and the realization of operating synergies. To realize these anticipated benefits, we must successfully integrate the acquired company's business into our existing business. Such integrations may be complex and time-consuming. The failure to successfully integrate and manage the challenges presented by the integration process may result in our failure to achieve some or all of the anticipated benefits of the acquisition. Potential difficulties that may be encountered in the integration process include the following:

- lost sales and customers as a result of customers deciding not to do business with us;
- complexities associated with managing the larger combined company with distant business locations;
- integrating personnel while maintaining focus on providing consistent, high quality products;
- loss of key employees;
- potential unknown liabilities associated with the acquisition;
- performance shortfalls as a result of the division of management's attention caused by completing the acquisition and integrating operations.

If any of these events were to occur, our ability to maintain relationships with the customers, suppliers and employees or our ability to achieve the anticipated benefits of the acquisition could be adversely affected, or could reduce our future earnings or otherwise adversely affect our business and financial results and, as a result, adversely affect the market price of our common stock.

If we cannot successfully transition our revenue mix from contract research revenues to product sales and license revenues, we may not be able to fully execute our business model or grow our business.

Our business model and future growth depend on our ability to transition to a revenue mix that contains significantly larger product sales and revenues from the provision of services or from licensing. Product sales and these revenues potentially offer greater scalability than contract research revenues. Our current plan is to increase our sales of commercial products, our licensing revenues and our provision of non-research services to customers so as to represent a larger percentage of our total revenues. If we are unable to develop and grow our product sales and revenues from the provision of services or from licensing to augment our contract research revenues, however, our ability to execute our business model or grow our business could suffer. There can be no assurance that we will be able to achieve increased revenues in this manner.

Failure to develop, introduce and sell new products or failure to develop and implement new technologies, could adversely impact our financial results.

Our success will depend on our ability to develop and introduce new products that customers choose to buy. The new products the market requires tend to be increasingly complex, incorporating more functions and operating at faster speeds than old products. If we fail to introduce new product designs or technologies in a timely manner or if customers do not successfully introduce new systems or products incorporating our products, our business, financial condition and results of operations could be materially harmed.

If we are unable to manage growth effectively, our revenues and net loss could be adversely affected.

We may need to expand our personnel resources to grow our business effectively. We believe that sustained growth at a higher rate will place a strain on our management as well as on our other human resources. To manage this growth, we must continue to attract and retain qualified management, professional, scientific and technical and operating personnel. If we are unable to recruit a sufficient number of qualified personnel, we may be unable to staff and manage projects adequately, which in turn may slow the rate of growth of our contract research revenues or our product development efforts.

We may not be successful in identifying market needs for new technologies or in developing new products.

Part of our business model depends on our ability to correctly identify market needs for new technologies. We intend to identify new market needs, but we may not always have success in doing so in part because our contract research largely centers on identification and development of unproven technologies, often for new or emerging markets. Furthermore, we must identify the most promising technologies from a sizable pool of projects. If our commercialization strategy process fails to identify projects with commercial potential or if management does not ensure that such projects advance to the commercialization stage, we may not successfully commercialize new products and grow our revenues.

Our growth strategy requires that we also develop successful commercial products to address market needs. We face several challenges in developing successful new products. Many of our existing products and those currently under development are technologically innovative and require significant and lengthy product development efforts. These efforts include planning, designing, developing and testing at the technological, product and manufacturing-process levels. These activities require us to make significant investments. Although there are many potential applications for our technologies, our resource constraints require us to focus on specific products and to forgo other opportunities. We expect that one or more of the potential products we choose to develop will not be technologically feasible or will not achieve commercial acceptance, and we cannot predict which, if any, of our products we will successfully develop or commercialize. The technologies we research and develop are new and steadily changing and advancing. The products that are derived from these technologies may not be applicable or compatible with the state of technology or demands in existing markets. Our existing products and technologies may become uncompetitive or obsolete if our competitors adapt more quickly than we do to new technologies and changes in customers' requirements. Furthermore, we may not be able to identify if and when new markets will open for our products given that future applications of any given product may not be readily determinable, and we cannot reasonably estimate the size of any markets that may develop. If we are not able to successfully develop new products, we may be unable to increase our product revenues.

We face risks associated with our international business.

We currently conduct business internationally and we might considerably expand our international activities in the future. Our international business operations are subject to a variety of risks associated with conducting business internationally, including:

- having to comply with U.S. export control regulations and policies that restrict our ability to communicate with non-U.S. employees and supply foreign affiliates and customers;
- changes in or interpretations of foreign regulations that may adversely affect our ability to sell our products, perform services or repatriate profits to the United States;
- the imposition of tariffs;
- hyperinflation or economic or political instability in foreign countries;
- imposition of limitations on, or increase of withholding and other taxes on remittances and other payments by foreign subsidiaries or joint ventures;
- conducting business in places where business practices and customs are unfamiliar and unknown;
- the imposition of restrictive trade policies;
- the imposition of inconsistent laws or regulations;
- the imposition or increase of investment and other restrictions or requirements by foreign governments;
- uncertainties relating to foreign laws and legal proceedings;
- having to comply with a variety of U.S. laws, including the Foreign Corrupt Practices Act ("FCPA"); and
- having to comply with licensing requirements.

We do not know the impact that these regulatory, geopolitical and other factors may have on our international business in the future.

Recent developments relating to the United Kingdom's referendum vote in favor of withdrawal from the European Union could adversely affect us.

On June 23, 2016, the U.K. held a referendum in which a majority of the eligible members of the electorate voted for the U.K. to leave the EU. The U.K's withdrawal from the EU is commonly referred to as Brexit. Pursuant to Article 50 of the Treaty on European Union, the U.K. will cease to be an EU Member State either on the effective date of a withdrawal agreement (entry into such a withdrawal agreement will require U.K. parliamentary approval) or, failing that, two years following the U.K's notification of its intention to leave the EU (the "Brexit Date"), unless the European Council (together with the U.K.) unanimously decides to extend the two year period. On March 29, 2017, the U.K. formally notified the European Council of its intention to leave the EU. It appears likely that Brexit will continue to involve a process of lengthy negotiations between the U.K. and EU Member States to determine the future terms of the U.K's relationship with the EU. For example, in March 2018, the U.K. reached a provisional agreement (the "Withdrawal Agreement") with the EU on transitional arrangements following the U.K's exit (which are intended to enable the U.K. to remain within the EU single market and customs union for a transitional period through 2020), but the Withdrawal Agreement needs to be formally agreed as part of the withdrawal arrangements currently under negotiation. Given that no formal withdrawal arrangements have been agreed, there have been several extensions to the Brexit Date and the U.K. has yet to formally leave the EU. On April 11, 2019, the EU granted the U.K. a further extension to the Brexit Date until October 31, 2019. The purpose of this extension is to allow for the ratification of the Withdrawal Agreement by the U.K. House of Commons. If the Withdrawal Agreement is ratified, the U.K. will leave the EU earlier than October 31, 2019. As a condition of the extension, the U.K. must take part in EU elections on May 23, 2019. If it does not, the U.K. must leave the EU on June 1, 2019 without any formal withdrawal arrangements.

The uncertainty concerning the U.K.'s legal, political and economic relationship with the EU after Brexit may be a source of instability in the international markets, create significant currency fluctuations, and/or otherwise adversely affect trading agreements or similar cross-border cooperation arrangements (whether economic, tax, fiscal, legal, regulatory or otherwise) beyond the date of Brexit.

These developments, or the perception that any of them could occur, have had and may continue to have a significant adverse effect on global economic conditions and the stability of global financial markets, and could significantly reduce global market liquidity and restrict the ability of key market participants to operate in certain financial markets. In particular, they could also lead to a period of considerable uncertainty in relation to the U.K. financial and banking markets, as well as on the regulatory process in Europe. Asset valuations, currency exchange rates and credit ratings may be especially subject to increased market volatility.

If the U.K. and the EU are unable to negotiate acceptable withdrawal terms or if other EU Member States pursue withdrawal, barrier-free access between the U.K. and other EU Member States or among the European Economic Area overall could be diminished or eliminated. The long-term effects of Brexit will depend on any agreements (or lack thereof) between the U.K. and the EU and, in particular, any arrangements for the U.K. to retain access to EU markets either during a transitional period or more permanently.

Such a withdrawal from the EU is unprecedented, and it is unclear how the U.K.'s access to the European single market for goods, capital, services and labor within the EU, or single market, and the wider commercial, legal and regulatory environment, will impact our U.K. customers. The occurrence of any such event could subject us to additional costs and impair our ability to complete projects for our clients, which could adversely affect our operating results and financial condition.

We may dispose of or discontinue existing product lines and technology developments, which may adversely impact our future results.

On an ongoing basis, we evaluate our various product offerings and technology developments in order to determine whether any should be discontinued or, to the extent possible, divested. In addition, if we are unable to generate the amount of cash needed to fund the future operations of our business, we may be forced to sell one or more of our product lines or technology developments.

We cannot guarantee that we have correctly forecasted, or that we will correctly forecast in the future, the right product lines and technology developments to dispose or discontinue or that our decision to dispose of our discontinued various investments, product lines and technology developments is prudent if market conditions change. In addition, there are no assurances that the discontinuance of various product lines will reduce operating expenses or will not cause us to incur material charges associated with such decision. Furthermore, the discontinuance of existing product lines entails various risks, including the risk that we will not be able to find a purchaser for a product line or the purchase price obtained will not be equal to at least the book value of the net assets for the product line. Other risks including managing the expectations of, and maintaining good relations with, our historical customers who previously purchased products from a disposed or discontinued product line, which could prevent us from selling other products to them in the future. We may also incur other significant liabilities and costs associated with disposal or discontinuance of product lines, including employee severance costs and excess facilities costs.

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We could be negatively affected by a security breach, either through cyber-attack, cyber-intrusion or other significant disruption of our IT networks and related systems.

We face the risk, as does any company, of a security breach, whether through cyber-attack or cyber-intrusion over the internet, malware, computer viruses, attachments to e-mails, persons inside our organization or persons with access to systems inside our organization, or other significant disruption of our IT networks and related systems. The risk of a security breach or disruption, particularly through cyber-attack or cyber-intrusion, including by computer hackers, foreign governments and cyber terrorists, has increased as the number, intensity and sophistication of attempted attacks and intrusions from around the world have increased.

As a technology company, and particularly as a government contractor, we may face a heightened risk of a security breach or disruption from threats to gain unauthorized access to our proprietary, confidential or classified information on our IT networks and related systems. These types of information and IT networks and related systems are critical to the operation of our business and essential to our ability to perform day-to-day operations, and, in some cases, are critical to the operations of certain of our customers. In addition, as certain of our technological capabilities become widely known, it is possible that we may be subjected to cyber-attack or cyber-intrusion as third parties seek to gain improper access to information regarding these capabilities and cyber-attacks or cyber-intrusion could compromise our confidential information or our IT networks and systems generally, as it is not practical as a business matter to isolate all of our confidential information and trade secrets from email and internet access. To date, we have not experienced a significant cyber-intrusion or cyber-attack. There can be no assurance that our security efforts and measures will be effective or that attempted security breaches or disruptions would not be successful or damaging.

A security breach or other significant disruption involving these types of information and IT networks and related systems could disrupt the proper functioning of these networks and systems and therefore our operations, compromise our confidential information and trade secrets, or damage our reputation among our customers and the public generally. Any of these developments could have a negative impact on our results of operations, financial condition and cash flows.

Risks Relating to our Regulatory Environment

Our operations are subject to domestic and foreign laws, regulations and restrictions, and noncompliance with these laws, regulations and restrictions could expose us to fines, penalties, suspension or debarment, which could have a material adverse effect on our profitability and overall financial position.

Our operations, particularly our international sales, subject us to numerous U.S. and foreign laws and regulations, including, without limitation, regulations relating to imports, exports (including the Export Administration Regulations and the

International Traffic in Arms Regulations), technology transfer restrictions, anti-boycott provisions, economic sanctions and the FCPA. The number of our various emerging technologies, the development of many of which has been funded by the Department of Defense, presents us with many regulatory challenges. Failure by us or our sales representatives or consultants to comply with these laws and regulations could result in administrative, civil, or criminal liabilities and could result in suspension of our export privileges, which could have a material adverse effect on our business. Changes in regulation or political environment may affect our ability to conduct business in foreign markets including investment, procurement and repatriation of earnings.

Environmental regulations could increase operating costs and additional capital expenditures and delay or interrupt operations.

The photonics industry, as well as the semiconductor industry, are subject to governmental regulations for the protection of the environment, including those relating to air and water quality, solid and hazardous waste handling, and the promotion of occupational safety. Various federal, state and local laws and regulations require that we maintain certain environmental permits. While we believe that we have obtained all necessary environmental permits required to conduct our manufacturing processes, if we are found to be in violation of these laws, we could be subject to governmental fines and liability for damages resulting from such violations.

Changes in the aforementioned laws and regulations or the enactment of new laws, regulations or policies could require increases in operating costs and additional capital expenditures and could possibly entail delays or interruptions of our operations.

If our manufacturing facilities do not meet Federal, state or foreign country manufacturing standards, we may be required to temporarily cease all or part of our manufacturing operations, which would result in product delivery delays and negatively impact revenues.

Our manufacturing facilities are subject to periodic inspection by regulatory authorities and our operations will continue to be regulated by the FDA for compliance with Good Manufacturing Practice requirements contained in the quality systems regulations. We are also required to comply with International Organization for Standardization ("ISO"), quality system standards in order to produce certain of our products for sale in Europe. If we fail to continue to comply with Good Manufacturing Practice requirements or ISO standards, we may be required to cease all or part of our operations until we comply with these regulations. Obtaining and maintaining such compliance is difficult and costly. We cannot be certain that our facilities will be found to comply with Good Manufacturing Practice requirements or ISO standards in future inspections and audits by regulatory authorities. In addition, if we cannot maintain or establish manufacturing facilities or operations that comply with such standards or do not meet the expectations of our customers, we may not be able to realize certain economic opportunities in our current or future supply arrangements.

We are subject to additional significant foreign and domestic government regulations, including environmental and health and safety regulations, and failure to comply with these regulations could harm our business.

Our facilities and current and proposed activities involve the use of a broad range of materials that are considered hazardous under applicable laws and regulations. Accordingly, we are subject to a number of foreign, federal, state and local laws and regulations relating to health and safety, protection of the environment and the storage, use, disposal of, and exposure to, hazardous materials and wastes. We could incur costs, fines and civil and criminal penalties, personal injury and third party property damage claims, or could be required to incur substantial investigation or remediation costs, if we were to violate or become liable under environmental, health and safety laws. Moreover, a failure to comply with environmental laws could result in fines and the revocation of environmental permits, which could prevent us from conducting our business. Liability under environmental laws can be joint and several and without regard to fault. There can be no assurance that violations of environmental and health and safety laws will not occur in the future as a result of the inability to obtain permits, human error, equipment failure or other causes. Environmental laws could become more stringent over time, imposing greater compliance costs and increasing risks and penalties associated with violations, which could harm our business. Accordingly, violations of present and future environmental laws could restrict our ability to expand facilities, pursue certain technologies, and could require us to acquire costly equipment or incur potentially significant costs to comply with environmental regulations.

Compliance with foreign, federal, state and local environmental laws and regulations represents a small part of our present budget. If we fail to comply with any such laws or regulations, however, a government entity may levy a fine on us or require us to take costly measures to ensure compliance. Any such fine or expenditure may adversely affect our development. We cannot predict the extent to which future legislation and regulation could cause us to incur additional operating expenses, capital expenditures or restrictions and delays in the development of our products and properties.

Risks Relating to our Intellectual Property

Our proprietary rights may not adequately protect our technologies.

Our commercial success will depend in part on our obtaining and maintaining patent, trade secret, copyright and trademark protection of our technologies in the United States and other jurisdictions as well as successfully enforcing this intellectual property and defending it against third-party challenges. We will only be able to protect our technologies from unauthorized use by third parties to the extent that valid and enforceable intellectual property protections, such as patents or trade secrets, cover them. In particular, we place considerable emphasis on obtaining patent and trade secret protection for significant new technologies, products and processes. The degree of future protection of our proprietary rights is uncertain because legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep our competitive advantage. The degree of future protection of our proprietary rights is also uncertain for products that are currently in the early stages of development because we cannot predict which of these products will ultimately reach the commercial market or whether the commercial versions of these products will incorporate proprietary technologies.

Our patent position is highly uncertain and involves complex legal and factual questions. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in our patents or in third-party patents. For example:

- we or our licensors might not have been the first to make the inventions covered by each of our pending patent applications and issued patents;
- we or our licensors might not have been the first to file patent applications for these inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies;
- it is possible that none of our pending patent applications or the pending patent applications of our licensors will result in issued patents;
- patents may issue to third parties that cover how we might practice our technology;
- our issued patents and issued patents of our licensors may not provide a basis for commercially viable technologies, may not provide us with any competitive advantages, or may be challenged and invalidated by third parties; and
- we may not develop additional proprietary technologies that are patentable.

Patents may not be issued for any pending or future pending patent applications owned by or licensed to us, and claims allowed under any issued patent or future issued patent owned or licensed by us may not be valid or sufficiently broad to protect our technologies. Moreover, protection of certain of our intellectual property may be unavailable or limited in the United States or in foreign countries, and we have not sought to obtain foreign patent protection for certain of our products or technologies due to cost, concerns about enforceability or other reasons. Any issued patents owned by or licensed to us now or in the future may be challenged, invalidated, or circumvented, and the rights under such patents may not provide us with competitive advantages. In addition, competitors may design around our technology or develop competing technologies. Intellectual property rights may also be unavailable or limited in some foreign countries, and in the case of certain products no foreign patents were filed or can be filed. This could make it easier for competitors to capture or increase their market share with respect to related technologies. We could incur substantial costs to bring suits in which we may assert our patent rights against others or defend ourselves in suits brought against us. An unfavorable outcome of any litigation could have a material adverse effect on our business and results of operations.

We also rely on trade secrets to protect our technology, especially where we believe patent protection is not appropriate or obtainable. However, trade secrets are difficult to protect. We regularly attempt to obtain confidentiality agreements and contractual provisions with our collaborators, employees and consultants to protect our trade secrets and proprietary know-how. These agreements may be breached or may not have adequate remedies for such breach. While we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors or scientific and other advisors, or those of our strategic partners, may unintentionally or willfully disclose our information to competitors. If we were to enforce a claim that a third party had illegally obtained and was using our trade secrets, our enforcement efforts would be expensive and time consuming, and the outcome would be unpredictable. In addition, courts outside the United States are sometimes unwilling to protect trade secrets. Moreover, if our competitors independently develop equivalent knowledge, methods and know-how, it will be more difficult for us to enforce our rights and our business could be harmed.

If we are not able to defend the patent or trade secret protection position of our technologies, then we will not be able to exclude competitors from developing or marketing competing technologies and we may not generate enough revenues from product sales to justify the cost of developing our technologies and to achieve or maintain profitability.

We also rely on trademarks to establish a market identity for our company and our products. To maintain the value of our trademarks, we might have to file lawsuits against third parties to prevent them from using trademarks confusingly similar to or dilutive of our registered or unregistered trademarks. Also, we might not obtain registrations for our pending trademark applications, and we might have to defend our registered trademark and pending trademark applications from challenge by third parties. Enforcing or defending our registered and unregistered trademarks might result in significant litigation costs and damages, including the inability to continue using certain trademarks.

Third parties may claim that we infringe their intellectual property, and we could suffer significant litigation or licensing expense as a result.

Various U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in our technology areas. Such third parties may claim that we infringe their patents. Because patent applications can take several years to result in a patent issuance, there may be currently pending applications, unknown to us, which may later result in issued patents that our technologies may infringe. For example, we are aware of competitors with patents in technology areas applicable to our optical test equipment products. Such competitors may allege that we infringe these patents. There could also be existing patents of which we are not aware that our technologies may inadvertently infringe. We have from time to time been, and may in the future be, contacted by third parties, including patent assertion entities or intellectual property advisors, about licensing opportunities that also contain claims that we are infringing on third party patent rights. If third parties assert these claims against us, we could incur extremely substantial costs and diversion of management resources in defending these claims, and the defense of these claims could have a material adverse effect on our business, financial condition and results of operations. Even if we believe we have not infringed on a third party's patent rights, we may have to settle a claim on unfavorable terms because we cannot afford to litigate the claim. In addition, if third parties assert claims against us and we are unsuccessful in defending against these claims, these third parties may be awarded substantial damages as well as injunctive or other equitable relief against us, which could effectively block our ability to make, use, sell, distribute or market our products and services in the United States or abroad.

Commercial application of nanotechnologies in particular, or technologies involving nanomaterials, is new and the scope and breadth of patent protection is uncertain. Consequently, the patent positions of companies involved in nanotechnologies have not been tested, and there are complex legal and factual questions for which important legal principles will be developed or may remain unresolved. In addition, it is not clear whether such patents will be subject to interpretations or legal doctrines that differ from conventional patent law principles. Changes in either the patent laws or in interpretations of patent laws in the United States and other countries may diminish the value of our nanotechnology-related intellectual property. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in our nanotechnology-related patents or in third party patents. In the event that a claim relating to intellectual property is asserted against us, or third parties not affiliated with us hold pending or issued patents that relate to our products or technology, we may seek licenses to such intellectual property or challenge those patents. However, we may be unable to obtain these licenses on commercially reasonable terms, if at all, and our challenge of the patents may be unsuccessful. Our failure to obtain the necessary licenses or other rights could prevent the sale, manufacture or distribution of our products and, therefore, could have a material adverse effect on our business, financial condition and results of operations.

A substantial portion of our technology is subject to retained rights of our licensors, and we may not be able to prevent the loss of those rights or the grant of similar rights to third parties.

A substantial portion of our technology is licensed from academic institutions, corporations and government agencies. Under these licensing arrangements, a licensor may obtain rights over the technology, including the right to require us to grant a license to one or more third parties selected by the licensor or that we provide licensed technology or material to third parties for non-commercial research. The grant of a license for any of our core technologies to a third party could have a material and adverse effect on our business. In addition, some of our licensors retain certain rights under the licenses, including the right to grant additional licenses to a substantial portion of our core technology to third parties for non-commercial academic and research use. It is difficult to monitor and enforce such non-commercial academic and research uses, and we cannot predict whether the third-party licensees would comply with the use restrictions of such licenses. We have incurred and could incur substantial expenses to enforce our rights against them. We also may not fully control the ability to assert or defend those patents or other intellectual property which we have licensed from other entities, or which we have licensed to other entities.

In addition, some of our licenses with academic institutions give us the right to use certain technology previously developed by researchers at these institutions. In certain cases, we also have the right to practice improvements on the licensed technology to the extent they are encompassed by the licensed patents and are within our field of use. Our licensors may currently own and may in the future obtain additional patents and patent applications that are necessary for the development, manufacture and commercial sale of our anticipated products. We may be unable to agree with one or more academic institutions from which we have obtained licenses whether certain intellectual property developed by researchers at these academic institutions is covered by our existing licenses. In the event that the new intellectual property is not covered by our existing licenses, we would be required to negotiate a new license agreement. We may not be able to reach agreement with current or future licensors on commercially reasonable terms, if at all, or the terms may not permit us to sell our products at a profit after payment of royalties, which could harm our business.

Some of our patents may cover inventions that were conceived or first reduced to practice under, or in connection with, U.S. government contracts or other federal funding agreements. With respect to inventions conceived or first reduced to practice under a federal funding agreement, the U.S. government may retain a non-exclusive, non-transferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the invention throughout the world. We may not succeed in our efforts to retain title in patents, maintain ownership of intellectual property or in limiting the U.S. government's rights in our proprietary technologies and intellectual property when an issue exists as to whether such intellectual property was developed in the performance of a federal funding agreement or developed at private expense.

If we fail to obtain the right to use the intellectual property rights of others which are necessary to operate our business, and to protect their intellectual property, our business and results of operations will be adversely affected.

In the past, we have licensed certain technologies for use in our products. In the future, we may choose, or be required, to license technology or intellectual property from third parties in connection with the development of our products. We cannot assure you that third-party licenses will be available on commercially reasonable terms, if at all. Our competitors may be able to obtain licenses, or cross-license their technology, on better terms than we can, which could put us at a competitive disadvantage. Also, we often enter into confidentiality agreements with such third parties in which we agree to protect and maintain their proprietary and confidential information, including at times requiring our employees to enter into agreements protecting such information. There can be no assurance that the confidentiality agreements will not be breached by any of our employees or that such third parties will not make claims that their proprietary information has been disclosed.

RISKS RELATING TO OUR COMMON STOCK

The United States Tax Cuts and Jobs Act of 2017 could adversely affect our business and financial condition.

The U.S. Tax Cuts and Jobs Act (the "TCJA") significantly reforms the US Internal Revenue Code. The TCJA, among other things, contains significant changes to U.S. federal corporate income taxation, including reduction of the U.S. federal corporate income tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted earnings (except for certain small businesses), limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits. Federal net operating losses arising in taxable year ending after December 31, 2017, will be carried forward indefinitely pursuant to the TCJA. We continue to examine the impact this tax reform legislation may have on our business. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the TCJA is uncertain and our business and financial condition could be adversely affected. The impact of this tax reform on holders of our common stock is also uncertain and could be adverse. We urge our stockholders to consult with their legal and tax advisors with respect to such legislation and the potential tax consequences of investing in our common stock.

If there are substantial sales of our common stock, or the perception that such sales may occur, our stock price could decline.

If any of our stockholders were to sell substantial amounts of our common stock, the market price of our common stock may decline, which might make it more difficult for us to sell equity or equity-related securities in the future at a time and price that we deem appropriate. Substantial sales of our common stock, or the perception that such sales may occur, may have a material adverse effect on the prevailing market price of our common stock.

Carilion Clinic holds approximately 3.4 million shares of our common stock (including approximately 1.3 million shares issuable to Carilion upon conversion of shares of Series A Convertible Preferred Stock that Carilion holds). All of these shares have been registered for sale on a Form S-3 registration statement and, accordingly, may generally be freely sold by Carilion at any time. Any sales of these shares, or the perception that future sales of shares may occur by Carilion or any of our other significant stockholders, may have a material adverse effect on the market price of our stock. Any such continuing material adverse effect on the market price of our stock could impair our ability to comply with Nasdaq's continuing listing standards in respect of our minimum stock price, as further described below.

We may become involved in securities class action litigation that could divert management's attention and harm our business and our insurance coverage may not be sufficient to cover all costs and damages.

The stock market has from time to time experienced significant price and volume fluctuations that have affected the market prices for the common stock of technology companies. These broad market fluctuations may cause the market price of our common stock to decline. In the past, following periods of volatility in the market price of a particular company's securities, securities class action litigation has often been brought against that company. Securities class litigation also often follows certain significant business transactions, such as the sale of a business division or a change in control transaction. We may become involved in this type of litigation in the future. Litigation often is expensive and diverts management's attention and resources, which could adversely affect our business.

Our common stock price has been volatile and we expect that the price of our common stock will fluctuate substantially in the future, which could cause you to lose all or a substantial part of your investment.

The public trading price for our common stock is volatile and may fluctuate significantly. Since January 1, 2009, our common stock has traded between a high of $5.00 per share and a low of $0.26 per share. Among the factors, many of which we cannot control, that could cause material fluctuations in the market price for our common stock are:

- sales of our common stock by our significant stockholders, or the perception that such sales may occur;
- changes in earnings estimates, investors' perceptions, recommendations by securities analysts or our failure to achieve analysts' earnings estimates;
- changes in our status as an entity eligible to receive SBIR contracts and grants;
- quarterly variations in our or our competitors' results of operations;
- general market conditions and other factors unrelated to our operating performance or the operating performance of our competitors;
- announcements by us, or by our competitors, of acquisitions, new products, significant contracts, commercial relationships or capital commitments;
- pending or threatened litigation;
- any major change in our board of directors or management or any competing proxy solicitations for director nominees;
- changes in governmental regulations or in the status of our regulatory approvals;
- announcements related to patents issued to us or our competitors;
- a lack of, limited or negative industry or securities analyst coverage;
- discussions of our company or our stock price by the financial and scientific press and online investor communities; and
- general developments in our industry.

In addition, the stock prices of many technology companies have experienced wide fluctuations that have often been unrelated to the operating performance of those companies. These factors may materially and adversely affect the market price of our common stock.

We expect that we will have to implement additional finance and accounting systems, procedures and controls to satisfy additional SEC reporting requirements that we will become subject to in the near future, which will increase our costs and require additional management resources. If we are unable to maintain effective internal control over financial reporting, it could harm investor confidence.

Section 404(a) of the Sarbanes-Oxley Act of 2002 requires us to include an internal control report with our Annual Report on Form 10-K. That report must include management's assessment of the effectiveness of our internal control over financial reporting as of the end of the fiscal year. We evaluate our existing internal control over financial reporting based on the framework issued by the Committee of Sponsoring Organizations of the Treadway Commission. During the course of our ongoing evaluation of the internal controls, we may identify areas requiring improvement, and may have to design enhanced processes and controls to address issues identified through this review. Remedying any deficiencies, significant deficiencies or material weaknesses that we identify may require us to incur significant costs and expend significant time and management resources. We cannot assure you that any of the measures we implement to remedy any such deficiencies will effectively mitigate or remedy such deficiencies. Investors could lose confidence in our financial reports, and our stock price may be adversely affected, if our internal controls over financial reporting are found not to be effective by management or if we make disclosure of existing or potential significant deficiencies or material weaknesses in those controls.

We are currently classified as a non-accelerated filer under SEC regulations. Until we are classified as an accelerated filer (based on the value of our "public float" measured as of the end of our second fiscal quarter), we are exempt from compliance with Section 404(b) of the Sarbanes-Oxley Act of 2002, relating to the attestation and reporting by our external auditing firm on our internal control over financial reporting. Based on the recent trading price of our common stock on the Nasdaq Capital Market, we currently expect that our public float, as of June 30, 2019, will exceed the triggering threshold for accelerated filer status and that, as a result, we will become an accelerated filer as of the end of 2019. If that occurs, we would be required to comply with Section 404(b) beginning with our Form 10-K for the year ending December 31, 2019. If we become subject to this requirement, we will be required to incur additional costs, which increased costs could be material to us and affect our results of operations. In addition, this effort would require additional management attention and resources.

Additionally, if we become subject to Section 404(b) of the Sarbanes-Oxley Act of 2002, and if we fail to maintain or implement adequate controls, or if our independent registered public accounting firm is unable to provide us with an unqualified report as to the effectiveness of our internal control over financial reporting as of the date of our first Form 10-K for which compliance is required, investors could lose confidence in the reliability of our internal control over financial reporting and in the accuracy of our periodic reports filed under the Exchange Act. A lack of investor confidence in the reliability and accuracy of our public reporting could cause our stock price to decline.

Regardless of whether we are subject to Section 404(b) of the Sarbanes-Oxley Act, if our internal control over financial reporting is found not to be effective or if we make disclosure of existing or potential material weaknesses in those controls, investors could lose confidence in our financial reports, and our stock price may be adversely affected.

If our estimates relating to our critical accounting policies are based on assumptions or judgments that change or prove to be incorrect, our operating results could fall below expectations of financial analysts and investors, resulting in a decline in our stock price.

The preparation of financial statements in conformity with U.S. GAAP requires our management to make estimates, assumptions and judgments that affect the amounts reported in the consolidated financial statements and accompanying notes. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets, liabilities, equity, revenue and expenses that are not readily apparent from other sources. Our operating results may be adversely affected if our assumptions change or if actual circumstances differ from those in our assumptions, which could cause our operating results to fall below the expectations of financial analysts and investors, resulting in a decline in our stock price. Significant assumptions and estimates used in preparing our consolidated financial statements include those related to revenue recognition, stock-based compensation and income taxes. Moreover, the new revenue recognition guidance, ASC Topic 606, *Revenue from Contracts with Customers*, requires more judgment than did the prior guidance.

Our financial results may be adversely affected by changes in accounting principles applicable to us.

U.S. GAAP are subject to interpretation by the FASB, the SEC, and other bodies formed to promulgate and interpret appropriate accounting principles. For example, in May 2014, the FASB issued ASC Topic 606, *Revenue from Contracts with Customers*, which supersedes nearly all existing revenue recognition guidance under U.S. GAAP. We adopted this guidance as of January 1, 2018. The most significant impact relates to changing the revenue recognition for custom optoelectronics to an over time method. Before the adoption of this standard, we deferred the recognition of revenue until products were shipped to the customer. Any difficulties in implementing these pronouncements or adequately accounting after adoption could cause us to fail to meet our financial reporting obligations, which could result in regulatory discipline and harm investors’ confidence in us.

Anti-takeover provisions in our amended and restated certificate of incorporation and bylaws and Delaware law could discourage or prevent a change in control, even if an acquisition would be beneficial to our stockholders, which could affect our stock price adversely and prevent attempts by our stockholders to replace or remove our current management.

Our amended and restated certificate of incorporation and bylaws and Delaware law contain provisions that might delay or prevent a change in control, discourage bids at a premium over the market price of our common stock and adversely affect the market price of our common stock and the voting and other rights of the holders of our common stock. These provisions include:

- a classified board of directors serving staggered terms;
- advance notice requirements to stockholders for matters to be brought at stockholder meetings;
- a supermajority stockholder vote requirement for amending certain provisions of our amended and restated certificate of incorporation and bylaws; and
- the right to issue preferred stock without stockholder approval, which could be used to dilute the stock ownership of a potential hostile acquirer.

We are also subject to provisions of the Delaware General Corporation law that, in general, prohibit any business combination with a beneficial owner of 15% or more of our common stock for three years unless the holder's acquisition of our stock was approved in advance by our board of directors or certain other conditions are satisfied.

The existence of these provisions could adversely affect the voting power of holders of common stock and limit the price that investors might be willing to pay in the future for shares of our common stock.

ITEM 2. *UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS*

(a) Unregistered Sales of Equity Securities during the Three Months Ended March 31, 2019

Common Stock Dividend Payable to Carilion

We issued 1,321,514 shares of Series A Preferred Stock, par value $0.001 per share, to Carilion Clinic in January 2010, which shares were issued in reliance on the exemptions from registration under the Securities Act provided by Sections 3(a)(9) and 4 (a)(2) thereof. The Series A Preferred Stock accrues dividends at the rate of $0.2815 per share per annum, payable quarterly in arrears. Accrued dividends are payable in shares of our common stock, with the number of shares being equal to the quotient of (i) the cumulative aggregate balance of accrued but unpaid dividends on each share of Series A Preferred Stock divided by (ii) the conversion price of the Series A Preferred Stock, which is currently $4.69159 per share. For the period from January 12, 2010, the original issue date of the Series A Preferred Stock, through March 31, 2019, the Series A Preferred Stock issued to Carilion has accrued $1,500,692 in dividends. The accrued dividend as of March 31, 2019 will be paid by the issuance of 730,808 shares of our common stock, which we will issue at Carilion's written request. As the Series A Preferred Stock was issued in reliance on the exemption provided by Section 3(a)(9), the shares of common stock payable as dividends will also be exempt from registration in reliance on Section 3(a)(9) of the Securities Act.

(b) Use of Proceeds from Sale of Registered Equity Securities

Not applicable.

(c) Purchases of Equity Securities by the Registrant

Not applicable.

ITEM 3. *DEFAULTS UPON SENIOR SECURITIES*

None.

ITEM 4. *MINE SAFETY DISCLOSURES*

Not applicable.

ITEM 5. *OTHER INFORMATION*

Not applicable.

ITEM 6. *EXHIBITS*

Exhibit Number	Description
2.1(1)+	Asset Purchase Agreement, by and among Luna Technologies, Inc., the Registrant and General Photonics Corporation, dated as of March 1, 2019 (Exhibit 2.1)
4.1(2)+	Luna Innovations Incorporated 2016 Equity Incentive Plan Form of Restricted Stock Unit Award Agreement (Exhibit 4.1)
10.1	Amended and Restated Non-Employee Director Compensation Policy, as amended as of February 26, 2019.
31.1	Certification of the Principal Executive Officer pursuant to Rule 13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of the Principal Financial Officer pursuant to Rule 13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Principal Executive Officer 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 Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101	The following materials from the Registrant’s Quarterly Report on Form 10-Q for the three months ended March 31, 2019, formatted in XBRL (eXtensible Business Reporting Language): (i) Consolidated Balance Sheets at March 31, 2019 and December 31, 2018, (ii) Consolidated Statements of Operations for the three months ended March 31, 2019 and 2018, (iii) Consolidated Statements of Cash Flows for the three months ended March 31, 2019 and 2018 and (iv) Notes to Unaudited Consolidated Financial Statements.

(1) Incorporated by reference to the exhibit to the Registrant's Current Report on Form 8-K, Commission File No. 000-52008, filed on March 4, 2019. The number given in parentheses indicates the corresponding exhibit number in such Form 8-K.

(2) Incorporated by reference to the exhibit to the Registrant's Current Report on Form 8-K, Commission File No. 000-52008, filed on January 16, 2019. The number given in parentheses indicates the corresponding exhibit number in such Form 8-K.

+ Pursuant to Item 601 (b)(2) of Regulation S-K promulgated by the SEC, certain exhibits and schedules to this agreement have been omitted. The Registrant hereby agrees to furnish supplementally to the SEC, upon its request, any or all of such omitted exhibits or schedules.

† Indicates management contract or compensatory plan.

* These certifications are being furnished solely to accompany this quarterly report pursuant to 18 U.S.C. Section 1350 and are not being filed for purposes of Section 18 of the Securities Exchange Act of 1934 and are not to be incorporated by reference into any filing of the registrant, whether made before or after the date hereof, regardless of any general incorporation language in such filing.

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.

		Luna Innovations Incorporated	
Date:	May 13, 2019	By:	/s/ Dale Messick
			Dale Messick
			Chief Financial Officer **(principal financial and accounting officer and duly authorized officer)**

AMENDED AND RESTATED NON-EMPLOYEE DIRECTOR COMPENSATION POLICY
(Amended as of February 26, 2019, effective July 1, 2019)

Cash Compensation[1]		
Annual Director (non-chair) Retainer	$	37,500
Annual Chair Retainer	$	62,500
Board Meetings	$	0
Committee Chair Retainer		
Audit	$	11,000
Compensation	$	11,000
Nominating	$	6,000
Committee Service Retainer		
Audit	$	4,000
Compensation	$	4,000
Nominating	$	4,000

(1) Cash compensation is payable quarterly in advance. New directors appointed to the Board in the future shall receive a prorated portion of the first quarter's fees.

Equity Compensation (grants at time of annual meeting) [1]	
Director (non-chair)	Restricted Stock Units with a value of $37,500 (vesting on the earlier of the one year anniversary of grant or the date of the next annual meeting)
Chair	Restricted Stock Units with a value of $62,500 (vesting on the earlier of the one year anniversary of grant or the date of the next annual meeting)

(1) New directors appointed to the Board in the future, other than in connection with an annual meeting, shall receive a pro rata amount of the annual equity grants described above, which shall vest upon the next annual meeting.

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Scott A. Graeff, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Luna Innovations Incorporated;
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 13, 2019

/s/ Scott A. Graeff

Scott A. Graeff
President 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, Dale E. Messick, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Luna Innovations Incorporated;

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 13, 2019

/s/ Dale E. Messick

Dale E. Messick
Chief Financial Officer
(principal financial officer)

Exhibit 32.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the quarterly report of Luna Innovations Incorporated (the “Company”) on Form 10-Q for the quarter ended March 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the “Report”), I, Scott A. Graeff, President and Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that to my knowledge:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

This certification accompanies this Report to which it relates, shall not be deemed “filed” with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Report), irrespective of any general incorporation language contained in such filing.

/s/ Scott A. Graeff

Scott A. Graeff
President and Chief Executive Officer
(principal executive officer)

May 13, 2019

Exhibit 32.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the quarterly report of Luna Innovations Incorporated (the "Company") on Form 10-Q for the quarter ended March 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Dale E. Messick, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that to my knowledge:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

This certification accompanies this Report to which it relates, shall not be deemed "filed" with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Report), irrespective of any general incorporation language contained in such filing.

/s/ Dale E. Messick

Dale E. Messick
Chief Financial Officer
(principal financial officer)

May 13, 2019