Lightwave Logic, Inc.
Form 10-K
March 18, 2019

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

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

For the fiscal year ended December 31, 2018

¨ **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: **0-52567**

Lightwave Logic, Inc.

(Exact name of registrant as specified in its charter)

Nevada	**82-049-7368**
(State or other jurisdiction of	(I.R.S. Employer

incorporation or organization) Identification No.)

369 Inverness Parkway, Suite 350, Englewood, CO **80112**

(Address of principal executive offices) (Zip Code)

(Registrant s Telephone Number, including Area Code): **720-340-4949**

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

Title of each class registered	Name of each exchange on which registered

Securities registered pursuant to section 12(g) of the Act:

Common Stock, Par Value $0.001

(Title of class)

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

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

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 þ 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 þ No ¨

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

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

Large accelerated filer ¨	Accelerated filer þ
Non-accelerated filer ¨	Smaller reporting company þ
	Emerging growth company ¨

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

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act of 1934). Yes ¨ No þ

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant was approximately $84,578,680 as of June 30, 2018.

As of March 18, 2019, there were 80,759,209 shares outstanding of the registrant s common stock, $.001 par value.

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Forward-Looking Statements

This report on Form 10-K contains forward-looking statements. Forward-looking statements involve risks and uncertainties, such as statements about our plans, objectives, expectations, assumptions or future events. In some cases, you can identify forward-looking statements by terminology such as anticipate, estimate, plan, projec continuing, ongoing, expect, we believe, we intend, may, should, will, could and similar exp uncertainty or an action that may, will or is expected to occur in the future. These statements involve estimates, assumptions, known and unknown risks, uncertainties and other factors that could cause actual results to differ materially from any future results, performances or achievements expressed or implied by the forward-looking statements. You should not place undue reliance on these forward-looking statements.

Factors that are known to us that could cause a different result than projected by the forward-looking statement, include, but are not limited to:

- inability to generate revenue or to manage growth;
- lack of available funding;
- lack of a market for or market acceptance of our products;
- competition from third parties;
- general economic and business conditions;
- intellectual property rights of third parties;
- changes in the price of our stock and dilution;
- regulatory constraints and potential legal liability;
- ability to maintain effective internal controls;
- security breaches, cybersecurity attacks and other significant disruptions in our information technology systems;
- changes in technology and methods of marketing;
- delays in completing various engineering and manufacturing programs;
- changes in customer order patterns and qualification of new customers;
- changes in product mix;
- success in technological advances and delivering technological innovations;
- shortages in components;
- production delays due to performance quality issues with outsourced components;
- those events and factors described by us in Item 1.A “Risk Factors”;
- other risks to which our Company is subject; and
- other factors beyond the Company's control.

Any forward-looking statement made by us in this report on Form 10-K is based only on information currently available to us and speaks only as of the date on which it is made. We undertake no obligation to publicly update any forward-looking statement, whether written or oral, that may be made from time to time, whether as a result of new information, future developments or otherwise.

PART I

Item 1. Business.

Our Company

We were incorporated under the laws of the State of Nevada on June 24, 1997 and in 2004 we acquired PSI-TEC Corp., and in 2006 we merged with PSI-TEC Corp. PSI-TEC Corp. was incorporated under the laws of the State of Delaware on September 12, 1995. In 2008 we changed our name to Lightwave Logic, Inc. Unless the context otherwise requires, all references to the **Company**, **we**, **our** or **us** and other similar terms means Lightwave Lo Inc., a Nevada corporation.

Our principal executive office is located at 369 Inverness Parkway, Suite 350, Englewood, CO 80112, and our telephone number is (720) 340-4949. Our website address is www.lightwavelogic.com. No information found on our website is part of this report. Also, this report includes the names of various government agencies and the trade names of other companies. Unless specifically stated otherwise, the use or display by us of such other parties' names and trade names in this report is not intended to and does not imply a relationship with, or endorsement or sponsorship of us by, any of these other parties.

Overview

Lightwave Logic, Inc. is a development stage company whose P^2IC^{TM} technology addresses advanced telecommunication, data communications, and data center markets utilizing its advanced organic electro-optic polymer systems. The Company currently has development activities in both polymer materials as well as device design.

Materials Development

The Company designs and synthesizes organic chromophores for use in its own proprietary electro-optic *polymer systems* and photonic device designs. A polymer system is not solely a material, but also encompasses various technical enhancements necessary for its implementation. These include host polymers, poling methodologies, and

molecular spacer systems that are customized to achieve specific optical properties. Our organic electro-optic polymer systems compounds are mixed into solution form that allows for thin film application. Our proprietary electro-optic polymers are designed at the molecular level for potentially superior performance, stability and cost-efficiency. We believe they have the potential to replace more expensive, higher power consuming, slower-performance materials and devices used in fiber-optic communication networks.

Our patented and patent pending molecular architectures are based on a well-understood chemical and quantum mechanical occurrence known as *aromaticity*. Aromaticity provides a high degree of molecular stability that enables our core molecular structures to maintain stability under a broad range of operating conditions.

We expect our patented and patent-pending optical materials along with trade secrets and licensed materials, to be the core of and the enabling technology for future generations of optical devices, modules, sub-systems and systems that we will develop or potentially out-license to electro-optic device manufacturers. The Company contemplates future applications that may address the needs of semiconductor companies, optical network companies, Web 2.0 media companies, high performance computing companies, telecommunications companies, aerospace companies, and government agencies.

Device Design and Development

Electro-optic Modulators

The Company designs its own proprietary electro-optical modulation devices. Electro-optical modulators convert data from electric signals into optical signals that can then be transmitted over high-speed fiber-optic cables. Our modulators are electro-optic, meaning they work because the optical properties of the polymers are affected by electric fields applied by means of electrodes. Modulators are key components that are used in fiber optic telecommunications, data communications, and data centers networks etc., to convey the high data flows that have been driven by applications such as pictures, video streaming, movies etc., that are being transmitted through the Internet. Electro-optical modulators are expected to continue to be an essential element as the appetite and hunger for data increases every year.

Polymer Photonic Integrated Circuits (P^2IC^{TM})

The Company also designs its own proprietary polymer photonic integrated circuits (otherwise termed a polymer PIC). A polymer PIC is a photonic device that integrates several photonic functions on a single chip. We believe that our technology can enable the ultra-miniaturization needed to increase the number of photonic functions residing on a semiconductor chip to create a progression like what was seen in the computer integrated circuits, commonly referred to as Moore s Law. One type of integration is to combine several instances of the same photonic functions such as a plurality of modulators to create a 4 channel polymer PIC. In this case, the number of photonic components would increase by a factor of 4. Another type is to combine different types of devices including from different technology bases such as the combination of a semiconductor laser with a polymer modulator. Our P^2IC platform encompasses both these types of architecture.

Current photonic technology today is struggling to reach faster device speeds. Our modulator devices, enabled by our electro-optic polymer material systems, work at extremely high frequencies (wide bandwidths) and possess inherent advantages over current crystalline electro-optic material contained in most modulator devices such as lithium niobate (LiNbO3), indium phosphide (InP), silicon (Si), and gallium arsenide GaAs). Our advanced electro-optic polymer platform is creating a new class of modulators and associated PIC platforms that can address higher data rates in a lower cost, lower power consuming manner, with much simpler modulation techniques.

Our electro-optic polymers can be integrated with other materials platforms because they can be applied as a thin film coating in a fabrication clean room such as may be found in semiconductor foundries. Our polymers are unique in that they are stable enough to seamlessly integrate into existing CMOS, Indium Phosphide (InP), Gallium Arsenide (GaAs), and other semiconductor manufacturing lines.

Glossary

Glossary of select technology terms to provide you with a better understanding our Company s technology and devices:

Electro-optic devices - Electro-optic devices convert data from electric signals into optical signals for use in communications systems and in optical interconnects for high-speed data transfer.

Electro-optic material - Electro-optic material is the core active ingredient in high-speed fiber-optic telecommunication systems. Electro-optic materials are materials that are engineered at the molecular level. Molecular level engineering is commonly referred to as nanotechnology.

Electro-optic modulators - Electro-optic (E/O) modulators are electro-optic devices that perform electric-to-optic conversions within the infrastructure of the Internet. Data centers may also benefit from this technology through devices that could significantly increase bandwidth and speed while decreasing costs. Polymer E/O modulators can be designed and fabricated with multiple structures such as Ridge waveguide and slot waveguide. The waveguides allow the light to be efficiently coupled into and out of the modulators, and provide a basis for integrating modulators together.

Photonic Devices - Photonic devices are components for creating, manipulating or detecting light. This can include modulators, laser diodes, light-emitting diodes, solar and photovoltaic cells, displays and optical amplifiers. Other examples are devices for modulating a beam of light and for combining and separating beams of light of different wavelength.

Polymers - Polymers, also known as plastics, are large carbon-based molecules that bond many small molecules together to form a long chain. Polymer materials can be engineered and optimized using nanotechnology to create a system in which unique surface, electrical, chemical and electro-optic characteristics can be controlled. Materials based on polymers are used in a multitude of industrial and consumer products, from automotive parts to home appliances and furniture, as well as scientific and medical equipment.

Our Business Opportunity

Lightwave Logic, Inc. is developing next generation proprietary photonic devices that are based on our advanced electro-optical polymer material systems. Current legacy technology is based on inorganic crystalline materials, which has allowed for the proliferation of data over fiber optic cables. However, there are inherent molecular deficiencies that have prevented this technology from scaling down in price and up in functionality, especially in terms of $/Gbps. This is primarily due to a closed valence structure that does not allow for the molecular improvements. The valence or valency of an element is a measure of its combining power with other atoms when it forms chemical compounds or molecules. Also, the physical properties of a crystal do not allow for its implementation into highly miniaturize slot structures that are in simple terms the pathways that light travels through in the device.

Organic polymer materials on the other hand, have free electrons that allow for limitless potential to combine with other molecular structures, which allows for multiple options and combinations to improving performance characteristics. Importantly, because they can be applied to optical structures in thin-film liquid form, it is possible to imbue electro-optic ability to highly miniaturized slot structures. Organic polymer materials are also vastly cheaper to manufacture in comparison to growing exotic crystals that are prone to contamination and further must be sliced into thin wafers. Our Company believes that the combination of less expensive manufacturing cost, ease of application, and better scalability, together with a lower cost of ownership due to marked less heat dissipation (requiring less cooling), will create enormous demand for our products.

Many companies early attempts at developing commercially reliable organic polymers were stymied due to the difficulty of creating organic molecules that could remain electro-optically active after being subjected to the high heat of semiconductor manufacturing temperatures (such as silicon CMOS, InP, GaAs etc.). These early attempts also encountered difficulty synthesizing materials that could withstand photochemical bleaching (loss of sensitivity to specific frequencies) and material degradation due to high operating temperatures.

Over the last several years, our Company has made various scientific breakthroughs that have allowed for the synthesis of proprietary organic polymer materials that can withstand extremely high process temperatures of 175^{0}C. Additionally, these materials have demonstrated photochemical stability, even after being subjected to tensor light for over 4,000 hours and exhibited little electro optic degradation even after 2,500 hours of continuous exposure to temperatures at 110^{0}C exceeding typical commercial operating temperatures of approximately 85^{0}C, as found in data center applications. After successfully achieving material test results that either met or exceeded commercial requirements (subsequently confirmed by an outside entity), in late 2016, the Company began production of its first photonic prototype device, a ***ridge waveguide modulator***.

Our First Product The Ridge Waveguide Modulator

A ridge waveguide modulator is a type of modulator where the waveguide is fabricated within a layer of our electro-optic polymer system. Various cladding materials and electrodes are layered over the core polymer. The polymer materials are then part of an integrated photonics platform that can house other photonic devices, such as lasers, waveguides etc.

In April 2017 we achieved bandwidth suitable for 25Gbps data rates in an all-organic polymer ridge waveguide intensity modulator prototype, a significant improvement over our initial 10Gbps device modulator prototype that was announced in 2016. This breakthrough was significant because a 25Gbps data rate is important to the optical networking industry because this data rate is a major node to achieve 100 Gbps (using 4 channels of 25 Gbps). In July 2017 we advanced our high-speed modulation performance to satisfy 28Gbps data rates for QSFP28 standards and 100Gbps data center applications.

In September 2017 we achieved outstanding performance of our ridge waveguide Mach-Zehnder modulators ahead of schedule, with bandwidth performance levels that will enable 50Gbps modulation in fiber-optic communications. This important achievement will allow users to utilize arrays of 4 x 50Gbps polymer modulators using PAM-4 encoding to access 400Gbps data rate systems. Pulse-Amplitude Modulation (PAM-4) is an encoding scheme that can double the amount of data that can be transmitted.

We are now optimizing our high-performance modulators against typical specifications that are required by the fiber communications industry. Furthermore, we are packaging our modulators with our packaging partner so that potential customers can evaluate our high-performance modulators in their systems. One of the most under-evaluated processes of developing high speed devices onto a new and novel technology platform is robustness and reliability. We have already made extensive progress with our polymer materials on this front, and now we are integrating our robust polymer materials onto an integrated photonics platform to provide customers with a more miniaturized, higher performance solution for their data rich systems.

We have also shown that with standard simulation and modeling of our devices, there is a potential to scale the high-speed performance beyond that of 50Gbps, thus providing a technology platform for even greater data rates in the future. This means that our technology platform using polymers is both scalable in high performance as well as scalable in miniaturization and low cost, something that the fiber communications industry has been searching for a long time.

While our initial focus is to address data communications and telecommunications network applications along with cloud computing/data center needs, we believe that in the future we will have additional opportunities to address other applications such as: backplane optical interconnects, photovoltaic cells, medical applications, satellite reconnaissance, navigation systems, radar applications, optical filters, spatial light modulators; and all-optical switches.

Electro-Optic Polymer Production Our Approach vs. the BLA Approach

Our Electro-Optic Material Approach

Our core material expertise relates to the production of high-performance, high-stability electro-optic polymers for high-speed (wide bandwidth) telecommunication and datacommunications applications. More specifically, it lies in a less mainstream, yet firmly established, scientific phenomenon called aromaticity. Aromaticity causes a high degree of molecular stability. It is a molecular arrangement wherein atoms combine into multi-membered rings and share their electrons among each other. Aromatic compounds are stable because the electronic charge distributes evenly over a

great area preventing hostile moieties, such as oxygen and free radicals, from finding an opening to attack.

Previous and Current Competitive Organic Electro-Optic Polymer Efforts

For the past several decades, diverse corporate interests, including, to our knowledge, IBM, Lockheed Martin, DuPont, AT&T Bell Labs, Honeywell, Motorola, HP, 3M, and others in addition to numerous universities and U.S. Government Agencies, have attempted to produce high-performance, high-stability electro-optic polymers for high-speed (wide bandwidth) telecommunication applications. These efforts were largely unsuccessful due, in our opinion, to the industry's singular adherence to an industry pervasive engineering model known as the Bond Length Alternation ("BLA") theory model, which none of our patented molecular designs rely upon. The BLA model, like all other current industry-standard molecular designs, consists of molecular designs containing long strings of atoms called polyene chains. Longer polyene chains provide higher electro-optic performance, but are also more susceptible to environmental threats, which result in unacceptably low-performing, thermally unstable electro-optic polymers.

As a result, high frequency modulators engineered with electro-optic polymers designed on the BLA model or any other polyene chain design models are unstable over typical operating temperature ranges, and often exhibit performance degradation within days, hours or even minutes. Similarly, lower frequency modulators exhibit comparable failings, but to a lesser extent. These flaws, in most cases, have prevented commercial quality polymer-based modulators from entering the commercial marketplace. The thermal stability of these devices does not generally meet the minimum Telcordia GR-468 operating temperature range (-40 degrees Celsius to +85 degrees Celsius) much less the harsher MILSPEC 883D (military specification) range of -55 degrees Celsius to 150 degrees Celsius. While many new applications do not require full military specifications for polymers, many potential customers prefer to see polymer operate at or near these conditions to convey confidence in the material system. We understand from initial conversations with data center architects and designers that the temperature specifications that our materials achieve are compliant with their equipment design needs.

We are aware of other academic and commercial development efforts some by larger companies with vastly more financial resources than we possess. However, we believe that no one yet has developed organic polymer materials that have demonstrated the combination of thermal stability, photochemical stability that can meet or exceed commercial specifications.

Our Electro-Optic Photonic P²IC™ Device Approach

Our electro-optic devices are built around our proprietary organic polymer material systems that we believe will enable better performance than the current embedded legacy technology built around inorganic materials. We also believe that the inherent flexibility of being able to apply our organic polymer materials in liquid thin-film form will accelerate the move toward ultra-miniaturization of Polymer Photonic Integrated Circuits (P²IC™) by increasing the number of photonic circuits on a single chip. Polymer photonics (previously referred in industry as silicon organic hybrid (SOH)) is the application of polymers on to a platform such as silicon where there are both active and passive photonic component designs. In polymer photonics, polymer devices such as modulators, waveguides, and multiplexers can be fabricated on to a silicon platform that acts as a package as well as a base for mounting lasers (which are needed to source the light).

Our initial device, a ridge waveguide modulator, though highly miniaturized utilizes conventional design and fabrication techniques in the industry. Our future devices will utilize silicon photonics (SiP) technology, which can support highly miniaturized slot waveguides structures etched in large format, low cost, and less expensive silicon wafers coated with our organic electro-optic polymers. The low-cost structure compares well to compound semiconductor technologies such as GaAs (Gallium arsenide) and InP (Indium Phosphide), which suffer from small format wafers that do not allow the economies of scale in high volume fabrication plants. The degree of miniaturization possible of the slot modulator using SiP is not technically feasible to accomplish with inorganic crystalline materials. Although this may not always remain the case, presently there are nearly insurmountable technical difficulties that are inherent to a crystalline molecule.

Although we believe that our polymers will be the key differentiating factor in Polymer photonic devices, we do not currently possess the technical skills and instrumentation necessary to fabricate and test PICs at this dramatically reduced scale and intend to seek an external partner to assist with development.

Our Intellectual Property

Our research and development efforts over the last 10 years have yielded our Company an extensive patent portfolio as well as critical trade secrets, unpatented technology and proprietary knowledge related to our optical polymer materials. Our intellectual property portfolio has expanded significantly over the last year as we are developing our P²IC into prototypes. We have filed more than 12 patents during 2017 and 2018 and are currently in the process of readying a number of other inventions for formal filings in early 2019. We expect to continue innovating with our P²IC platform during 2019, and expect to at least maintain this level of invention at our Company during the whole of 2019. For 2018 our focus was to establish the world s first unique Perkinamine™ polymer based integrated photonics circuit portfolio of patents to support our working prototypes.

Also in 2018, we acquired the Polymer Technology Intellectual Property Assets of BrPhotonics Productos Optoelectrónicos S.A., a Brazilian corporation, which significantly advanced our patent portfolio of electro-optic polymer technology with 15 polymer chemistry materials, devices, packaging and subsystems patents and further strengthened our design capabilities to solidify our market position as we prepare to enter the 400Gbps integrated photonics marketplace with a highly competitive, scalable alternative to installed legacy systems.

In addition to the 12 patents we filed during 2017 and 2018, we expect to file new patents in the first half of 2019. In total, our patent portfolio consists of 45 granted patents that include 35 from the US, 1 from Canada, 5 from the EU, 2 from Japan and 2 from China.

Our materials patent portfolio has also strengthened significantly in 2017 with the filing of additional new patent applications on our core Perkinamine™ molecular compounds as well as recent, innovative inventions that are expected to protect our P^{2}IC polymer PIC platform from potential competition.

Included in our patent portfolio are the following nonlinear optic chromophore designs:

- Stable Free Radical Chromophores, processes for preparing the same
- Stable Free Radical Chromophores, processes for preparing the same
- Tricyclic Spacer Systems for Nonlinear Optical Devices
- Anti-Aromatic Chromophore Architectures
- Heterocyclical Anti-Aromatic Chromophore Architectures
- Heterocyclical Chromophore Architectures
- Heterocyclical Chromophore Architectures with Novel Electronic Acceptor Systems
- Multi-fiber/port hermetic capsule sealed by metallization and method

Our strategic plan is to utilize our core proprietary technology and leverage our proprietary optical materials to be the core of and the enabling technology for future generations of optical devices, modules, sub-systems and systems that we will develop or potentially out-license to electro-optic device manufacturers. Our Company contemplates future applications that may address the needs of semiconductor companies, aerospace companies and government agencies.

We rely on a combination of patents, patent applications, trademarks, trade secrets and contractual provisions to protect our technologies. Further, employees are required to surrender any inventions or intellectual property developed as part of their employment agreements. We also have a policy of requiring prospective business partners to enter into non-disclosure agreements (NDAs) before disclosure of any of our confidential or proprietary information. Our Company can make no assurances that we will be able to effectively protect our technologies and know-how or that third parties will not be able to develop similar technologies and know-how independently.

The anti-aromatic nature of these structures dramatically improves the "zwitterionic-aromatic push-pull" of the systems, providing for low energy charge transfer. Low energy charge transfer is important for the production of extremely high electro-optic character.

Heterocyclical Steric Hindering System This patent describes a nitrogenous heterocyclical structure for the integration of steric hindering groups that are necessary for the nanoscale material integration. Due to the [pi]-orbital configuration of the nitrogen bridge, this structure has been demonstrated not to interfere with the conductive nature of the electronic conductive pathway and thus is non-disruptive to the electro-optic character of the core molecular construction. The quantum mechanical design of the system is designed to establish complete molecular planarity (flatness) for optimal performance.

Totally Integrated Material Engineering System This patent covers material integration structures under a design strategy known as Totally Integrated Material Engineering. These integration structures provide for the "wrapping" of the core molecule in sterically hindering groups that maximally protect the molecule from environmental threats and maximally protect it from microscopic aggregation (which is a major cause of performance degradation and optical loss) within a minimal molecular volume. These structures also provide for the integration of polymerizable groups for integration of materials into a highly stable cross-linked material matrix.

Recent Significant Events and Milestones Achieved

In December 2016 we achieved high-speed modulation in our first all-organic polymer ridge waveguide intensity modulator prototype, which constituted one of the most significant moments in the history of our Company. Our initial "alpha" prototype device, enabled by our P^2IC polymer system, demonstrated bandwidth suitable for data rates

up to about 10 Gbps. This performance exceeds the telecom OC-48 standard (2.5 Gbps). This device demonstrated true amplitude (intensity) modulation in a Mach-Zehnder modulator structure incorporating our polymer waveguides.

In April 2017 we achieved bandwidth suitable for 25Gbps data rates in an all-organic polymer ridge waveguide intensity modulator prototype, a significant improvement over our initial 10Gbps device modulator prototype. This breakthrough was significant because a 25Gbps data rate is important to the optical networking industry because this data rate is a major node to achieve 100 Gbps (using 4 channels of 25 Gbps). In July 2017 we advanced our high-speed modulation performance to satisfy 28Gbps data rates for QSFP28 standards and 100Gbps data center applications.

In September 2017 we achieved outstanding performance of our ridge waveguide Mach-Zehnder modulators ahead of schedule, with bandwidth performance levels that will enable 50Gbps modulation in fiber-optic communications. This important achievement will allow users to utilize arrays of 4 x 50Gbps polymer modulators using PAM-4 encoding to access 400Gbps data rate systems. Pulse-Amplitude Modulation (PAM-4) is an encoding scheme that can double the amount of data that can be transmitted.

During February and March 2018, we moved our Newark, Delaware synthetic laboratory and our Longmont, Colorado optical testing laboratory and corporate headquarters to our new office, laboratory and research and development space located at 369 Inverness Parkway, Suite 350, Englewood, Colorado. The new 13,420 square feet Englewood facility includes fully functional 1,000 square feet of class 1,000 cleanroom, 500 square feet of class 10,000 cleanroom, 220 square feet of class 100 cleanroom, chemistry laboratories, and analytic laboratories. The new Englewood facility streamlines all of our Company s research and development workflow for greater operational efficiencies.

During March 2018, our Company, together with our packaging partner, successfully demonstrated packaged polymer modulators designed for 50Gbps, which we believe will allow us to scale our P2IC platform with our Mach-Zehnder ridge waveguide modulator design as well as other photonics devices competitively in the 100Gbps and 400Gbps datacom and telecommunications applications market. We are currently fine-tuning the performance parameters of these prototypes in preparation for customer evaluations.

During June 2018, our Company Acquired the Polymer Technology Intellectual Property Assets of BrPhotonics Productos Optoelectrónicos S.A., a Brazilian corporation, which significantly advanced our patent portfolio of electro-optic polymer technology with 15 polymer chemistry materials, devices, packaging and subsystems patent and further strengthened our design capabilities to solidify our market position as we prepare to enter the 400Gbps integrated photonics marketplace with a highly competitive, scalable alternative to installed legacy systems. Since June 2018, we have made significant progress on integrating this technology into our P2IC (polymer photonic integrated circuit) platform.

Also, during June 2018, our Company promoted polymer PICs and Solidified Polymer PICs as Part of the Photonics Roadmap at the World Technology Mapping Forum in Enschede, Netherlands, which includes our Company s technology of polymers and polymer PICs that have the potential to drive not only 400Gbps aggregate data rate solutions, but also 800Gbps and beyond.

In August 2018 we announced the completion (ahead of schedule) of our fully equipped on-site fabrication facility, where we are expanding our high-speed test and design capabilities. We also announced the continuation of the building of our internal expertise with the hiring of world-class technical personnel with 100Gbps experience.

In February 2019 we announced a major breakthrough in our development of clean technology polymer materials that target the insatiable demand for fast and efficient data communications in the multi-billion-dollar telecom and data markets supporting Internet, 5G and IoT (Internet of Things) webscale services. The improved thermally stable polymer has more than double the electro-optic response of our previous materials, enabling optical device performance of well over 100 GHz with extremely low power requirements. This addition to the family of Perkinamine™ polymers will hold back run-away consumption of resources and energy needed to support ever-growing data consumption demands. We anticipate we will continue rigorous testing of the material and its performance in device structures during the remainder of this year before releasing it into full device development.

In March 2019 we created an Advisory Board comprised of three world-class leaders in the photonics industry: Dr. Craig Ciesla, Dr. Christoph S. Harder, and Mr. Andreas Umbach. The Advisory Board will work closely with our Company leadership to enhance our Company s product positioning and promote our polymer modulator made on our proprietary *Faster by Design* polymer PIC platform. The mission of the Advisory Board will initially be to increase our Company s outreach into the datacenter interconnect market and later to support expansion into other billion-dollar

markets. The Advisory Board members have each been chosen for their combination of deep technical expertise, breadth of experience and industry relationships in the fields of fiber optics communications, polymer and semiconductor materials. Each of the Advisory Board members has experience at both innovators like Lightwave Logic and large industry leaders of the type most likely to adopt game-changing polymer-based products. In addition, they possess operational experience with semiconductor and polymer businesses.

As we move forward to diligently to meet our goals, we continue to work closely with our packaging partner for the 50Gbaud prototypes, and we are advancing our reliability and characterization efforts to support our prototyping. We are actively engaged with test equipment manufacturers to deliver the most advanced test equipment for our state-of-the-art polymer results. We continue to engage with multiple industry bodies to promote our roadmap. We continue to fine tune our business model with target markets, customers, and technical specifications. Discussions with prospective customers are validating that our modulators are ideally suited for the datacenter and telecommunications markets that are over 10km in length. Details of what these prospective customers are seeking from a prototype are delivered to our technical team.

The Global Photonic Device Market

General Overview

Lightwave Logic has been reviewing the latest market data as well as its own internal data for its business strategy, and below we detail the global market dynamics both in terms of data traffic as well as how PIC based technologies will grow in the fiber communications segment of the market.

As we have already seen with products such as smart phones, lap top computers, and personal digital assistants (PDAs), Internet traffic is one of the important metrics that is being used to show activity in fiber communications, and particularly telecommunications as well as datacommunications (which includes datacenters and high-performance computing). Internet Protocol (IP) traffic has typically been used to gauge the amount of data that is being used on the Internet as shown in the graph below (sourced from Cisco VNI in 2018). The metric is Exabytes per month. An Exabyte is 1E18 which is 1000 Petabytes, or 1000,000 Terabytes or a billion Gigabytes of data. As seen from the graph which has a strong growth of 22% CAGR (2015-2020), the majority of the traffic is being driven by video, traffic, and is fast approaching the metric of Zetta which is 1E21 bytes of data. Some estimates are discussing the further metric of Yotta which is 1E24 bytes of data over the next decade, which is also expected to be driven for the most part by video.

Within the overall market trends of IP traffic growth, the Internet will need to be able to support high volumes of data traffic. In order to do this, the fiber-optic infrastructure that allows data to be communicated between network nodes such as datacenters, within datacenters, and optical network switches etc., has to be upgraded. Today, fiber-optic networks are a combination of long, medium and short optical interconnects that range from 3 meters (or 1yard) to over 1000km depending on application in the optical network. Optical components, typically known as photonics components are used to build the fiber-optic infrastructure and consist of things like: laser diode, photodetectors, multipliers, modulators, transceivers etc. These are known as discrete components, while a mix of these components that are integrated or connected on a single substrate (such as silicon, InP, GaAs etc.) are called PICs (Photonic Integrated Components). The summary photonics market has been reviewed in 2018 and is shown below. The summary photonics market is forecast to grow to $43B by 2025 with a 7% CAGR (20-25) that includes both discrete and PIC photonic components. The summary photonics components market is forecasted to reach $23B in 2018.

Within the summary photonics components market, three major segments exist: WAN (wide area networks), access, and Datacom. The WAN segment is forecast to grow to $27B by 2025 with a 19% CARG (20-25) and the Datacom segment is forecast to grow to $12.1B by 2025 with 22% CAGR (20-25). As can be seen from the graph below, the growth of the WAN and Datacom segments is forecasted to be very strong over the next decade and provide the engine for growth in the overall global photonics components market.

One of the key metrics that is needed for any overall market analysis is how photonics components will grow over the next decade from a PIC perspective. This is important as the trend to integrate photonics components is beginning to accelerate. The trend has been driven by customer applications that require smaller photonic component solutions, lower power, high data rates, larger buildings for longer interconnect lengths, and more economic in terms of $/Gbps. PIC technologies, i.e. those technologies that include integrated photonics are forecasted to grow to ~$30B by 2025 with 16% CAGR (20-25). These technologies include InP which is the current incumbent, GaAs, and other newer integrated technology solutions such as SiP (silicon photonics), polymer photonics, and dielectric photonics. The forecast of ~$30B is approximately 69% of the summary photonics components market by 2025, which represents a huge acceleration for PIC based technologies over the next decade. This also means while PIC based technologies are $7B today with 24% of the photonics components market, PIC based technologies become de facto by 2025.

While the rise of PIC based technologies is exciting, what also is exciting in the photonics component market is the rise of fiber-optic transceivers. Transceivers are small boxes located at the end of each fiber-optic link that house photonics components and PIC components which send and receive data. While the global overall photonic components market is expected to reach $43B by 2025, the photonics transceivers sub-segment is forecasted to grow to $25B by this time. This represents that transceivers will accelerate to 58% of the global overall photonics market by

2025 and become a major driver for optical networking over the next decade.

The key segments in photonics based fiber-optic transceivers achieved $12B in 2018 with growth from 9 different segments that include: AOC, CATV, Fibre Channel, DWDM, Ethernet-datacom, WAN-client side, Radio etc., based transceivers. Three of these segments are forecasted to grow very well to achieve revenues of $25B by 2025, with the biggest contributions from DWDM, Ethernet-datacom, and WAN-client based transceivers.

The transceiver growth shows which sub-segments that will utilize small boxes at the ends of fiber-optic interconnects, it is well known that transceiver trends over the past decade have been towards smaller boxes i.e. smaller transceiver formats and footprints (such as SFF, SFP, QSFP, and many others), with higher densities of photonics components designed into them. It is expected over the forecast period that transceivers will be an excellent platform for the accelerating trends of PICs in both telecom and datacom applications. The graph below shows the PIC transceiver forecast to 2025. PIC transceivers are forecast to reach $20B by 2025 with 17% CARG (20-25) growing from ~$4B in 2018. What is more interesting is that by about 2021, PIC transceivers will lead discrete photonic component transceivers from a revenue standpoint. This means that the trend to integrate photonics components inside a transceiver is accelerating quickly, driven by the customer interest for smaller, denser, and higher performance metrics of transceivers. This trend is ideal for our polymer based integrated photonics platform to have a huge impact in the market segment over the next decade.

Within the PIC transceivers market there are a number of sub-segments that summate to $20B by 2025. The major segments that drive this forecast are Ethernet, DWDM, and WAN-client-side applications as can be seen from the graph below. In particular these segments are technologically driven by PIC based technologies that operate at 100Gbps and 400Gbps data rates that generally are considered high performance solutions.

Data rates and high performance of transceivers can be seen by the graph below which depicts PIC based technologies in the Ethernet sub-segment. For Ethernet applications only, transceivers are driven by 100GE based PIC technologies. The market is forecast with 100GE to grow to $4.5B by 2025 with 6% CAGR (20-25) and with 400GE to grow to $0.98B by 2025 with 16% CAGR (20-25). This is a clear drive for the PIC based transceivers in the Ethernet application is 100GE over the forecast period and sets the scene for polymer based integrated photonics to have the opportunity to grow extremely quickly.

As the Company is developing polymer based photonic devices such as fiber-optic modulators, these devices translate electric signals into optical signals and allow laser based technology to operate effectively at 50Gbps and beyond. Lasers with modulator are used in fiber communication systems to transfer data over fiber-optic networks today and are expected to be a key driver in photonics components for PIC based technological solutions over the next decade. Optical data transfer using lasers and modulators is significantly faster and more efficient than transfer technologies

using only electric signals, permitting more cost-effective use of bandwidth for broadband Internet and voice services.

Our Target Markets

Cloud computing and data centers

Big data is a general term used to describe the voluminous amount of unstructured and semi-structured data a Company creates -- data that would take too much time and cost too much money to load into a relational database for analysis. Companies are looking to cloud computing in their data centers to access all the data. Inherent speed and bandwidth limits of traditional solutions and the potential of organic polymer devices offer an opportunity to increase the bandwidth, reduce costs and improve speed of access.

Datacenters have grown to enormous sizes with hundreds of thousands and even millions of servers in a single datacenter. The number of so-called hyperscale datacenters are expected to continue to increase in number. Due to their size, a single datacenter may consist of multiple large warehouse-size buildings on a campus or even several locations distributed around a metropolitan area. Data centers are confronted with the problem of moving vast amounts of data not only around a single data center building, but also between buildings in distributed data center architecture. Links within a single datacenter building may be shorter than 500 meters, though some will require optics capable of 2 km. Between datacenter buildings, there is an increasing need for high performance interconnects over 10km in reach.

Our modulators are suitable for single-mode fiber optic links. We believe that our single mode modulator solutions will be competitive at 500m to 10km link distances, but it will be ideally suited at greater than 10km link distances.

Telecommunications/Data Communications

The telecommunications industry has evolved from transporting traditional analogue voice data over copper wire into the movement of digital voice and data. Telecommunication companies are faced with the enormous increasing challenges to keep up with the resulting tremendous explosion in demand for bandwidth. The metropolitan network is especially under stress now and into the near future. Telecommunications companies provide services to some data center customers for the inter-data center connections discussed above. 5G mobile upgrade, autonomous driving and IoT are expected to increase the need for data stored and processed close to the end user in edge data centers. This application similarly requires optics capable of very high speeds and greater than 10 km reach.

Industry issues of scaling

The key issues facing the fiber-optic communications industry are the economic progress and scalability of any PIC based technological platform. The polymer platform is unique in that it is truly scalable. Scalable means being able to scale up for high speed data rates, while simultaneously being able to scale down in cost. This allows a competitive cost per data rate or cost per Gbps metric to be achieved.

Fiber optic datacenter and high-performance computing customers want to achieve the metric of $1/Gbps @ 400Gbps (this essentially means a single mode fiber optic link that has a total cost of $400 and operates with a data rate of 400Gbps à which also means that each transceiver at each end of the fiber optic link must be able to be priced at $200), but as industry tries to match this target, it is already falling behind as can be seen in the Figure below which plots generic typical PIC based technology:

In the above figures (where the left-hand graph is a linear vertical scale, and the right-hand graph is a log scale), it can be seen that the orange curve plots the customer expectation, while the other color curves show $/Gbps improvement over time for various high-speed data rate transceivers using PIC based technologies. A gap is appearing between what customer expect and what the technologists can produce.

Polymers play an important role in PICs over the next decade as they can reduce or close the gap between customer expectations and technical performance through effective scaling increase of high performance with low cost. This is shown in the Figure below how polymers have the potential to scale to the needs of the customers over the next 3-5years.

Some of the things needed to achieve the scaling performance of polymers in n integrated photonics platform is within sight today:

1) Increased r33 (which leads to very low Vpi in modulator devices) and we are currently optimizing our polymers for this.
2) Increase temperature stability so that the polymers can operate at broader temperature ranges effective, where we have made significant progress over the past few years.
3) Low optical loss in waveguides and active/passive devices for improved optical budget metrics which is currently an ongoing development program at our Company.
4) Higher levels of hermeticity for lower cost packaging of optical sub-assemblies within a transceiver module, where our advanced designs are being implemented into polymer-based packages.

Our Business Strategy

Our business strategy anticipates that our revenue stream will be derived from one or some combination of the following: (i) technology licensing for specific product application; (ii) joint venture relationships with significant industry leaders; or (iii) the production and direct sale of our own electro-optic device components. Our objective is to be a leading provider of proprietary technology and know-how in the electro-optic device market. In order to meet this objective, we intend to:

· Further the development of proprietary organic electro-optic polymer material systems

- Develop photonic devices based on our P^{2}IC^{TM} technology
- Continue to develop proprietary intellectual property
- Grow our commercial device development capabilities
- Grow our product reliability and quality assurance capabilities
- Grow our optoelectronic packaging and testing capabilities
- Grow our commercial material manufacturing capabilities
- Maintain/develop strategic relationships with major telecommunications and data communications companies to further the awareness and commercialization of our technology platform
- Continue to add high-level personnel with industrial and manufacturing experience in key areas of our materials and device development programs.

Create Organic Polymer-Enabled Electro-Optic Modulators

We intend to utilize our proprietary optical polymer technology to create an initial portfolio of commercial electro-optic polymer product devices with applications for various markets, including telecommunications, data communications and data centers. These product devices will be part of our proprietary photonics integrated circuit (PIC) technology platform.

We expect our initial modulator products will operate at data rates at least 50 Gbaud (capable of 50 Gbps with standard data encoding of NRZ and 100 Gbps with more complex PAM-4 encoding). Our devices are highly linear, enabling the performance required to take advantage of the more advance complex encoding schemes. We are currently developing our polymer technology to operate at the next industry node of 100Gbaud.

Our P^{2}IC platform will have the flexibility to allow multiple channels through integration. For example, where 4 modulated channels are expected each to operate at least 50 Gbaud per channel, the aggregate optical signal output could carry 400 Gbps with PAM-4 advanced data encoding, and potentially 100Gbaud per channel. Pulse-Amplitude Modulation (PAM-4) is an industry standard encoding scheme that can double the amount of data that can be transmitted with a given device speed. This relationship between baudrate and bitrate by encoding scheme is described in a number of places, including in a white paper publicly available on our website. We believe the capability of the electro-optic polymer technology up to these speeds will be highly attractive to potential customers seeking to assure their own product roadmaps. This will allow our Company to participate in opportunities that range up to 800Gbaud using a 4 channel P^{2}IC platform, and potentially 1600Gbaud (or 1.6Tbaud) with an 8 channel P^{2}IC platform.

Continue to Expand Our Intellectual Property Portfolio and Reliance on Trade Secrets

We plan to continuously advance the development of unique organic electro-optic polymer materials along with proprietary designs and device configurations. We intend to protect our technology by filing patent applications where appropriate or by obtaining exclusive technology rights where available. However, in some cases, we will refrain from protecting certain proprietary information with patents in favor of trade secrets.

Continue to Recruit Technical Expertise

In December 2011, we retained Dr. Frederick Leonberger, PhD as our Senior Advisor. Dr. Leonberger is the former Chief Technology Officer of JDS Uniphase, Inc. We previously retained EOvation Advisors LLC, a technology and business advisory firm founded by Dr. Frederick Leonberger, as a consultant to the Company. Dr. Leonberger is presently assisting our Company with strategic planning and the design of optical modulators that we intend to develop. In May 2017, Dr. Leonberger was elected to our Board of Directors and serves as a member of the operations committee and assists with the technical direction and strategy of the Company.

In July 2018 we retained Dr. Karen Liu, a former industry analyst and marketing executive in datacom and telecom fiber optic communications, as our Vice President of Sales and Marketing to advance our customer-facing position in the datacom and telecom markets and to assist with engaging with customers on our 400Gbps and 800Gbps prototypes.

Our Research and Development Process

Our research and development process consist of the following steps:

- We develop novel polymer materials utilizing our patented and patent pending technology to meet certain performance specifications. We then develop methods to synthesize larger quantities of such material.
- We conduct a full battery of tests at the completion of the synthesis of each new polymer material to evaluate its characteristics. We also create development strategies to optimize materials to meet specifications for specific applications. We model and simulate each new polymer material so that we can further understand how to optimize the material for device operation.
- We integrate data from the material characterization and test results to fabricate devices. We analyze device-testing results to refine and improve fabrication processes and methods. In addition, we investigate alternative material and design variations to possibly create more efficient fabrication processes.
- We create an initial device design using simulation software. Following device fabrication, we run a series of optical and electronic tests on the device.

We have and expect to continue to make significant operating and capital expenditures for research and development. Our research and development expenses were $3,794,565 and $3,519,129 for the years ended December 31, 2018 and 2017, respectively.

Our Proprietary Products in Development

As part of a two-pronged marketing strategy, our Company is developing several optical devices, which are in various stages of development and that utilize our organic nonlinear optical materials. They include:

Ridge Waveguide Modulator

Our ridge electro-optic waveguide modulator was designed and fabricated in our Longmont, Colorado laboratory. The fabrication of our first in-house device is significant to our entire device program and is an important starting point for modulators that are being developed for target markets. We have multiple generations of new materials that we will soon be optimizing for this specific design. In September 2017 we announced that our initial alpha prototype ridge waveguide modulator, enabled by our P^2IC polymer system, demonstrated bandwidth performance levels that will enable 50Gbps modulation in fiber-optic communications. This device demonstrated true amplitude (intensity) modulation in a Mach-Zehnder modulator structure incorporating our polymer waveguides. This important achievement will allow users to utilize arrays of 4 x 50Gbps polymer modulators using PAM-4 encoding to access 400Gbps data rate systems. Pulse-Amplitude Modulation (PAM-4) is an encoding scheme that can double the amount of data that can be transmitted. These ridge waveguide modulators are currently being packaged with our partner and will be available for evaluation by potential customers in 2019. In parallel, we are simulating and modeling the modulators for scalability to higher data rates above 50Gbps and lower cost structures that will be competitive with incumbent technology. This provides our technology platform with higher levels of scalability and will provide potential customers with technological solutions that they are currently looking for.

The ridge waveguide modulator represents our first commercially viable device, and targets metro networks (< 10Km) within large scale telecommunications and data communications networks and represents at least a $300M per year market opportunity for us.

Slot Waveguide Modulator

Our functional polymer photonics slot waveguide modulator utilizes an existing modulator structure with one of our proprietary electro-optic polymer material systems as the enabling material layer, and is functional as an operating prototype device.

Preliminary testing and initial data on our polymer photonics slot waveguide modulators demonstrated several promising characteristics. The tested polymer photonic chip had a 1-millimeter square footprint, enabling the possibility of sophisticated integrated optical circuits on a single silicon substrate. In addition, the waveguide structure was approximately 1/20 the length of a typical inorganic-based silicon photonics modulator waveguide.

With the combination of our proprietary electro-optic polymer material and the extremely high optical field concentration in the slot waveguide modulator, the test modulators demonstrated less than 2.2 volts to operate. Initial speeds exceeded 30-35 GHz in the telecom, 1550 nanometer frequency band. This is equivalent to four, 10Gb/sec, inorganic, lithium niobate modulators that would require approximately 12-16 volts to move the same amount of information.

Our material also operates in the 1550 nanometer frequency band, which is suitable for data communications applications. We continued with our collaborative development of our SOH/ Polymer photonic slot waveguide modulator in 2014 and continued our collaboration with an associated third-party research group in 2017 and expect to see initial results in 2019.

Our Long-Term Device Development Goal - Multichannel Integrated Nanophotonic Transceiver

While we consider our ridge waveguide and slot waveguide modulators currently under development to be commercially viable products, in another sense they are intermediate steps in the development of our long-term goal a multichannel integrated nanophotonic transceiver for application in data communications.

The transceiver consists of a silicon photonic chip fabricated with nonlinear polymer infused modulators (polymer photonic), multiplexers, demultiplexers, detectors and grating fiber couplers to an external light source. The CMOS-compatible optical modulators are key components for future silicon-based photonic transceivers. Our solution, the silicon-organic hybrid (polymer photonic) platform has been proposed and is being prototyped. In the polymer photonic approach, the optical signal is guided by a silicon waveguide while an organic cladding provides the electro-optic effect.

Other Potential Applications for Our Products

We believe that there are myriad potential applications for our organic polymer materials and devices outside of our initial focus of data communications, telecommunications and data centers. These potential applications encompass areas as diverse as military, space, optical computing, and life sciences. We believe that as viable organic polymer materials gain acceptance, their increased flexibility, functionality and low cost will create new applications that may not yet be technically feasible. Two such future applications with revolutionary potential are:

All-Optical Switches

An all-optical switch is one that enables signals in optical fibers or networks to be selectively switched from one fiber or circuit to another. Many device designs have been developed and commercialized in today s telecom networks to effect optical switching by using mechanical or electrical control elements to accomplish the switching event. Future networks will require all-optical switches that can be more rapidly activated with a low energy and short duration optical (light) control pulse.

Multi-Channel Optical Modem

The availability of low cost electro-optic modulators will enable low cost multichannel optical modems that will use many wavelengths in parallel and employ high efficiency modulation techniques such as QAM (quadrature amplitude modulation). Such modems would enable an order of magnitude increase in the Internet capacity of legacy fiber. Our Company is in the early feasibility stage of such a multichannel optical modem.

Our Past Government Program Participation

Our Company has been a participant in several vital government sponsored research and development programs with various government agencies that protect the interests of our country. The following is a list of some of the various divisions of government agencies that have provided us with advisory, financial and/or materials support in the pursuit of high-speed electro-optic materials. We are not currently partnered with, strategically related to, or financially supported by any governmental agency at this time, however, we may explore future opportunities as our Company grows and gains the additional resources and personnel necessary to support these efforts. Our previous relationships included:

- National Reconnaissance Office (NRO)
- Properties Branch of the Army Research Laboratory on the Aberdeen Proving Grounds in Aberdeen, Maryland.
- Defense Advance Research Project Agency (DARPA)
- Naval Air Warfare Center Weapons Division in China Lake, California
- Air Force Research Laboratory at Wright-Patterson Air Force Base in Dayton, Ohio

Our Competition

Competitive Technologies - PIC Based Technologies

PIC technologies have historically been driven using III-V compound semiconductors, namely InP, although GaAs remains a strong PIC platform, and is expected to strengthen via the VCSEL based 3D sensing applications. Indium Phosphide has been used since the 1980s as the first PIC platform with laser modulator chips where both the laser and modulator were fabricated monolithically. Since the 1980s, there have been InP based transmitters, receivers, and other functional elements that all support the fiber-communications industry. In fact, over the past 3 decades, the fiber communications industry has driven the increased performance, miniaturization and simplicity in packaging for PIC based technologies. Also, back in the 1980s, optoelectronics was the key word to describe having both electronic and photonic functions or devices on a single chip. This was known in early publications as an optoelectronics integrated circuit (OEIC). Today optoelectronics is synonymous with photonics , and hence the common-place use of photonics integrated circuits for PICs.

In the below figure, it can be seen in red that the incumbent technology for PICs is InP. InP is capable of providing a number of devices and opportunities in both electronics as well as photonics. InP main weakness from a function standpoint is that although it can provide HFETs, JFETs, bipolar electronic devices, it has not been able to successfully penetrate LSI, or VLSI with digital IC circuitry. Chips such as ASICs are not practically available with the InP platform mostly due to advancement in electronic transistor design, and also through limited maturity in large format wafer manufacturing. Today the majority of InP fabrication is based on 4 or 100mm wafers, and only in the past year have folks been seriously looking at 6 or 150mm InP wafer infrastructure. From the photonics standpoint, there are very good reasons why InP is the incumbent technology it provides world class performance in lasers, modulators, simple electronics such as drivers and TIAs (transimpedance amplifiers), as well as highly performing active and passive devices such as SOAs, waveguides, spot-size converters, and mux/demux blocks such as AWG and Eschelle gratings.

Over the past decade, the rise of silicon-based photonics has accelerated quickly (as can be seen in blue in the Figure). Silicon has a huge history in electronics, and it s been said by many that if the existing infrastructure could be utilized effectively, then the cost of producing photonics with similar fabrication, design, testing, and simulation tools, would

become competitive with the current incumbent technology: InP. As can be seen by the figure, silicon is capable of handling many photonics devices in addition to all electronic functionality with CMOS and BiCMOS based technologies. The only photonic device that remains impossible (at least for the time being) is the emitter or laser where light is generated. This has spawned a new segment for silicon photonics (SiP) where engineers and scientists have developed creative ways to implement InP into device, wafer, and epi-designs that are silicon based. These solutions are typically referred to as heterogeneous solutions where both InP and silicon are utilized to create PIC platforms with emitter or laser-based functionality.

While the red area of the Figure represents the incumbent technology InP, the blue areas, Silicon Photonics, the middle areas that are shaded green represent PIC based technologies that can utilize either III-V compound semiconductor platforms such as InP, GaAs, even GaN, as well as silicon platforms such as silicon wafers, and various combinations of silicon-based materials such as SOI (silicon on insulator), SiGe etc. The green areas are represented by both polymers and dielectric materials that can be deposited onto either silicon or III-V material wafers. These combinations of technology allow flexibility in PIC designs where both polymers and dielectrics can provide a multitude of active and passive photonic devices such as: waveguides (W/G), spot size converters (SSC), modulators (such as Mach Zehnder and slot types), multipliers and demultipliers (Mux/Demux variants such as AWGs, MMI, and Echelle gratings). The interesting part of the polymer and dielectric technology is that combinations of active and passive devices can be mixed and matched with either III-V compound devices as well as silicon based, heterogeneous based devices to design more effective and efficient PICs. For polymers, very low voltage can be utilized for low cost, low power consumption, very high-speed modulators that can be deposited onto a semiconductor platform. For dielectric photonics, very low temperature sensitivity mux/demux devices (such as athermal designs) can be deposited onto a semiconductor platform. As can be seen from the Figure, polymer and dielectric technology suffers from that the fact that high density ICs and laser-based emitters are not available but could be integrated with the appropriate designs for the PIC with III-V compound semiconductors and/or silicon based technology that have both DSP/ASIC type circuits and laser emitters.

PIC technologies have a number various and broad applications as can be seen by the Figure below. In this Figure applications range from fiber optic communications, self-driving vehicles, sensing, internet of things, bio-photonics, healthcare, industrial, military, high performance computing etc.

PIC technologies are based upon semiconductor wafers (such as III-V compound semiconductors InP, GaAs etc.) as well as silicon wafers (which can be tailored to become SiGe heterogeneous, SOI, etc.). As these platforms are semiconductor based, the wafers are processed in fabs or fabrication facilities to produce devices. As a general rule, silicon has the largest wafers with 8 (200mm) and 12 (300mm) format discs. GaAs typically is running 3 (75mm), 4 (100mm) and 6 (150mm) wafers in production fabs or fabrication plants around the world. There is an expectation that GaAs will eventually move to 8 (200mm) wafers in the next 5 years. InP is in production today on 2 (50mm), 3 (75mm) and 4 (100mm) wafers with an expectation to move to 6 (150mm) in the next 5 years. Heterogeneous solutions with silicon photonics that utilize materials such as SiGe and InP are typically 8 (200mm) and 12 (300mm) format wafers. Polymer photonics can be deposited on either III-V compound semiconductor wafers as well as silicon wafers which makes it suitable for the next generation of PIC based technological platforms for the fiber communications industry.

The supply chain for the PIC industry starts with the wafer development and continues through epitaxial growth, device fabrication, optical sub-assembly, module or transceiver builds, and sub-systems which are implemented into optical networking applications. Within these supply chain segments, a number of combinations of technology can be utilized. For example, CMOS IC circuits can be fabricated onto silicon wafers together with silicon photonics, heterogeneous solutions, that could have the advantage of polymer active devices, and dielectric passive devices on board. InP may be combined with polymer photonics to house on-board or on-wafer emitters to source light for the optical signaling with modulators. Included in the wafers can be combinations of electrical and optical circuitry. Electrical circuitry is usually set up as both as single as well as multilevel interconnects. Optical circuitry is usually set up as a waveguide or optical layer as part of the device fabrication design. PICs can interconnect electrical devices with photonic devices, and also increase chip functionality through the use of electrical and optical active and passive device solutions. Polymer technologies can provide active device function through for example Mach Zehnder modulators, as well as providing passive device function with waveguides, multipliers, and demultipliers.

Competitors

The markets we are targeting for our electro-optic polymer technology are intensely competitive. Among the largest fiber-optic component manufactures are Finisar, Lumentum, II-VI, NeoPhotonics, Molex, Avago. Additionally, the four largest inorganic modulator component manufacturers hold approximately 85% of the electro-optic modulator component market. They are Lumentum, Sumitomo, Fujitsu and ThorLabs. These companies are heavily invested in the production of crystalline-based electro-optic modulator technologies, as well as the development of novel manufacturing techniques and modulator designs.

Our Plan to Compete

We believe that as our organic polymer technology gains industry acceptance, we will be poised to obtain a significant portion of the component manufacturing market. Electro-optic polymers demonstrate several advantages over other technologies, such as inorganic-based technologies, due to their reduced manufacturing and processing costs, higher performance and lower power requirements. Our patented organic polymers and future electro-optic photonic devices have demonstrated significant stability advantages over our known competitor's materials.

We believe the principal competitive factors in our target markets are:

- The ability to develop and commercialize highly stable optical polymer-based materials and optical devices in commercial quantities.
- The ability to obtain appropriate patent and proprietary rights protection.

- Lower cost, high production yield for these products.
- The ability to enable integration and implement advanced technologies.
- Strong sales and marketing, and distribution channels for access to products.

We believe that our current business planning will position our Company to compete adequately with respect to these factors. Our future success is difficult to predict because we are an early stage company with all of our potential products still in development.

Many of our existing and potential competitors have substantially greater research and product development capabilities and financial, scientific, marketing and human resources than we do. As a result, these competitors may:

- Succeed in developing products that are equal to or superior to our potential products or that achieve greater market acceptance than our potential products.
- Devote greater resources to developing, marketing or selling their products.
- Respond quickly to new or emerging technologies or scientific advances and changes in customer requirements, which could render our technologies or potential products obsolete.
- Introduce products that make the continued development of our potential products uneconomical.
- Obtain patents that block or otherwise inhibit our ability to develop and commercialize our potential products.
- Withstand price competition more successfully than we can.
- Establish cooperative relationships among themselves or with third parties that enhance their ability to address the needs of our prospective customers.
- Take advantage of acquisition or other opportunities more readily than we can.

Employees

We currently have 17 full-time employees, and we retain several independent contractors on an as-needed basis. Based on our current development plan we expect to add 2 to 4 additional full-time employees in 2019. We believe that we have good relations with our employees.

Properties and Laboratory Facilities

Our principal executive offices and research and development facility is located at our new office, laboratory and research and development space located at 369 Inverness Parkway, Suite 350, Englewood, Colorado. The new 13,420 square feet Englewood facility includes fully functional 1,000 square feet of class 1,000 cleanroom, 500 square feet of class 10,000 cleanroom, 220 square feet of class 100 cleanroom, chemistry laboratories, and analytic laboratories. The new Englewood facility streamlines all of our Company s research and development workflow for greater operational efficiencies.

Legal Proceedings

We are not currently a party to or engaged in any material legal proceedings and we are not aware of any litigation or threatened litigation of a material nature. However, we may be subject to various claims and legal actions arising in the ordinary course of business from time to time.

Item 1A. Risk Factors.

Investing in our common stock is risky. In addition to the other information contained in this annual report, you should consider carefully the following risk factors in evaluating our business and us. If any of the following events actually occur, our business, operating results, prospects or financial condition could be materially and adversely affected. This could cause the trading price of our common stock to decline and you may lose all or part of your investment. The risks described below are not the only ones that we face. Additional risks not presently known to us or that we currently deem immaterial may also significantly impair our business operations and could result in a complete loss of your investment.

We have incurred substantial operating losses since our inception and will continue to incur substantial operating losses for the foreseeable future.

Since our inception, we have been engaged primarily in the research and development of our electro-optic polymer materials technologies and potential products. As a result of these activities, we incurred significant losses and experienced negative cash flow since our inception. We incurred a net loss of $5,772,958 for the year ended December 31, 2018 and $5,749,382 for the year ended December 31, 2017. We anticipate that we will continue to incur operating losses through at least 2019.

We may not be able to generate significant revenue either through customer contracts for our potential products or technologies or through development contracts from the U.S. government or government subcontractors. We expect to continue to make significant operating and capital expenditures for research and development and to improve and expand production, sales, marketing and administrative systems and processes. As a result, we will need to generate significant revenue to achieve profitability. We cannot assure you that we will ever achieve profitability.

We are subject to the risks frequently experienced by early stage companies.

The likelihood of our success must be considered in light of the risks frequently encountered by early stage companies, especially those formed to develop and market new technologies. These risks include our potential inability to:

- Establish product sales and marketing capabilities;
- Establish and maintain markets for our potential products;
- Identify, attract, retain and motivate qualified personnel;
- Continue to develop and upgrade our technologies to keep pace with changes in technology and the growth of markets using polymer based materials;
- Develop expanded product production facilities and outside contractor relationships;
- Maintain our reputation and build trust with customers;
- Scale up from small pilot or prototype quantities to large quantities of product on a consistent basis;
- Contract for or develop the internal skills needed to master large volume production of our products; and

- Fund the capital expenditures required to develop volume production due to the limits of our available financial resources.

If we fail to effectively manage our growth, and effectively transition from our focus on research and development activities to commercially successful products, our business could suffer.

Failure to manage growth of operations could harm our business. To date, a large number of our activities and resources have been directed at the research and development of our technologies and development of potential related products. The transition from a focus on research and development to being a vendor of products requires effective planning and management. Additionally, growth arising from the expected synergies from future acquisitions will require effective planning and management. Future expansion will be expensive and will likely strain management and other resources.

In order to effectively manage growth, we must:

- Continue to develop an effective planning and management process to implement our business strategy;
- Hire, train and integrate new personnel in all areas of our business; and
- Expand our facilities and increase capital investments.

We cannot assure you that we will be able to accomplish these tasks effectively or otherwise effectively manage our growth.

We will require additional capital to continue to fund our operations and if we do not obtain additional capital, we may be required to substantially limit our operations.

Our business does not presently generate the cash needed to finance our current and anticipated operations. Based on our current operating plan and budgeted cash requirements, we believe that we have sufficient funds to finance our operations through June 2019; however, we will need to obtain additional future financing after that time to finance our operations until such time that we can conduct profitable revenue-generating activities. We expect that we will need to seek additional funding through public or private financings, including equity financings, and through other arrangements, including collaborative arrangements. Poor financial results, unanticipated expenses or unanticipated

opportunities could require additional financing sooner than we expect. Other than with respect to the purchase agreement for $25 million (the Purchase Agreement) we entered into with Lincoln Park Capital Fund, LLC (Lincoln Park), we have no plans or arrangements with respect to the possible acquisition of additional financing, and such financing may be unavailable when we need it or may not be available on acceptable terms.

Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement and involves risks and uncertainties, and actual results could vary as a result of a number of factors, including the factors discussed elsewhere in this annual report. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect.

Additional financing may not be available to us, due to, among other things, our Company not having a sufficient credit history, income stream, profit level, asset base eligible to be collateralized, or market for its securities. If we raise additional funds by issuing equity or convertible debt securities, the percentage ownership of our existing shareholders may be reduced, and these securities may have rights superior to those of our common stock. If adequate funds are not available to satisfy our long-term capital requirements, or if planned revenues are not generated, we may be required to substantially limit our operations.

We are entering new markets, and if we fail to accurately predict growth in these new markets, we may suffer substantial losses.

We are devoting significant resources to engineer next-generation organic nonlinear optical materials and devices for future applications to be utilized by electro-optic device manufacturers, such as telecommunications component and systems manufacturers, networking and switching suppliers, semiconductor companies, aerospace companies and government agencies as well as our proprietary photonic devices, such as our Polymer Photonic Integrated Circuits P^2IC^{TM}. We expect to continue to develop products for these markets and to seek to identify new markets. These markets change rapidly, and we cannot assure you that they will grow or that we will be able to accurately forecast market demand, or lack thereof, in time to respond appropriately. Our investment of resources to develop products for these markets may either be insufficient to meet actual demand or result in expenses that are excessive in light of actual sales volumes. Failure to predict growth and demand accurately in new markets may cause us to suffer substantial losses. In addition, as we enter new markets, there is a significant risk that:

- The market may not accept the price and/or performance of our products;
- There may be issued patents we are not aware of that could block our entry into the market or could result in excessive litigation; and
- The time required for us to achieve market acceptance of our products may exceed our capital resources that would require additional investment.

Our plan to develop relationships with strategic partners may not be successful.

Part of our business strategy is to maintain and develop strategic relationships with private firms, and to a lesser extent, government agencies and academic institutions, to conduct research and development of products and technologies. For these efforts to be successful, we must identify partners whose competencies complement ours. We must also successfully enter into agreements with them on terms attractive to us, and integrate and coordinate their resources and capabilities with our own. We may be unsuccessful in entering into agreements with acceptable partners or negotiating favorable terms in these agreements. Also, we may be unsuccessful in integrating the resources or capabilities of these partners. In addition, our strategic partners may prove difficult to work with or less skilled than we originally expected. If we are unsuccessful in our collaborative efforts, our ability to develop and market products could be severely limited.

The failure to establish and maintain collaborative relationships may have a materially adverse affect on our business.

We plan to sell many of our products directly to commercial customers or through potential industry partners. For example, we expect to sell our proprietary electro-optic polymer systems to electro-optic device manufacturers, such as telecommunications component and systems manufacturers, networking and switching suppliers, semiconductor companies, aerospace companies and government agencies. Our ability to generate revenues depends significantly on the extent to which potential customers and other potential industry partners develop, promote and sell systems that incorporate our products, which, of course, we cannot control. Any failure by potential customers and other potential industry partners to successfully develop and market systems that incorporate our products could adversely affect our sales. The extent to which potential customers and other industry partners develop, promote and sell systems incorporating our products is based on a number of factors that are largely beyond our ability to control.

We may participate in joint ventures that expose us to operational and financial risk.

We may participate in one or more joint ventures for the purpose of assisting us in carrying out our business expansion, especially with respect to new product and/or market development. We may experience with our joint venture partner(s) issues relating to disparate communication, culture, strategy, and resources. Further, our joint venture partner(s) may have economic or business interests or goals that are inconsistent with ours, exercise their rights in a way that prohibits us from acting in a manner which we would like, or they may be unable or unwilling to fulfill their obligations under the joint venture or other agreements. We cannot assure you that the actions or decisions of our joint venture partners will not affect our operations in a way that hinders our corporate objectives or reduces any anticipated cost savings or revenue enhancement resulting from these ventures.

If we fail to develop and introduce new or enhanced products on a timely basis, our ability to attract and retain customers could be impaired and our competitive position could be harmed.

We plan to operate in a dynamic environment characterized by rapidly changing technologies and industry standards and technological obsolescence. To compete successfully, we must design, develop, market and sell products that provide increasingly higher levels of performance and reliability and meet the cost expectations of our customers. The introduction of new products by our competitors, the market acceptance of products based on new or alternative technologies, or the emergence of new industry standards could render our anticipated products obsolete. Our failure to anticipate or timely develop products or technologies in response to technological shifts could adversely affect our operations. In particular, we may experience difficulties with product design, manufacturing, marketing or certification that could delay or prevent our development, introduction or marketing of products. If we fail to introduce products that meet the needs of our customers or penetrate new markets in a timely fashion our Company will be adversely affected.

Our future growth will suffer if we do not achieve sufficient market acceptance of our organic nonlinear optical material products or our proprietary photonic devices.

We are developing our proprietary electro-optic polymer systems to be utilized by electro-optic device manufacturers, such as telecommunications component and systems manufacturers, networking and switching suppliers, semiconductor companies, aerospace companies and government agencies, as well as our proprietary photonic devices, such as our Polymer Photonic Integrated Circuits P^2IC^{TM}. All of our potential products are still in the development stage, and we do not know when a market for these products will develop, if at all. Our success depends, in part, upon our ability to gain market acceptance of our products. To be accepted, our products must meet the technical and performance requirements of our potential customers. OEMs, suppliers or government agencies may not accept polymer-based products. In addition, even if we achieve some degree of market acceptance for our potential products in one industry, we may not achieve market acceptance in other industries for which we are developing products.

Achieving market acceptance for our products will require marketing efforts and the expenditure of financial and other resources to create product awareness and demand by customers. We may be unable to offer products that compete effectively due to our limited resources and operating history. Also, certain large corporations may be predisposed against doing business with a company of our limited size and operating history. Failure to achieve broad acceptance of our products by customers and to compete effectively would harm our operating results.

Our potential customers require our products to undergo a lengthy and expensive qualification process, which does not assure product sales.

Prior to purchasing our products, our potential customers will require that our products undergo extensive qualification processes. These qualification processes may continue for several months or more. However, qualification of a product by a customer does not assure any sales of the product to that customer. Even after successful qualification and sales of a product to a customer, a subsequent revision to the product, changes in our customer s manufacturing process or our selection of a new supplier may require a new qualification process, which may result in additional delays. Also, once one of our products is qualified, it could take several additional months or more before a customer commences volume production of components or devices that incorporate our products. Despite these uncertainties, we are devoting substantial resources, including design, engineering, sales, marketing and management efforts, to qualifying our products with customers in anticipation of sales. If we are unsuccessful or delayed in qualifying any of our products with a customer, sales of our products to a customer may be precluded or delayed, which may impede our growth and cause our business to suffer.

Obtaining a sales contract with a potential customer does not guarantee that a potential customer will not decide to cancel or change its product plans, which could cause us to generate no revenue from a product and adversely affect our results of operations.

Even after we secure a sales contract with a potential customer, we may experience delays in generating revenue from our products as a result of a lengthy development cycle that may be required. Potential customers will likely take a considerable amount of time to evaluate our products; it could take 12 to 24 months from early engagement by our sales team to actual product sales. The delays inherent in these lengthy sales cycles increase the risk that a customer will decide to cancel, curtail, reduce or delay its product plans, causing us to lose anticipated sales. In addition, any delay or cancellation of a customer s plans could materially and adversely affect our financial results, as we may have incurred significant expense and generated no revenue. Finally, our customers failure to successfully market and sell their products could reduce demand for our products and materially and adversely affect our business, financial condition and results of operations. If we were unable to generate revenue after incurring substantial expenses to develop any of our products, our business would suffer.

Many of our products will have long sales cycles, which may cause us to expend resources without an acceptable financial return and which makes it difficult to plan our expenses and forecast our revenue.

Many of our products will have long sales cycles that involve numerous steps, including initial customer contacts, specification writing, engineering design, prototype fabrication, pilot testing, regulatory approvals (if needed), sales and marketing and commercial manufacture. During this time, we may expend substantial financial resources and management time and effort without any assurance that product sales will result. The anticipated long sales cycle for some of our products makes it difficult to predict the quarter in which sales may occur. Delays in sales may cause us to expend resources without an acceptable financial return and make it difficult to plan expenses and forecast revenues.

Successful commercialization of our current and future products will require us to maintain a high level of technical expertise.

Technology in our target markets is undergoing rapid change. To succeed in our target markets, we will have to establish and maintain a leadership position in the technology supporting those markets. Accordingly, our success will depend on our ability to:

- Accurately predict the needs of our target customers and develop, in a timely manner, the technology required to support those needs;
- Provide products that are not only technologically sophisticated but are also available at a price acceptable to customers and competitive with comparable products;
- Establish and effectively defend our intellectual property; and
- Enter into relationships with other companies that have developed complementary technology into which our products may be integrated.

We cannot assure you that we will be able to achieve any of these objectives.

One of our significant target markets is the telecommunications market, which historically has not accepted polymer modulators.

One of our significant target markets is the telecommunications market, which demands high reliability optical components. Historically, polymer modulators have not been accepted into this market even though polymer modulators have achieved Telcordia based specifications. It is clear that the telecommunications market is demanding

higher and higher data rates for its optical components, and may again decide that polymer based modulators are not suitable even if higher data rates, high reliability, and low power consumption are demonstrated

Another of our significant target markets is the data communications (datacenter and/or high performance computing) market, which may be subject to heavy competition from other PIC based technologies such as silicon photonics and Indium Phosphide.

Another of our significant target markets is the data communications (datacenter and/or high performance computing) market, which may be subject to heavy competition from other PIC based technologies such as silicon photonics and Indium Phosphide. As the demands for high performance, low cost ($/Gbps) is implemented into next generation architectures, polymer modulators and polymer based PIC products may be subject to significant competition. Furthermore, there is a potential that technologies such as silicon photonics and Indium Phosphide might reach the might reach the metric of $1/Gbps at 400Gbps before ours. Customers may then be less willing to purchase new technology such as ours or invest in new technology development such as ours for next generation systems.

Our inability to successfully acquire and integrate other businesses, assets, products or technologies could harm our business and cause us to fail at achieving our anticipated growth.

We may grow our business through strategic acquisitions and investments, such as our acquisition of BrPhotonics polymer business, and we are actively evaluating acquisitions and strategic investments in businesses, products or technologies that we believe could complement or expand our product offering, create and/or expand a client base, enhance our technical capabilities or otherwise offer growth or cost-saving opportunities. From time to time, we may enter into letters of intent with companies with which we are negotiating potential acquisitions or investments or as to which we are conducting due diligence. Although we are currently not a party to any binding definitive agreement with respect to potential investments in, or acquisitions of, complementary businesses, products or technologies, we may enter into these types of arrangements in the future, which could materially decrease the amount of our available cash or require us to seek additional equity or debt financing. We have limited experience in successfully acquiring and integrating businesses, products and technologies. We may not be successful in negotiating the terms of any potential acquisition, conducting thorough due diligence, financing the acquisition or effectively integrating the acquired business, product or technology into our existing business and operations. Our due diligence may fail to identify all of the problems, liabilities or other shortcomings or challenges of an acquired business, product or technology, including issues related to intellectual property, product quality or product architecture, regulatory compliance practices, revenue recognition or other accounting practices, or employee or customer issues.

Additionally, in connection with any acquisitions we complete, we may not achieve the synergies or other benefits we expected to achieve, and we may incur write-downs, impairment charges or unforeseen liabilities that could negatively affect our operating results or financial position or could otherwise harm our business. If we finance acquisitions using existing cash, the reduction of our available cash could cause us to face liquidity issues or cause other unanticipated problems in the future. If we finance acquisitions by issuing convertible debt or equity securities, the ownership interest of our existing stockholders may be diluted, which could adversely affect the market price of our stock. Further, contemplating or completing an acquisition and integrating an acquired business, product or technology could divert management and employee time and resources from other matters, which could harm our business, financial condition and operating results.

The exercise of options and warrants and other issuances of shares of common stock or securities convertible into common stock will dilute your interest.

As of December 31, 2018, we have outstanding options and warrants to purchase an aggregate of 18,964,867 shares of our common stock at exercise prices ranging from $0.57 - $1.69 per share with a weighted average exercise price of $0.91 per share. The exercise of options and warrants at prices below the market price of our common stock could adversely affect the price of shares of our common stock. Additional dilution may result from the issuance of shares of our capital stock in connection with any collaboration (although none are contemplated at this time) or in connection with other financing efforts, including pursuant to the Purchase Agreement with Lincoln Park.

Any issuance of our common stock that is not made solely to then-existing stockholders proportionate to their interests, such as in the case of a stock dividend or stock split, will result in dilution to each stockholder by reducing his, her or its percentage ownership of the total outstanding shares. Moreover, if we issue options or warrants to purchase our common stock in the future and those options or warrants are exercised or we issue restricted stock, stockholders may experience further dilution. Holders of shares of our common stock have no preemptive rights that entitle them to purchase their pro rata share of any offering of shares of any class or series.

We may incur debt in the future that might be secured with our intellectual property as collateral, which could subject our Company to the risk of loss of all of our intellectual property.

If we incur debt in the future, we may be required to secure the debt with our intellectual property, including all of our patents and patents pending. In the event we default on the debt, we could incur the loss of all of our intellectual property, which would materially and adversely affect our Company and cause you to lose your entire investment in our Company.

Our quarter-to-quarter performance may vary substantially, and this variance, as well as general market conditions, may cause our stock price to fluctuate greatly and even potentially expose us to litigation.

We have generated no significant sales to date and we cannot accurately estimate future quarterly revenue and operating expenses based on historical performance. Our quarterly operating results may vary significantly based on many factors, including:

- Fluctuating demand for our potential products and technologies;
- Announcements or implementation by our competitors of technological innovations or new products;
- Amount and timing of our costs related to our marketing efforts or other initiatives;
- The status of particular development programs and the timing of performance under specific development agreements;
- Timing and amounts relating to the expansion of our operations;
- Product shortages requiring suppliers to allocate minimum quantities;
- Announcements or implementation by our competitors of technological innovations or new products;
- The status of particular development programs and the timing of performance under specific development agreements;
- Our ability to enter into, renegotiate or renew key agreements;
- Timing and amounts relating to the expansion of our operations;
- Costs related to possible future acquisitions of technologies or businesses; or
- Economic conditions specific to our industry, as well as general economic conditions.

Our current and future expense estimates are based, in large part, on estimates of future revenue, which is difficult to predict. We expect to continue to make significant operating and capital expenditures in the area of research and development and to invest in and expand production, sales, marketing and administrative systems and processes. We may be unable to, or may elect not to, adjust spending quickly enough to offset any unexpected revenue shortfall. If our increased expenses were not accompanied by increased revenue in the same quarter, our quarterly operating results would be harmed.

Our failure to compete successfully could harm our business.

The markets that we are targeting for our proprietary electro-optic polymer systems and photonic devices are intensely competitive. Most of our present and potential competitors have or may have substantially greater research and product development capabilities, financial, scientific, marketing, manufacturing and human resources, name recognition and experience than we have. As a result, these competitors may:

- Succeed in developing products that are equal to or superior to our potential products or that will achieve greater market acceptance than our potential products;
- Devote greater resources to developing, marketing or selling their products;
- Respond more quickly to new or emerging technologies or scientific advances and changes in customer requirements, which could render our technologies or potential products obsolete;
- Introduce products that make the continued development of our potential products uneconomical;
- Obtain patents that block or otherwise inhibit our ability to develop and commercialize our potential products;
- Withstand price competition more successfully than we can;
- Establish cooperative relationships among themselves or with third parties that enhance their ability to address the needs of our prospective customers.

The failure to compete successfully against these existing or future competitors could harm our business.

We may be unable to obtain effective intellectual property protection for our potential products and technology.

Our intellectual property, or any intellectual property that we have or may acquire, license or develop in the future, may not provide meaningful competitive advantages. Our patents and patent applications, including those we license, may be challenged by competitors, and the rights granted under such patents or patent applications may not provide meaningful proprietary protection. For example, numerous patents held by third parties relate to polymer materials and electro-optic devices. These patents could be used as a basis to challenge the validity or limit the scope of our patents or patent applications. A successful challenge to the validity or limitation of the scope of our patents or patent applications could limit our ability to commercialize our polymer materials technology and, consequently, reduce our revenues.

Moreover, competitors may infringe our patents or those that we license, or successfully avoid these patents through design innovation. To combat infringement or unauthorized use, we may need to resort to litigation, which can be expensive and time-consuming and may not succeed in protecting our proprietary rights. In addition, in an infringement proceeding a court may decide that our patents or other intellectual property rights are not valid or are unenforceable, or may refuse to stop the other party from using the intellectual property at issue on the ground that it is non-infringing. Policing unauthorized use of our intellectual property is difficult and expensive, and we may not be able to, or have the resources to, prevent misappropriation of our proprietary rights, particularly in countries where the laws may not protect these rights as fully as the laws of the United States.

We also rely on the law of trade secrets to protect unpatented technology and know-how. We try to protect this technology and know-how by limiting access to those employees, contractors and strategic partners with a need to know this information and by entering into confidentiality agreements with these parties. Any of these parties could breach the agreements and disclose our trade secrets or confidential information to our competitors, or these competitors might learn of the information in other ways. Disclosure of any trade secret not protected by a patent could materially harm our business.

We may be subject to patent infringement claims, which could result in substantial costs and liability and prevent us from commercializing our potential products.

Third parties may claim that our potential products or related technologies infringe their patents. Any patent infringement claims brought against us may cause us to incur significant expenses, divert the attention of our management and key personnel from other business concerns and, if successfully asserted against us, require us to pay substantial damages. In addition, as a result of a patent infringement suit, we may be forced to stop or delay developing, manufacturing or selling potential products that are claimed to infringe a patent covering a third party's intellectual property unless that party grants us rights to use its intellectual property. We may be unable to obtain these rights on terms acceptable to us, if at all. Even if we are able to obtain rights to a third party's patented intellectual property, these rights may be non-exclusive, and therefore our competitors may obtain access to the same intellectual property. Ultimately, we may be unable to commercialize our potential products or may have to cease some of our business operations as a result of patent infringement claims, which could severely harm our business.

If our potential products infringe the intellectual property rights of others, we may be required to indemnify customers for any damages they suffer. Third parties may assert infringement claims against our current or potential customers. These claims may require us to initiate or defend protracted and costly litigation on behalf of customers, regardless of the merits of these claims. If any of these claims succeed, we may be forced to pay damages on behalf of these customers or may be required to obtain licenses for the products they use. If we cannot obtain all necessary licenses on commercially reasonable terms, we may be unable to continue selling such products.

Our technology may be subject to government rights.

We may have obligations to government agencies in connection with the technology that we have developed, including the right to require that a compulsory license be granted to one or more third parties selected by certain government agencies. It may be difficult to monitor whether these third parties will limit their use of our technology to these licensed uses, and we could incur substantial expenses to enforce our rights to our licensed technology in the event of misuse.

The loss of certain of our key personnel, or any inability to attract and retain additional personnel, could impair our ability to attain our business objectives.

Our future success depends to a significant extent on the continued service of our key management personnel, particularly Dr. Michael Lebby, our Chief Executive Officer and James S. Marcelli our President, Chief Operating Officer, Secretary and Principal Financial Officer. Accordingly, the loss of the services of either of these persons would adversely affect our business and our ability to timely commercialize our products, and impede the attainment of our business objectives.

Our future success will also depend on our ability to attract, retain and motivate highly skilled personnel to assist us with product development and commercialization. Competition for highly educated qualified personnel in the polymer industry is intense. If we fail to hire and retain a sufficient number of qualified management, engineering, sales and technical personnel, we will not be able to attain our business objectives.

If we fail to develop and maintain the quality of our manufacturing processes, our operating results would be harmed.

The manufacture of our potential products is a multi-stage process that requires the use of high-quality materials and advanced manufacturing technologies. Also, polymer-related device development and manufacturing must occur in a highly controlled, clean environment to minimize particles and other yield and quality-limiting contaminants. In spite of stringent quality controls, weaknesses in process control or minute impurities in materials may cause a substantial percentage of a product in a lot to be defective. If we are not able to develop and continue to improve on our manufacturing processes or to maintain stringent quality controls, or if contamination problems arise, our operating results would be harmed.

The complexity of our anticipated products may lead to errors, defects and bugs, which could result in the necessity to redesign products and could negatively, impact our reputation with customers.

Products as complex as those we intend to market might contain errors, defects and bugs when first introduced or as new versions are released. Delivery of products with production defects or reliability, quality or compatibility problems could significantly delay or hinder market acceptance of our products or result in a costly recall and could damage our reputation and adversely affect our ability to sell our products. If our products experience defects, we may need to undertake a redesign of the product, a process that may result in significant additional expenses.

We may also be required to make significant expenditures of capital and resources to resolve such problems. There is no assurance that problems will not be found in new products after commencement of commercial production, despite testing by our suppliers, our customers and us.

If we decide to make commercial quantities of products at our facilities, we will be required to make significant capital expenditures to increase capacity.

We lack the internal ability to manufacture products at a level beyond the stage of early commercial introduction. To the extent we do not have an outside vendor to manufacture our products, we will have to increase our internal production capacity and we will be required to expand our existing facilities or to lease new facilities or to acquire entities with additional production capacities. These activities would require us to make significant capital investments and may require us to seek additional equity or debt financing. We cannot assure you that such financing would be available to us when needed on acceptable terms, or at all. Further, we cannot assure you that any increased demand for our potential products would continue for a sufficient period of time to recoup our capital investments associated with increasing our internal production capacity.

In addition, we do not have experience manufacturing our potential products in large quantities. In the event of significant demand for our potential products, large-scale production might prove more difficult or costly than we anticipate and lead to quality control issues and production delays.

We may not be able to manufacture products at competitive prices.

To date, we have produced limited quantities of products for research, development, demonstration and prototype purposes. The cost per unit for these products currently exceeds the price at which we could expect to profitably sell them. If we cannot substantially lower our cost of production as we move into sales of products in commercial quantities, our financial results will be harmed.

We conduct significantly all of our research and development activities at our Englewood, CO facility, and circumstances beyond our control may result in considerable interruptions.

We conduct significantly all of our research and development activities at our Englewood, CO facility, and although we have an agreement with CU Boulder to use their facilities in case of any contingency, a disaster such as a fire, flood or severe storm at or near one of our facilities could prevent us from further developing our technologies or manufacturing our potential products, which would harm our business.

We are subject to regulatory compliance related to our operations.

We are subject to various U.S. governmental regulations related to occupational safety and health, labor and business practices. Failure to comply with current or future regulations could result in the imposition of substantial fines, suspension of production, alterations of our production processes, cessation of operations, or other actions, which could harm our business.

We may be unable to export our potential products or technology to other countries, convey information about our technology to citizens of other countries or sell certain products commercially, if the products or technology are subject to United States export or other regulations.

We are developing certain polymer-based products that we believe the United States government and other governments may be interested in using for military and information gathering or antiterrorism activities. United States government export regulations may restrict us from selling or exporting these potential products into other countries, exporting our technology to those countries, conveying information about our technology to citizens of other countries or selling these potential products to commercial customers. We may be unable to obtain export licenses for products or technology, if they become necessary. We currently cannot assess whether national security concerns would affect our potential products and, if so, what procedures and policies we would have to adopt to comply with applicable existing or future regulations.

We may incur liability arising from the use of hazardous materials.

Our business and our facilities are subject to a number of federal, state and local laws and regulations relating to the generation, handling, treatment, storage and disposal of certain toxic or hazardous materials and waste products that we use or generate in our operations. Many of these environmental laws and regulations subject current or previous owners or occupiers of land to liability for the costs of investigation, removal or remediation of hazardous materials. In addition, these laws and regulations typically impose liability regardless of whether the owner or occupier knew of, or was responsible for, the presence of any hazardous materials and regardless of whether the actions that led to the presence were taken in compliance with the law. In our business, we use hazardous materials that are stored on site. We use various chemicals in our manufacturing process that may be toxic and covered by various environmental controls. An unaffiliated waste hauler transports the waste created by use of these materials off-site. Many environmental laws and regulations require generators of waste to take remedial actions at an off-site disposal location even if the disposal was conducted lawfully. The requirements of these laws and regulations are complex, change frequently and could become more stringent in the future. Failure to comply with current or future environmental laws and regulations could result in the imposition of substantial fines, suspension of production, alteration of our production processes, cessation of operations or other actions, which could severely harm our business.

Our data and information systems and network infrastructure may be subject to hacking or other cyber security threats. If our security measures are breached and an unauthorized party obtains access to our proprietary business information, our information systems may be perceived as being unsecure, which could harm our business and reputation, and our proprietary business information could be misappropriated which could have an adverse effect on our business and results of operations.

Our Company stores and transmits its proprietary information on its computer systems. Despite our security measures, our information systems and network infrastructure may be vulnerable to cyber-attacks or could be breached due to an employee error or other disruption that could result in unauthorized disclosure of sensitive information that has the potential to significantly interfere with our business operations. Breaches of our security measures could expose us to a risk of loss or misuse of this information, litigation and potential liability. Since techniques used to obtain unauthorized access or to sabotage information systems change frequently and generally are not recognized until launched against a target, we may be unable to anticipate these techniques or to implement adequate preventive measures in advance of such an attack on our systems. In addition, we use a vendor that uses cyber or Cloud storage of information as part of their service or product offerings, and despite our attempts to validate the security of such services, our proprietary information may be misappropriated by third parties. In the event of an actual or perceived breach of our security, or the security of one of our vendors, the market perception of the effectiveness of our security measures could be harmed and we could suffer damage to our reputation or our business. Additionally, misappropriation of our proprietary business information could prove competitively harmful to our business.

If we are unable to maintain effective internal controls, our business, financial position and results of operations could be adversely affected.

If we are unable to maintain effective internal controls, our business, financial position and results of operations could be adversely affected. We are subject to the reporting and other obligations under the Securities Exchange Act of 1934 (Exchange Act), including the requirements of Section 404 of the Sarbanes-Oxley Act of 2002, which require annual management assessments of the effectiveness of our internal control over financial reporting. Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with accounting principles generally accepted in the United States. Any failure to achieve and maintain effective internal controls could have an adverse effect on our business, financial position and results of operations. In addition, our independent registered public accounting firm is required to attest to the effectiveness of our internal control over financial reporting annually. If our independent registered public accounting firm is unable to attest to the effectiveness of our internal control over financial reporting, investor confidence in our reported results will be harmed and the price of our securities may fall. These reporting and other obligations place significant demands on our management and administrative and operational resources, including accounting resources.

Shares eligible for future sale may adversely affect the market.

From time to time, certain of the Company s shareholders may be eligible to sell all or some of their shares of common stock by means of ordinary brokerage transactions in the open market pursuant to Rule 144, promulgated under the Securities Act of 1933, as amended (the Securities Act), subject to certain limitations. In general, a non-affiliate stockholder who has satisfied a six-month holding period may, under certain circumstances, sell its shares, without limitation. Any substantial sale of the Company s common stock pursuant to Rule 144 or pursuant to any resale prospectus may have a material adverse effect on the market price of our common stock.

There is a limited market for our common stock, which may make it more difficult for you to sell your stock.

Our Company s common stock is quoted on the OTCMarkets (OTCQB) under the symbol "LWLG." The trading market for our common stock is limited, accordingly, there can be no assurance as to the liquidity of any markets that may develop for our common stock, your ability to sell our common stock, or the prices at which you may be able to sell our common stock.

Our Company s stock price may be volatile.

The market price of our Company s common stock is likely to be highly volatile and could fluctuate widely in price in response to various factors, many of which are beyond our control, including:

- Technological innovations or new products and services by our Company or our competitors;
- Additions or departures of key personnel;
- Sales of our Company s common stock;
- Our Company s ability to integrate operations, technology, products and services;
- Our Company s ability to execute our business plan;
- Operating results below expectations;
- Loss of any strategic relationship;
- Industry developments;
- Economic and other external factors; and
- Period-to-period fluctuations in our Company s financial results.

You may consider any one of these factors to be material, and our stock price may fluctuate widely as a result of any of the above listed factors.

In addition, the securities markets have from time to time experienced significant price and volume fluctuations that are unrelated to the operating performance of particular companies. These market fluctuations may also materially and adversely affect the market price of our Company s common stock.

Our board of directors has the authority, without stockholder approval, to issue preferred stock with terms that may not be beneficial to existing common stockholders and with the ability to affect adversely stockholder voting power and perpetuate their control over us.

Our amended articles of incorporation allow us to issue shares of preferred stock without any vote or further action by our stockholders. Our board of directors has the authority to fix and determine the relative rights and preferences of preferred stock. Our board of directors also has the authority to issue preferred stock without further stockholder approval, including large blocks of preferred stock. As a result, our board of directors could authorize the issuance of a series of preferred stock that would grant to holders thereof the preferred right to our assets upon liquidation, the right to receive dividend payments before dividends are distributed to the holders of common stock or other preferred stockholders and the right to the redemption of the shares, together with a premium, prior to the redemption of our common stock or existing preferred stock, if any.

Preferred stock could be used to dilute a potential hostile acquirer. Accordingly, any future issuance of preferred stock or any rights to purchase preferred stock may have the effect of making it more difficult for a third party to acquire control of us. This may delay, defer or prevent a change of control or an unsolicited acquisition proposal. The issuance of preferred stock also could decrease the amount of earnings attributable to, and assets available for distribution to, the holders of our common stock and could adversely affect the rights and powers, including voting rights, of the holders of our common stock and preferred stock.

Our articles of incorporation and bylaws, and certain provisions of Nevada corporate law, as well as certain of our contracts, contain provisions that could delay or prevent a change in control even if the change in control would be beneficial to our stockholders.

Nevada law, as well as our amended articles of incorporation and bylaws, contain anti-takeover provisions that could delay or prevent a change in control of our Company, even if the change in control would be beneficial to our stockholders. These provisions could lower the price that future investors might be willing to pay for shares of our common stock. These anti-takeover provisions:

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authorize our board of directors to create and issue, without stockholder approval, preferred stock, thereby increasing the number of outstanding shares, which can deter or prevent a takeover attempt;

.

prohibit cumulative voting in the election of directors, which would otherwise allow less than a majority of stockholders to elect director candidates;

.

empower our board of directors to fill any vacancy on our board of directors, whether such vacancy occurs as a result of an increase in the number of directors or otherwise;

.

provide that our board of directors be divided into three classes, with approximately one-third of the directors to be elected each year;

.

provide that our board of directors is expressly authorized to adopt, amend or repeal our bylaws; and

.

provide that our directors will be elected by a plurality of the votes cast in the election of directors.

Nevada Revised Statutes, the terms of our employee stock option agreements and other contractual provisions may also discourage, delay or prevent a change in control of our Company. Nevada Revised Statutes sections 78.378 to 78.3793 provide state regulation over the acquisition of a controlling interest in certain Nevada corporations unless the articles of incorporation or bylaws of the corporation provide that the provisions of these sections do not apply. Our articles of incorporation and bylaws do not state that these provisions do not apply. The statute creates a number of restrictions on the ability of a person or entity to acquire control of a Nevada company by setting down certain rules of conduct and voting restrictions in any acquisition attempt, among other things. The statute contains certain limitations and it may not apply to our Company. Our 2016 Equity Incentive Plan includes change-in-control provisions that allow us to grant options that may become vested immediately upon a change in control. Our board of directors also has the power to adopt a stockholder rights plan that could delay or prevent a change in control of our Company even if the change in control is generally beneficial to our stockholders. These plans, sometimes called poison pills, are oftentimes criticized by institutional investors or their advisors and could affect our rating by such investors or advisors. If our board of directors adopts such a plan, it might have the effect of reducing the price that new investors are willing to pay for shares of our common stock.

Together, these charter, statutory and contractual provisions could make the removal of our management and directors more difficult and may discourage transactions that otherwise could involve payment of a premium over prevailing market prices for our common stock. Furthermore, the existence of the foregoing provisions, as well as the significant common stock beneficially owned by our founders, executive officers, and members of our board of directors, could limit the price that investors might be willing to pay in the future for shares of our common stock. They could also deter potential acquirers of our Company, thereby reducing the likelihood that you could receive a premium for your common stock in an acquisition.

Item 1B. Unresolved Staff Comments.

Not Applicable.

Item 2. Properties.

Our principal executive offices and research and development facility is located at 369 Inverness Parkway, Suite 350, Englewood, Colorado. The 13,420 square feet facility includes fully functional 1,000 square feet of class 1,000 cleanroom, 500 square feet of class 10,000 cleanroom, chemistry laboratories, and analytic laboratories, and serves as our office, laboratory and research and development space. Our annual base rent during 2019 is approximately $32,432.

Item 3. Legal Proceedings.

We are not aware of any litigation or threatened litigation of a material nature.

Item 4. Mine Safety Disclosures.

Not Applicable.

PART II

Item 5. Market For Registrant s Common Equity, Related Stockholder Matters and Issuer Purchases Of Equity Securities.

Market Information

Our common stock is traded on the OTCQB under the symbol LWLG . Any over-the-counter market quotations reflect inter-dealer prices, without retail mark-up, mark-down or commission and may not necessarily represent actual transactions.

Shareholders

As of March 15, 2019, there were approximately 108 holders of our common stock, including The Depository Trust Company, which holds shares of our common stock on behalf of an indeterminate number of beneficial owners.

Dividends

No cash dividends have been declared or paid on our common stock to date and we currently intend to use all available funds to fund the development and growth of our business.

Securities Authorized for Issuance under Equity Compensation Plans

Equity Compensation Plans as of December 31, 2018.

Equity Compensation Plan Information

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights (a)	Weighted-average exercise price of outstanding options, warrants and rights (b)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)) (c)
Equity compensation plans approved by security holders (1)	6,755,000 (1)	$0.86	765,000
Equity compensation plans not approved by security holders (2)	1,677,500	$0.80	0
Total	8,432,500	$0.85	765,000

(1) Reflects shares of common stock to be issued pursuant to our 2016 Equity Incentive Plan and our 2007 Employee Stock Plan, both of which are for the benefit of our directors, officers, employees and consultants. We have reserved 3,000,000 shares of common stock for such persons pursuant to our 2016 Equity Incentive Plan. We terminated our 2007 Employee Stock Plan in June 2016 and no additional awards are made under that plan.

(2) Comprised of common stock purchase warrants we issued for services.

Recent Sales of Unregistered Securities

During the period covered by this report, our Company has sold the following securities without registering the securities under the Securities Act:

Date	Security	
April 2018	Common Stock	100,000 shares of common stock at a purchase price of $0.615 per share issued pursuant to a warrant exercise.
July 2018	Warrant	right to buy 150,000 shares of common stock at $1.15 per share issued for services.

No underwriters were utilized, and no commissions or fees were paid with respect to any of the above transactions. These persons were the only offerees in connection with these transactions. We relied on Section 4(a)(2), 4(a)(5) and Rule 506 of Regulation D of the Securities Act since the transaction does not involve any public offering.

Item 6. Selected Financial Data.

Not Applicable.

Item 7. MANAGEMENT S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS.

The following management's discussion and analysis of financial condition and results of operations provides information that management believes is relevant to an assessment and understanding of our plans and financial condition. The following selected financial information is derived from our historical financial statements and should be read in conjunction with such financial statements and notes thereto set forth elsewhere herein and the "Forward-Looking Statements" explanation included herein.

Overview

Lightwave Logic, Inc. is a development stage company whose P^2IC^{TM} technology addresses advanced telecommunication, data communications, and data center markets utilizing its advanced organic electro-optic polymer systems. The Company currently has development activities in both polymer materials as well as device

design.

Materials Development

The Company designs and synthesizes organic chromophores for use in its own proprietary electro-optic *polymer systems* and photonic device designs. A polymer system is not solely a material, but also encompasses various technical enhancements necessary for its implementation. These include host polymers, poling methodologies, and molecular spacer systems that are customized to achieve specific optical properties. Our organic electro-optic polymer systems compounds are mixed into solution form that allows for thin film application. Our proprietary electro-optic polymers are designed at the molecular level for potentially superior performance, stability and cost-efficiency. We believe they have the potential to replace more expensive, higher power consuming, slower-performance materials and devices used in fiber-optic communication networks.

Our patented and patent pending molecular architectures are based on a well-understood chemical and quantum mechanical occurrence known as *aromaticity*. Aromaticity provides a high degree of molecular stability that enables our core molecular structures to maintain stability under a broad range of operating conditions.

We expect our patented and patent-pending optical materials along with trade secrets and licensed materials, to be the core of and the enabling technology for future generations of optical devices, modules, sub-systems and systems that we will develop or potentially out-license to electro-optic device manufacturers. The Company contemplates future applications that may address the needs of semiconductor companies, optical network companies, Web 2.0 media companies, high performance computing companies, telecommunications companies, aerospace companies, and government agencies.

Device Design and Development

Electro-optic Modulators

The Company designs its own proprietary electro-optical modulation devices. Electro-optical modulators convert data from electric signals into optical signals that can then be transmitted over high-speed fiber-optic cables. Our modulators are electro-optic, meaning they work because the optical properties of the polymers are affected by electric fields applied by means of electrodes. Modulators are key components that are used in fiber optic telecommunications, data communications, and data centers networks etc., to convey the high data flows that have been driven by applications such as pictures, video streaming, movies etc., that are being transmitted through the Internet. Electro-optical modulators are expected to continue to be an essential element as the appetite and hunger for data increases every year.

Polymer Photonic Integrated Circuits (P^2IC^{TM})

The Company also designs its own proprietary polymer photonic integrated circuits (otherwise termed a polymer PIC). A polymer PIC is a photonic device that integrates several photonic functions on a single chip. We believe that our technology can enable the ultra-miniaturization needed to increase the number of photonic functions residing on a semiconductor chip to create a progression like what was seen in the computer integrated circuits, commonly referred to as Moore s Law. One type of integration is to combine several instances of the same photonic functions such as a plurality of modulators to create a 4 channel polymer PIC. In this case, the number of photonic components would increase by a factor of 4. Another type is to combine different types of devices including from different technology bases such as the combination of a semiconductor laser with a polymer modulator. Our P^2IC platform encompasses both these types of architecture.

Current photonic technology today is struggling to reach faster device speeds. Our modulator devices, enabled by our electro-optic polymer material systems, work at extremely high frequencies (wide bandwidths) and possess inherent advantages over current crystalline electro-optic material contained in most modulator devices such as lithium niobate (LiNbO3), indium phosphide (InP), silicon (Si), and gallium arsenide GaAs). Our advanced electro-optic polymer platform is creating a new class of modulators and associated PIC platforms that can address higher data rates in a lower cost, lower power consuming manner, with much simpler modulation techniques.

Our electro-optic polymers can be integrated with other materials platforms because they can be applied as a thin film coating in a fabrication clean room such as may be found in semiconductor foundries. Our polymers are unique in that they are stable enough to seamlessly integrate into existing CMOS, Indium Phosphide (InP), Gallium Arsenide

(GaAs), and other semiconductor manufacturing lines.

Business Strategy

Our business strategy anticipates that our revenue stream will be derived from one or some combination of the following: (i) technology licensing for specific product application; (ii) joint venture relationships with significant industry leaders; or (iii) the production and direct sale of our own electro-optic device components. Our objective is to be a leading provider of proprietary technology and know-how in the electro-optic device market. In order to meet this objective, we intend to:

- Further the development of proprietary organic electro-optic polymer material systems
- Develop photonic devices based on our P^2IC^{TM} technology
- Continue to develop proprietary intellectual property
- Grow our commercial device development capabilities
- Grow our product reliability and quality assurance capabilities
- Grow our optoelectronic packaging and testing capabilities
- Grow our commercial material manufacturing capabilities
- Maintain/develop strategic relationships with major telecommunications and data communications companies to further the awareness and commercialization of our technology platform
- Continue to add high-level personnel with industrial and manufacturing experience in key areas of our materials and device development programs.

Create Organic Polymer-Enabled Electro-Optic Modulators

We intend to utilize our proprietary optical polymer technology to create an initial portfolio of commercial electro-optic polymer product devices with applications for various markets, including telecommunications, data communications and data centers. These product devices will be part of our proprietary photonics integrated circuit (PIC) technology platform.

We expect our initial modulator products will operate at data rates at least 50 Gbaud (capable of 50 Gbps with standard data encoding of NRZ and 100 Gbps with more complex PAM-4 encoding). Our devices are highly linear, enabling the performance required to take advantage of the more advance complex encoding schemes. We are currently developing our polymer technology to operate at the next industry node of 100Gbaud.

Our Proprietary Products in Development

As part of a two-pronged marketing strategy, our Company is developing several optical devices, which are in various stages of development and that utilize our polymer optical materials. They include:

Ridge Waveguide Modulator

Our ridge electro-optic waveguide modulator was designed and fabricated in our in-house laboratory. The fabrication of our first in-house device is significant to our entire device program and is an important starting point for modulators that are being developed for target markets. We have multiple generations of new materials that we will soon be optimizing for this specific design. In September 2017 we announced that our initial alpha prototype ridge waveguide modulator, enabled by our P^2IC polymer system, demonstrated bandwidth performance levels that will enable 50 Gbaud modulation in fiber-optic communications. This device demonstrated true amplitude (intensity) modulation in a Mach-Zehnder modulator structure incorporating our polymer waveguides. This important achievement will allow users to utilize arrays of 4 x 50 Gbaud (4x 100 Gbps) polymer modulators using PAM-4 encoding to access 400 Gbps data rate systems. These ridge waveguide modulators are currently being packaged with our partner into prototype packages. We showed an example packaged modulator at our Annual Shareholders Meeting in May 2018.

These prototype packages will enable potential customers to evaluate the performance at 50 Gbaud. Once a potential customer generates technical feedback on our prototype, we expect to be asked to optimize the performance to their specifications. Assuming this is successful, we expect to enter a qualification phase where our prototypes will be evaluated more fully.

In parallel, we are developing modulators for scalability to higher data rates above 50 Gbaud. In September 2018, we showed in conference presentations the potential of our polymer modulator platform to operate at over 100 GHz bandwidth. This preliminary result corresponds to 100 Gbaud data rates using a simple NRZ data encoding scheme or 200 Gbps with PAM-4 encoding. With 4 channel arrays in our P^2IC platform, the Company thus has the potential to address both 400 Gbps and 800 Gbps markets. While customers may start the engagement at 50 Gbaud, we believe potential customers recognize that scalability to higher speeds is an important differentiator of the polymer technology.

We believe the ridge waveguide modulator represents our first commercially viable device and targets the fiber optics communications market. We have completed internal market analysis and are initially targeting interconnect reach distances of greater than 10km. In these markets, the system network companies are looking to implement modulator-based transceivers that can handle aggregated data rates 100 Gbps and above. The market opportunity for greater than 10km is worth over $1B over the next decade.

Advanced Modulator Structures

As part of supporting further improvement and scalability of our platform, we continue to explore more advanced device structures. Our functional polymer photonics slot waveguide modulator utilizes an existing modulator structure with one of our proprietary electro-optic polymer material systems as the enabling material layer and is functional as an operating prototype device.

Preliminary testing and initial data on our polymer photonics slot waveguide modulators demonstrated several promising characteristics. The tested polymer photonic chip had a 1-millimeter square footprint, enabling the possibility of sophisticated integrated optical circuits on a single silicon substrate. In addition, the waveguide structure was approximately 1/20 the length of a typical inorganic-based silicon photonics modulator waveguide.

With the combination of our proprietary electro-optic polymer material and the extremely high optical field concentration in the slot waveguide modulator, the test modulators demonstrated less than 2.2 volts to operate. Initial speeds exceeded 30-35 GHz in the telecom, 1550 nanometer frequency band. This is equivalent to 4 x 10Gbps, inorganic, lithium niobate modulators that would require approximately 12-16 volts to move the same amount of information.

We continued with our collaborative development of our polymer photonic slot waveguide modulator in 2014 and continued our collaboration with an associated third-party research group in 2017 and 2018. We are now designing slot modulators to operate at data rates greater than 50 Gbaud.

Our Long-Term Device Development Goal - Multichannel Polymer Photonic Integrated Circuit (P^2IC)

Our P^2IC platform is positioned to address markets with aggregated data rates of 100 Gbaud, 400 Gbaud, 800 Gbaud and beyond. Our P^2IC platform will contain a number of photonic devices that may include, over and above polymer-based modulators, photonic devices such as lasers, multiplexers, demultiplexers, detectors, fiber couplers.

While our polymer-based ridge waveguide and slot modulators are currently under development to be commercially viable products, our long-term device development goal is to produce a platform for the 400 Gbps and beyond transceiver market. This has been stated in our photonics product roadmap that is publicly available on our website. The roadmap shows a progression from: 10 Gbaud ridge waveguide modulators; to 25 Gbaud based ridge waveguide modulators; to 50 Gbaud based ridge waveguide modulators, and potentially 100 Gbaud based ridge waveguide modulators. These modulators are then arrayed to create a multichannel P^2IC platform for the 100 Gbps, 400 Gbps, 800 Gbps, and potentially 1.6 Tbps aggregated data-rate markets. As the performance of the modulator is capable of up to 100 Gbaud, the next major milestone on our roadmap will be to create a multichannel polymer-based P^2IC platform for the 400 Gbps market. This will be composed of either 4 channels each carrying 100 Gbps, implemented either with NRZ modulation on 100 Gbaud modulators or PAM-4 modulation on 50 Gbaud modulators.

For our device goals, we are developing polymer materials that perform even faster at a serial single channel 100Gbps using a NRZ modulation format. We showed bandwidths of polymer-based modulator devices at a major international conference (ECOC European Conference on Optical Communications) this year with bandwidths that exceeded 100GHz. We noted that to achieve 100Gbaud, the polymer-based modulator only has to achieve 80GHz bandwidth. We were pleased with the polymer modulator performance, and we are now optimizing the device parameters for very low voltage operation.

Our Target Markets

Cloud computing and data centers

Big data is a general term used to describe the voluminous amount of unstructured and semi-structured data a Company creates -- data that would take too much time and cost too much money to load into a relational database for analysis. Companies are looking to cloud computing in their data centers to access all the data. Inherent speed and bandwidth limits of traditional solutions and the potential of organic polymer devices offer an opportunity to increase the bandwidth, reduce costs and improve speed of access.

Datacenters have grown to enormous sizes with hundreds of thousands and even millions of servers in a single datacenter. The number of so-called hyperscale datacenters are expected to continue to increase in number. Due to their size, a single datacenter may consist of multiple large warehouse-size buildings on a campus or even several locations distributed around a metropolitan area. Data centers are confronted with the problem of moving vast amounts of data not only around a single data center building, but also between buildings in distributed data center architecture. Links within a single datacenter building may be shorter than 500 meters, though some will require optics capable of 2 km. Between datacenter buildings, there is an increasing need for high performance interconnects over 10km in reach.

Our modulators are suitable for single-mode fiber optic links. We believe that our single mode modulator solutions will be competitive at 500m to 10km link distances, but it will be ideally suited at greater than 10km link distances.

Telecommunications/Data Communications

The telecommunications industry has evolved from transporting traditional analogue voice data over copper wire into the movement of digital voice and data. Telecommunication companies are faced with the enormous increasing challenges to keep up with the resulting tremendous explosion in demand for bandwidth. The metropolitan network is especially under stress now and into the near future. Telecommunications companies provide services to some data center customers for the inter-data center connections discussed above. 5G mobile upgrade, autonomous driving and IoT are expected to increase the need for data stored and processed close to the end user in edge data centers. This application similarly requires optics capable of very high speeds and greater than 10 km reach.

Recent Significant Events and Milestones Achieved

In December 2016 we achieved high-speed modulation in our first all-organic polymer ridge waveguide intensity modulator prototype, which constituted one of the most significant moments in the history of our Company. Our initial "alpha" prototype device, enabled by our P^{2}IC polymer system, demonstrated bandwidth suitable for data rates up to about 10 Gbps. This performance exceeds the telecom OC-48 standard (2.5 Gbps). This device demonstrated true amplitude (intensity) modulation in a Mach-Zehnder modulator structure incorporating our polymer waveguides.

In April 2017 we achieved bandwidth suitable for 25Gbps data rates in an all-organic polymer ridge waveguide intensity modulator prototype, a significant improvement over our initial 10Gbps device modulator prototype. This breakthrough was significant because a 25Gbps data rate is important to the optical networking industry because this data rate is a major node to achieve 100 Gbps (using 4 channels of 25 Gbps). In July 2017 we advanced our high-speed modulation performance to satisfy 28Gbps data rates for QSFP28 standards and 100Gbps data center applications.

In September 2017 we achieved outstanding performance of our ridge waveguide Mach-Zehnder modulators ahead of schedule, with bandwidth performance levels that will enable 50Gbps modulation in fiber-optic communications. This important achievement will allow users to utilize arrays of 4 x 50Gbps polymer modulators using PAM-4 encoding to access 400Gbps data rate systems. Pulse-Amplitude Modulation (PAM-4) is an encoding scheme that can double the amount of data that can be transmitted.

During February and March 2018, we moved our Newark, Delaware synthetic laboratory and our Longmont, Colorado optical testing laboratory and corporate headquarters to our new office, laboratory and research and development space located at 369 Inverness Parkway, Suite 350, Englewood, Colorado. The new 13,420 square feet Englewood facility includes fully functional 1,000 square feet of class 1,000 cleanroom, 500 square feet of class 10,000 cleanroom, chemistry laboratories, and analytic laboratories. The new Englewood facility streamlines all of our Company s research and development workflow for greater operational efficiencies.

During March 2018, our Company, together with our packaging partner, successfully demonstrated packaged polymer modulators designed for 50Gbps, which we believe will allow us to scale our P^{2}IC platform with our Mach-Zehnder ridge waveguide modulator design as well as other photonics devices competitively in the 100Gbps and 400Gbps datacom and telecommunications applications market. We are currently fine-tuning the performance parameters of these prototypes in preparation for customer evaluations.

During June 2018, our Company Acquired the Polymer Technology Intellectual Property Assets of BrPhotonics Productos Optoelectrónicos S.A., a Brazilian corporation, which significantly advanced our patent portfolio of electro-optic polymer technology with 15 polymer chemistry materials, devices, packaging and subsystems patent and further strengthened our design capabilities to solidify our market position as we prepare to enter the 400Gbps integrated photonics marketplace with a highly competitive, scalable alternative to installed legacy systems. Since June 2018, we have made significant progress on integrating this technology into our P^2IC (polymer photonic integrated circuit) platform.

Also, during June 2018, our Company promoted polymer PICs and Solidified Polymer PICs as Part of the Photonics Roadmap at the World Technology Mapping Forum in Enschede, Netherlands, which includes our Company s technology of polymers and polymer PICs that have the potential to drive not only 400Gbps aggregate data rate solutions, but also 800Gbps and beyond.

In August 2018 we announced the completion (ahead of schedule) of our fully equipped on-site fabrication facility, where we are expanding our high-speed test and design capabilities. We also announced the continuation of the building of our internal expertise with the hiring of world-class technical personnel with 100Gbps experience.

In February 2019 we announced a major breakthrough in our development of clean technology polymer materials that target the insatiable demand for fast and efficient data communications in the multi-billion-dollar telecom and data markets supporting Internet, 5G and IoT (Internet of Things) webscale services. The improved thermally stable polymer has more than double the electro-optic response of our previous materials, enabling optical device performance of well over 100 GHz with extremely low power requirements. This addition to the family of Perkinamine™ polymers will hold back run-away consumption of resources and energy needed to support ever-growing data consumption demands. We anticipate we will continue rigorous testing of the material and its performance in device structures during the remainder of this year before releasing it into full device development.

In March 2019 we created an Advisory Board comprised of three world-class leaders in the photonics industry: Dr. Craig Ciesla, Dr. Christoph S. Harder, and Mr. Andreas Umbach. The Advisory Board will work closely with our Company leadership to enhance our Company s product positioning and promote our polymer modulator made on our proprietary *Faster by Design* polymer HC platform. The mission of the Advisory Board will initially be to increase our Company s outreach into the datacenter interconnect market and later to support expansion into other billion-dollar markets. The Advisory Board members have each been chosen for their combination of deep technical expertise, breadth of experience and industry relationships in the fields of fiber optics communications, polymer and semiconductor materials. Each of the Advisory Board members has experience at both innovators like Lightwave Logic and large industry leaders of the type most likely to adopt game-changing polymer-based products. In addition, they possess operational experience with semiconductor and polymer businesses.

As we move forward to diligently to meet our goals, we continue to work closely with our packaging partner for the 50Gbaud prototypes, and we are advancing our reliability and characterization efforts to support our prototyping. We are actively engaged with test equipment manufacturers to deliver the most advanced test equipment for our state-of-the-art polymer results. We continue to engage with multiple industry bodies to promote our roadmap. We continue to fine tune our business model with target markets, customers, and technical specifications. Discussions with prospective customers are validating that our modulators are ideally suited for the datacenter and telecommunications markets that are over 10km in length. Details of what these prospective customers are seeking from a prototype are delivered to our technical team.

Capital Requirements

As a development stage company, we do not generate revenues. We have incurred substantial net losses since inception. We have satisfied our capital requirements since inception primarily through the issuance and sale of our common stock.

Results of Operations

Comparison of fiscal 2018 to fiscal 2017

Revenues

As a development stage company, we had no revenues during the years ended December 31, 2018 and December 31, 2017. The Company is in various stages of photonic device and material development and evaluation. We expect the next revenue stream to be in product development agreements and prototype devices prior to moving into production.

Operating Expenses

Our operating expenses were $5,601,016 and $5,523,538 for the years ended December 31, 2018 and 2017, respectively, for an increase of $77,478. This increase in operating expenses was due primarily to increases in salaries and wages, depreciation, laboratory materials and supplies, rent and utility expenses, consulting expense, travel expenses, office expenses, accounting fees, auditing fees, moving expenses, other tax expenses, director and officer insurance expenses, and repair offset by decreases in non-cash stock option and warrant amortization, legal, laboratory material testing expense and electro-optic device development, patent amortization and patent related expenses, royalty fees and recruiting fees.

Included in our operating expenses for the year ended December 31, 2018 was $3,794,565 for research and development expenses compared to $3,519,129 for the year ended December 31, 2017, for an increase of $275,436. This is primarily due to increases in research and development salaries and wages, depreciation, laboratory materials and supplies, rent and utility expenses, travel expenses, product development consulting expenses, research and development moving expenses, research and development office expenses and repair and maintenance expenses offset by decreases in non-cash stock option amortization, laboratory material testing expense and electro-optic device development, patent amortization and patent related expenses and royalty fees.

Research and development expenses currently consist primarily of compensation for employees and consultants engaged in internal research, product development activities; laboratory operations, internal material and device fabrication testing and prototype electro-optic device design, development and prototype device processing; costs; and related operating expenses.

We expect to continue to incur substantial research and development expense to develop and commercialize our photonic devices PIC development and electro-optic materials platform. These expenses will increase as a result of accelerated development effort to support commercialization of our non-linear optical polymer materials technology; to build photonic device prototypes in our in-house laboratories; hiring additional technical and support personnel; engaging a senior technical advisor; pursuing other potential business opportunities and collaborations; customer testing and evaluation; and incurring related operating expenses.

Wages and salaries increased $428,337 from $1,357,594 for the year ended December 31, 2017 to $1,785,931 for the year ended December 31, 2018. The reason for the variation was primarily due to an increase in full time technical personnel working on device and material development and change in research and development allocation.

Depreciation expense increased $213,905 from $177,638 for the year ended December 31, 2017 to $391,543 for the year ended December 31, 2018. The primary reason for the increase was due to the addition of capital equipment for wafer fabrication in the new facility.

Laboratory materials and supplies increased $139,698 from $202,304 for the year ended December 31, 2017 to $342,002 for the year ended December 31, 2018. The primary reason for the increase was fabrication of prototype wafers and devices, and e.o. polymer material systems.

Rent and utility expenses increased $69,793 from $151,932 for the year ended December 31, 2017 to $221,725 for the year ended December 31, 2018. The primary reason for the increase was due to acquiring a larger facility in order to consolidate all the Company s operations into one facility.

Travel expenses increased by $53,967 to $114,258 for the year ended December 31, 2018 from $60,291 for the year ended December 31, 2017. The increase was primarily due to employee travel for relocation planning and conferences.

Product development consulting expenses increased $47,290 from $372,981 for the year ended December 31, 2017 to $420,271 for the year ended December 31, 2018. The primary reason for the increase was due to engaging outside consultants to speed up device development.

Moving expenses increased by $19,983 to $63,511 for the year ended December 31, 2018 from $43,528 for the year ended December 31, 2017. The primary reason for the increase was the relocation to the new facility.

Office expenses increased by $18,596 to $25,361 for the year ended December 31, 2018 from $6,765 for the year ended December 31, 2017. The increase was primarily due furnishing the new Colorado facility.

Repair and maintenance expenses increased by $13,726 to $44,459 for the year ended December 31, 2018 from $30,733 for the year ended December 31, 2017. The primary reason for the increase was due to general maintenance in the new Colorado facility.

Research and development non-cash stock option amortization decreased $493,210 from $713,783 for the year ended December 31, 2017 to $220,573 for the year ended December 31, 2018. The reason for the variation in decreased amortization was the vesting schedules.

Product prototype development and material testing expense decreased $155,149 from $219,650 for the year ended December 31, 2017 to $64,501 for the year ended December 31, 2018. The decrease was primarily due to the move to the new facility and transitioning of outside services in-house.

Patent amortization and patent related expenses decreased by $65,250 to $65,015 for the year ended December 31, 2018 from $130,265 for the year ended December 31, 2017. The primary reason for the decrease was lower cost in patent application prosecution.

Royalty expenses decreased $30,000 to $0 for the year ended December 31, 2018 from $30,000 for the year ended December 31, 2017. The primary reason for the decrease was the termination of a license agreement.

General and administrative expense consists primarily of compensation and support costs for management staff, and for other general and administrative costs, including executive, sales and marketing, investor relations, accounting and finance, legal, consulting and other operating expenses.

General and administrative expenses decreased $197,958 to $1,806,451 for the year ended December 31, 2018 from $2,004,409 for the year ended December 31, 2017. The decrease is primarily due to decreases in legal fees, general and administrative non-cash stock option and warrant amortization and recruiting fees offset by increases in office expenses, rent and utility expenses, accounting fees, general and administrative consulting, auditing fees, travel, moving expenses, general and administrative salary and wages, other tax expenses and director and officer insurance expenses.

Legal fees decreased $262,429 to $91,007 for the year ended December 31, 2018 from $353,436 for the year ended December 31, 2017. The primary reason for the variance was an overall decrease in general legal work.

General and administrative non-cash stock option and warrant amortization decreased $252,384 from $497,889 for the year ended December 31, 2017 to $245,505 for the year ended December 31, 2018. The reason for the variation was due to stock options and warrants vesting schedules.

Recruiting fees decreased $10,000 to $40,500 for the year ending December 31, 2018 from $50,500 for the year ending December 31, 2017. The primary reason for the variance was due to a reduction in employment activity with a recruiting firm.

Office expenses increased $60,826 from $44,598 for the year ended December 31, 2017 to $105,424 for the year ended December 31, 2018. The reason for the variation was due to relocating into a larger facility.

Rent and utility expenses increased $43,134 from $43,552 for the year ended December 31, 2017 to $86,686 for the year ended December 31, 2018. The primary reason was due to support of the new larger facility.

Accounting fees increased $40,666 to $145,750 for the year ended December 31, 2018 from $105,084 for the year ended December 31, 2017. The primary reason for the increase was due to the additional work being an accelerated filer and general accounting expense.

General and administrative consulting fees increased $40,124 from ($15,958) for the year ended December 31, 2017 to $24,166 for the year ended December 31, 2018. The primary reason for the increase was due to a non-cash consulting expense.

Travel expenses increased $32,009 to $73,307 for the year ending December 31, 2018 from $41,298 for the year ended December 31, 2017. The primary reason for the increase was due to travel expense to the new facility and conferences.

General and administrative wages and salaries increased $26,305 from $533,676 for the year ended December 31, 2017 to $559,981 for the year ended December 31, 2018. The primary reason for the increase was due to increase in fringe benefit costs and additional head count.

Auditing fees increased $24,925 to $87,600 for the year ending December 31, 2018 from $62,675 for the year ending December 31, 2017. The primary reason for the increase was due to the Company s change in status to an Accelerated Filer, which requires additional testing by the auditors.

Moving expenses increased $20,606 to $20,606 for the year ending December 31, 2018 from $0 for the year ending December 31, 2017. The reason for the variation was due to moving to a new facility.

Other tax expenses increased $16,884 to $29,608 for the year ended December 31, 2018 from $12,724 for the year ended December 31, 2017. The primary reason for the increase was due to sales and use tax on capital equipment for new facility.

Director and officer insurance expense increased $14,207 from $131,787 for the year ended December 31, 2017 to $145,994 for the year ended December 31, 2018. The primary reason for the increase was an increase in insurance premiums.

We expect general and administrative expense to increase in future periods as we increase the level of corporate and administrative activity, including increases associated with our operation as a public company; and significantly increase expenditures related to the future production and sales of our products.

Other Income (Expense)

Other expenses decreased $53,902 to $171,942 for the year ending December 31, 2018 from $225,844 for the year ending December 31, 2017, relating to the commitment fee associated with the purchase of shares by an institutional investor for sale under a stock purchase agreement.

Net Loss

Net loss was $5,772,958 and $5,749,382 for the years ended December 31, 2018 and 2017, respectively, for a increase of $23,576, due primarily to increases in salaries and wages, depreciation, laboratory materials and supplies, rent and utility expenses, consulting expenses, travel expenses, office expenses, accounting fees, auditing fees, moving expenses, other tax expenses, director and officer insurance expenses and repair expenses offset by decreases in non-cash stock option and warrant amortization, legal, laboratory material testing expense and electro-optic device development, patent amortization and patent related expenses, commitment fee associated with the purchase of shares by an institutional investor for resale under a stock purchase agreement, royalty fees and recruiting fees.

Significant Accounting Policies

Our Company's accounting policies are more fully described in Note 1 of Notes to Financial Statements. As disclosed in Note 1 of Notes to Financial Statements, the preparation of financial statements in conformity with accounting principles generally accepted in the United States requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying disclosures. Although these estimates are based on our management s best knowledge of current events and actions our Company may undertake in the future, actual results could differ from the estimates.

Recently Adopted Accounting Pronouncements. In July 2018, the FASB issued ASU No. 2018-11, *Leases (Topic 842), Targeted Improvements*. The amendments in this Update relieve businesses and organizations from having to present prior comparative years results when they adopt the new standard. It also lets landlords and other lessors avoid breaking out the parts of a rental contract that are not specifically being leased, such as the cost of snow removal services, and account for them separately from the base rent. The amendments in this Update are the same as the effective dates and transition requirements in ASU No. 2016-02, *Leases*.

The Company is in the process of evaluating the above ASUs and estimating lease liabilities and corresponding right-of-use assets as of January 1, 2019.

Reclassifications. Certain reclassifications have been made to the 2017 financial statement in order to conform to the 2018 financial statement presentation.

Stock Based Compensation

Our Company uses the Black-Scholes option pricing model to calculate the grant-date fair value of an award, with the following assumptions for 2018: no dividend yield in all years, expected volatility, based on the Company s historical volatility, 60% to 90%, risk-free interest rate between 1.89% to 3.06% and expected option life of 5.0 to 10 years. Prior to May 2018, the expected life is based on the estimated average of the life of options using the simplified method, as prescribed in FASB ASC 718, due to insufficient historical exercise activity during recent years. Starting in May 2018, the expected life is based on the legal contractual life of options. The Company uses the Black-Scholes option pricing model to calculate the grant-date fair value of an award, with the following assumptions for 2017: no dividend yield in all years, expected volatility, based on the Company s historical volatility, 39% to 87%, risk-free interest rate between 1.16% to 2.37% and expected option life of .03 to 9.08 years.

As of December 31, 2018, there was $324,497 of unrecognized compensation expense related to non-vested market-based share awards that is expected to be recognized through August 30, 2020.

Liquidity and Capital Resources

For the year ended December 31, 2018

During the year ended December 31, 2018, net cash used in operating activities was $4,400,965 and net cash used in investing activities was $1,432,363, which was due primarily to the Company s research and development activities and general and administrative expenditures. Net cash provided by financing activities for the year ended December 31, 2018 was $4,525,626. At December 31, 2018, our cash and cash equivalents totaled $2,174,625, our assets totaled $5,251,264, our liabilities totaled $344,202, and we had stockholders equity of $4,907,062.

For the year ended December 31, 2017

During the year ended December 31, 2017, net cash used in operating activities was $4,409,696 and net cash used in investing activities was $265,532, which was due primarily to the Company s research and development activities and general and administrative expenditures. Net cash provided by financing activities for the year ended December 31, 2017 was $6,200,711. At December 31, 2017, our cash and cash equivalents totaled $3,482,327, our assets totaled $5,849,770, our liabilities totaled $833,055 and we had stockholders equity of $5,016,715.

Sources and Uses of Cash

Our future expenditures and capital requirements will depend on numerous factors, including: the progress of our research and development efforts; the rate at which we can, directly or through arrangements with original equipment manufacturers, introduce and sell products incorporating our polymer materials technology; the costs of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights; market acceptance of our products and competing technological developments; and our ability to establish cooperative development, joint venture and licensing arrangements. We expect that we will incur approximately $535,000 of expenditures per month over the next 12 months. Based upon our current cash position and expenditures of approximately $585,000 per month over the next four months and no debt service, we believe our Company has sufficient funds to finance its operations through June 2019. Our cash requirements are expected to increase at a rate consistent with the Company s path to revenue growth as we expand our activities and operations with the objective of commercializing our electro-optic polymer technology.

On January 21, 2019, our Company entered into the Purchase Agreement with Lincoln Park, pursuant to which Lincoln Park agreed to purchase from us up to $25,000,000 of our Common Stock (subject to certain limitations) from time to time over a 36-month period. Pursuant to the Purchase Agreement, Lincoln Park is obligated to make purchases as the Company directs in accordance with the Purchase Agreement, which may be terminated by the Company at any time, without cost or penalty. Sales of shares will be made in specified amounts and at prices that are based upon the market prices of our Common Stock immediately preceding the sales to Lincoln Park. We expect this financing to provide us with sufficient funds to maintain our operations for the foreseeable future. With the additional capital, we expect to achieve a level of revenues attractive enough to fulfill our development activities and adequate enough to support our business model for the foreseeable future. We cannot assure you that we will meet the conditions of the Purchase Agreement with Lincoln Park in order to obligate Lincoln Park to purchase our shares of common stock. In the event we fail to do so, and other adequate funds are not available to satisfy long-term capital requirements, or if planned revenues are not generated, we may be required to substantially limit our operations. This limitation of operations may include reductions in capital expenditures and reductions in staff and discretionary costs.

There are no trading volume requirements or restrictions under the Purchase Agreement, and we will control the timing and amount of any sales of our Common Stock to Lincoln Park. Lincoln Park has no right to require any sales by us, but is obligated to make purchases from us as we direct in accordance with the Purchase Agreement. We can also accelerate the amount of Common Stock to be purchased under certain circumstances. There are no limitations on use of proceeds, financial or business covenants, restrictions on future funding, rights of first refusal, participation rights, penalties or liquidated damages in the Purchase Agreement. Lincoln Park may not assign or transfer its rights and obligations under the purchase agreement.

We expect that our cash used in operations will continue to increase during 2019 and beyond as a result of the following planned activities:

- The addition of management, sales, marketing, technical and other staff to our workforce;
- Increased spending for the expansion of our research and development efforts, including purchases of additional laboratory and production equipment;
- Increased spending in marketing as our products are introduced into the marketplace;
- Developing and maintaining collaborative relationships with strategic partners;
- Developing and improving our manufacturing processes and quality controls; and
- Increases in our general and administrative activities related to our operations as a reporting public company and related corporate compliance requirements.

Analysis of Cash Flows

For the year ended December 31, 2018

Net cash used in operating activities was $4,400,965 for the year ended December 31, 2018, primarily attributable to the net loss of $5,772,958 adjusted by $78,390 in warrants issued for services, $387,688 in options issued for services, $172,192 in common stock issued for services, $465,795 in depreciation expenses and patent amortization expenses, $10,084 net loss on disposal of equipment, $247,288 in prepaid expenses and $10,556 in accounts payable and accrued expenses. Net cash used in operating activities consisted of payments for research and development, legal, professional and consulting expenses, rent and other expenditures necessary to develop our business infrastructure.

Net cash used by investing activities was $1,432,363 for the year ended December 31, 2018, consisting of $397,479 in cost for intangibles and $1,037,384 in asset additions primarily for the new Colorado headquarter facility offset by proceeds of $2,500 on the sale of equipment.

Net cash provided by financing activities was $4,525,626 for the year ended December 31, 2018 and consisted of $4,863,535 in proceeds from resale of common stock to an institutional investor and $161,500 in proceeds from exercise of warrants and options offset by $499,409 repayment of equipment purchased.

For the year ended December 31, 2017

Net cash used in operating activities was $4,409,696 for the year ended December 31, 2017, primarily attributable to the net loss of $5,749,382 adjusted by $416,934 in warrants issued for services, $794,738 in options issued for services, $270,343 in common stock issued for services, $325,946 in depreciation expenses and patent amortization expenses, ($447,977) in prepaid expenses and ($20,298) in accounts payable and accrued expenses. Net cash used in operating activities consisted of payments for research and development, legal, professional and consulting expenses, rent and other expenditures necessary to develop our business infrastructure.

Net cash used by investing activities was $265,532 for the year ended December 31, 2017, consisting of $81,743 in cost for intangibles and $183,789 in asset additions primarily for the new Colorado headquarter facility.

Net cash provided by financing activities was $6,200,711 for the year ended December 31, 2017 and consisted of $5,722,060 proceeds from common stock and $502,500 proceeds from the exercise of warrants offset by $23,849 repayment of equipment purchased.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Not Applicable.

Item 8. Financial Statements and Supplementary Data

Our Financial Statements of are attached as Appendix A (following Exhibits) and included as part of this Form 10-K Report. A list of our Financial Statements is provided in response to Item 15 of this Form 10-K Report.

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Item 9. Changes In And Disagreements With Accountants On Accounting and Financial Disclosure

Not Applicable.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

As of the end of the period covered by this report, our Company evaluated the effectiveness and design and operation of its disclosure controls and procedures. Our Company s disclosure controls and procedures are the controls and other procedures that we designed to ensure that our Company records, processes, summarizes, and reports in a timely manner the information that it must disclose in reports that our Company files with or submits to the Securities and Exchange Commission. Our principal executive officer and principal financial officer reviewed and participated in this evaluation. Based on this evaluation, our Company made the determination that its disclosure controls and procedures were effective.

Management's Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Under the supervision and with the participation of management, including our principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal controls over financial reporting based on the framework in Internal Control -Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). Based on this evaluation, management has concluded that our internal control over financial reporting was effective as of December 31, 2018.

The Company's internal control over financial reporting includes policies and procedures that (1) pertain to maintenance of records that, in reasonable detail, accurately and fairly reflect transactions and dispositions of the assets of the Company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the Company's assets that could have a material effect on the financial statements.

Our management, including our principal executive officer and principal financial officer, does not expect that our disclosure controls or our internal control over financial reporting will prevent or detect all errors and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. Internal control over financial reporting is a process that involves human diligence and compliance and is subject to lapses in judgment and breakdowns resulting from human failures. In addition, the design of any system of controls is based in part on certain assumptions about the likelihood of future events, and controls may become inadequate if conditions change. There can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions.

Attestation Report of Independent Registered Public Accounting Firm

Our independent registered public accounting firm, Morison Cogen LLP, audited our internal control over financial reporting as of December 31, 2018. Their report dated March 18, 2019 expressed an unqualified opinion on our internal control over financial reporting. That report appears in Item 15 of Part IV of this Annual Report on Form 10-K and is incorporated by reference to this Item 9A.

Changes in Internal Control Over Financial Reporting

No change in our Company s internal control over financial reporting occurred during our fourth fiscal quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information

Not Applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Identity of directors, executive officers and significant employees

Name	Age	Position	Director Class/ Term
Michael Lebby	58	Director; Chief Executive Officer	Class II Expires 2019
James S. Marcelli	71	Director; President; Chief Operating Officer, Secretary	Class III Expires 2020
Thomas E. Zelibor	64	Chair of the Board of Directors	Class III Expires 2020
Joseph A. Miller	77	Director	Class II Expires 2019
Ronald A Bucchi	64	Director	Class II Expires 2019
Siraj Nour El-Ahmadi	54	Director	Class I Expires 2021
Frederick J. Leonberger	71	Director	Class I Expires 2021

Business experience of directors, executive officers, and significant employees

Dr. Michael Lebby. Dr. Lebby has served as our Chief Executive Officer since May 1, 2017 and as a director of our Company since August 26, 2015. He also previously served a member of our Operations Committee until April 30, 2017. Dr. Lebby is in charge of the overall general management of the Company and supervision of Company policies, setting the Company s strategies, formulating and overseeing the Company s business plan, raising capital, expanding the Company s management team and the general promotion of the Company From June 2013 to 2015, Dr. Lebby has served as President and CEO of OneChip Photonics, Inc., a privately held company headquartered in Ottawa, Canada, that is a leading provider of low-cost, small-footprint, high-performance indium phosphide (InP)-based photonic integrated circuits (PICs) and PIC-based optical sub-assemblies (OSAs) for the Data Center markets. Also, from 2013 to 2015 Dr. Lebby presently served as part-time full professor, and chair of optoelectronics at Glyndwr University in Wales, UK, to bring forward advanced materials, device, and integrated photonics based technologies for the datacenter and high performance computing markets. During the period 2014 to 2016, Dr. Lebby focused on a foundry based model for InP-based photonic integrated circuits (PICs) and optoelectronic integrated circuits (OEICs) in the datacenter segment and was been instrumental in assembling California s proposal (via USC) to the Federal Government for an integrated photonics manufacturing institute. Dr. Lebby holds a Doctor of Engineering, a Ph.D., a MBA and a bachelor s degree, all from the University of Bradford, United Kingdom. Dr. Lebby has well over 200 issued utility patents with the USPTO. This number expands to over 450 if international derivative patents are included.

Mr. James S. Marcelli. Mr. Marcelli has served as an officer and director of our Company since August 2008. Since May 2012, Mr. Marcelli has served as our Company s President and Chief Operating Officer, and he was named our Secretary in March 2018. Previously, from August 2008 to April 2012, Mr. Marcelli served as our President and Chief Executive Officer. Mr. Marcelli is in charge of the day-to-day operations of our Company and its movement to a fully functioning commercial corporation, and also serves as our Company s principal financial officer. Since 2000, Mr. Marcelli has served as the president and chief executive officer of Marcelli Associates, a consulting company that offers senior management consulting, mentoring, and business development services to start-up and growth companies. Business segments Mr. Marcelli has worked with included an Internet networking gaming center, high-speed custom gaming computers, high tech manufacturing businesses and business service companies.

Thomas E. Zelibor, Rear Admiral, USN (Ret). RADM Zelibor has served as our Chair of the Board of Directors (non-executive) since May 1, 2017. Previously, has served as our Chief Executive Officer and Chair of the Board of Directors (executive) from May 2012 to April 30, 2017. Mr. Zelibor also previously served as Chair of the Board of Directors (non-executive) of our Company since October 2011 and has served as a director of our Company since July 2008. He also previously served on our Operation Committee. Mr. Zelibor is currently the Chief Executive Officer of the Space Foundation and a director of Nuvectra Corp. Mr. Zelibor previously served as the Chief Executive Officer and President of Zelibor & Associates, LLC, a management-consulting firm and as the Chief Executive Officer and President of Flatirons Solutions Corp. Prior to that time, Mr. Zelibor served in the U.S. Navy in a number of positions, including as the Dean of the College of Operational and Strategic Leadership at the United States Naval War College where he was responsible for the adoption of a corporate approach to leadership development; Director of Global Operations, United States Strategic Command; Director, Space, Information Warfare, Command and Control on the Navy staff; Department of the Navy, Deputy Chief Information Officer (CIO), Navy; Commander, Carrier Group Three and Commander, Naval Space Command. Mr. Zelibor earned his bachelor s degree from the United States Naval Academy and has been a participant in the Senior Leader in Residence Program and a visiting scholar for the Zell Center for Risk Research at the Kellogg School of Management, Northwestern University.

Dr. Joseph A. Miller, Jr. Dr. Miller has served as a director of our Company since May 10, 2011. From 2002 to May 2012, Dr. Miller served as Executive Vice President and Chief Technology Officer of Corning Incorporated, having joined Corning Incorporated in 2001 as Senior Vice President and Chief Technology Officer. Prior to joining Corning Incorporated, Dr. Miller was with E.I. DuPont de Nemours, Inc., where he served as Chief Technology Officer and Senior Vice President for Research and Development since 1994. Dr. Miller began his career with DuPont in 1966. Dr. Miller is a director and Non-executive Chairman of Nuvectra Corp., and he previously served as a director for Greatbatch, Inc. He holds a doctorate degree in Chemistry from Penn State University.

Mr. Ronald A. Bucchi. Mr. Ronald A. Bucchi has served as a director of our Company since June 11, 2012, and he currently serves a Chair of our Audit Committee. Mr. Bucchi is currently a self-employed C.P.A., CGMA with a specialized practice that concentrates in CEO consulting, strategic planning, mergers, acquisitions, business sales and tax. He works with domestic and international companies. Mr. Bucchi is a former member of the board of directors of First Connecticut Bancorp, Inc., having served as Lead Director, Chair of the Audit Committee, Governance Chairman and a member of the Asset Liability Committee and Loan Committee. The Bank sold in September of 2018. He is currently a member of the Advisory Board of Baker Street Scientific, Inc., the Treasurer and a member of the Board of Directors of the Petit Family Foundation, Inc. and the Farmington Bank Foundation, Inc. He has served on numerous other community boards and is past Chairman of the Wheeler Clinic and the Wheeler YMCA. He is a member of the Connecticut Society of Certified Public Accountants, American Institute of Certified Public Accountants, Chartered Global Management Accountant and the National Association of Corporate Directors. Mr. Bucchi is a graduate of the Harvard Business School Executive Education program with completed course studies in general board governance, audit and compensation and a graduate of Central Connecticut State University where he received his B.S. in Accounting.

Mr. Siraj Nour El-Ahmadi. Mr. El-Ahmadi has served as a director of our Company since October 2, 2013, and he currently serves a member of our Audit Committee. Since 2004, Mr. El-Ahmadi has served as Founder, President and

Chief Executive Officer of Menara Networks, a developer of innovative products and solutions that simplify layered optical transport networks. Mr. El-Ahmadi has over 17 years of experience in optical transmission in particular and the telecom industry in general. Prior to founding Menara, Mr. El-Ahmadi served as Vice President-Marketing & Product Management at Nortel where he was responsible for the OPTera LH 4000 ULR product (acquired from Qtera) that achieved over $200M in revenues in its first two years. Prior to that, Mr. El-Ahmadi was the Product Architect & Vice President of Product Management at Qtera Corporation, a successful technology start-up acquired by Nortel in 2000 for $3.25 billion. Mr. El-Ahmadi also held a Senior Manager position at Bell Northern Research and worked as a Transmission Engineer at WilTel (WorldCom) where he evaluated and deployed the world first bidirectional EDFA and bi-directional WDM transmission. Mr. El-Ahmadi holds a BS and MS in Electrical Engineering from the University of Oklahoma, is a member of Eta Kappa Nu and is the inventor of 11 patents, issued or pending, in the area of optical communications. He has authored a number of publications and is a frequent speaker at telecom and optical networking events and conferences.

Dr. Frederick J. Leonberger. Dr. Leonberger has served as a director of our Company since April 1, 2017. Since 2010, Dr. Leonberger has served as the Principal of EOvation Advisors LLC, a private technology and business advisory firm and presently serves as a board member for various private photonics companies. Dr. Leonberger is a widely known technologist and industry leader in the field of photonics and fiber optics. For nearly 40 years he has been a leading contributor to the development of a variety of important optical devices, company leadership, product and business strategy, and commercialization. The integrated optical modulator technology he and his colleagues pioneered has been used pervasively for over 20 years to encode data at multi-Gb/s rates in long-haul fiber optic networks (the Internet "superhighways"). He previously served as senior vice president and chief technology officer of JDS Uniphase Corporation (JDSU, now Lumentum), a leading optical components company, from 1995 until his retirement in 2003, where he played a lead role in technology strategy, mergers and acquisitions and intellectual property activities. Prior to JDSU, he was co-founder and general manager of United Technologies Photonics (UTP), a high-speed optical modulator company, and held research management positions at United Technologies Research Center (UTRC) and MIT Lincoln Laboratory. He is a member of the National Academy of Engineering and the recipient of several industry awards.

The Board of Directors believes that each of the Directors named above has the necessary qualifications to be a member of the Board of Directors. Each Director has exhibited during his prior service as a director the ability to operate cohesively with the other members of the Board of Directors. Moreover, the Board of Directors believes that each director brings a strong background and skill set to the Board of Directors, giving the Board of Directors as a whole competence and experience in diverse areas, including corporate governance and board service, finance, management and industry experience.

Our bylaws provide that the number of directors who constitute our Board of Directors is determined by resolution of the Board of Directors, but the total number of directors constituting the entire Board of Directors shall not be less than three or more than nine. Our Board of Directors currently consists of seven directors. Our Board of Directors is divided into three classes, as nearly equal in number as possible, designated: Class I, Class II and Class III, with staggered terms and with each director serving for a term ending on the date of the third annual meeting following the annual meeting at which such director was elected; provided that the term of each director shall continue until the election and qualification of a successor and be subject to such director's earlier death, resignation or removal.

Section 16(a) Beneficial Ownership Reporting Compliance

Section 16(a) of the Securities Exchange Act of 1934 requires that our executive officers and directors, and persons who own more than ten percent of a registered class of our equity securities, file reports of ownership and changes in ownership with the SEC. Executive officers, directors and greater-than-ten percent stockholders are required by SEC regulations to furnish us with all Section 16(a) forms they file. To the best of our knowledge, based solely upon a review of Forms 3 and 4 and amendments thereto furnished to our Company during its most recent fiscal year and Forms 5 and amendments thereto furnished to our Company with respect to its most recent fiscal year, and any written representation referred to in paragraph (b)(1) of Item 405 of Regulation S-K, all of our executive officers, directors

and greater-than-ten percent stockholders complied with all Section 16(a) filing requirements.

Code of Ethics

Our Company has adopted a Code of Ethics and Business Conduct that applies to all of the Company s employees, including its principal executive officer and principal financial officer. A copy of our Code of Ethics and Business Conduct is available for review on the Investors - Governance page of our Company s website www.lightwavelogic.com. The Company intends to disclose any changes in or waivers from its Code of Ethics and Business Conduct by posting such information on its website.

Nominating Committee

Our Board of Directors does not have a nominating committee. This is due to our development stage and smaller sized Board of Directors. Instead of having such a committee, our entire Board of Directors historically has searched for and evaluated qualified individuals to become nominees for membership on our Board of Directors. No material changes to the procedures by which our stockholders may recommend nominees to our Board of Directors has occurred since we last provided disclosure regarding these procedures in our Definitive Schedule 14A filed on April 13, 2018.

Audit Committee

Our Company has in place a separately designated standing audit committee in accordance with Section 3(a)(58)(A) of the Securities Exchange Act of 1934, as amended. Our audit committee is governed by an audit committee charter. A copy of our Audit Committee Charter is available for review on the Investors - Governance page of our Company s website www.lightwavelogic.com.

Our audit committee has reviewed and discussed the audited financial statements with management and has discussed with its independent auditors the matters required to be discussed by the statement on Auditing Standards No. 61, as amended (AICPA, Professional Standards, Vol. 1, AU section 380) as adopted by the Public Company Accounting Oversight Board in Rule 3200T. The audit committee has received the written disclosures and the letter from its independent accountant required by applicable requirements of the Public Company Accounting Oversight Board regarding the independent accountant s communications with the audit committee concerning independence, and has discussed with its independent accountant the independent accountant s independence. Based on the review and discussions described above, the audit committee recommended to the Board of Directors that the audited financial statements be included in our Annual Report on Form 10-K for the last fiscal year for filing with the Securities and Exchange Commission.

Our audit committee is comprised of Ronald A. Bucchi and Siraj Nour El-Ahmadi. Mr. Bucchi serves as our audit committee financial expert as that term is defined by the rules promulgated by the Securities and Exchange Commission. Mr. Bucchi is an independent director, as defined below in Certain Relationships and Related Transactions, and Director Independence.

Item 11. Executive Compensation.

Compensation Discussion and Analysis

The Company s entire Board of Directors currently participates in the review and determination of the compensation packages of our executive officers because our Board of Directors currently has no standing compensation committee or committee performing similar functions. A discussion of the policies and decisions that shape our executive compensation program, including the specific objectives and elements, is set forth below.

Executive Compensation Objectives and Philosophy

The objective of our executive compensation program is to attract, retain and motivate talented executives who are critical for the continued growth and success of our Company and to align the interests of these executives with those of our shareholders. To this end, our compensation programs for executive officers are designed to achieve the following objectives:

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attract talented and experienced executives to join the company;

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motivate, reward and retain executives whose knowledge, skills and performance are critical to our success;

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be “market-based” and reflect the competitive environment for personnel;

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focus executive behavior on achievement of our corporate mission and long-term corporate objectives and strategy;

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be affordable, within the context of our operating expense model;

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be fairly and equitably administered;

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reflect our values; and

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align the interests of management and shareholders by providing management with longer-term incentives through equity ownership.

The Board of Directors reviews the allocation of compensation components regularly to help ensure alignment with strategic and operating goals, competitive market practices and our changing business needs. The Board of Directors focuses on simplicity and flexibility wherever possible. The Board of Directors does not apply a specific formula to determine the allocation between cash and non-cash forms of compensation. Certain compensation components, such as base salaries, benefits and perquisites, are intended primarily to attract and retain qualified executives. Other compensation elements, such as long-term incentive opportunities, are designed to motivate and reward our long-term performance and to strongly align named executive officers' interests with those of shareholders.

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Elements of Executive Officer Compensation

The primary elements of our executive officer compensation program are: (i) annual base salary; and (ii) long-term equity incentive compensation in the form of stock option grants, with the objective of aligning the executive officers' long-term interests with those of the shareholders.

In establishing overall executive compensation levels and making specific compensation decisions for the executives in 2018, the Board of Directors considered a number of criteria, including the executive's position, any applicable employment agreement, prior compensation levels, scope of responsibilities, prior and current period performance, attainment of individual and overall company performance objectives and retention concerns. In addition, the Board of Directors considered the results of the advisory vote by shareholders on the "say-on-pay" proposal presented to shareholders at the Company s 2018 Annual Meeting of Shareholders where approximately 96% of the votes cast on the say-on-pay proposal was voted for approval of the 2017 executive compensation. In determining our 2018 executive compensation program, the Board of Directors reviewed the results of the say-on-pay vote and concluded that changes to the program were not desired by our shareholders for 2018. Therefore, our 2018 executive compensation approach was overall generally in line with the executive officer compensation approach previously approved by our shareholders.

The Board of Directors performs a review of compensation for our executive officers annually. As part of this review, the Board of Directors takes into consideration its understanding of external market data, including companies competing in our industry. The Board of Directors does not engage independent consultants to perform an analysis of the current compensation program.

Generally, our Board of Directors reviews and approves compensation arrangements for executive officers annually and in connection with the hiring of new executives. We do not have any formal or informal policy regarding compensation arrangements for executive officers. Instead, the Board of Directors determines what it believes to be the appropriate level and mix of the various compensation components based on recommendations from our chief executive officer, Company performance against stated objectives and individual performance.

In considering compensation of executives, one of the factors the Board of Directors takes into account is the anticipated tax treatment of various components of compensation. Our Board s strategy is to be cost and tax efficient and the Board intends to preserve corporate tax deductions where possible, while maintaining the flexibility in the future to approve arrangements that it deems to be in our best interests and the best interests of our shareholders, even if such arrangements do not always qualify for full tax deductibility. We do not believe Section 162(m) of the Internal Revenue Code, which generally disallows a tax deduction for certain compensation in excess of $1 million to our named executive officers, will have a material effect on us due to the current compensation levels of named executive officers.

Base Salary

Base salaries are reviewed at least annually by our Board of Directors and may be adjusted from time to time based upon market conditions, individual responsibilities and Company and individual performance. We believe that a competitive base salary is a necessary element of any compensation program that is designed to attract and retain talented and experienced executives. We also believe that attractive base salaries can motivate and reward executives for their overall performance. Base salaries are established in part based on the individual experience, skills and expected contributions of our executives and our executives' performance during the prior year, in addition to affordability within the context of our operating expense model.

Annual Non-Equity Incentive Compensation

Annual non-equity incentive compensation is typically not included as part of our named executive compensation given that our Company is in the development stage.

Long-term Equity Incentive Compensation

Long-term incentive compensation allows the executive officers to share in any appreciation in the value of our common stock. The Board of Directors believes that stock option participation aligns executive officers' interests with those of the shareholders. The amounts of the awards are designed to reward past performance, create incentives to meet long-term objectives and ensure that we retain executive talent over a longer period of time. Awards are based upon various factors, including market conditions and incentives given by other companies in our industry.

Stock option awards provide our executive officers with the right to purchase shares of our common stock at a fixed exercise price, and stock option vest over time, subject to continued employment with our company over the vesting period. Stock options generally vest quarterly over a period of one year. All stock options have an exercise price equal to fair market value of our common stock on the date of grant, which is equal to our closing market price on such date.

Severance and Change in Control Benefits

Pursuant to employment agreements we have entered into with our executives and the terms of our 2016 Equity Incentive Plan, our executives are entitled to certain benefits in the event of a change in control of our Company or the termination of their employment under specified circumstances, including termination following a change in control. We believe these benefits help us compete for and retain executive talent and are generally in line with severance packages offered to executives by the companies in our peer group. We also believe that these benefits would serve to minimize the distraction caused by any change in control scenario and reduce the risk that key talent would leave the Company before any such transaction closes, which could reduce the value of the Company if such transaction failed to close.

Other Compensation

Generally, benefits available to executive officers are available to all employees on similar terms and include health and welfare benefits, disability benefits and a 401(k) plan.

We provide the benefits above to attract and retain our executive officers by offering compensation that is competitive with other companies similar in size and stage of development. These benefits represent a relatively small portion of their total compensation.

The table below summarizes all compensation awarded to, earned by, or paid to our named executive officers for the fiscal years ended December 31, 2018 and 2017.

Summary Compensation Table

Name and Principal Position	Year	Salary	Bonus	Stock Awards	Option Awards	All Other Compensation	Total
		($)	($)	($)	($)	($)	($)
(a)	(b)	(c)[1]	(d)	(e)[2]	(f)[2]	(g)[3]	(h)
Dr. Michael S. Lebby[4]	2018	265,000			38,448	2,840	306,288
CEO; Director	2017	176,667		8,000	305,662	29,893	520,222
James S. Marcelli	2018	250,000				2,355	252,355
President; COO; Sec., Director	2017	241,667				2,282	243,949

(1)

The named executive officer s compensation includes the amount for services rendered to the Company in his capacity as both an officer and a director.

(2)

The aggregate fair value of awards and options in columns (e) and (f) are computed in accordance with FASB ASC 718. The amounts shown in columns (f) do not reflect dollar amounts actually received by our named executive officers.

(3)

The amount in column (g) reflects a salary gross up for long term disability premium payments.

(4)

Dr. Lebby became our Chief Executive Officer on May 1, 2017. The amounts in column (e) and (g) for 2017 include compensation for serving on the Operations Committee of the Board of Directors in the amounts of $8,000 and $28,000, respectively. Dr. Lebby resigned from the Operations Committee of the Board of Directors effective April 30, 2017. The amount in column (g) also includes a salary gross up for long term disability premium payments of $1,893.

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At no time during the last fiscal year was any outstanding option otherwise modified or re-priced, and there was no tandem feature, reload feature, or tax-reimbursement feature associated with any of the stock options we granted to our executive officers or otherwise.

We grant stock awards and stock options to our executive officers based on their level of experience and contributions to our Company. The aggregate fair value of awards and options are computed in accordance with FASB ASC 718 and are reported in the Summary Compensation Table above in the columns (e) and (f).

No plan-based awards were granted to our named executive officers:

The table below summarizes all of the outstanding equity awards for our named executive officers as of December 31, 2018, our latest fiscal year end.

Outstanding Equity Awards At Fiscal Year-End

	Option Awards				
Name	**Number of securities underlying unexercised options(#) exercisable**	**Number of securities underlying unexercised options(#) unexercisable**	**Equity incentive plan awards: number of securities underlying unexercised unearned options (#)**	**Option exercise price ($)**	**Option expiration date**
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**
Dr. Michael S. Lebby	200,000			0.69	08/25/25
CEO, Director[1][3]	50,000			0.68	01/28/26
	50,000			0.85	01/16/27
	350,000			0.70	03/19/27
James S. Marcelli	50,000			0.67	08/09/25

President, COO, Sec.,	1,150,000	0.70	06/30/25
Director[2][3]	100,000	1.00	05/16/23

(1)

Dr. Lebby received an option to purchase up to: (i) 200,000 shares of common stock, of which 50,000 shares vested on August 26, 2015 and the remaining shares vest in equal annual installments of 50,000 options per year commencing on August 26, 2016; (ii) 50,000 shares of common stock, of which 20,000 shares vested on February 11, 2016 and the remaining shares vested quarterly in equal installments of 10,000 options per quarter commencing on April 1, 2016; (iii) 50,000 shares of common stock, of which 20,000 shares vested on January 17, 2017 and the remaining shares vested quarterly in equal installments of 10,000 options per quarter commencing on April 1, 2017; (iv) 350,000 shares of common stock, which vest quarterly over one year in equal installments of 87,500 shares per quarter beginning May 1, 2017.

(2)

Mr. Marcelli received an option to purchase up to (i) 50,000 shares of common stock, of which 12,500 shares vested on August 10, 2015 and the remaining shares vested quarterly in equal installments of 12,500 shares; (ii) 1,150,000 shares of common stock at an exercise price of $.70 that vested immediately; and (iii) up to 100,000 shares of common stock, of which 25,000 shares vested on August 1, 2013 and the remaining shares vested quarterly in equal installments of 25,000 shares commencing on October 1, 2013.

(3)

In the event of a change in control of our Company, such person s options shall remain exercisable as set forth in their stock option agreement.

Option Exercises and Stock Vested

No stock options, SARs and similar instruments were exercised, and no stock, including restricted stock, restricted stock units and similar instruments vested, by or for any of our named executive officer during the last completed fiscal year.

Pension Benefits-Nonqualified Defined Contribution and Other Nonqualified Deferred Compensation

No pension benefits were paid to any of our named executive officers during the last completed fiscal year. We do not currently sponsor any non-qualified defined contribution plans or non-qualified deferred compensation plans.

Employee, Severance, Separation and Change in Control Agreements

Dr. Michael S. Lebby Employee Agreement- Chief Executive Officer

On March 20, 2017, we entered into an employment agreement with Dr. Michael S. Lebby (the **Lebby Employment Agreement**). The term of the Lebby Employment Agreement commenced on May 1, 2017 for a period of 24 months, following which time the Lebby Employment Agreement will be renewed for successive 12-month periods at the end of each term upon the written agreement of the parties that shall be delivered by each party to the other not less than 60 days prior to the expiration of the existing term. Pursuant to the Lebby Employment Agreement, Dr. Lebby s 2017 base compensation was $265,000 per year. Upon entering into the Lebby Employment Agreement, Dr. Lebby was granted (i) 350,000 stock options, which have an exercise price of $0.70 per share and are fully vested at this time. In the event of a change in control of our Company, Dr. Lebby s options shall remain exercisable as set forth in Dr. Lebby s stock option agreement.

If Dr. Lebby s employment terminates upon the expiration of the term of the Lebby Employment Agreement, and the Company elects for any reason not to renew the Lebby Employment Agreement for an additional 12-month term, then our Company will continue to pay to Dr. Lebby the compensation described in the Lebby Employment Agreement for a period of 9 months the after the termination. If Dr. Lebby s employment is terminated by the Company without cause during the term of the Lebby Employment Agreement, the Company will pay to Dr. Lebby s the compensation described in the Lebby Employment Agreement for the remainder of the term of Lebby Employment Agreement or 12 months, whichever is longer.

Mr. James S. Marcelli Employee Agreement- President; Chief Operating Officer

On August 10, 2015, we entered into a new employment agreement with Mr. Marcelli, which was amended during 2015 and 2017 (collectively, the **Marcelli Employment Agreement**), which replaced his previous employment agreement, as amended. The term of the Marcelli Employment Agreement commenced on January 1, 2014 and expires December 31, 2019, following which time the Marcelli Employment Agreement will be renewed for successive 12-month periods at the end of each term upon the written agreement of the parties that shall be delivered

by each party to the other not less than 60 days prior to the expiration of the existing term. Pursuant to the Marcelli Employment Agreement, Mr. Marcelli s 2017 base compensation was $250,000 per year. Upon entering into the Marcelli Employment Agreement, Mr. Marcelli was granted (i) 50,000 stock options, which have an exercise price of $0.67 per share and are fully vested at this time. In the event of a change in control of our Company, Mr. Marcelli s options shall remain exercisable as set forth in Mr. Marcelli s stock option agreement.

If Mr. Marcelli s employment terminates upon his death and key man life insurance is in place for Mr. Marcelli, our Company will continue to pay the compensation described in the Marcelli Employment Agreement to his estate through the remainder of the term of the Marcelli Employment Agreement, or 12 months, whichever is longer. If Mr. Marcelli s employment terminates upon the expiration of the term of the Marcelli Employment Agreement, and the Company elects for any reason not to renew the Marcelli Employment Agreement for an additional 12-month term, then our Company will continue to pay to Mr. Marcelli the compensation described in the Marcelli Employment Agreement for a period of 9 months the after the termination. If Mr. Marcelli s employment is terminated by the Company without cause during the term of the Marcelli Employment Agreement, the Company will pay to Mr. Marcelli the compensation described in the Marcelli Employment Agreement for the remainder of the term of Marcelli Employment Agreement or 12 months, whichever is longer.

Compensation of Directors

Set forth below is a summary of the compensation of our directors during our December 31, 2018 fiscal year.

Name	Fees Earned or Paid in Cash ($)	Stock Awards ($)	Option Awards ($)	Non-Equity Incentive Plan Compensation ($)	Non-Qualified Deferred Compensation Earnings ($)	All Other Compensation ($)	Total ($)
Michael Lebby (1)							
Thomas E. Zelibor (2)			34,530				34,530
James S. Marcelli (3)							
William C. Pickett, III (4)			27,586				27,586
Joseph A. Miller (5)			34,530				34,530
Ronald A. Bucchi (6)			34,530				34,530
Siraj Nour El-Ahmadi (7)			34,530				34,530
Frederick Leonberger (8)	$108,000		57,659				165,659

(1)

Dr. Lebby serves as an executive officer and a director but receives no additional compensation for serving as a director.

(2)

On January 22, 2018, Mr. Zelibor received an option to purchase up to up to 50,000 shares of common stock at an exercise price of $1.22 that vest pursuant to the following schedule: 20,000 shares vested immediately; and the remaining options vest in 3 equal quarterly installments of 10,000 options per year commencing on April 1, 2018.

(3)

Mr. Marcelli serves as an executive officer and a director but receives no additional compensation for serving as a director.

(4)

Mr. Pickett served as a director until August 15, 2018. On January 22, 2018, Mr. Pickett received an option to purchase up to 50,000 shares of common stock at an exercise price of $1.22 that vest pursuant to the following schedule: 20,000 shares vested immediately; and the remaining options vest in 3 equal quarterly installments of 10,000 options per year commencing on April 1, 2018.

(5)

On January 22, 2018, Dr. Miller received an option to purchase up to up to 50,000 shares of common stock at an exercise price of $1.22 that vest pursuant to the following schedule: 20,000 shares vested immediately; and the remaining options vest in 3 equal quarterly installments of 10,000 options per year commencing on April 1, 2018.

(6)

On January 22, 2018, Mr. Bucchi received an option to purchase up to up to 50,000 shares of common stock at an exercise price of $1.22 that vest pursuant to the following schedule: 20,000 shares vested immediately; and the remaining options vest in 3 equal quarterly installments of 10,000 options per year commencing on April 1, 2018.

(7)

On January 22, 2018, Mr. El-Ahmadi received an option to purchase up to up to 50,000 shares of common stock at an exercise price of $1.22 that vest pursuant to the following schedule: 20,000 shares vested immediately; and the remaining options vest in 3 equal quarterly installments of 10,000 options per year commencing on April 1, 2018.

(8)

During 2018, Dr. Leonberger received $108,000 in cash compensation for serving on our Operations Committee. On January 22, 2018, Dr. Leonberger received an option to purchase up to up to 50,000 shares of common stock at an exercise price of $1.22 that vest pursuant to the following schedule: 20,000 shares vested immediately; and the remaining options vest in 3 equal quarterly installments of 10,000 options per year commencing on April 1, 2018.

In the event of a change in control of our Company, all of the above person s options become fully vested and/or exercisable, as the case may be, immediately prior to such change in control, and shall remain exercisable as set forth in their stock option agreement.

Compensation Policies and Practices as They Relate to Our Risk Management

No risks arise from our Company s compensation policies and practices for our employees that are reasonably likely to have a material adverse effect on our Company.

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

The following table sets forth, as of March 15, 2018, the names, addresses, amount and nature of beneficial ownership and percent of such ownership of each person or group known to our Company to be the beneficial owner of more than five percent (5%) of our common stock:

Security Ownership of Certain Beneficial Owners

Name and Address of Beneficial Owner (1)	Amount and Nature of Beneficial Ownership (2)	% of Class Owned (3)
Mary Goetz	4,517,306	5.59%

(1)

In care of our Company at 369 Inverness Parkway, Suite 350, Englewood, CO 80112.

(2)

To our best knowledge, as of the date hereof, such holders had the sole voting and investment power with respect to the voting securities beneficially owned by them, unless otherwise indicated herein. Includes the person's right to obtain additional shares of common stock within 60 days from the date hereof.

(4)

Based on 80,759,209 shares of common stock outstanding on March 15, 2018. Does not include shares underlying: (i) options to purchase shares of our common stock under our 2007 Employee Stock Plan and our 2016 Equity Incentive Plan; or (ii) outstanding warrants to purchase shares of our common stock.

The following table sets forth, as of March 15, 2018, the names, addresses, amount and nature of beneficial ownership and percent of such ownership of our common stock of each of our officers and directors, and officers and directors as a group:

Security Ownership of Management

Name and Address (1)	Amount and Nature of Beneficial Ownership (2)	% Owned (3)(4)
Michael Lebby	712,643(5)	*
Chief Executive Officer, Principal Executive Officer and Director		
James S. Marcelli	1,553,400(6)	1.92%
President, Chief Operating Officer, Principal Financial Officer, Secretary and Director		
Thomas E. Zelibor	1,401,824(7)	1.73%
Chair of the Board of Directors		
Joseph A. Miller, Jr.	506,800(8)	*
Director		
Ronald A. Bucchi	827,400(9)	1.02
Director		
Siraj Nour El-Ahmadi	480,000(10)	*
Director		
Frederick Leonberger	955,000(11)	1.18
Director		
Directors and Officers as a Group (7 Persons):	6,437,067	7.97%

* Less than 1%.

(1)

In care of our Company at 369 Inverness Parkway, Suite 350, Englewood, CO 80112.

(2)

To our best knowledge, as of the date hereof, such holders had the sole voting and investment power with respect to the voting securities beneficially owned by them, unless otherwise indicated herein. Includes the person's right to obtain additional shares of common stock within 60 days from March 15, 2019.

(3)

Based on 80,759,209 shares of common stock outstanding on March 15, 2019. Does not include shares underlying: (i) options to purchase shares of our common stock under our 2007 Employee Stock Plan and our 2016 Equity Incentive Plan and (ii) outstanding warrants to purchase shares of our common stock.

(4)

If a person listed on this table has the right to obtain additional shares of common stock within 60 days from March 15, 2019, the additional shares are deemed to be outstanding for the purpose of computing the percentage of class owned by such person but are not deemed to be outstanding for the purpose of computing the percentage of any other person.

(5)

Consists of 62,643 shares of common stock and an option to purchase up to 650,000 shares of common stock exercisable within 60 days from March 15, 2019.

(6)

Consists of 246,700 shares of common stock, an option to purchase up to 1,300,000 shares of common stock exercisable within 60 days from March 15, 2019, and a warrant to purchase up to 6,700 shares of common stock exercisable within 60 days from March 15, 2019.

(7)

Consists of 50,124 shares of common stock, an option to purchase up to 1,345,000 shares of common stock exercisable within 60 days from March 15, 2019 and a warrant to purchase up to 6,700 shares of common stock exercisable within 60 days from March 15, 2019.

(8)

Consists of 13,400 shares of common stock, options to purchase up to 480,000 shares of common stock exercisable within 60 days from March 15, 2019 and warrants to purchase up to 13,400 shares of common stock exercisable within 60 days from March 15, 2019.

(9)

Consists of 174,000 shares of common stock, an option to purchase up to 640,000 shares of common stock exercisable within 60 days from March 15, 2019 and warrants to purchase up to 13,400 shares of common stock exercisable within 60 days from March 15, 2019. Mr. Bucchi disclaims beneficial ownership of 53,000 shares held by his spouse.

(10)

Consists of an option to purchase up to 480,000 shares of common stock exercisable within 60 days from March 15, 2019.

(11)

Consists of an option to purchase up to 230,000 shares of common stock exercisable within 60 days from March 15, 2019 and warrants to purchase up to 725,000 shares of common stock exercisable within 60 days from March 15, 2019.

We are not aware of any arrangements that could result in a change of control.

Securities Authorized for Issuance under Equity Compensation Plans

Information regarding our compensation plans under which our equity securities are authorized for issuance can be found in Part II Item 5 of this report.

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

Dr. Frederick J. Leonberger, through EOvation Advisors LLC, has served as a senior advisor to our Company since December 2011, with emphasis on modulator/technology development. In December 2017, the Company extended five separate warrants it previously issued to Dr. Leonberger, each for a period of five additional years. Additional information regarding Dr. Leonberger s warrants is described in Item 12 - Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

Policies and Procedures for Related-Party Transactions

Our Company does not have any formal written policies or procedures for related party transactions, however in practice, our Board of Directors reviews and approves all related party transactions and other matters pertaining to the integrity of management, including potential conflicts of interest, trading in our securities, or adherence to standards of business conduct.

Director Independence

Although we are currently traded on the OTCQB Market, our Board of Directors has reviewed each of the Directors relationships with the Company in conjunction with NASDAQ Listing Rule 5605(a)(2) that provides that an independent director is a person other than an Executive Officer or employee of the Company or any other individual having a relationship which, in the opinion of the Company's board of directors, would interfere with the exercise of independent judgment in carrying out the responsibilities of a director. Our Board of Directors has affirmatively determined that following directors, Joseph A. Miller, Jr., Ronald A. Bucchi, Siraj Nour El-Ahmadi and William C. Pickett III (who served as a director until August 15, 2018) are (or were) independent directors in that they are independent of management and free of any relationship that would interfere with their independent judgment as members of our Board of Directors. In making such determination, our Board of Directors considered the relationships that each such non-employee director has with our Company and all other facts and circumstances that our Board of Directors deemed relevant in determining their independence, including the beneficial ownership of our capital stock by each non-employee director. The following members of our Board of Directors, Thomas E. Zelibor, Dr. Michael Lebby, James S. Marcelli and Frederick J. Leonberger are not independent directors pursuant to the standards described above.

Our Company does not have a separately designated nominating or compensation committee or committee performing similar functions; therefore, our full Board of Directors currently serves in these capacities.

Item 14.

Principal Accounting Fees and Services.

Audit Fees.

The aggregate fees billed for the years ended December 31, 2018 and December 31, 2017 for professional services rendered by Morison Cogen, LLP for the audit of the Company s annual financial statements and review of financial statements included in the Company s Form 10-Q or services that are normally provided by Morison Cogen, LLP in connection with statutory and regulatory filings or engagements were $81,000 for the year ended December 31, 2018 and $56,675 for the year ended December 31, 2017.

Audit-Related Fees.

Fees billed for the years ended December 31, 2018 and December 31, 2017 for assurance and related services rendered by Morison Cogen, LLP that are reasonably related to the performance of the audit or review of the Company s financial statements and are not reported under the category Audit Fees described above were $0 for the year ended December 31, 2018 and $0 for the year ended December 31, 2017.

Tax Fees.

Fees billed for the years ended December 31, 2018 and December 31, 2017 for tax compliance services rendered by Morison Cogen, LLP were $6,000 for the year ended December 31, 2018 and $6,000 for the year ended December 31, 2017.

All Other Fees.

Fees billed for the years ended December 31, 2018 and December 31, 2017 for products and services provided by Morison Cogen, LLP, other than the services reported in the Audit Fees, Audit-Related Fees, and Tax Fees categories above were $0 for the year ended December 31, 2018 and $0 for the year ended December 31, 2017.

Audit Committee Pre-Approval Policies.

The Company s audit committee currently does not have any pre-approval policies or procedures concerning services performed by Morison Cogen, LLP. All the services performed by Morison Cogen, LLP that are described above were pre-approved by the Company s audit committee.

None of the hours expended on Morison Cogen, LLP s engagement to audit the Company s financial statements for the years ended December 31, 2018 and December 31, 2017 were attributed to work performed by persons other than Morison Cogen, LLP s full-time, permanent employees.

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) The following Audited Financial Statements are filed as part of this Form 10-K Report:

Report of Independent Registered Public Accounting Firm
Balance Sheets
Statements of Operations
Statement of Stockholders Equity
Statements of Cash Flows
Notes to Financial Statements

(b) The following exhibits are filed as part of this report.

Exhibit No.	Description of Exhibit	Location
3.1	Articles of Incorporation	Incorporated by reference to Company s Form 10-SB as filed with the SEC on April 13, 2007
3.2	Certificate of Amendment to Articles of Incorporation	Incorporated by reference to Company s Definitive Schedule 14C Information Statement as filed with the SEC on February 19, 2008
3.3	Certificate of Amendment to Articles of Incorporation	Incorporated by reference to Company s Form S-1 Registration Statement as filed with the SEC on August 3, 2015
3.4	Restated Bylaws	Incorporated by reference to the Company's Form 10-K as filed with the SEC on March 16, 2018
10.1	Employee Agreement Michael Lebby	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on March 22, 2017
10.2	Employee Agreement - James Marcelli	Incorporated by reference to Company s Form 10-Q as filed with the SEC on August 12, 2015
10.3	Employee Agreement Amendment - James Marcelli	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on March 22, 2017
10.4	Employee Agreement Thomas E. Zelibor	Incorporated by reference to the Company s Form 8-K as filed with the SEC on March 5, 2014
10.5	Employment Agreement Amendment - Thomas E. Zelibor	Incorporated by reference to the Company s Quarterly Report on Form 10-Q as filed with the SEC on May 14, 2014
10.6		

	Employee Agreement Amendment Thomas E. Zelibor	Incorporated by reference to the Company's Form 10-Q as filed with the SEC on November 16, 2015
10.7	Form of Executive Paid Time Off Waiver Agreement	Incorporated by reference to the Company's Form 10-K as filed with the SEC on March 16, 2018
10.8	Form of Director Agreement	Incorporated by reference to the Company's Form 10-K as filed with the SEC on March 16, 2018
10.9	Form of Director Indemnification Agreement	Incorporated by reference to the Company's Form 10-K as filed with the SEC on March 16, 2018
10.10	Form of Director s Non-Disclosure Agreement	Incorporated by reference to the Company's Form 10-K as filed with the SEC on March 16, 2018
10.11	Operations Committee Charter	Incorporated by reference to the Company's Form 10-Q as filed with the SEC on August 15, 2016
10.12	Statement of Operations Committee Work - Michael Lebby	Incorporated by reference to the Company's Form 8-K as filed with the SEC on August 27, 2015
10.13	Statement of Operations Committee Work - Frederick J. Leonberger	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on April 3, 2017
10.14	Consulting Agreement - EOvation Advisors, LLC dated December 26, 2016	Incorporated by reference to the Company s Form S-1 as filed with the SEC on April 19, 2017

10.15	2007 Employee Stock Plan	Incorporated by reference to Company s Definitive Schedule 14C Information Statement as filed with the SEC on February 19, 2008
10.16	2007 Employee Stock Plan Amendment	Incorporated by reference to Company s Definitive Schedule 14A Proxy Statement as filed with the SEC on June 16, 2010
10.17	2007 Employee Stock Plan Amendment	Incorporated by reference to the Company s Definitive Schedule 14A Proxy Statement as filed with the SEC on August 8, 2012
10.18	2007 Employee Stock Plan Amendment	Incorporated by reference to Company s Definitive Schedule 14A Proxy Statement as filed with the SEC on July 22, 2014
10.19	2016 Equity Incentive Plan	Incorporated by reference to Appendix A to the Company's Definitive Schedule 14A filed with the SEC on April 20, 2016
10.20	Form of Non-qualified Stock Option Award Agreement - Employees	Incorporated by reference to the Company s Annual Report on Form 10-K as filed with the SEC on March 17, 2017
10.21	Form of Non-qualified Stock Option Award Agreement - Executive Officers	Incorporated by reference to the Company s Annual Report on Form 10-K as filed with the SEC on March 17, 2017
10.22	Form of Non-qualified Stock Option Award Agreement - Non Employee Directors	Incorporated by reference to the Company s Annual Report on Form 10-K as filed with the SEC on March 17, 2017
10.23	Lease Agreement - Longmont, CO Facility	Incorporated by reference to the Company s Form 8-K as filed with the SEC on December 12, 2013
10.24	Lease Agreement Englewood, CO. Facility	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on November 2, 2017
10.25	Agreement - Atotech USA, LLC	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on November 2, 2017
10.26	Purchase Agreement, dated as of January 29, 2016, by and between the Company and Lincoln Park Capital Fund, LLC	Incorporated by reference to the Company's Form 8-K as filed with the SEC on February 1, 2016
10.27	Registration Rights Agreement, dated as of January 29, 2016, by and between the Company and Lincoln Park Capital Fund, LLC	Incorporated by reference to the Company's Form 8-K as filed with the SEC on February 1, 2016
10.28	Asset Purchase Agreement dated June 11, 2018, by and among the Company and BrPhotonics, *et. al.*	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on June 15, 2018
10.29		

	Purchase Agreement dated as of January 21, 2019, by and between the Company and Lincoln Park Capital Fund, LLC	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on January 22, 2019
10.30	Registration Rights Agreement, dated as of January 21, 2019, by and between the Company and Lincoln Park Capital Fund, LLC	Incorporated by reference to the Company s Current Report on Form 8-K as filed with the SEC on January 22, 2019
10.31		
14.1	Code of Ethics and Business Conduct	Incorporated by reference to the Company's Form 10-K as filed with the SEC on March 16, 2018
23.1	Consent of Independent Registered Public Accounting Firm - Morison Cogen LLP	Filed herewith
31.1	Certification pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, as amended, executed by the Principal Executive Officer of the Company.	Filed herewith

31.2	Certification pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, as amended, executed by the Principal Financial Officer of the Company.	Filed herewith
32.1	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, executed by the Principal Executive Officer of the Company.	Furnished herewith
32.2	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, executed by the Principal Financial Officer of the Company.	Furnished herewith
101	XBRL data files of Financial Statements and Notes contained in this Annual Report on Form 10-K	

Item 16. Form 10-K Summary

None

SIGNATURES

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

LIGHTWAVE LOGIC, INC.

Registrant

By: /s/ Michael Lebby
Michael Lebby,
Chief Executive Officer
(Principal Executive Officer)

Date: March 18, 2019

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

Signature	Title	Date
/s/ Michael Lebby Michael Lebby	Chief Executive Officer, Principal Executive Officer, Director	March 18, 2019
/s/ James S. Marcelli James S. Marcelli	President, Chief Operating Officer, Principal Financial Officer, Secretary, Director	March 18, 2019
/s/ Thomas E. Zelibor Thomas E. Zelibor	Chair of the Board of Directors	March 18, 2019
/s/ Joseph A. Miller Joseph A. Miller	Director	March 18, 2019
/s/ Ronald A. Bucchi Ronald A. Bucchi	Director	March 18, 2019

/s/ Siraj Nour El-Ahmadi Siraj Nour El-Ahmadi	Director	March 18, 2019
/s/ Frederick J. Leonberger Frederick J. Leonberger	Director	March 18, 2019

LIGHTWAVE LOGIC, INC.

FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and

Stockholders of Lightwave Logic, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying balance sheets of Lightwave Logic, Inc. (the Company) as of December 31, 2018 and 2017, and the related statements of operations, stockholders equity, and cash flows for each of the two years in the period ended December 31, 2018, and the related notes (collectively referred to as the financial statements). We also have audited the Company s internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America. Also, in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control Integrated Framework (2013)* issued by COSO.

Basis for Opinion

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

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

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

To the Board of Directors and

Stockholders of Lightwave Logic, Inc.

(Continued)

Definition and Limitations of Internal Control over Financial Reporting

A company s internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company s internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company s assets that could have a material effect on the financial statements.

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

/s/ Morison Cogen LLP

We have served as the Company s auditor since 2005.

Blue Bell, Pennsylvania

March 18, 2019

LIGHTWAVE LOGIC, INC.

BALANCE SHEETS

	December 31, 2018	December 31, 2017
ASSETS		
CURRENT ASSETS		
Cash and cash equivalents	$ 2,174,625	$ 3,482,327
Prepaid expenses and other current assets	337,631	584,919
	2,512,256	4,067,246
PROPERTY AND EQUIPMENT - NET	1,800,769	1,176,749
OTHER ASSETS		
Intangible assets - net	938,239	605,775
TOTAL ASSETS	$ 5,251,264	$ 5,849,770
LIABILITIES AND STOCKHOLDERS' EQUITY		
CURRENT LIABILITIES		
Accounts payable	$ 150,741	$ 54,208
Current portion of equipment purchase	178,482	493,597
Accounts payable and accrued expenses - related parties	13,824	8,770
Accrued expenses	1,155	92,186
	344,202	648,761
LONG TERM EQUIPMENT PURCHASE - NET OF CURRENT PORTION		184,294
TOTAL LIABILITIES	344,202	833,055
STOCKHOLDERS' EQUITY		
Preferred stock, $0.001 par value, 1,000,000 authorized, no shares issued or outstanding		
Common stock $0.001 par value, 250,000,000 authorized, 79,176,330 and 74,068,259 issued and outstanding at December 31, 2018 and December 31, 2017	79,177	74,068
Additional paid-in-capital	62,356,854	56,698,658
Accumulated deficit	(57,528,969)	(51,756,011)
TOTAL STOCKHOLDERS' EQUITY	4,907,062	5,016,715

TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	$	5,251,264	$	5,849,770

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

LIGHTWAVE LOGIC, INC.

STATEMENTS OF OPERATIONS

FOR THE YEARS ENDING DECEMBER 31, 2018 AND 2017

	For the Year Ending December 31, 2018	For the Year Ending December 31, 2017
NET SALES	$	$
COST AND EXPENSE		
Research and development	3,794,565	3,519,129
General and administrative	1,806,451	2,004,409
	5,601,016	5,523,538
LOSS FROM OPERATIONS	(5,601,016)	(5,523,538)
OTHER INCOME (EXPENSE)		
Interest income	250	250
Commitment fee	(172,192)	(226,094)
NET LOSS	$ (5,772,958)	$ (5,749,382)
Basic and Diluted Loss per Share	$ (0.08)	$ (0.08)
Basic and Diluted Weighted Average Number of Shares	76,395,750	70,876,576

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

LIGHTWAVE LOGIC, INC.

STATEMENT OF STOCKHOLDERS' EQUITY

FOR THE YEARS ENDING DECEMBER 31, 2018 AND 2017

	Number of Shares	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Total
BALANCE AT DECEMBER 31, 2016	68,077,288	$ 68,078	$ 48,998,073	$ (46,006,629)	$ 3,059,522
Common stock issued to institutional investor	5,300,000	5,300	5,716,760		5,722,060
Common stock issued for additional commitment shares	185,974	186	225,907		226,093
Exercise of warrants	469,000	469	502,031		502,500
Common stock issued for services	35,997	35	44,215		44,250
Options issued for services			794,738		794,738
Warrants issued for services			416,934		416,934
Net loss for the year ending December 31, 2017				(5,749,382)	(5,749,382)
BALANCE AT DECEMBER	74,068,259	$ 74,068	$ 56,698,658	$ (51,756,011)	$ 5,016,715

31, 2017

	Number of Shares	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Total
BALANCE AT DECEMBER 31, 2017	74,068,259	$ 74,068	$ 56,698,658	$ (51,756,011)	$ 5,016,715
Common stock issued to institutional investor	4,750,000	4,750	4,858,785		4,863,535
Common stock issued for additional commitment shares	158,071	159	172,033		172,192
Exercise of options	100,000	100	99,900		100,000
Exercise of warrants	100,000	100	61,400		61,500
Options issued for services			387,688		387,688
Warrants issued for services			78,390		78,390
Net loss for the year ending December 31, 2018				(5,772,958)	(5,772,958)
BALANCE AT DECEMBER 31, 2018	79,176,330	$ 79,177	$ 62,356,854	$ (57,528,969)	$ 4,907,062

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

LIGHTWAVE LOGIC, INC.

STATEMENTS OF CASH FLOWS
FOR THE YEARS ENDING DECEMBER 31, 2018 AND 2017

	For the Year Ending December 31, 2018	For the Year Ending December 31, 2017
CASH FLOWS FROM OPERATING ACTIVITIES		
Net loss	$ (5,772,958)	$ (5,749,382)
Adjustments to reconcile net loss to net cash used in operating activities		
Warrants issued for services	78,390	416,934
Stock options issued for services	387,688	794,738
Common stock issued for services and fees	172,192	270,343
Depreciation and amortization and noncash patent expenses	465,795	325,946
Loss on disposal of property and equipment	10,084	
(Increase) decrease in assets		
Prepaid expenses and other current assets	247,288	(447,977)
(Decrease) increase in liabilities		
Accounts payable	96,533	(10,819)
Accounts payable and accrued expenses-related parties	5,054	3,211
Accrued expenses	(91,031)	34,886
Net cash used in operating activities	(4,400,965)	(4,362,120)
CASH FLOWS FROM INVESTING ACTIVITIES		
Cost of intangibles	(397,479)	(81,743)
Purchase of property and equipment	(1,037,384)	(183,789)
Sale of property and equipment	2,500	
Net cash used in investing activities	(1,432,363)	(265,532)
CASH FLOWS FROM FINANCING ACTIVITIES		
Exercise of options and warrants	161,500	502,500
Issuance of common stock, institutional investor	4,863,535	5,722,060
Repayment of equipment purchase payable	(499,409)	(71,425)
Net cash provided by financing activities	4,525,626	6,153,135
NET INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS	(1,307,702)	1,525,483
CASH AND CASH EQUIVALENTS - BEGINNING OF YEAR	3,482,327	1,956,844
CASH AND CASH EQUIVALENTS - END OF YEAR	$ 2,174,625	$ 3,482,327

Supplemental Disclosure of Non-cash investing and financing activities:		
Equipment acquisition funded by liability	$	$ 749,316
Common stock for service, paid in advance		36,250

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

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

History and Nature of Business

Lightwave Logic, Inc. is a technology Company focused on the development of next generation photonic devices and non-linear optical polymer materials systems for applications in high speed fiber-optic data communications and optical computing markets. Currently the Company is in various stages of photonic device and materials development and evaluation with potential customers and strategic partners. The Company expects to obtain a revenue stream from datacom and telecom devices, sales of non-linear optical polymers, and product development agreements prior to moving into full-scale production.

The Company s current development activities are subject to significant risks and uncertainties, including failing to secure additional funding to operationalize the Company s technology now under development.

Lightwave Logic, Inc., (the Company) was organized under the laws of the State of Nevada in 1997 as Eastern Idaho Internet Service, Inc. The Company was engaged in an unrelated business until June 30, 1998, at which time the principal assets of that business were sold and operations were discontinued. The Company was inactive until the acquisition of PSI-TEC Corporation (PSI-TEC) on July 14, 2004, which is when the Company commenced with its current business and changed its name to PSI-TEC Holdings, Inc.

Merger

On July 14, 2004, the Company acquired PSI-TEC in a share exchange, which was considered to be a capital transaction in substance rather than a business combination, and was accounted for as a change of capital structure under accounting principles generally accepted in the United States. On October 20, 2006, the Company and PSI-TEC merged and the Company changed its name to Third-Order Nanotechnologies, Inc. On March 10, 2008, the Company changed its name to Lightwave Logic, Inc.

Basis of Presentation

The accompanying financial statements are presented in accordance with accounting principles generally accepted in the United States of America.

Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying disclosures. Although these estimates are based on management s best knowledge of current events and actions the Company may undertake in the future, actual results could differ from the estimates.

Cash Equivalents

For the purposes of the statement of cash flows, the Company considers all highly liquid instruments with maturities of three months or less at the time of purchase to be cash equivalents.

Concentration of Credit Risk

Certain financial instruments potentially subject the Company to concentrations of credit risk. These financial instruments consist primarily of cash. At December 31, 2018, the Company did have deposits with a financial institution that exceed the Federal Depository Insurance coverage.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Property and Equipment

Equipment is stated at cost. Depreciation is principally provided by use of straight-line methods for financial and tax reporting purposes over the estimated useful lives of the assets, generally 5 years. When property is retired or otherwise disposed of, the cost and accumulated depreciation are removed from the accounts and any resulting gain or loss is included in operations.

Intangible Assets

Definite-lived intangible assets are stated at cost. Patents are amortized over their estimated useful lives, commencing from the date of grant for the remaining legal lives of the patents. The patents generally have a term of up to 20 years from the date of filing of the earliest related patent application. When certain patent applications are abandoned by the Company for claims that are covered by patents already granted to the Company, the cost of patent applications are removed from the accounts and the resulting expense is reflected in the statement of operations.

Fair Value of Financial Instruments

The Company s financial instruments consist of cash, accounts payable and accrued expenses. The carrying values of cash, accounts payable and accrued expenses approximate fair value because of their short maturities.

Income Taxes

The Company follows Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 740, Income Taxes, which requires an asset and liability approach to financial accounting and reporting for income taxes. Deferred income tax assets and liabilities are computed annually for temporary differences between the financial statement and tax bases of assets and liabilities that will result in taxable or deductible amounts in the future based on enacted tax laws and rates applicable to the periods in which the differences are expected to affect taxable income. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized. Income tax expense is the tax payable or refundable for the period plus or minus the change during the period in deferred tax assets and liabilities.

Stock-based Payments

The Company accounts for stock-based compensation under the provisions of Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 718, "Compensation - Stock Compensation", which requires the measurement and recognition of compensation expense for all stock-based awards made to employees and directors based on estimated fair values on the grant date. The Company estimates the fair value of stock-based awards on the date of grant using the Black-Scholes model. The value of the portion of the award that is ultimately expected to vest is recognized as expense over the shorter of the vesting period or the requisite service periods using the straight-line method. The Company accounts for stock-based compensation awards to nonemployees in accordance with FASB ASC 505-50, "Equity- Based Payments to Non-Employees (ASC 505-50). Under ASC 505-50, the Company determines the fair value of the warrants or stock-based compensation awards granted as either the fair value of the consideration received or the fair value of the equity instruments issued, whichever is more reliably measurable. All issuances of stock options or other equity instruments to non-employees as consideration for goods or services received by the Company are accounted for based on the fair value of the equity instruments issued. Any stock options issued to non-employees are recorded as an expense and additional paid in capital in stockholders equity over the applicable service periods. Non-employee equity based payments are recorded as an expense over the service period, as if the Company had paid cash for the services. At the end of each financial reporting period, prior to vesting or prior to the completion of the services, the fair value of the equity based payments will be re-measured and the non-cash expense recognized during the period will be adjusted accordingly. Since the fair value of equity based payments granted to non-employees is subject to change in the future, the amount of the future expense will include fair value re-measurements until the equity based payments are fully vested or the service completed. As of June 30, 2018 the Company changed its accounting policy for non-employee equity based payments by adopting FASB ASU 2018-07, which expands Topic 718 to include transactions for acquiring goods and services, from nonemployees.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Loss Per Share

The Company follows FASB ASC 260, Earnings per Share , resulting in the presentation of basic and diluted earnings per share. Because the Company reported a net loss in 2018 and 2017, common stock equivalents, including stock options and warrants were anti-dilutive; therefore, the amounts reported for basic and dilutive loss per share were the same.

Recoverability of Long-Lived Assets

The Company follows FASB ASC 360, Property, Plant, and Equipment . Long-lived assets to be held and used are reviewed for impairment whenever events or changes in circumstances indicate that the related carrying amount may not be recoverable. When required, impairment losses on assets to be held and used are recognized based on the excess of the asset s carrying amount.

Comprehensive Income

The Company follows FASB ASC 220.10, Reporting Comprehensive Income. Comprehensive income is a more inclusive financial reporting methodology that includes disclosure of certain financial information that historically has not been recognized in the calculation of net income. Since the Company has no items of other comprehensive income, comprehensive loss is equal to net loss.

Recently Adopted Accounting Pronouncements

In June 2018, the FASB issued ASU No. 2018-07, Compensation Stock Compensation (Topic 718), Improvements to Nonemployee Share-Based Payment Accounting. The amendments in this Update expand the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. Prior to this Update, Topic 718 applied only to share-based transactions to employees. Consistent with the accounting requirement for employee share-based payment awards, nonemployee share-based payment awards within the scope of Topic 718 are measured at grant-date fair value of the equity instruments that an entity is obligated to issue when the good has been delivered or the service has been rendered and any other conditions necessary to earn the right to benefit from the instruments have been satisfied.

The amendments in this Update are effective for public business entities for fiscal years beginning after December 15, 2018, including interim periods within that fiscal year. Early adoption is permitted, but no earlier than an entity s adoption date of Topic 606. The adoption of this pronouncement on June 30, 2018 had no material impact on the Company s financial statements.

Recently Issued Accounting Pronouncements Not Yet Adopted

In February 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)*. The amendments in this Update specify the accounting for leases. The core principle of Topic 842 is that a lessee should recognize the assets and liabilities that arise from leases. For public business entities, the amendments in this Update are effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years.

In July 2018, the FASB issued ASU No. 2018-11, *Leases (Topic 842), Targeted Improvements*. The amendments in this Update relieve businesses and organizations from having to present prior comparative years results when they adopt the new standard. It also lets landlords and other lessors avoid breaking out the parts of a rental contract that are not specifically being leased, such as the cost of snow removal services, and account for them separately from the base rent. The amendments in this Update are the same as the effective dates and transition requirements in ASU No. 2016-02, *Leases*.

The Company is in the process of evaluating the above ASUs and estimating lease liabilities and corresponding right-of-use assets as of January 1, 2019.

Reclassifications

Certain reclassifications have been made to the 2017 financial statement in order to conform to the 2018 financial statement presentation.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 2 MANAGEMENT S PLANS

As a technology company focusing on the development of the next generation photonic devices and non-linear optical polymer materials systems, substantial net losses have been incurred since inception. The Company has satisfied capital requirements since inception primarily through the issuance and sale of its common stock. As of March 18, 2019, the Company has a cash position of approximately $2,200,000. Based upon the current cash position and expenditures of approximately $585,000 per month and no debt service, management believes the Company has sufficient funds to finance its operations through June 2019. In January 2016, the Company signed a purchase agreement (Purchase Agreement) with an institutional investor to sell up to $20,000,000 of common stock. Under the Purchase Agreement and at Company's sole discretion, the institutional investor has committed to invest up to $20,000,000 in common stock over a 36-month period with the remaining available amount of $7,861,215 as of December 31, 2018. Since December 31, 2018, the Company has raised an additional $1,011,585. In January 2019, the Company signed a Purchase Agreement with the institutional investor to sell up to $25,000,000 of common stock. The Company registered 9,500,000 shares pursuant to a registration statement filed on January 30, 2019 which became effective February 13, 2019.

NOTE 3 PREPAID EXPENSES AND OTHER CURRENT ASSETS

Prepaid expenses and other current assets consist of the following:

	December 31, 2018	December 31, 2017
Insurance	$ 226,363	$ 79,403
Prepaid material	46,120	
Rent	21,896	254,978
Other	37,210	20,992
Stock award	6,042	30,208
Deposits		199,338
	$ 337,631	$ 584,919

NOTE 4 PROPERTY AND EQUIPMENT

Property and equipment consists of the following:

	December 31, 2018	December 31, 2017
Office equipment	$ 79,886	$ 82,453
Lab equipment	2,513,459	1,695,604
Furniture	33,128	32,693
Leasehold improvements	220,389	231,859
	2,846,862	2,042,609
Less: Accumulated depreciation	1,046,093	865,860
	$ 1,800,769	$ 1,176,749

Depreciation expense for the years ending December 31, 2018 and 2017 was $400,780 and 182,006. During the year ending December 31, 2018, the Company sold equipment for proceeds of $2,500 and a gain of $2,500. During the year ending December 31, 2018, the Company retired property and equipment and recorded a loss on the retirement of $12,584. During the year ended December 31, 2017, the Company did not sell or retire property and equipment.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 5 INTANGIBLE ASSETS

This represents legal fees and patent fees associated with the prosecution of patent applications. The Company has recorded amortization expense on patents granted, which are amortized over the remaining legal life. Maintenance patent fees are paid to a government patent authority to maintain a granted patent in force. Some countries require the payment of maintenance fees for pending patent applications. Maintenance fees paid after a patent is granted are expensed, as these are considered ongoing costs to maintain a patent . Maintenance fees paid prior to a patent grant date are capitalized to patent costs, as these are considered patent application costs . No amortization expense has been recorded on the remaining patent applications since patents have yet to be granted.

On June 11, 2018, the Company purchased patents for $315,000.

Intangible assets consist of the following:

	December 31, 2018	December 31, 2017
Patents	$ 1,184,882	$ 787,403
Less: Accumulated amortization	246,643	181,628
	$ 938,239	$ 605,775

Amortization expense for the years ending December 31, 2018 and 2017 was $65,015 and $95,341. There were no patent costs written off for the years ended December 31, 2018. Patent costs in the amount of $48,599 previously capitalized for possible filing of two provisional patents were written off to research and development expenses during the year ended December 31, 2017. After review by the Company, it was decided to keep secret some aspects of its chromophore development and protect them as Trade Secrets and Know-How.

NOTE 6 LONG TERM EQUIPMENT PURCHASE PAYABLE

Outstanding long term equipment purchase payable is comprised of the following:

Final Year of Maturity	Classification	Interest Rate	December 31, 2018	December 31, 2017
	Current	0.00%	$ 178,482	$ 493,597
2019	Long term	0.00%		184,294
			$ 178,482	$ 677,891

NOTE 7 COMMITMENTS

On October 30, 2017, the Company entered into a new lease to lease approximately 13,420 square feet of office, laboratory and research and development space located in Colorado for the Company s new principal executive offices and research and development facility. The term of the lease is sixty- one (61) months, beginning on November 1, 2017 and ending on November 30, 2022. The term shall be extended for an additional twenty-four (24) months, subject to certain conditions, waivable solely by Landlord in its sole and absolute discretion. Base rent for the first year of the lease term is approximately $168,824, with an increase in annual base rent of approximately 3% in each subsequent year of the lease term. As specified in the lease, the Company paid the landlord (i) all base rent for the period November 1, 2017 and ending on October 31, 2019, in the sum of $347,045; and (ii) the estimated amount of tenant s proportionate share of operating expenses for the same period in the sum of $186,293.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 7 COMMITMENTS (CONTINUED)

Commencing on November 1, 2019, monthly installments of base rent and one-twelfth of landlord s estimate of tenant s proportionate share of annual operating expenses shall be due on the first day of each calendar month. The lease also provides that (i) on November 1, 2019 landlord shall pay the Company for the cost of the cosmetic improvements in the amount of $3.00 per rentable square foot of the premises, and (ii) on or prior to November 1, 2019, the Company shall deposit with Landlord the sum of $36,524 as a security deposit which shall be held by landlord to secure the Company s obligations under the lease. On October 30, 2017, the Company entered into an agreement with the tenant leasing the premise from the landlord (Original Lessee) whereby the Original Lessee agreed to pay the Company the sum of $260,000 in consideration of the Company entering into the lease and landlord agreeing to the early termination of the Original Lessee s lease agreement with landlord. The consideration of $260,000 was received on November 1, 2017.

The Company is obligated under an operating lease for office and laboratory space. The aggregate minimum future lease payments under the operating leases are as follows:

YEARS ENDING DECEMBER 31,		AMOUNT
2019	$	32,432
2020		195,574
2021		201,501
2022		189,837
TOTAL	$	619,344

In June 2018, the lease for the facility located in Longmont Colorado was terminated.

Rent expense amounting to $149,131 and $51,791 is included in research and development and general and administrative expenses for the year ended December 31, 2018. Rent expense approximating $121,228 and $25,348 is included in research and development and general and administrative expenses for the year ended December 31, 2017.

NOTE 8 INCOME TAXES

As discussed in Note 1, the Company utilizes the asset and liability method of accounting for income taxes in accordance with FASB ASC 740.

The income tax (benefit) provision consists of the following:

	2018	2017
Current	$	$
Deferred	(1,503,000)	5,063,000
Change in valuation allowance	1,503,000	(5,063,000)
	$	$

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 8 INCOME TAXES (CONTINUED)

The reconciliation of the statutory federal rate to the Company s effective income tax rate is as follows:

	2018		2017	
	Amount	**%**	**Amount**	**%**
Income tax benefit at U.S. federal income tax rate	$ (1,213,000)	(21)	$ (1,955,000)	(34)
State tax benefit, net of federal tax effect	(346,000)	(6)	(345,000)	(6)
Non-deductible share-based compensation	56,000	1	250,000	4
Tax rate change			7,113,000	124
Change in valuation allowance	1,503,000	26	(5,063,000)	(88)
	$		$	

The components of deferred tax assets as of December 31, 2018 and 2017 are as follows:

	2018	2017
Deferred tax asset for NOL carryforwards	$ 11,892,000	$ 10,440,000
Share-based compensation	1,873,000	1,822,000
Valuation allowance	(13,765,000)	(12,262,000)
	$	$

In December 2017, the Tax Cuts and Jobs Act was enacted, which reduces the U.S. statutory corporate tax rate from 34% to 21% for tax years beginning in 2018 which resulted in the re-measurement of the federal portion of the Company s deferred tax assets and valuation allowance as of December 31, 2017 from 34% to the new 21% tax rate.

The valuation allowance for deferred tax assets as of December 31, 2018 and 2017 was $13,765,000 and $12,262,000, respectively. The change in the total valuation for the year ended December 31, 2018 was an increase of $1,503,000 and for the year ended December 31, 2017 was a decrease of $5,063,000. In assessing the realization of deferred tax assets, management considers whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which the net operating losses and temporary differences become deductible. Management considered projected future taxable income and tax planning strategies in making this assessment. The value of the deferred tax assets was offset by a valuation allowance, due to the current uncertainty of the future realization of the deferred tax assets.

As of December 31, 2018, the Company had net operating loss carry forwards of approximately $44,044,000, expiring through the year ending December 31, 2038. This amount can be used to offset future taxable income of the Company.

The timing and manner in which the Company can utilize operating loss carryforwards in any year may be limited by provisions of the Internal Revenue Code regarding changes in ownership of corporations. Such limitation may have an impact on the ultimate realization of its carryforwards and future tax deductions.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 8 INCOME TAXES (CONTINUED)

The Company follows FASB ASC 740.10, which provides guidance for the recognition and measurement of certain tax positions in an enterprise s financial statements. Recognition involves a determination of whether it is more likely than not that a tax position will be sustained upon examination with the presumption that the tax position will be examined by the appropriate taxing authority having full knowledge of all relevant information. The adoption of FASB ASC 740.10 did not require an adjustment to the Company s financial statements.

The Company s policy is to record interest and penalties associated with unrecognized tax benefits as additional income taxes in the statement of operations. As of January 1, 2018, the Company had no unrecognized tax benefits and no charge during 2018, and accordingly, the Company did not recognize any interest or penalties during 2018 related to unrecognized tax benefits. There is no accrual for uncertain tax positions as of December 31, 2018.

The Company files U.S. income tax returns and a state income tax return. With few exceptions, the U.S. and state income tax returns filed for the tax years ending on December 31, 2015 and thereafter are subject to examination by the relevant taxing authorities.

NOTE 9 STOCKHOLDERS EQUITY

Preferred Stock

Pursuant to the Company s Articles of Incorporation, the Company s board of directors is empowered, without stockholder approval, to issue series of preferred stock with any designations, rights and preferences as they may from time to time determine. The rights and preferences of this preferred stock may be superior to the rights and preferences of the Company s common stock; consequently, preferred stock, if issued could have dividend, liquidation, conversion, voting or other rights that could adversely affect the voting power or other rights of the common stock. Additionally, preferred stock, if issued could be utilized, under special circumstances, as a method of discouraging, delaying or preventing a change in control of the Company s business or a takeover from a third party.

Common Stock Options and Warrants

In January 2016, the Company signed a Purchase Agreement with an institutional investor to sell up to $20,000,000 of common stock. The Company also entered into a registration rights agreement with the institutional investor whereby the Company agreed to file a registration statement related to the transaction with the U.S. Securities and Exchange Commission registering 5,000,000 shares of the Company s common stock. The registration statement was filed on March 25, 2016. The registration statement became effective April 7, 2016. The Company registered an additional 5,000,000 shares pursuant to a registration statement filed on April 19, 2017 which became effective June 15, 2017. The Company registered an additional 5,000,000 shares pursuant to a registration statement filed on May 2, 2018 which became effective May 11, 2018. Under the Purchase Agreement and at Company's sole discretion, the institutional investor has committed to invest up to $20,000,000 in common stock over a 36-month period. The Company issued 350,000 shares of restricted common stock to the institutional investor as an initial commitment fee valued at $237,965, fair value, and 650,000 shares of common stock are reserved for additional commitment fees to the institutional investor in accordance with the terms of the Purchase Agreement. During the period August 2016 through December 31, 2018, the institutional investor purchased 12,450,000 shares of common stock for proceeds of $12,138,785 and the Company issued 394,526 shares of common stock as additional commitment fee, valued at $432,205, fair value, leaving 255,474 in reserve for additional commitment fees. During the year ending December 31, 2018, the institutional investor purchased 4,750,000 shares of common stock for proceeds of $4,863,535 and the Company issued 158,071 shares of common stock as additional commitment fee, valued at $172,192, fair value. During January, through March 2019, the institutional investor purchased 1,550,000 shares of common stock for proceeds of $1,011,585 and the Company issued 32,879 shares of common stock as additional commitment fee, valued at $24,162, fair value, leaving 222,595 in reserve for additional commitment fees. In January 2019, the Company signed a Purchase Agreement with the institutional investor to sell up to $25,000,000 of common stock. The Company registered 9,500,000 shares pursuant to a registration statement filed on January 30, 2019 which became effective February 13, 2019.

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 10 STOCK BASED COMPENSATION

During 2007, the Board of Directors of the Company adopted the 2007 Employee Stock Plan (2007 Plan) that was approved by the shareholders. Under the Plan, the Company is authorized to grant options to purchase up to 10,000,000 shares of common stock to directors, officers, employees and consultants who provide services to the Company. The Plan is intended to permit stock options granted to employees under the 2007 Plan to qualify as incentive stock options under Section 422 of the Internal Revenue Code of 1986, as amended (Incentive Stock Options). All options granted under the 2007 Plan, which are not intended to qualify as Incentive Stock Options are deemed to be non-qualified options (Non-Statutory Stock Options). Effective June 24, 2016, the 2007 Plan was terminated. As of December 31, 2018, options to purchase 4,520,000 shares of common stock have been issued and are outstanding.

During 2016, the Board of Directors of the Company adopted the 2016 Equity Incentive Plan (2016 Plan) that was approved by the shareholders at the 2016 annual meeting of shareholders on May 20, 2016. Under the 2016 Plan, the Company is authorized to grant awards of incentive and non-qualified stock options and restricted stock to purchase up to 3,000,000 shares of common stock to employees, directors and consultants. As of December 31, 2018, options to purchase 2,235,000 shares of common stock have been issued and are outstanding and 755,000 shares of common stock remain available for grants under the 2016 Plan.

Both plans are administered by the Board of Directors or its compensation committee which determines the persons to whom awards will be granted, the number of awards to be granted, and the specific terms of each grant. Subject to the provisions regarding Ten Percent Shareholders, the exercise price per share of each option cannot be less than 100% of the fair market value of a share of common stock on the date of grant. Options granted under the 2016 Plan are generally exercisable for a period of 10 years from the date of grant and may vest on the grant date, another specified date or over a period of time.

The Company uses the Black-Scholes option pricing model to calculate the grant-date fair value of an award, with the following assumptions for 2018: no dividend yield in all years, expected volatility, based on the Company s historical volatility, 60% to 90%, risk-free interest rate between 1.89% to 3.06% and expected option life of 5.0 to 10 years. Prior to May 2018, the expected life is based on the estimated average of the life of options using the simplified method, as prescribed in FASB ASC 718, due to insufficient historical exercise activity during recent years. Starting in May 2018, the expected life is based on the legal contractual life of options. The Company uses the Black-Scholes option pricing model to calculate the grant-date fair value of an award, with the following assumptions for 2017: no

dividend yield in all years, expected volatility, based on the Company s historical volatility, 39% to 87%, risk-free interest rate between 1.16% to 2.37% and expected option life of .03 to 9.08 years.

As of December 31, 2018, there was $324,497 of unrecognized compensation expense related to non-vested market-based share awards that is expected to be recognized through August 30, 2020.

Share-based compensation was recognized as follows:

	2018	2017
2007 Employee Stock Option Plan	$ 15,149	$ 18,322
2016 Equity Incentive Plan	372,539	776,416
Warrants	78,390	416,934
Total share-based compensation	$ 466,078	$ 1,211,672

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 10 STOCK BASED COMPENSATION (CONTINUED)

The following tables summarize all stock option and warrant activity of the Company during the years ended December 31, 2018 and 2017:

	Non-Qualified Stock Options and Warrants Outstanding and Exercisable				
	Number of Shares		Exercise Price		Weighted Average Exercise Price
Outstanding, December 31, 2016	18,101,367	$	0.57 - $1.69	$	0.90
Granted	1,770,000	$	0.60 - $1.50	$	0.97
Expired	(772,500)	$	0.68 - $1.69	$	0.98
Forfeited					
Exercised	(469,000)	$	1.00. - $1.25	$	1.07
Outstanding, December 31, 2017	18,629,867	$	0.57 - $1.69	$	0.90
Granted	720,000	$	1.07 - $1.27	$	1.19
Expired	(100,000)	$	0.90 - $.90	$	0.90
Forfeited	(85,000)	$	0.92 - $1.22	$	0.96
Exercised	(200,000)	$	0.615 - $1.00	$	0.81
Outstanding, December 31, 2018	18,964,867	$	0.57 - $1.69	$	0.91
Exercisable, December 31, 2018	18,504,240	$	0.57 - $1.69	$	0.90

The aggregate intrinsic value of options and warrants outstanding and exercisable as of December 31, 2018 was $183,350. The aggregate intrinsic value is calculated as the difference between the exercise price of the underlying options and warrants and the closing stock price of $0.71 for the Company s common stock on December 31, 2018. The total intrinsic value of options and warrants exercised during the year ended December 31, 2017 was $4,891,501. During the year ending December 31, 2018, 100,000 warrants were exercised for proceeds of $61,500. During the

year ending December 31, 2018, 100,000 options were exercised for proceeds of $100,000. No options were exercised during 2017. During 2017, 335,000 warrants were exercised to purchase shares of common stock at a price of $1.00 per share for proceeds of $335,000 and 134,000 warrants were exercised to purchase shares of common stock at a price of $1.25 per share for proceeds of $167,500.

	Non-Qualified Stock Options and Warrants Outstanding		
Range of Exercise Prices	**Number Outstanding Currently Exercisable at December 31, 2018**	**Weighted Average Remaining Contractual Life**	**Weighted Average Exercise Price of Options and Warrants Currently Exercisable**
$0.57 - $1.69	18,504,240	3.53 Years	$0.90

LIGHTWAVE LOGIC, INC.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018 AND 2017

NOTE 11 RELATED PARTY

At December 31, 2018 the Company had a legal and accounting service accrual to related party of $10,999 and travel and office expense accruals of officers in the amount of $2,825. At December 31, 2017 the Company had a legal accrual to related party of $4,725 and travel and office expense accruals of officers in the amount of $4,045.

In December 2016, the board of directors approved a grant to a senior advisor effective January 1, 2017 of a warrant to purchase up to 275,000 shares of common stock at a purchase price of $0.60 per share. Using the Black-Scholes Option Pricing Formula, the warrant was valued at $102,222, fair value. In March 2017, the warrant was amended to accelerate full vesting and the revaluation of the warrant at $106,576, fair value, was expensed immediately.

During July 2018, the Company issued a warrant to purchase 100,000 shares of common stock at a purchase price of $1.15 per share for professional services to be rendered over a twelve month period commencing July 1, 2018. The warrant was valued at $62,637, fair value upon issuance, using the Black-Scholes Option Pricing Formula. The expense is being recognized based on service terms of the agreement over a twelve month period. For the year ending December 31, 2018, the Company recognized $31,318 of expense. During July 2017, the Company issued a warrant to purchase 150,000 shares of common stock at a purchase price of $1.48 per share for professional services to be rendered over a twelve month period commencing July 1, 2017. The warrant was valued at $124,788, fair value upon issuance, using the Black-Scholes Option Pricing Formula. The warrant was re-valued at $91,995, fair value at December 31, 2017. The expense is being recognized based on service terms of the agreement over a twelve month period. For the years ending December 31, 2018 and 2017, the Company recognized $47,072 and $45,997 of expense. During July 2016, the Company issued a warrant to purchase 150,000 shares of common stock at a purchase price of $0.63 per share for professional services to be rendered over a twelve month period commencing July 1, 2016. The warrant was valued at $60,272, fair value, using the Black-Scholes Option Pricing Formula The warrant was re-valued at $65,941, fair value at June 30, 2017. The expense is being recognized based on service terms of the agreement over a twelve month period. For the years ending December 31, 2018 and 2017, the Company recognized $0 and $40,238 of expense.

In December 2017, the Board of Directors approved extension of the warrants previously granted to a Board member extending the term of outstanding warrants to purchase in the aggregate 725,000 shares of common stock at exercise prices ranging from $0.60 per share to $0.98 per share. These warrants were scheduled to expire at various dates starting 2017 to 2021, with the new expiration dates ranging from 2022 to 2026. The total incremental compensation cost resulting from this modification was $224,123 which was expensed during the year ended December 31, 2017.

The Company used the Black-Scholes option pricing model to calculate the increase in fair value, with the following assumptions: historical volatility from 39% to 87%, risk-free interest rate from 1.16% to 2.37% and expected option life from .03 to 9.08 years.

NOTE 12 RETIREMENT PLAN

The Company established a 401(k) retirement plan covering all eligible employees beginning November 15, 2013. A contribution of $24,587 was charged to expense and accrued for the year ending December 31, 2018 to all eligible non-executive participants. . A contribution of $15,873 was charged to expense and accrued for the year ending December 31, 2017 to all eligible non-executive participants

NOTE 13 SUBSEQUENT EVENTS

During February 2019, the Company issued three warrants each to purchase 25,000 shares of common stock at a purchase price of $0.64 per share for Advisory Board Agreement services to be rendered over a twelve month period commencing February 15, 2019. The warrants were each valued at $8,455, fair value, using the Black-Scholes Option Pricing Formula, vesting over the next twelve months with each vesting 2,087 immediately, 2,083 vesting per month on the first day of the next eleven months commencing March 1, 2019. The warrants expire in five years. The expense is being recognized based on service terms of the agreement over a twelve month period.