Lightwave Logic, Inc.
Form POS AM
April 26, 2012

As Filed with the Securities and Exchange Commission on April 26, 2012 **Registration No. 333-174648**

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

POST EFFECTIVE AMENDMENT NO. 1

TO

FORM S-1

REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933

LIGHTWAVE LOGIC, INC.

(Name of Registrant As Specified in its Charter)

Nevada	**3080**	**82-049-7368**
(State or Other Jurisdiction of Incorporation or Organization)	*(Primary Standard Industrial Classification Code Number)*	*(I.R.S. Employer Identification No.)*

111 Ruthar Drive

Newark, DE 19711
Telephone: (302) 356-2709

(Address and Telephone Number of Principal Executive Offices)

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Approximate Date of Proposed Sale to the Public: As soon as practicable after this Registration Statement becomes effective.

If any of the securities being registered on this form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box. [X]

If this form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering: [ ]

If this form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering: [ ]

If this form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement the same offering: [ ]

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

Large accelerated filer [ ]	Accelerated filer [ ]	Non-accelerated filer [ ]	Smaller reporting company [X]
		(Do not check if a smaller reporting company)	

The Registrant amends this registration statement on such date or dates as may be necessary to delay its effective date until the Registrant shall file a further amendment which specifically states that this registration statement shall hereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, or until the registration statement shall become effective on such date as the Commission, acting pursuant to Section 8(a), may determine.

EXPLANATORY NOTE

Lightwave Logic, Inc. (the Company) previously filed a Registration Statement on Form S-1 (File No. 333-174648) with the U.S. Securities and Exchange Commission on June 1, 2011 which was declared effective by the SEC on June 8, 2011 (the Existing Registration Statement). The Existing Registration Statement registered for resale of up to 10,000,000 shares of common stock of the Company by Lincoln Park Capital Fund, LLC. The common stock being offered by Lincoln Park is issuable pursuant to a Purchase Agreement between the Company and Lincoln Park.

As of the date of this prospectus, the Company has issued 2,586,857 shares to Lincoln Park under the Purchase Agreement, including the sale of 2,529,535 purchase shares and the issuance of 57,322 additional commitment shares, for aggregate proceeds to the Company of $3,799,998.09, and 2,294,626 of such shares have been sold by Lincoln Park pursuant to the Existing Registration Statement, with 7,705,374 shares remaining unsold under the Existing Registration Statement.

This Registration Statement constitutes Post-Effective Amendment No. 1 to the Existing Registration Statement and is being filed to update the Existing Registration Statement by including, among other things, the Company s audited financial statements for the fiscal years ended December 31, 2011 and 2010 pursuant to Section 10(a)(3) of the Securities Act of 1933, as amended and to reflect all sales of the Company s common stock that have been made by Lincoln Park under the Existing Registration Statement as of the date hereof.

The information in this prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission becomes effective. This prospectus is not an offer to sell these securities and we are not soliciting offers to buy these securities in any state where the offer or sale is not permitted.

PRELIMINARY PROSPECTUS **SUBJECT TO COMPLETION** **APRIL 26, 2012**

7,705,374 Shares

Common Stock

This prospectus relates to the sale of up to 7,705,374 shares of our common stock which may be offered by the selling shareholder, Lincoln Park Capital Fund, LLC, or Lincoln Park, from time to time. The shares of common stock being offered by the selling shareholder are issuable pursuant to the Lincoln Park Purchase Agreement, which we refer to in this prospectus as the Purchase Agreement. Please refer to the section of this prospectus entitled The Lincoln Park Transaction for a description of the Purchase Agreement and the section entitled Selling Shareholder for additional information. Such registration does not mean that Lincoln Park will actually offer or sell the full number of these shares. We will not receive any proceeds from the sales of shares of our common stock by the selling shareholder; however, we may receive proceeds of up to $20,000,000 under the Purchase Agreement.

As of the date of this prospectus, the Company has issued 2,586,857 shares to Lincoln Park under the Purchase Agreement, including the sale of 2,529,535 purchase shares and the issuance of 57,322 additional commitment shares, for aggregate proceeds to the Company of $3,799,998.09, and 2,294,626 of such shares have been sold by Lincoln Park hereunder, with 7,705,374 shares remaining unsold as of the date of this prospectus.

Our common stock is currently quoted on the OTC Bulletin Board under the symbol LWLG.OB . On April 16, 2012, the last reported sale price of our common stock was $1.28 per share.

Investing in our securities involves a high degree of risk. See Risk Factors beginning on page 15 of this prospectus for a discussion of information that should be considered in connection with an investment in our securities.

The selling shareholder is an underwriter within the meaning of the Securities Act of 1933, as amended. The selling shareholder is offering these shares of common stock and may sell all or a portion of these shares from time to time in market transactions, in negotiated transactions or otherwise, and at prices and on terms that will be determined by the then prevailing market price or at negotiated prices directly or through a broker or brokers, who may act as agent or as principal or by a combination of such methods of sale. For additional information on the methods of sale, you should refer to the section entitled Plan of Distribution .

Neither the Securities and Exchange Commission nor any state securities regulators have approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus is _____ ___, 2012.

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INFORMATION NOT REQUIRED IN PROSPECTUS

You should rely only on the information contained in this prospectus. We have not, and the selling shareholder has not, authorized any person to provide you with different information. If anyone provides you with different or inconsistent information, you should not rely on it. This prospectus is not an offer to sell, nor is the selling shareholder seeking an offer to buy, securities in any state where the offer or solicitation is not permitted. The information contained in this prospectus is complete and accurate as of the date on the front cover of this prospectus, but information may have changed since that date. We are responsible for updating this prospectus to ensure that all material information is included and will update this prospectus to the extent required by law.

This prospectus includes statistical and other industry and market data that we obtained from industry publications and research, surveys and studies conducted by third parties. Industry publications and third-party research, surveys and studies generally indicate that their information has been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information. While we believe that these industry publications and third-party research, surveys and studies are reliable, we have not independently verified such data and we do not make any representation as to the accuracy of the information.

PROSPECTUS SUMMARY

The items in the following summary are described in more detail later in this prospectus. This summary does not contain all of the information you should consider. Before investing in our securities, you should read the entire prospectus carefully, including the Risk Factors beginning on page 15 and the financial statements and related notes beginning on page F-1.

Overview

We are a development stage research and development company. Our primary area of expertise is the chemical synthesis of chromophore dyes used in the development of Organic Application Specific Electro-Optic Polymers (ASEOP) and Organic Non-Linear All-Optical Polymers (NLAOP) that have high electro-optic and optical activity. Both types of materials are thermally and photo-chemically stable, which we believe could have utility across a broad range of applications in devices that address markets as such telecommunications, data communications, computing and photovoltaic cells. Secondarily, the Company is developing proprietary electro-optical and all-optical devices utilizing the advanced capabilities of our materials.

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. We expect our patented and patent-pending technologies when completed and tested 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.

Our electro-optic polymers (polymers) are property-engineered at the molecular level (nanotechnology level) to meet the exacting thermal, environment and performance specifications demanded by electro-optic devices. We believe that our patented and patent pending technologies will enable us to design electro-optic polymers that are free from the numerous diverse inherent flaws that plague competitive polymer technologies employed by other companies and research groups. We engineer our polymers with the intent to have temporal, thermal, chemical and photochemical stability within our patent pending molecular architectures.

Our non-linear all optical polymers have demonstrated resonantly enhanced Third-order properties approximately 2,630 times larger than fused silica, which means that they are highly photo-optically active in the absence of an RF layer. In this way they differ from our electro-optical polymers and are considered more advanced next-generation materials.

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. Aromaticity

is what will enable our core molecular structures to maintain stability under a broad range of polymerization conditions that otherwise appear to affect other current polymer molecular designs. Polymers, polymer-based devices and the processes used to create them are often patentable, which can provide the developers of such technology with a significant competitive advantage. We consider our proprietary intellectual property to be unique.

Our Business Development

PSI-TEC Corporation (PSI-TEC) was founded in 1991 and incorporated under the laws of the State of Delaware on September 12, 1995. PSI-TEC was founded in Upland, Pennsylvania by Dr. Frederick J. Goetz where he established a laboratory with a small amount of private funding. PSI-TEC subsequently moved its operations to laboratory space provided by the U.S. Army on the Aberdeen Proving Grounds in cooperation with a division of the Department of Defense for the advancement of ultra wide-bandwidth satellite telecommunications. Thereafter, PSI-TEC commenced operations of its own organic synthesis and thin-films laboratory in Wilmington, Delaware.

In order to become a non-reporting publicly-traded corporation, in July 2004 PSI-TEC reorganized with our Company whereby (i) our Company changed its name from Eastern Idaho Internet Services, Inc. to PSI-TEC Holdings, Inc.; (ii) our Company acquired all of the issued and outstanding shares of PSI-TEC stock; (iii) PSI-TEC became our Company s wholly-owned operating subsidiary; and (iv) our Company's then sole officer and director resigned, PSI-TEC's nominees were elected to our Company's board of

directors and new management was appointed. For accounting purposes, this acquisition transaction was accounted for as a reverse-acquisition, whereby PSI-TEC was deemed to have purchased our Company. As a result, the historical financial statements of PSI-TEC became the historical financial statements of our Company.

Immediately prior to the time of the reorganization transaction, our Company was a non-reporting development stage company whose stock was traded on the OTC: Pink Sheets. We had no substantive business operations and we were seeking other business opportunities. Our Company was originally incorporated under the laws of the State of Nevada on June 24, 1997 as Eastern Idaho Internet Services, Inc. to operate as an Internet services marketing firm. It was unsuccessful in this venture, and in June 1998 it ceased its operations and sold all of its operating assets.

On October 20, 2006, in order to consolidate the operations of PSI-TEC Holdings, Inc. and PSI-TEC (PSI-TEC Holdings, Inc.'s wholly owned subsidiary), PSI-TEC Holdings, Inc. and PSI-TEC merged, and PSI-TEC Holdings, Inc., a Nevada corporation, became the surviving entity and subsequently changed its name to Third-Order Nanotechnologies, Inc. No change of control or domicile occurred as a result of the merger.

On March 10, 2008, Third-order Nanotechnologies, Inc. changed its name to Lightwave Logic, Inc. to better suit its strategic business plan and to facilitate stockholder recognition of the Company and its business.

Unless the context otherwise requires, all references to the Company, we, our or us and other similar terms means Lightwave Logic, Inc., a Nevada corporation.

Recent Developments

In February and April 2011, respectively, the United States Patent Office granted our Company two patents: US Patent No. 7,894,695 covering our Tricyclic Spacer System for Non-Linear Optical Devices and US Patent No. 7,919,619 for Heterocyclical Chromophore Architectures directed to our Perkinamine ™ chromophores. These composition of matter patents taken together protect the core of our electro-optical materials portfolio.

In March 2011, we entered into a research and development agreement with the City University of New York s Laboratory for Nano Micro Photonics (LaNMP) to develop Third-order non-linear devices. We believe that the combination of LaNMP s device capabilities together with our materials expertise should accelerate the development of all-optical devices.

In March 2011, the United States Patent Office granted our Company 2 patents: US Patent No. 7,919,619 for Heterocyclical Chromophore Architectures directed to our Perkinamine ™ chromophores and US Patent No.

7,894,695 covering our Tricyclic Spacer System for Non-Linear Optical Devices. These composition of matter patents taken together protect the core of our electro-optical materials portfolio.

In March 2011, the City University of New York s Laboratory for Nano Micro Photonics (LaNMP) fabricated our first-ever all optical waveguide using one of our Perkinamine NR ™ chromophores. It is anticipated that LaNMP will use this device architecture to develop various all-optical devices including an all-optical transistor.

In March 2011, we announced a two-year research and development collaboration with the University of Alabama to explore the advanced energy capture properties of our Perkinamine ™ class of chromophores. Our material absorbs light across a wide range of wavelengths from near infra-red into the near ultraviolet. The University intends to explore how to efficiently capture a wide range of solar radiation with our material.

In December 2011, we announced the discovery of a new material named Perkinamine™ Indigo. We believe this represents a major advancement in the field of organic nonlinear optical materials. The material demonstrated an unusually high electro-optical effect of greater than 250 picometers per volt with excellent thermal and photo stability. Independent research laboratories at Photon-X and The University of Colorado confirmed these characteristics.

Award

On September 26, 2006, we were awarded the 2006 Electro-Optic Materials Technology Innovation of the Year Award by Frost & Sullivan. Frost & Sullivan's Technology Innovation of the Year Award is bestowed upon candidates whose original research has resulted in innovations that have, or are expected to bring, significant contributions to multiple industries in terms of adoption, change, and competitive posture. This award recognizes the quality and depth of our Company's research and development program as well as the vision and risk-taking that enabled us to undertake such an endeavor.

Corporate Information

Our principal executive office is located at 111 Ruthar Drive, Newark, DE 19711, and our telephone number is (302)-356-2709. Our website address is www.lightwavelogic.com. No information found on our website is part of this prospectus. Also, this prospectus 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 prospectus is not intended to and does not imply a relationship with, or endorsement or sponsorship of us by, any of these other parties.

The Offering

Common stock outstanding prior to the offering (1)	48,947,153 shares, including 150,830 initial commitment shares previously issued to Lincoln Park under the Purchase Agreement (and included in this offering), 2,529,535 shares issued and sold to Lincoln Park under the Purchase Agreement and 57,322 additional commitment shares issued to Lincoln Park under the Purchase Agreement.
Common Stock offered by the selling shareholder	7,705,374 shares, consisting of the 150,830 initial commitment shares already issued to Lincoln Park, up to 244,337 shares to be issued to Lincoln Park as additional commitment shares and the remaining shares to be purchased from time to time under the Purchase Agreement
Common stock to be outstanding after giving effect to the issuance of 7,705,374 shares to Lincoln Park under the Purchase Agreement	56,652,527 shares
Use of proceeds	We will not receive any proceeds from the sale of the shares of common stock by Lincoln Park. However, we may receive up to $20,000,000 from sales of shares under the Purchase Agreement. Any proceeds that we receive from sales to Lincoln Park under the Purchase Agreement will be used to further our business plan of expanding our research and development of our polymer materials technologies, commercialize potential optical devices and materials and for general and administrative purposes. See Use of Proceeds .
OTC Bulletin Board symbol	LWLG.OB

Risk factors	This investment involves a high degree of risk. See Risk Factors for a discussion of factors you should consider carefully before making an investment decision.

(1) The number of shares of our common stock set forth above is based on 48,947,153 shares of common stock outstanding as of the date of this prospectus, and excludes:

options to purchase 4,522,000 shares of our common stock pursuant to our 2007 Employee Stock Plan, of which 3,672,000 have vested as of the date of this prospectus, at a weighted average exercise price of $1.24 per share; and

warrants to purchase an aggregate of 3,301,500 shares of our common stock, of which 3,226,500 have vested as of the date of this prospectus at a weighted average exercise price of $1.00 per share.

On May 3, 2011, we executed a Purchase Agreement and a Registration Rights Agreement with the selling shareholder, Lincoln Park Capital Fund, LLC, or Lincoln Park. Under the Purchase Agreement, we have the right to sell to Lincoln Park up to an aggregate $20,000,000 of our common stock at our option as described below.

Pursuant to the Registration Rights Agreement, we are filing this prospectus with the SEC covering the shares that may be issued to Lincoln Park under the Purchase Agreement. We did not have the right to commence any sales of our shares to Lincoln Park until the SEC declared effective the registration statement of which this prospectus is made a part (Registration No. 333-174648). Thereafter, over approximately 30 months, and subject to certain terms and conditions, we have the right to direct Lincoln Park to make periodic purchases of up to $1,000,000 of our common stock per sale depending on certain conditions as set forth in the Purchase Agreement as often as every five business days up to the aggregate commitment of $20,000,000. The purchase price of the shares will be based on the market prices of our

shares immediately prior to the time of sale as computed under the Purchase Agreement without any fixed discount. In no event, however, will Lincoln Park be obligated to purchase shares of our common stock under the Purchase Agreement at a price of less than $1.00 per share. We may, at any time, and in our sole discretion, terminate the Purchase Agreement without fee, penalty or cost upon notice to Lincoln Park. Lincoln Park may not assign or transfer its rights and obligations under the Purchase Agreement.

Under the Purchase Agreement and the Registration Rights Agreement, we are required to register an aggregate 10,000,000 shares, which originally included the 150,839 shares previously issued to Lincoln Park upon signing the Purchase Agreement as a commitment fee and an aggregate 301,659 additional commitment shares which we are required to issue pro rata in the future as a commitment fee if and when we sell shares to Lincoln Park under the Purchase Agreement.

As of the date of this prospectus, we have issued 2,586,857 shares to Lincoln Park under the Purchase Agreement, including the sale of 2,529,535 purchase shares and the issuance of 57,322 of the 301,659 additional commitment shares, and received aggregate proceeds of $3,799,998.09. We originally registered for resale by Lincoln Park the 10,000,000 shares of our common stock in June 2011 under the Existing Registration Statement (File No. 333-174648) and as of the date of this prospectus, 7,705,374 shares remain unsold.

Although the Purchase Agreement provides that we may sell up to a remaining $16,200,001.91 of our common stock to Lincoln Park, we are only registering 7,705,374 remaining shares to be purchased thereunder, which may or may not cover all such shares purchased by Lincoln Park under the Purchase Agreement, depending on the purchase price per share. Of the 7,705,374 remaining shares offered under this prospectus:

150,839 shares were already issued to Lincoln Park as a commitment fee for entering into the Purchase Agreement; and

244,337 shares represent remaining shares that we are required to issue proportionally in the future, as a commitment fee, if and when we sell additional shares to Lincoln Park under the Purchase Agreement; and

The remainder represents shares we may sell to Lincoln Park under the Purchase Agreement.

Except as otherwise indicated herein, all information in this prospectus, including the number of shares that will be outstanding after this offering, assumes or gives effect to no exercise of options or warrants outstanding on the date of this prospectus or in the future, except as specifically set forth herein.

As of the date of this prospectus, there were 48,947,153 shares outstanding, of which 35,699,919 shares were held by non-affiliates. If all of the 7,705,374 remaining shares offered by Lincoln Park were issued and outstanding as of the date hereof, such shares would represent 13.6% of the total common stock outstanding, or 17.75% of the non-affiliates shares outstanding (assuming that the shares offered by Lincoln Park are not held by affiliates). The number of shares ultimately offered for sale by Lincoln Park is dependent upon the number of shares that we sell to Lincoln Park under the Purchase Agreement. If we elect to issue more than the 7,705,374 shares offered under this prospectus, which we have the right but not the obligation to do, we must first register under the Securities Act the resale by Lincoln Park of any additional shares we may elect to sell to Lincoln Park before we can sell such additional shares.

Glossary of Select Technology Terms Used Herein

All-optical devices

All-optical devices convert data in the form of input light signals to a secondary light data stream. The future market of all-optic devices is expected to include all-optical transistors.

All-optical transistors

All-optical transistors are devices currently under development that use an input light signal to switch a secondary light signal. All-optical transistors are expected to enable the fabrication of an entirely new generation of high-speed computers that operate on light instead of electricity. We believe that this will significantly improve computation speeds.

Aromaticity

Aromaticity causes an extremely high degree of molecular stability. It is a molecular arrangement wherein atoms combine into a ring or rings and share their electrons among each other. Aromatic compounds are extremely 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.

CLD-1

An electro-optic material based upon unstable polyene molecular architectures. Unlike our own molecular designs, CLD-1 is not a CSC model molecule and exhibits thermal degradation at low temperatures (~250 C) making it less suitable for commercial and military applications.

CSC (Cyclical Surface Conduction) theory

Most charge-transfer dyes (e.g. Disperse Red 1, CLD, FTC) are based upon a polyene architecture wherein the ground state and first excited state differ by the alteration of single and double bonds. CSC model molecules use nitrogenous heterocyclical structures.

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 materials

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 modulators are electro-optic devices that perform electric-to-optic conversions within the infrastructure of the Internet.

Nanotechnology

Nanotechnology refers to the development of products and production processes at the molecular level, which is a scale smaller than 100 nanometers (a nanometer is one-billionth of a meter).

Nitrogenous heterocyclical structure

A multi-atom molecular ring or combination of rings that contain nitrogen.

Plastics/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.

Polymerization

Polymerization is a molecular engineering process that provides the environmental and thermal stability necessary for functional electro-optical devices. 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.

Thermal Gravimetric Analysis (TGA)

The basic principle in TGA is to measure the mass of a sample as a function of temperature. This, in principle, simple measurement is an important and powerful tool in solid-state chemistry and materials science. The method, for example, can be used to determine water of crystallization, follow degradation of materials, determine reaction kinetics, study oxidation and reduction, or to teach the principles of stoichiometry, formulae and analysis.

Zwitterionic-aromatic push-pull

Most charge-transfer dyes (e.g. Disperse Red 1, CLD, FTC) have an excited state (such as during photonic absorption) wherein a full charge is separated across the molecule. Such a molecule is said to be excited-state zwitterionic. Within such a molecular system the zwitterionic state is unstable and the molecule typically collapses rapidly into its lower dipole ground state. In our molecular designs, the excited state is further stabilized by the aromatization of the molecular core. In that aromaticity stabilizes this excited state, it is said to "pull" the molecule into this higher energy state; on the other hand, the unstable zwitterionic state is said to "push" the molecule out of the excited state.

SUMMARY FINANCIAL DATA

The following tables summarize our financial data. We have derived the following summary of our balance sheet data as of December 31, 2011, 2010 and 2009, and our statement of operations data for the years ended December 31, 2011, 2010 and 2009 from our audited financial statements appearing later in this prospectus. Our historical results are not necessarily indicative of the results that may be expected in the future. You should read the summary of our financial data set forth below together with our financial statements and the related notes to those statements, as well as Management s Discussion and Analysis of Financial Condition and Results of Operations appearing later in this prospectus.

	Years Ended December 31,		
	2011	2010	2009
Statement of Operations Data:			
NET SALES	$ -	$ 3,200	$ -
COST AND EXPENSE			
Research and development	1,682,557	1,709,171	1,662,813
General and administrative	1,633,786	2,006,900	1,058,071
LOSS FROM OPERATIONS	(3,316,343)	(3,712,871)	(2,720,884)
OTHER INCOME (EXPENSE)	(166,279)	(361)	(987)
NET LOSS	$ (3,482,622	$ (3,713,232)	$ (2,721,871)
Basic and Diluted Loss per Share	$ (0.08)	$ (0.09)	$ (0.07)
Basic and Diluted Weighted Average Number of Shares	43,386,149	42,253,450	39,431,766

	As of December 31, 2011
Balance Sheet Data:	
Current assets	$ 401,580
Property and equipment - net	88,751

Other assets		-
Intangible assets - net		431104
TOTAL ASSETS	$	921435
TOTAL LIABILITIES		238,426
TOTAL STOCKHOLDERS' EQUITY		683,009
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	$	921,435

RISK FACTORS

Before you make a decision to invest in our securities, you should consider carefully the risks described below, together with other information in this prospectus. 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 $3,482,622 for the year ended December 31, 2011 and $3,713,232 for the year ended December 31, 2010. We anticipate that we will continue to incur operating losses through at least the remainder of 2012.

We may not be able to generate significant revenue either through development contracts from the U.S. government or government subcontractors or through customer contracts for our potential products or technologies. 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 additional 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:

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Establish product sales and marketing capabilities;

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Establish and maintain markets for our potential products;

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Identify, attract, retain and motivate qualified personnel;

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Continue to develop and upgrade our technologies to keep pace with changes in technology and the growth of markets using polymer based materials;

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Develop expanded product production facilities and outside contractor relationships;

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Maintain our reputation and build trust with customers;

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Scale up from small pilot or prototype quantities to large quantities of product on a consistent basis; and

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

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 electro-optic plastics 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. 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:

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The market may not accept the price and/or performance of our products;

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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

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The time required for us to achieve market acceptance of our products may exceed our capital resources that would require additional investment.

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 electro-optic plastic products 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.

Our future growth will suffer if we do not achieve sufficient market acceptance of our electro-optic plastic products.

We are developing our electro-optic polymer products 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. 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.

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:

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Accurately predict the needs of our target customers and develop, in a timely manner, the technology required to support those needs;

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Provide products that are not only technologically sophisticated but are also available at a price acceptable to customers and competitive with comparable products;

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Establish and effectively defend our intellectual property; and

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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.

Two of our significant target markets are the telecommunications and networking markets, which continue to be subject to overcapacity and slow growth or decline.

Two of our significant target markets are the telecommunications and networking markets, and developments that adversely affect the telecommunications or networking markets, including delays in traffic growth and changes in U.S. government regulation, could slow down, or even halt our efforts to enter into these markets. Reduced spending and technology investment by telecommunications companies may make it more difficult for our products to gain market acceptance. Such companies may be less willing to purchase new technology such as ours or invest in new technology development when they have reduced capital expenditure budgets.

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 revenues.

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, device certification, 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.

We will require additional capital to continue to fund our operations. 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 September 2013; 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 the Lincoln Park financing transaction, 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.

In May 2011, we entered into the Purchase Agreement with Lincoln Park, under which we may direct Lincoln Park to purchase up to $20,000,000 worth of shares of our registered common stock over a 30-month period. If we make sales of our common stock under the Purchase Agreement, we would be able to fund our operations for a longer period of time. However, the extent to which we will rely on the Purchase Agreement with Lincoln Park as a source of funding will depend on a number of factors, including the prevailing market price of our common stock and volume of

trading and the extent to which we are able to secure working capital from other sources. Specifically, Lincoln Park does not have the obligation to purchase any shares of our common stock on any business day that the price of our common stock is less than $1.00 per share.

We are registering the resale by Lincoln Park of 7,705,374 shares of our common stock pursuant to this prospectus. In the event we elect to issue more than the 7,705,374 shares being offered hereby, we would be required to file a new registration statement and have it declared effective by the SEC. If obtaining sufficient funding from Lincoln Park does not occur or is prohibitively dilutive, we will need to secure another source of funding in order to satisfy our working capital needs. Should the financing we require to sustain our working capital needs be unavailable or prohibitively expensive when we require it, the consequences could be a material adverse effect on our business, operating results, financial condition and prospects.

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 prospectus. 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 may not be able to access the full amounts available under the Purchase Agreement, which could prevent us from accessing the capital we need to continue our operations that could have an adverse affect on our business.

Under the Purchase Agreement, we may direct Lincoln Park to purchase up to $20,000,000 worth of shares of our common stock over a 30-month period (as of the date of this prospectus, this amount has now been reduced to a remaining $16,200,201.91 as a result of sales made under the Existing Registration Statement). On any trading day selected by us, we may sell to Lincoln Park up to $200,000 of common stock by delivering a purchase notice to Lincoln Park. The Purchase Price of such shares is equal to the lesser of: (i) the lowest sale price of our common stock on the purchase date; or (ii) the arithmetic average of the three lowest closing sale prices for our common stock during the twelve consecutive trading days ending on the trading day immediately preceding the purchase date. Lincoln Park does not have the right or the obligation to purchase any shares of our common stock on any business day that the market price of our common stock is less than $1.00. To the extent that the market price of our common stock is below $1.00 per share on a trading day, we would not receive any proceeds under the Purchase Agreement for that day.

If the market price of our common stock is not below $9.50 per share, our sales will be limited to up to $1,000,000 of our common stock on each purchase date. If the market price of our common stock is not below $4.50 per share, our sales will be limited to up to $500,000 of our common stock on each purchase date. If the market price of our common stock is not below $3.50 per share, our sales will be limited to up to $400,000 of our common stock on each purchase date. If the market price of our common stock is not below $2.50 per share, our sales will be limited to up to $300,000 of our common stock on each purchase date.

Depending on the prevailing market price of our common stock, we may not be able to sell shares to Lincoln Park for the maximum $16,200,201.91 remaining over the term of the Purchase Agreement. In addition, we are only registering 7,705,374 shares of our common stock under this prospectus. Assuming a purchase price of $1.28 per share, the closing sale price of our common stock on April 16, 2012, and the issuance to Lincoln Park of 7,554,544 shares, which would be comprised of 7,411,462 shares purchased at $1.28 per share and 143,082 shares issued as additional pro rata commitment shares for no additional consideration, the proceeds to us would only be $9,486,671.36. In the event we elect to issue more than 7,705,374 shares, we would be required to file a new registration statement and have it declared effective by the SEC.

The sale of shares of our common stock to Lincoln Park under the Purchase Agreement may cause substantial dilution to our existing stockholders and could cause the price of our common stock to decline.

Under the Purchase Agreement, we may sell to Lincoln Park, from time to time and under certain circumstances, up to $20,000,000 of our common stock upon the SEC declaring effective the resale registration statement. Over approximately 30 months from that time, generally, we have the right, but no obligation, to direct Lincoln Park to periodically purchase up to $20,000,000 of our common stock in specific amounts under certain conditions, which periodic purchase amounts can be increased under specified circumstances.

We also agreed to issue to Lincoln Park up to an aggregate of 452,489 shares of common stock as a fee for Lincoln Park s commitment to purchase our shares. Of these commitment shares, we issued 150,830 shares upon entering into the agreement with Lincoln Park. As of the date of this prospectus, we have issued 57,322 additional commitment shares based on our sale of 2,529,535 purchase shares to Lincoln Park, and therefore there are 244,337 remaining commitment shares which are issuable to Lincoln Park on a pro rata basis as further sales are made under the Purchase Agreement.

Depending upon market liquidity at the time, sales of shares of our common stock to Lincoln Park may cause the trading price of our common stock to decline. Lincoln Park may ultimately purchase all, some or none of the $20,000,000 of common stock, and after it has acquired shares, Lincoln Park may sell all, some or none of those shares. Therefore, sales to Lincoln Park by us could result in substantial dilution to the interests of other holders of our common stock. The sale of a substantial number of shares of our common stock to Lincoln Park, or the anticipation of such sales, could make it more difficult for us to sell equity or equity-related securities in the future at a time and at a price that we might otherwise wish to effect sales. However, we have the right to control the timing and amount of any sales of our shares to Lincoln Park, and the Purchase Agreement may be terminated by us at any time at our discretion without any cost to us.

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 the date of this prospectus, we had outstanding options and warrants to purchase an aggregate of 7,823,500 shares of our common stock at exercise prices ranging from $0.25 per share to $1.75 per share with a weighted average exercise price of $1.12 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 collaborations (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.

You will experience immediate dilution in the book value per share of the common stock you purchase.

Because the price per share of our common stock being offered is likely to be substantially higher than the book value per share of our common stock, you will suffer substantial dilution in the net tangible book value of the common stock you purchase in this offering. Based on the assumed minimum allowed offering price of $1.00 per share in this offering and a pro forma net tangible book value per share of our common stock of $0.15 as of December 31, 2011, if you purchase securities in this offering, you will suffer immediate and substantial dilution of $0.85 per share in the net tangible book value of the common stock purchased. See Dilution on page 31 for a more detailed discussion of the dilution you will incur in connection with this offering.

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.

Management will have broad discretion as to the use of the proceeds from sales under the Purchase Agreement, and we may not use the proceeds effectively which could have a materially adverse affect on our business.

We have not designated any portion of the proceeds from sales to Lincoln Park under the Purchase to be used for any particular purpose. Accordingly, our management will have broad discretion as to the application of the proceeds from any such sales and could spend the proceeds in ways that do not necessarily improve our operating results or enhance the value of our common stock, which could have a materially adverse affect on our business.

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 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:

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Fluctuating demand for our potential products and technologies;

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Announcements or implementation by our competitors of technological innovations or new products;

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Amount and timing of our costs related to our marketing efforts or other initiatives;

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The status of particular development programs and the timing of performance under specific development agreements;

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Timing and amounts relating to the expansion of our operations;

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Product shortages requiring suppliers to allocate minimum quantities;

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Announcements or implementation by our competitors of technological innovations or new products;

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The status of particular development programs and the timing of performance under specific development agreements;

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Our ability to enter into, renegotiate or renew key agreements;

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Timing and amounts relating to the expansion of our operations;

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Costs related to possible future acquisitions of technologies or businesses; or

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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 are 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 electro-optic polymer technology 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:

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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;

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Devote greater resources to developing, marketing or selling their products;

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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;

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Introduce products that make the continued development of our potential products uneconomical;

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Obtain patents that block or otherwise inhibit our ability to develop and commercialize our potential products;

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Withstand price competition more successfully than we can;

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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, which could have an adverse effect on our business.

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 and retained research institution rights, which could have an adverse effect on our business.

We may have obligations to government agencies or universities 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. In addition, academic research partners often retain certain rights, including the right to use the technology for noncommercial academic and research use, to publish general scientific findings from research related to the technology, and to make customary scientific and scholarly disclosures of information relating to the technology. It is difficult to monitor whether our partners will limit their use of the technology to these 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 James S. Marcelli, our Chief Executive Officer and Dr. Louis C. Glasgow our Chief Technology 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.

If we decide to make commercial quantities of products at our facilities, we will be required to make significant capital expenditures to increase capacity which could have an adverse effect our business.

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, which could have an adverse effect on our business.

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 a single facility, and circumstances beyond our control may result in considerable interruptions.

We conduct significantly all of our research and development activities at a single facility. A disaster such as a fire, flood or severe storm at or near this facility could prevent us from further developing our technologies or manufacturing our potential products, which would harm our business.

Failure to comply with regulatory compliance related to our operations could harm our business.

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

Part of our business strategy is to maintain and develop strategic relationships with government agencies, private firms, and academic institutions to conduct research and development of technologies and products. 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.

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, 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 OTC Bulletin Board under the symbol "LWLG.OB". 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.

We are subject to the penny stock rules and brokers cannot generally solicit the purchase of our common stock, which adversely affects its liquidity and market price.

The SEC has adopted regulations that generally define penny stock to be an equity security that has a market price of less than $5.00 per share, subject to specific exemptions. The market price of our common stock on the OTC Bulletin Board has been substantially less than $5.00 per share and therefore we are currently considered a penny stock according to SEC rules. This designation requires any broker-dealer selling these securities to disclose certain information concerning the transaction, obtain a written agreement from the purchaser and determine that the purchaser is reasonably suitable to purchase the securities. These rules limit the ability of broker-dealers to solicit purchases of our common stock and therefore reduce the liquidity of the public market for our shares.

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:

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Technological innovations or new products and services by our Company or our competitors;

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Additions or departures of key personnel;

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Sales of our Company s common stock;

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Our Company s ability to integrate operations, technology, products and services;

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Our Company s ability to execute our business plan;

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Operating results below expectations;

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Loss of any strategic relationship;

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Industry developments;

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Economic and other external factors; and

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Period-to-period fluctuations in our Company s financial results.

Because we have a limited operating history, you may consider any one of these factors to be material. 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 common stock.

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements that involve substantial risks and uncertainties. The forward-looking statements are contained principally in the sections entitled Prospectus Summary , Risk Factors , Management s Discussion and Analysis of Financial Condition and Results of Operations and Business but are also contained elsewhere in this prospectus. In some cases, you can identify forward-looking statements by the words may , might , will , could , would , should , expect , intend , plan , objective , anticipate , believe , estimate potential , continue and ongoing, or the negative of these terms, or other comparable terminology intended to identify statements about the future. These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from the information expressed or implied by these forward-looking statements. Although we believe that we have a reasonable basis for each forward-looking statement contained in this prospectus, we caution you that these statements are based on a combination of facts and factors currently known by us and our expectations of the future, about which we cannot be certain. Forward-looking statements include, but are not limited to, statements about:

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Our business;

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Our business strategy;

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Our future operating results;

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Our ability to obtain external financing;

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Our understanding of our competition;

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Industry and market trends;

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Future capital expenditures; and

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The impact of technology on our products, operations and business.

In addition, you should refer to the Risk Factors section of this prospectus for a discussion of other important factors that may cause our actual results to differ materially from those expressed or implied by our forward-looking statements. As a result of these factors, we cannot assure you that the forward-looking statements in this prospectus will prove to be accurate or that we will achieve the plans, intentions or expectations expressed or implied in our forward-looking statements. Furthermore, if our forward-looking statements prove to be inaccurate, the inaccuracy may be material. In light of the significant uncertainties in these forward-looking statements, you should not regard these statements as a representation or warranty by us or any other person that we will achieve our objectives and plans in any specified time frame, or at all. Any forward-looking statements we make in this prospectus speak only as of its date, and we undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

You should read this prospectus and the documents that we reference in this prospectus and have filed as exhibits to the registration statement, of which this prospectus is a part, completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of our forward-looking statements by these cautionary statements.

USE OF PROCEEDS

This prospectus relates to shares of our common stock that may be offered and sold from time to time by Lincoln Park. We will not receive any proceeds upon the sale of shares by Lincoln Park. However, we may receive proceeds of up to $20,000,000 under the Purchase Agreement with Lincoln Park, subject to the terms and conditions of the Purchase Agreement. As of the date of this prospectus, the Company has issued 2,586,857 shares to Lincoln Park under the Purchase Agreement, including the sale of 2,529,535 purchase shares and the issuance of 57,322 additional commitment shares, and has received aggregate proceeds of $3,799,998.09. The Company originally registered for resale by Lincoln Park 10,000,000 shares of our common stock in June 2011 (Registration No. 333-174648) and as of the date of this prospectus, 7,705,374 shares remain unsold hereunder.

We will retain broad discretion in determining how we will allocate the proceeds from any sales to Lincoln Park. However, any proceeds that we receive from sales to Lincoln Park under the Purchase Agreement will be used to further our business plan of expanding our research and development of our polymer materials technologies, commercialize potential optical devices and materials and for general and administrative purposes.

Although we have no specific plans for use of proceeds as of the date of this prospectus, we believe that approximately 65% of any proceeds received may be used towards our research and development efforts which may include, without limitation, (a) retaining additional management, sales, marketing, technical and other staff to our workforce, (b) expanding our research and development facilities, including the purchase of additional laboratory and production equipment, (c) marketing our future products as they are introduced into the marketplace, (d) developing and maintaining collaborative relationships with strategic partners, (e) developing and improving our manufacturing processes and quality controls, and approximately 35% of any proceeds received may used for increasing our general and administrative activities related to our operations as a reporting public company and related corporate compliance requirements.

CAPITALIZATION

The following table sets forth our cash and cash equivalents and our capitalization as of December 31, 2011:

Cash and cash equivalents	$	359,824
Shareholders equity:		
Preferred stock, $0.001 par value, 1,000,000 shares authorized, no shares issued or outstanding		-
Common stock, $0.001 par value, 100,000,000 shares authorized, 45,337,092 shares issued and outstanding		45,337
Additional paid-in-capital		24,513,000
Accumulated deficit		(15,827)
Deficit accumulated during development stage		(23,859,501)
Total shareholders equity		683,009
Total capitalization	$	683,009

The number of shares of common stock outstanding in the table above excludes, as of December 31, 2011:

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4,522,000 shares of our common stock available for future issuance under our 2007 Employee Stock Plan; and

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3,301,500 shares of our common stock issuable upon the exercise of outstanding warrants, with a weighted average exercise price of $1.01 per share.

MARKET FOR COMMON EQUITY AND RELATED SHAREHOLDER MATTERS

Market For Common Equity

Our common stock is currently quoted under the symbol LWLG.OB on the OTC Bulletin Board.

The following table set forth below lists the range of high and low bids for our common stock for each fiscal quarter for the last two fiscal years. The prices in the table reflect inter-dealer prices, without retail markup, markdown or commission and may not represent actual transactions.

		High		Low	
		Bid	**Ask**	**Bid**	**Ask**
2010	1st Quarter	$	$	$	$
	2nd Quarter	$ 2.30	$ 2.37	$ 1.30	$ 1.35
	3rd Quarter	$ 1.90	$ 2.20	$ 1.28	$ 1.35
	4th Quarter	$ 1.65	$ 1.80	$ 0.80	$ 0.90
		1.77	1.90	0.87	1.14
2011	1st Quarter	$	$	$	$
	2nd Quarter	$ 1.56	$ 1.58	$ 1.10	$ 1.25
	3rd Quarter	$ 1.20	$ 1.40	0(1)	0(1)
	4th Quarter	$ ---(2)	$ ---(2)	$ ---(2)	$ ---(2)
		---(2)	---(2)	---(2)	---(2)
2012	1st Quarter	$	$	$	$
		2.85	2.87	1.61	1.65

(1)

Reflects that at least two market makers posted two-sided quotes for our common stock and all of the quotes were priced at zero.

(2)

Reflects that no priced bids or asks were calculated because there was not a minimum of 2 two-sided quotes for our common stock.

Holders of Common Equity

As of April 24, 2012, we have a total of 48,947,153 shares of common stock outstanding, held of record by approximately 113 shareholders and we believe we have an additional 2,500 beneficial shareholders who hold their shares in brokerage accounts. We do not have any shares of preferred stock outstanding.

Dividends

No cash dividends have been declared or paid on our common stock to date. No restrictions limit our ability to pay dividends on our common stock. The payment of cash dividends in the future, if any, will be contingent upon our Company's revenues and earnings, if any, capital requirements and general financial condition. The payment of any dividends is within the discretion of our board of directors. Our board of director's present intention is to retain all earnings, if any, for use in our business operations and, accordingly, the board of directors does not anticipate paying any cash dividends in the foreseeable future.

Securities Authorized for Issuance under Equity Compensation Plans

Equity Compensation Plans as of December 31, 2011:

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)	4,647,000	$1.16	957,450
Equity compensation plans not approved by security holders (2)	2,876,500	$0.69	0
Total	7,523,500	$0.98	957,450

(1)

Reflects our 2007 Employee Stock Plan for the benefit of our directors, officers, employees and consultants. We have reserved 6,500,000 shares of common stock for such persons pursuant to that plan.

(2)

Comprised of common stock purchase warrants we issued for services.

Penny Stock Regulations and Restrictions on Marketability

The SEC has adopted rules that regulate broker-dealer practices in connection with transactions in penny stocks. Penny stocks are generally equity securities with a market price of less than $5.00, other than securities registered on certain national securities exchanges or quoted on the NASDAQ system, provided that current price and volume information with respect to transactions in such securities is provided by the exchange or system. The penny stock rules require a broker-dealer, prior to a transaction in a penny stock, to deliver a standardized risk disclosure document prepared by the SEC, that: (a) contains a description of the nature and level of risk in the market for penny stocks in both public offerings and secondary trading; (b) contains a description of the broker's or dealer's duties to the customer and of the rights and remedies available to the customer with respect to a violation of such duties or other requirements of the securities laws; (c) contains a brief, clear, narrative description of a dealer market, including bid and ask prices for penny stocks and the significance of the spread between the bid and ask price; (d) contains a toll-free telephone number for inquiries on disciplinary actions; (e) defines significant terms in the disclosure document or in the conduct of trading in penny stocks; and (f) contains such other information and is in such form, including language, type size and format, as the SEC shall require by rule or regulation.

The broker-dealer also must provide, prior to effecting any transaction in a penny stock, the customer with (a) bid and offer quotations for the penny stock; (b) the compensation of the broker-dealer and its salesperson in the transaction; (c) the number of shares to which such bid and ask prices apply, or other comparable information relating to the depth and liquidity of the market for such stock; and (d) a monthly account statement showing the market value of each penny stock held in the customer's account.

In addition, the penny stock rules require that prior to a transaction in a penny stock not otherwise exempt from those rules, the broker-dealer must make a special written determination that the penny stock is a suitable investment for the purchaser and receive the purchaser's written acknowledgment of the receipt of a risk disclosure statement, a written agreement as to transactions involving penny stocks, and a signed and dated copy of a written suitability statement.

These disclosure requirements may have the effect of reducing the trading activity for our common stock. Therefore, shareholders may have difficulty selling our securities.

Recent Sales of Unregistered Securities

During the year ended December 31, 2011, our Company has sold the following securities without registering the securities under the Securities Act:

Securities issued for cash

Date	Security
June 2011	Common stock 185,185 shares of common stock for aggregate proceeds of $200,000 pursuant to the Lincoln Park purchase agreement and registration rights agreement.
3rd/4th FQ 2011	Common stock/Warrants - 1,000,000 shares of common stock and warrants to purchase 1,000,000 shares of common stock for aggregate proceeds of $1,000,000 pursuant to a private offering.

Securities issued for services

Date	Security
January 2011	Warrant - 10,000 shares of common stock at $1.25 per share for services.
January 2011	Warrant - 25,000 shares of common stock at $1.25 per share for services.
March 2011	Common stock 10,000 shares of common stock for $14,500 in services.
April 2011	Warrant - 150,000 shares of common stock at $1.18 per share for services.
May/June 2011	Common stock 153,847 shares of common stock for commitment fee to institutional investor.
June 2011	Common stock - 10,000 shares of common stock for $10,400 in services.
September 2011	Common stock - 10,000 shares of common stock for $14,500 in services.
October 2011	Common stock 2,018 shares of common stock for $2,163 in services.

Securities issued pursuant to our Employee Stock Plan

Date	Security
May 2011	Stock options - 200,000 shares of common stock at $1.12 per share.
August 2011	Stock options - 150,000 shares of common stock at $1.01 per share.

November 2011	Stock options - 150,000 shares of common stock at $0.63 per share.
December 2011	Stock options 250,000 shares of common stock at $1.01 per share.
December 2011	Stock options - 150,000 shares of common stock at $1.30 per share.

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(2) and Rule 506 of Regulation D of the Securities Act since the transactions did not involve any public offering.

DILUTION

Investors who purchase our common stock will be diluted to the extent of the difference between the public offering price per share of our common stock and the pro forma as adjusted net tangible book value per share of our common stock immediately after this offering. Net tangible book value per share is determined by dividing our total tangible assets less total liabilities by the number of outstanding shares of our common stock. As of December 31, 2011, we had a net tangible book value of $683,009, or approximately $0.02 per share of common stock.

Dilution in net tangible book value per share represents the difference between the amount per share paid by purchasers of common stock in this offering, assuming a purchase price of $1.00 per share, which is the minimum purchase price at which shares can be sold under the Purchase Agreement, and the pro forma as adjusted net tangible book value per share of common stock immediately after the completion of this offering. After giving effect to our assumed receipt of $7,442,296 in estimated proceeds from the sale of 7,554,544 shares of common stock issuable under the Purchase Agreement and registered in this offering (assuming a purchase price of $1.00 per share, the issuance of 112,248 additional commitment shares for no additional cash consideration, offering expenses of $70,000, and assuming all such sales and issuances were made on December 31, 2011), our pro forma as adjusted net tangible book value as of December 31, 2011 would have been approximately $8,055,305, or $0.15 per share. This would represent an immediate increase in the net tangible book value of $0.14 per share to existing shareholders attributable to this offering. The following table illustrates this per share dilution:

Assumed public offering price per share of common stock (minimum allowed price)	$	1.00
As adjusted net tangible book value per share as of December 31, 2011	$	0.02
Increase in as adjusted net tangible book value per share attributable to this offering		0.14
Pro forma net tangible book value per share after this offering		0.15
Dilution per share to new investors	$	0.85

To the extent that we sell more or less than $7,442,296 worth of shares under the Purchase Agreement, or to the extent that some or all sales are made at prices in excess of the minimum allowable purchase price of $1.00 per share, then the dilution reflected in the table above will differ. The above table is based on 45,337,092 shares of our common stock outstanding as of December 31, 2011, adjusted for the assumed sale of $7,442,296 in shares to Lincoln Park under the Purchase Agreement at the assumed minimum purchase price described above. In addition, the calculations in the foregoing table do not take into account, as of December 31, 2011:

4,522,000 shares of our common stock available for future issuance under our 2007 Employee Stock Plan; and

3,301,500 shares of our common stock issuable upon the exercise of outstanding warrants, with a weighted average exercise price of $1.01 per share.

To the extent that options or warrants are exercised, new options are issued under our equity benefit plans, or we issue additional shares of common stock in the future, there may be further dilution to investors participating in this offering. In addition, we may choose to raise additional capital because of market conditions or strategic considerations, even if we believe that we have sufficient funds for our current or future operating plans. If we raise additional capital through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our shareholders.

SELECTED FINANCIAL DATA

You should read the following selected financial data together with Management s Discussion and Analysis of Financial Condition and Results of Operations and our financial statements and accompanying notes included later in this prospectus. The selected financial data in this section is not intended to replace our financial statements and the accompanying notes.

We have derived the selected balance sheet data as of December 31, 2011, 2010 and 2009 and the selected statement of operations data for the years ended December 31, 2011, 2010 and 2009 from our audited financial statements that are included in this prospectus. We have derived the selected balance sheet data as of December 31, 2008, 2007 and 2006 and the selected statement of operations data for the years ended December 31, 2008, 2007 and 2006 from our audited financial statements that are not included in this prospectus.

Our historical results are not necessarily indicative of the results to be expected in any future period.

	Year Ended December 31,				
	2011	**2010**	**2009**	**2008**	**2007**
Statement of Operations Data:					
NET SALES	$ -	$ 3,200	$ -	$ -	$ -
COST AND EXPENSE					
Research and development	1,682,557	1,709,171	1,662,813	1,421,955	1,455,608
General and administrative	1,633,786	2,006,900	1,058,071	2,820,398	2,773,140
LOSS FROM OPERATIONS	(3,316,343)	(3,712,871)	(2,720,884)	(4,242,353)	(4,228,748)
OTHER INCOME (EXPENSE)	(166,279)	(361)	(987)	(98,254)	5,299
NET LOSS	$ (3,482,622)	$ (3,713,232)	$ (2,721,871)	$ (4,340,607)	$ (4,223,449)
Basic and Diluted Loss per Share	$ (0.08)	$ (0.09)	$ (0.07)	$ (0.12)	$ (0.14)
Basic and Diluted Weighted Average Number of Shares	44,386,149	42,253,4500	39,431,766	34,726,411	30,983,663

	As of December 31,					
Balance Sheet Data:	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**
	$					
Current assets	401,580	$ 1,028,056	$ 513,362	$ 100,423	$ 600,384	$ 596,152
Property and equipment - net	88,751	97,568	104,087	61,726	67,276	42,335
Other assets	-	-	-	-	29,190	158,883
Intangible assets - net	431,104	346,009	261,215	212,416	174,421	42,376
	$					
TOTAL ASSETS	921,435	$ 1,471,633	$ 878,664	$ 374,565	$ 871,271	$ 839,746
TOTAL LIABILITIES	238,426	116,012	131,676	168,027	218,091	264,974
TOTAL STOCKHOLDERS' EQUITY	683,009	1,355,621	746,988	206,538	653,180	574,772
	$					
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	921,435	$ 1,471,633	$ 878,664	$ 374,565	$ 871,271	$ 839,746

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. (then known as Eastern Idaho Internet Service, Inc.) was organized under the laws of the State of Nevada in 1997, where we engaged in the business of marketing Internet services until June 30, 1998 when our operations were discontinued. We were then inactive until we acquired PSI-TEC Corporation as our wholly owned subsidiary on July 14, 2004, at which time our name was changed to PSI-TEC Holdings, Inc. On October 20, 2006, we completed a parent-subsidiary merger with PSI-TEC Corporation whereby we were the surviving corporation of the merger, and our name was changed to Third-Order Nanotechnologies, Inc. On March 10, 2008, we changed our name to Lightwave Logic, Inc. to better suit our strategic business plan and to facilitate shareholder recognition of our Company and our business.

We are a development stage research and development company. We have developed and are continuing to develop Application Specific Electro-Optic Polymers (ASEOP) and Non-Linear All-Optical Polymers (NLAOP), which have high electro-optic and optical activity. Both types of materials are thermally and photo-chemically stable, which we believe could have utility across a broad range of applications in devices. We engineer our proprietary electro-optic polymers at the molecular level for superior performance, stability, cost-efficiency and ease of processing. We expect our NLAOP polymers to broadly replace more expensive, lower-performance materials that are currently used in, telecommunication, data communications, computing, photovoltaic cells, wireless and satellite communication networks.

In order to transmit digital information at extremely high-speeds (wide bandwidth) over the Internet, it is necessary to convert the electrical signals produced by a computer into optical signals for transmission over long-distance fiber-optic cable. The actual conversion of electricity to an optical signal may be performed by a molecularly engineered material known as an electro-optic polymer.

We are currently developing electro-optic polymers that promise performance many times faster than any technology currently available and that have unprecedented thermal stability. High-performance electro-optic materials produced by our Company have demonstrated stability as high as 350 degrees Celsius. Stability above 250 degrees Celsius is necessary for vertical integration into many semi-conductor production lines. In December 2011 one of our non-linear optical polymers demonstrated an unusually high electro-optical effect of greater than 250 picometers per volt with

excellent thermal and photo stability. Independent research laboratories at Photon-X and The University of Colorado confirmed these characteristics.

Our non-linear all optical polymers have demonstrated resonantly enhanced Third-order properties about 2,630 times larger than fused silica, which means that they are very photo-optically active in the absence of an RF layer. In this way they differ from our electro-optical polymers and are considered more advanced next-generation materials.

Our revenue model relies substantially on the assumption that we will be able to successfully develop electro-optic products for applications within the industries described below. When appropriate, we intend to create specific materials for each of these applications and use our proprietary knowledge base to continue to enhance its discoveries.

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Satellite Reconnaissance

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Navigational Systems

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Radar Applications

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Telecommunications

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Optical Interconnects

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Optical Computing

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Entertainment

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Medical Applications

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Solar Panels (Photovoltaic cells)

To be successful, we must, among other things:

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Develop and maintain collaborative relationships with strategic partners;

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Continue to expand our research and development efforts for our products;

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Develop and continue to improve on our manufacturing processes and maintain stringent quality controls;

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Produce commercial quantities of our products at commercially acceptable prices;

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Rapidly respond to technological advancements;

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Attract, retain and motivate qualified personnel; and

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Obtain and retain effective intellectual property protection for our products and technology.

We believe that Moore's Law (a principle which states the number of transistors on a silicon chip doubles approximately every eighteen months) will create markets for our high-performance electro-optic material products.

Plan of Operation

Since our inception, we have been engaged primarily in the research and development of our polymer materials technologies and potential products. We are devoting significant resources to engineer next-generation electro-optic polymers 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. We expect to continue to develop products that we intend to introduce to these rapidly changing markets and to seek to identify new markets. We expect to continue to make significant operating and capital expenditures for research and development activities.

As we move from a development stage company to a product vendor, we expect that our financial condition and results of operations will undergo substantial change. In particular, we expect to record both revenue and expense from product sales, to incur increased costs for sales and marketing and to increase general and administrative expense. Accordingly, the financial condition and results of operations reflected in our historical financial statements are not expected to be indicative of our future financial condition and results of operations.

On August 8, 2006, we contracted with Triple Play Communications Corporation, a design and market consulting company, to deliver a comprehensive market opportunity assessment report for high-speed 40G (commercial) & 100G+ (military/aerospace) modulators and system applications.

In August, 2006, we entered into a co-location agreement with InPlane Photonics, a New Jersey-based micro-optics company that allowed our scientists to establish a pre-production line in order to test and integrate our organic materials into waveguide devices and system prototypes as a first step toward product commercialization. This agreement was terminated at the end of January 2007 so that we could focus on pursuing a strategic relationship with Photon-X LLC, a Pennsylvania-based firm with extensive experience in polymer waveguide processing. We entered into a non-binding memorandum of understanding with Photon-X, LLC in December 2006 to work towards creating a fee for services agreement with Photon-X, LLC to design, develop, produce and market electro-optic components based upon our polymer technology, which we ultimately finalized in March 2007. This agreement with Photon-X, LLC enables our Company access to a full suite of fabrication facilities capable of producing commercial quantities of precision micro-optic devices such as high-speed (40GHz) telecom modulators, optical filters, and optical interconnects important to military and civilian global information movement and management markets.

On September 25, 2006, we obtained independent laboratory results that confirmed the thermal stability of our Perkinamine™ electro-optic materials. Thermal stability as high as 350 degrees Celsius was confirmed, significantly exceeding many other commercially available high performance electro-optic

materials, such as CLD-1 that exhibits thermal degradation in the range of 250 degrees Celsius to 275 degrees Celsius. This high temperature stability of our materials eliminates a major obstacle to vertical integration of electro-optic polymers into standard microelectronic manufacturing processes (e.g. wave/vapor-phase soldering) where thermal stability of at least 300 degrees Celsius is required. In independent laboratory tests, ten-percent material degradation, a common evaluation of overall thermal stability, did not occur until our Perkinamine™ materials base was exposed to temperatures as high as 350 degrees Celsius, as determined by Thermo-Gravimetric Analysis (TGA). The test results supported our Company's progress to introduce our materials into commercial applications such as optical interconnections, high-speed telecom and datacom modulators, and military/aerospace components.

In July 2007, our Company developed an innovative process to integrate our unique architecture into our anticipated commercial devices, whereby dendritic spacer systems are attached to its core chromophore. In the event we are successful in developing a commercially viable product, we believe these dendrimers will reduce the cost of manufacturing materials and reduce the cost and complexity of tailoring the material to specific customer requirements.

In January 2008, we retained TangibleFuture, Inc., a San Francisco based technology analysis and business development consulting company, to generate an independent assessment of our business opportunities in the fiber-optic telecommunications and optical computing sectors and develop strategies to penetrate those potential markets.

In March 2008, we commenced production of our first prototype photonic chip, which we delivered to Photon-X, LLC to fabricate a prototype polymer optical modulator and measure its technical properties. As a result of delays caused by engineering setbacks related to our material production, the production of our first prototype photonic chip was temporarily halted, along with the completion of our proof of concept tests that were being administered by Dr. Robert Norwood at the University of Arizona Photonics Department. In order to address this issue, our Chief Technology Officer Dr. David F. Eaton s role and responsibilities with the Company were significantly expanded, and we added two veteran synthetic chemists to our science and technology team. We have since overcome a majority of these engineering setbacks and we are currently in the continual process of extensive testing for material performance, including, among other tests, the (r33) Teng-Man testing protocol.

In June 2009, we released test results conducted by Dr. C.C. Teng that re-confirmed our previous test results, and we intend to deliver completed independent validated material performance test results, including the (r33) Teng-Man testing protocol, as they become ripe for release.

In August 2009, Photon-X, LLC commenced a compatible study, process sequences and fabricated wafers/chips containing arrays of phase modulators. The first one hundred plus modulators were completed at the end of October 2009, and were successfully characterized for insertion loss, Vpi, modulation dynamic range and initial frequency response in March 2010. The multi-step manufacturing process we utilized to fabricate our modulators involved exposing our proprietary Perkinamine ™ materials to extreme conditions that are typically found in standard commercial manufacturing settings. Our step-by-step analysis throughout the fabrication process demonstrated to us that our Perkinamine ™ materials can successfully withstand each step of the fabrication process without damage. We anticipated completing the development and building of functional prototype 40 Gb/s and 100 Gb/s modulators during the second quarter of 2010. However, we have incurred delays with our modulator project due to our focus on current application driven projects and evaluations that we believe will more quickly generate revenue for our Company. The completion of these two modulator designs will most likely occur during the second half of 2011 upon completion of an anticipated updated optical device design. However, we may incur delays in this process due to slower than expected material production within our laboratories and/or delays caused by the production of the modulator and testing procedures.

In August 2009, we retained Perdix, Inc. to help us identify and build prototype products for high growth potential target markets in fiber optic telecommunications systems. During October 2009, we initiated the development and

production of our prototype amplitude modulator, which can ultimately be assembled into 1- and 2- dimensional arrays that are useful for optical computing applications, such as encryption and pattern recognition. We expected our initial prototype amplitude modulator to be completed by the end of the second quarter 2010. Our Company continues to work with strategic partners in this development effort and we anticipate prototypes in second half of 2011. However, we may incur delays in this process due to slower than expected material production within our laboratories and/or delays caused by the production of the modulator and testing procedures.

In November 2009, we introduced our new prototype phase modulator to the Gilder/Forbes Telecosm Conference in Tarrytown, New York and discussed how Lightwave s material could be spun onto silicon chips prior to stacking and used for input, output, and interconnect due to the stability of Lightwave s electro-optic polymer and Lightwave s recent demonstration that its proprietary Perkinamine ™ materials can survive all of the rigors of standard commercial manufacturing processes. Other applications discussed with the conference attendees included low cost modulators for fiber optic communications, multi-channel modulators for ultra dense wavelength division multiplex systems, and optical computing.

In December 2009, we filed our sixth patent application. The provisional application covers stable free radical chromophores for use in Non-Linear optical applications. The new polymeric electro-optic material has enormous potential in spatial light modulation and all optical signal processing (light switching light).

In January 2010, we entered into an agreement with the University of Alabama at Tuscaloosa to conduct cooperative development, analytical testing, optimization, and scale-up of our proprietary materials platform, which should help shorten the time to market for our new Polymeric Electro-Optic materials.

In March 2010, we successfully concluded the electrical and optical performance testing stage of our proof of principle prototype phase modulator and began Application Engineering of our technology in customer design environments and working directly with interested large system suppliers to attempt to engineer specific individual product materials and device designs for sale to or by these suppliers.

In October of 2010, we completed the concept stage of a novel design for an advanced optical computing application and moved forward into the design stage with Celestech, Inc. of Chantilly, Virginia. This project will incorporate one of our Company s advanced electro-optical polymer materials.

In October of 2010, we announced the results of testing performed by Lehigh University that demonstrated the Third-order non-linear properties of our proprietary molecules in the Perkinamine NR™ chromophore class. Lehigh University determined that the material was 100 times stronger than the highest off-resonance small molecule currently known. They also determined that it was 2,600 times more powerful than fused silica and demonstrated extremely fast (less than 1 picosecond) photo-induced non-linear response that would be capable of modulation at raters of 1 THz (terahertz).

In February and April 2011, respectively, the United States Patent Office granted our Company two patents: US Patent No. 7,894,695 covering our Tricyclic Spacer System for Non-Linear Optical Devices and US Patent No. 7,919,619 for Heterocyclical Chromophore Architectures directed to our Perkinamine ™ chromophores. These composition of matter patents taken together protect the core of our electro-optical materials portfolio.

In March 2011, we entered into a research and development agreement with the City University of New York s Laboratory for Nano Micro Photonics (LaNMP) to develop Third-order non-linear devices. We believe that the combination of LaNMP s device capabilities together with our materials expertise should accelerate the development of all-optical devices.

In March 2011, the United States Patent Office granted our Company 2 patents: US Patent No. 7,919,619 for Heterocyclical Chromophore Architectures directed to our Perkinamine ™ chromophores and US Patent No. 7,894,695 covering our Tricyclic Spacer System for Non-Linear Optical Devices. These composition of matter patents taken together protect the core of our electro-optical materials portfolio.

In March 2011, the City University of New York s Laboratory for Nano Micro Photonics (LaNMP) fabricated our first-ever all optical waveguide using one of our Perkinamine NR ™ chromophores. It is anticipated that LaNMP will use this device architecture to develop various all-optical devices including an all-optical transistor.

In March 2011, we announced a two-year research and development collaboration with the University of Alabama to explore the advanced energy capture properties of our Perkinamine ™ class of chromophores. Our material absorbs light across a wide range of wavelengths from near infra-red into the near ultraviolet. The University intends to explore how to efficiently capture a wide range of solar radiation with our material.

In December 2011, we announced the discovery of a new material named Perkinamine™ Indigo. We believe this represents a major advancement in the field of organic nonlinear optical materials. The material demonstrated an unusually high electro-optical effect of greater than 250 picometers per volt with excellent thermal and photo stability. Independent research laboratories at Photon-X and The University of Colorado confirmed these characteristics.

We ultimately intend to use our next-generation electro-optic polymers for future applications vital to the following industries. We expect to create specific materials for each of these applications as appropriate:

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Satellite Reconnaissance

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Navigational Systems

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Radar Applications

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Telecommunications

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Optical Interconnects

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Optical Computing

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Entertainment

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Medical Applications

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Solar Panels (Photovoltaic cells)

In an effort to maximize our future revenue stream from our electro-optic polymer products, we are currently evaluating each of or some combination of the following approaches:

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Licensing our technology for individual specific applications;

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Entering into collaborative or joint venture agreements with one or a number of partners; or

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Selling our products directly to commercial customers.

Additionally, we must create an infrastructure, including operational and financial systems, and related internal controls, and recruit qualified personnel. Failure to do so could adversely affect our ability to support our operations.

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. During 2004 we raised approximately $529,000 from the issuance of convertible promissory notes, of which $30,000 was converted into common stock of the company during 2004 and the remaining $499,000 converted in 2005. Also, during 2005, we raised an aggregate of $1,000,000 from the private sale of our common stock. During 2006, we raised approximately $425,000 from the private sale of our common stock, of which $200,000 was rescinded during 2007. During 2007, we raised approximately $2,301,524 from the private sale of our common stock. During 2008, we raised approximately $414,000 from the private sale of our common stock and $375,270 from the exercise of outstanding warrants. Through June 30, 2009, we raised approximately $855,000 from the private sale of our common stock. We have also issued shares of our common stock and warrants to purchase shares of our common stock in exchange for services rendered to our company, including professional services. During October 2009 we obtained proceeds of $455,000 from the exercise of outstanding warrants.

During 2010, we raised $1,500,000 from the private sale of our common stock and $539,000 from the exercise of outstanding options and warrants. We also issued shares of our common stock and warrants to purchase shares of our common stock in exchange for services rendered to our company. During 2011, we raised $1,000,000 from the private sale of our common stock and warrants to purchase our common stock. We also issued shares of our common stock and warrants to purchase shares of our common stock in exchange for services rendered to our Company.

Additionally, in May 2011, we executed the Purchase Agreement with Lincoln Park to sell up to $20 million of common stock. Under the Purchase Agreement, subject to certain conditions and at our sole discretion, Lincoln Park has committed to invest up to $20 million in our common stock over a 30-month period. Lincoln Park is obligated to make purchases as we direct in accordance with the Purchase Agreement, which may be terminated by us 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

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immediately preceding the sales to Lincoln Park. As of the date of this prospectus, the Company has issued 2,586,857 shares to Lincoln Park under the Purchase Agreement, including the sale of 2,529,535 purchase shares and the issuance of 57,322 additional commitment shares, and has received aggregate proceeds of $3,799,998.09.

Results of Operations

Comparison of Fiscal 2011 to Fiscal 2010

Revenues

As a development stage research and development company, we had no revenues during the year ended December 31, 2011. There was $3,200 in engineering revenues during the year ended December 31, 2010. The Company is at various stages with potential customers and expects additional revenues once customers release purchase orders against outstanding proposals or once customers complete product evaluations and product development.

Operating Expenses

Our operating expenses were $3,316,343 and $3,716,071 for the years ended December 31, 2011 and 2010, respectively, for a decrease of $399,728. The decrease is due primarily to decrease in non cash general and administrative amortization of warrants based on vesting terms as part of the employment agreement entered into in January 2010 with the Company s new Chairman of the Board, non cash research and development amortization of options and investor relation expenses offset by increases in fees incurred for the registration of common stock for resale to an institutional investor, expenses for the 2011 submission of the Company s Form 10-Q in eXtensible Business Reporting Language (XBRL), laboratory electro-optic device prototype design, development and testing expense and wages and salaries.

Included in our operating expenses for the year ended December 31, 2011 was $1,682,557 for research and development expenses compared to $1,709,171 for the year ended December 31, 2010, for a decrease of $26,614. This is primarily due to decreases in non cash stock compensation and stock option amortization offset by increases in laboratory electro-optic device prototype design, development and testing expense, salaries and wages, the allocation of health insurance and travel and lodging expenses and expenditures for the removal of material past its useful life.

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

We expect to continue to incur substantial research and development expense to develop and commercialize our electro-optic material platform. These expenses will increase as a result of accelerated development effort to support commercialization of our non-linear optical polymer materials technology; subcontracting work to build prototypes; expanding and equipping 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.

Non cash stock compensation and stock option amortization decreased $295,209 from $936,912 for the year ended December 31, 2010 to $641,703 for the year ended December 31, 2011.

Laboratory electro-optic and optical device prototype, development and testing expense increased $94,846 from $189,148 for the year ended December 31, 2010 to $283,994 for the year ended December 31, 2011.

Wages and salaries increased $47,008 from $440,196 for the year ended December 31, 2010 to $487,204 for the year ended December 31, 2011 primarily due to additional employees hired during 2010 and 2011 including a full time Chief Technology Officer.

Due to a change in the allocation between general and administrative and research and development expenses, health insurance, travel and lodging expenses allocated to research and development increased for the year ended December 31, 2011 as compared to the year ended December 31,

2010. Health insurance expenditures for research and development employees increased $23,678 from $26,558 for the year ended December 31, 2010 to $50,236 for the year ended December 31, 2011. Travel and lodging expenses increased $52,970 from $1,034 for the year ended December 31, 2010 to $54,004 for the year ended December 30, 2011. Travel and lodging expenses also increased as the result of additional travel in research and development activities.

Expenses for the disposal of materials past its useful life in research and development operations increased $20,798 from $2,092 for the year ended December 31, 2010 to $22,890 for the year ended December 31, 2011.

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 $373,114 to $1,633,786 for the year ended December 31, 2011 compared to $2,006,900 for the year ended December 31, 2010. The decrease is due primarily to decrease in non cash amortization of warrants based on vesting terms as part of the employment agreement entered into in January 2010 with the Company s new Chair and investor relations expense offset by increases in fees for the registration of common stock for resale to an institutional investor, expenses for the 2011 submission of the Company s 10-Q in eXtensible Business Reporting Language (XBRL), wages and salaries and insurance.

Legal fees increased $37,363 to $113,107 and for the year ended December 31, 2011 compared to $75,744 for the year ended December 31, 2010. The increase relates to the legal fees incurred during the year ended December 31, 2011 for the filing of a registration statement for the resale of common stock to an institutional investor.

Investor relations expenses decreased by $38,396 from $151,725 for the year ended December 30, 2010 to $113,329 for the year ended December 31, 2011. During 2011, the Company employed an investor relations specialist in an effort to control costs and to expand its exposure to a broader base of investors.

Remaining general and administrative wages and salaries increased $71,193 from $97,193 for the year ended December 31, 2010 to $168,386 for the year ended December 31, 2011 primarily due to the employment of a Vice President of Sales and Marketing during 2011.

Total expenses for accounting and administrative services decreased by $54,639 for the year ended December 31, 2011 compared to the year ended December 31, 2010. Non-cash amortization of warrants for accounting and administrative services decreased $103,639 from $213,459 for the year ended December 31, 2010 to $109,820 for the year ended December 31, 2011. Accounting fees increased $49,000 from $42,000 for the year ended December 31, 2010 compared to $91,000 for the year ended December 31, 2011. The additional accounting fees incurred during the

year ended December 31, 2011 included fees of $13,000 for services relating to the registration statement for the resale of common stock to an institutional investor and the 2011 submission of the Company s 10-Q in eXtensible Business Reporting Language (XBRL) as required by the U.S. Securities and Exchange Commission (SEC).

SEC filing fees increased by $7,652 from $5,250 for the year ended December 31, 2010 to $12,902 for the year ended December 31, 2011 for services relating to the 2011 submission of the Company s 10-Q in eXtensible Business Reporting Language (XBRL).

Other professional fees increased by $18,822 from $1,941 for the year ended December 31, 2010 to $20,763 for the year ended December 31, 2011 for fees associated with the resale of common stock to an institutional investor.

Health insurance premiums and directors and officers insurance increased $56,156 from $65,050 for the year ended December 31, 2010 to $121,206 for the year ended December 31, 2011 primarily due to health insurance coverage for additional employees hired and an increase in directors and officers insurance coverage during 2011 offset by a change in the allocation between general and administrative and research and development expenses.

Non-cash stock compensation decreased by $573,378 to $749,925 for the year ended December 31, 2011 compared to $1,323,303 for the year ended December 31, 2010. The stock compensation for the

year ended December 31, 2011 included the aforementioned non-cash amortization of warrants for accounting and administrative expenses. This total decrease in stock compensation is primarily due to the non-cash amortization of warrants as part of the employment agreement entered into with the Company s new Chair during 2010.

Annual Shareholder meeting expenses decreased by $16,049 to $23,809 for the year ended December 31, 2011 compared to $39,858 for the year ended December 31, 2010.

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 increase expenditures related to the future business development and sales of our products.

Other Income (Expense)

Other income (expense) was ($166,279) for the year ended December 31, 2011, relating primarily to the commitment fee associated with the resale of shares to an institutional investor during the year ending December 31, 2011. Other income (expense) was ($361) for the year ended December 31, 2010.

Net Loss

Net loss was $3,482,622 and $3,713,232 for the years ended December 31, 2011 and 2010, respectively, for a decrease of $230,610, primarily resulting from the decreases in non cash general and administrative amortization of warrants based on vesting terms as part of the employment agreement entered into in January 2010 with the Company s new Chair, non cash research and development amortization of options and investor relations expenses offset by increase in fees for the registration of common stock for resale to an institutional investor and commitment fees for the resale of common stock, expenses for the 2011 submission of the Company s 10-Q in eXtensible Business Reporting Language (XBRL), laboratory electro-optic and optical device prototype designs, development and testing expense and wages and salaries.

Significant Accounting Policies

Our Company's accounting policies are more fully described in Note 1 of Notes to Financial Statements provided herewith. 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.

Stock Based Compensation

The Company uses the Black-Scholes option pricing model to calculate the grant-date fair value of an award, with the following assumptions for 2011 and 2010: no dividend yield in both years, expected volatility, based on the Company s historical volatility, between 115% and 125% in 2011 and between 123% and 134% in 2010, risk-free interest rate between 0.82% and 2.15% in 2011 and between 1.64% and 2.55% in 2010 and expected option life of three to five years in 2011 and 2010.

As of December 31, 2011, there was $844,322 of unrecognized compensation expense related to non-vested market-based share awards that is expected to be recognized through December 2014.

Liquidity and Capital Resources

During the year ended December 31, 2011, net cash used in operating activities was $1,682,371 and net cash used in investing activities was $111,672, 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, 2011 was $1,200,000. At December 31, 2011, our cash and cash equivalents totaled $359,824, our assets totaled $921,435, our liabilities totaled $238,426, and we had stockholders equity of $683,009.

During the year ended December 31, 2010, net cash used in operating activities was $1,436,681 and net cash used in investing activities was $108,441, 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, 2010 was $2,039,000. At December 31, 2010, our cash and cash equivalents totaled $953,867, our assets totaled $1,471,633, our liabilities totaled $116,012, and we had stockholders equity of $1,355,621.

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 in excess of $2,000,000 of expenditures over the next 12 months. 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 during 2012.

Our business does not presently generate the cash needed to finance our current and anticipated operations. We believe we have raised sufficient capital to finance our operations through September 2013, 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.

Such future sources of financing may include cash from equity offerings, exercise of stock options, warrants and proceeds from debt instruments; but we cannot assure you that such equity or borrowings will be available or, if available, will be at rates or prices acceptable to us.

In May 2011 we executed the Purchase Agreement with Lincoln Park whereby subject to certain conditions and at our sole discretion, Lincoln Park has committed to purchase up to $20 million of our registered common stock over a

30-month period. As of the date of this prospectus, the Company has issued 2,586,857 shares to Lincoln Park under the Purchase Agreement, including the sale of 2,529,535 purchase shares and the issuance of 57,322 additional commitment shares, and has received aggregate proceeds of $3,799,998.09. The Company originally registered for resale by Lincoln Park 10,000,000 shares of our common stock in June 2011 (Registration No. 333-174648) and as of the date of this prospectus, 7,705,374 shares remain unsold hereunder.

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 Company's common stock immediately preceding the sales to Lincoln Park. We expect this financing to provide our Company with sufficient funds to maintain its 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 either short-term or 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. We may terminate the Purchase Agreement at any time, at our discretion, without any penalty or cost to us. Lincoln Park may not assign or transfer its rights and obligations under the Purchase Agreement.

We expect that our cash used in operations will increase during 2012 and beyond as a result of the following planned activities:

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The addition of management, sales, marketing, technical and other staff to our workforce;

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Increased spending for the expansion of our research and development efforts, including purchases of additional laboratory and production equipment;

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Increased spending in marketing as our products are introduced into the marketplace;

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Developing and maintaining collaborative relationships with strategic partners;

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Developing and improving our manufacturing processes and quality controls; and

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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, 2011

Net cash used in operating activities was $1,682,371 for the year ended December 31, 2011, consisting of payments for research and development, legal, professional and consulting expenses, rent and other expenditures necessary to develop our business infrastructure, offset by $519,441 in warrants issued for services, $882,640 in options issued for services, $207,929 in common stock issued for services, $35,394 in depreciation and patent amortization expenses, $32,433 in prepaid expenses and other current assets and $122,414 in accounts payable and accrued expenses.

Net cash used by investing activities was $111,672 for the year ended December 31, 2011, consisting of $93,778 for intangibles (patents) and $17,894 in asset additions for the lab and research and development activities.

Net cash provided by financing activities was $1,200,000 for the year ended December 31, 2011 and consisted of $200,000 proceeds from sale of common stock to an institutional investor proceeds and $1,000,000 from the issuance of common stock under private placement.

For the Year Ended December 31, 2010

Net cash used in operating activities was $1,436,681 for the year ended December 31, 2010, consisting of payments for research and development, legal, professional and consulting expenses, rent and other expenditures necessary to develop our business infrastructure, offset by $1,007,689 in warrants issued for services, $1,252,526 in options issued for services, $22,650 in common stock issued for services, $37,500 in amortization of prepaid expenses, $30,166 in depreciation expense, ($58,316) in prepaid expenses and ($15,664) in accounts payable and accrued expenses.

Net cash used by investing activities was $108,441 for the year ended December 31, 2010, consisting of the purchase of intangibles (patents) for $84,794 and $23,647 in asset additions for the lab facility.

Net cash provided by financing activities was $2,039,000 for the year ended December 31, 2010 and consisted of $1,500,000 from the issuance of common stock under private placement and $539,000 proceeds from the exercise of warrants.

BUSINESS

General

Lightwave Logic, Inc. is developing a new generation of advanced organic nonlinear materials to be used to make electro-optic polymers and non-linear all-optical polymers. These polymer-based materials when used in modulators can convert high-speed electronic signals into optical (light) signals for use in communications systems for high-speed data transfer. In the case of non-linear all-optical polymers, certain of our Company s materials can be used in devices that use light waves to switch other light waves.

Electro-optic material is the core active ingredient in high-speed fiber-optic telecommunication systems. Utilizing our proprietary technology, we are in the process of engineering advanced electro-optic polymers that we believe may lead to significant performance advancements, component size and cost reduction, ease of processing, and thermal and temporal stability. We believe that polymer materials engineered at the molecular level may have a significant role in the future development of commercially significant electro-optic related products.

Our organic materials work by affecting the optical properties of light in the presence of an electric field at extremely high frequencies (wide bandwidths), but possess inherent advantages to inorganic materials.

Currently, the core electro-optic material contained in most modulators is a crystalline material, such as lithium niobate or gallium arsenide, which must be manufactured in strict dust-free conditions since even slight contamination can render them inoperable. As a result, these crystalline materials are expensive to produce. Current electro-optic crystals are limited to telecommunication speeds that are less than 40Gb/s (40 billion digital bits of data per second). Lithium niobate devices require large power levels (modulation voltages) to operate and are large in size -- typically measuring about four inches long. Considering that most integrated circuits are literally invisible to the naked eye, these devices are enormous. Additionally, it is important to note that these crystalline-based electro-optic modulators require expensive mechanical packaging (housings) generally comprised of materials, such as gold-plated Kovar, in order to assure operational integrity over required time and operating temperature ranges.

Unlike crystals, electro-optic polymers appear to be capable of being tailored at the molecular level for optimal performance characteristics. Additionally, electro-optic polymers are less expensive to manufacture and demand significantly lower power requirements (modulation voltages). The electro-optic polymers have demonstrated the ability to perform many times faster (>100Gb/s) than existing crystalline technology.

We consider electro-optic polymers to be the most feasible technology for future high-speed (wide bandwidth) electronic-optical conversion. Due to the ease of processing afforded by electro-optic polymers, as well as their capacity to foster component size reduction. We believe electro-optic polymers have the potential to replace existing high-speed fiber-optics components that are used today in many commercial and military applications.

We also believe that the extreme miniaturization provided by advanced electro-optic polymers may allow for the successful fabrication of chip-to-chip (backplane) optical interconnect devices for computers that create the high-speed data transmission necessary for extremely high-speed computations. Further, we believe that additional potential applications for electro-optic polymers may include phased array radar, cable television (CATV), electronic counter measure (ECM) systems, ultra-fast analog-to-digital conversion, land mine detection, radio frequency photonics, spatial light modulation and all-optical (light-switching-light) signal processing.

Our Electro-Optic Technology

For the past two decades, diverse corporate interests, including, to our knowledge, IBM, Lockheed Martin, DuPont, AT&T Bell Labs, Corning, Honeywell and 3M, as well as numerous universities and U.S. Government Agencies, have been attempting to produce high-performance, high-stability electro-optic polymers for high-speed (wide bandwidth) telecommunication applications. These efforts have largely been 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. 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 have prevented commercial quality polymer-based modulators operating at 10-40Gb/s 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 more harsh MILSPEC 883D (military specification) range of -55 degrees Celsius to 150 degrees Celsius.

None of our molecular designs rely on the BLA polyene chain design model. Our proposed solution lies in a far 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.

Our research and findings in this area resulted in our Company being the sole recipient of the 2006 Electro-Optic Materials Technology Innovation of the Year Award by Frost & Sullivan. Frost & Sullivan's Technology Innovation of the Year Award is bestowed upon candidates whose original research has resulted in innovations that have, or are expected to bring, significant contributions to multiple industries in terms of adoption, change, and competitive posture. This award recognizes the quality and depth of our Company's research and development program as well as the vision and risk-taking that enabled us to undertake such an endeavor. Our Company did not actively elicit consideration or apply to receive this award. Frost & Sullivan independently contacted our Company and conducted several interviews, which included chemical and technical experts in the field of electro-optics who were supplied with detailed public information regarding our Company's technological innovations.

Our Intellectual Property

The following U.S. patents have been issued to us:

US 7 919 619	-	Heterocyclical Chromophore Architectures (Granted April 5, 2011)
US 7 894 695	-	Tricyclic Spacer Systems for Nonlinear Optical Devices (Granted February 22, 2011)

We have twenty seven pending patent applications (including six patent families with applications in Australia, Canada, China, European Patent Office, Japan and the U.S. based on the PCT and U.S. applications below) in the field of nonlinear optic chromophore design as follows:

61/265012	-	Stable Free Radical Chromophores, processes for preparing the same.
PCT/US05/39212	-	Tricyclic Spacer Systems for Nonlinear Optical Devices
PCT/US05/39664	-	Anti-Aromatic Chromophore Architectures
PCT/US05/39213	-	Heterocyclical Anti-Aromatic Chromophore Architectures
PCT/US05/39010	-	Heterocyclical Chromophore Architectures
PCT/US06/11637	-	Heterocyclical Chromophore Architectures with Novel Electronic Acceptor Systems.

Heterocyclical Anti-Aromatic Systems

Two of our provisional patents cover heterocyclical anti-aromatic electronic conductive pathways, which are the heart of our high-performance, high-stability molecular designs. The completely heterocyclical nature of our molecular designs "lock" conductive atomic orbitals into a planar (flat) configuration, which provides improved electronic conduction and a significantly lower reaction to environmental threats (e.g. thermal, chemical, photochemical, etc.) than the BLA design paradigm employed by other competitive electro-optic polymers.

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.

Our Latest Tests and Results

Prior to our recent experimental results, in 2004, quantum mechanical calculations were independently performed on our novel electro-optic polymer designs at government laboratories located at the Naval Air Warfare Center Weapons Division in China Lake, California. The results of these calculations suggest that our initial aromatic molecules perform two and a half (2.5) to three and three-tenths (3.3) times more efficiently than currently available telecom grade electro-optic polymers. Logical extensions of this novel molecular design paradigm further suggest even greater

performance improvements. Subsequently, top scientists and engineers at Wright-Patterson Air Force Base reviewed these calculations and concluded that our molecular designs show promise of a five to ten times improvement over existing commercial polymeric architectures. Our conclusion is that performance improvements of this magnitude indicate a significant breakthrough in the field of fiber-optic telecommunication.

In May and June of 2006, we initiated performance evaluations of one of our first extremely high-performance electro-optic materials. The initial tests were performed by electro-optic expert, Dr. C.C. Teng, co-inventor of the renowned Teng-Man test, the industry-wide standard method of evaluating the material performance of electro-optic polymers, and subsequently confirmed by the University of Arizona's College of Optical Sciences, one of the most respected and fastest growing optical sciences departments in the world. Under identical laboratory conditions at low molecular loadings, one of our recent molecular designs outperformed one of the industry's highest performance electro-optic systems by a factor as high as 650%.

We believe results of the Teng-Man test have established the validity of our novel, patent pending molecular design paradigm known as CSC (Cyclical Surface Conduction) theory. We believe the success of CSC theory has the potential to establish the fundamental blueprint of electro-optic material design for decades to come, and to have broad application in commercial and military telecommunication and advanced computational systems.

On September 25, 2006 we obtained independent laboratory results that confirmed the thermal stability of our Perkinamine™ electro-optic materials. Thermal stability as high as 350 degrees Celsius was

confirmed, significantly exceeding many other commercially available high performance electro-optic materials, such as CLD-1 that exhibits thermal degradation in the range of 250 degrees Celsius to 275 degrees Celsius. This high temperature stability of our materials eliminates a major obstacle to vertical integration of electro-optic polymers into standard microelectronic manufacturing processes (e.g. wave/vapor-phase soldering) where thermal stability of at least 300 degrees Celsius is required. In independent laboratory tests, ten-percent material degradation, a common evaluation of overall thermal stability, did not occur until our Perkinamine™ materials base was exposed to temperatures as high as 350 degrees Celsius, as determined by Thermo-Gravimetric Analysis (TGA).

The test results supported our Company's progress to introduce our materials into commercial applications such as optical interconnections, high-speed telecom and datacom modulators, and military/aerospace components.

In July 2007, our Company developed an innovative process to integrate our unique architecture into our anticipated commercial devices, whereby dendritic spacer systems are attached to its core chromophore. In the event we are successful in developing a commercially viable product, we believe these dendrimers will reduce the cost of manufacturing materials and reduce the cost and complexity of tailoring the material to specific customer requirements.

In March 2008, we commenced production of our first prototype photonic chip, which we delivered to Photon-X, LLC to fabricate a prototype polymer optical modulator and measure its technical properties. As a result of delays caused by engineering setbacks related to our material production, the production of our first prototype photonic chip was temporarily halted, along with the completion of our proof of concept tests that were being administered by Dr. Robert Norwood at the University of Arizona Photonics Department. In order to address this issue, Dr. David Eaton s role and responsibilities with the Company were significantly expanded, and we added two veteran synthetic chemists to our science and technology team. We have since overcome a majority of these engineering setbacks and we are currently in the continual process of extensive testing for material performance, including, among other tests, the (r33) Teng-Man testing protocol. In June 2009 we released test results conducted by Dr. C.C. Teng that re-confirmed our previous test results, and we intend to deliver completed independent validated material performance test results, including the (r33) Teng-Man testing protocol, as they become ripe for release.

In August 2009, Photon-X, LLC commenced a compatible study, process sequences, and fabricated wafers/chips containing arrays of phase modulators. The first one hundred plus modulators were completed at the end of October 2009, and were successfully characterized for insertion loss, Vpi, modulation dynamic range and initial frequency response in March 2010. The multi-step manufacturing process we utilized to fabricate our modulators involved exposing our proprietary Perkinamine™ materials to extreme conditions that are typically found in standard commercial manufacturing settings. Our step-by-step analysis throughout the fabrication process demonstrated to us that our Perkinamine™ materials could successfully withstand each step of the fabrication process without damage. We anticipate completing the development and building of functional prototype 40 Gb/s and 100 Gb/s modulators during the second quarter of 2010. However, we may incur delays in this process due to slower than expected material production within our laboratories and/or delays caused by the production of the modulator and testing procedures. With the current application driven projects and evaluations we have incur delays in this development. The completion of these two modulator designs will most likely be pushed out into the forth quarter of 2012 in order for us the focus on the applications that will generate revenue quicker for Lightwave. However, we do expect to complete a newly designed prototype modulator using our Perkinamine Indigo™ materials during the third quarter of 2012.

In August 2009, we retained Perdix, Inc in Boulder, Colorado to help us identify and build prototype products for high growth potential target markets in fiber optic telecommunications systems. During October 2009, we initiated the development and production of our prototype amplitude modulator, which can ultimately be assembled into 1- and 2-dimensional arrays that are useful for optical computing applications, such as encryption and pattern recognition. We expect our initial prototype amplitude modulator to be completed by the end of the second quarter 2010. We continued to work with our strategic partner on this device through out 2010 and discovered this design had limitations. We terminated the program to take a different design approach. We embarked on the new design approach in 2011 with another design partner. A feasibility study with the new design partner was started in 2011.

In November 2009 we introduced our new prototype phase modulator to the Gilder/Forbes Telecosm Conference in Tarrytown, New York and discussed how our material could be spun onto silicon

chips prior to stacking and used for input, output, and interconnect due to the stability of our electro-optic polymer and our recent demonstration that our proprietary Perkinamine™ materials can survive all of the rigors of standard commercial manufacturing processes. Other applications discussed with the conference attendees included low cost modulators for fiber optic communications, multi-channel modulators for ultra dense wavelength division multiplex systems, and optical computing.

In December 2009 we filed our sixth patent application. The provisional application covers stable free radical chromophores for use in Non-linear optical applications. The new polymeric electro-optic material has enormous potential in spatial light modulation and all optical signal processing (light switching light).

In January 2010 we entered into an agreement with the University of Alabama at Tuscaloosa to conduct cooperative development, analytical testing, optimization, and scale-up of our proprietary materials platform, which should help shorten the time to market for our new Polymeric Electro-Optic materials.

In March 2010 we successfully concluded the electrical and optical performance testing stage of our prototype phase modulator and began Application Engineering of our technology in customer design environments and working directly with interested large system suppliers to attempt to engineer specific individual product materials and device designs for sale to or by these suppliers.

In October of 2010 we completed the concept stage of a novel design for an advanced optical computing application and moved forward into the design stage with Celestech, Inc. of Chantilly, Virginia. This project will incorporate one of our Company s advanced electro-optical polymer materials.

In October of 2010 we announced the results of testing performed by Lehigh University that demonstrated the Third-order non-linear properties of our proprietary molecules in the Perkinamine NR™ chromophore class. Lehigh University determined that the material was 100 times stronger than the highest off-resonance small molecule currently known. They also determined that it was 2,600 times more powerful than fused silica and demonstrated extremely fast (less than 1 picosecond) photo-induced non-linear response that would be capable of modulation at raters of 1 THz (terahertz).

In March 2011 we entered into a research and development agreement with the City University of New York s Laboratory for Nano Micro Photonics (LaNMP) to develop Third-order non-linear devices. The combination of LaNMP s device capabilities together with our materials expertise should accelerate the development of all-optical devices.

In February and April 2011, the United States Patent Office granted our Company 2 patents: US Patent No. 7,919,619 for Heterocyclical Chromophore Architectures directed to our Perkinamine™ chromophores and US Patent No.

7,894,695 covering our Tricyclic Spacer System for Non-Linear Optical Devices. These composition of matter patents taken together protect the core of our electro-optical materials portfolio.

In March 2011 the City University of New York s Laboratory for Nano Micro Photonics (LaNMP) fabricated our first-ever all optical waveguide using one of our Perkinamine NR™ chromophores. It is anticipated that LaNMP will use this device architecture to develop various all-optical devices including an all-optical transistor.

In March 2011 we announced a two-year research and development collaboration with the University of Alabama to explore the advanced energy capture properties of our Perkinamine™ class of chromophores. Our material absorbs light across a wide range of wavelengths from near infrared into the near ultraviolet. The University intends to explore how to efficiently capture a wide range of solar radiation with our material.

In December 2011, we announced the discovery of a new material named Perkinamine™ Indigo. We believe this represents a major advancement in the field of organic nonlinear optical materials. The material demonstrated an unusually high electro-optical effect of greater than 250 picometers per volt with excellent thermal and photo stability. Independent research laboratories at Micron Inc., Photon-X and The University of Colorado confirmed these characteristics.

The Electro-Optic Device Market

General

Electro-optic devices such as fiber-optic modulators translate electric signals into optical signals. Such devices are used in communication systems to transfer data over fiber-optic networks. Optical data transfer 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.

Two distinct technologies currently exist for the fabrication of fiber-optic devices, such as fiber-optic modulators. The first, which is the more traditional technology, utilizes an electro-optically active inorganic core crystalline material (e.g. lithium niobate). The second, which is the focus of the Company s research, involves the exploitation of electro-optic polymers.

Traditional Technology - Inorganic Crystals

Traditional technology translates electric signals into optical signals generally relying upon electro-optic materials, such as lithium niobate or gallium arsenide. Six of the largest inorganic fiber-optic component manufactures hold approximately 85% of the electro-optic modulator component market. They are JDS Uniphase, Sumitomo, Avanex, Covega, Fujitsu, and Bookham. 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 integrated laser/modulator designs. While each company possesses their own modulator design and processing patents, the underlying core constituents (lithium niobate, gallium arsenide, indium phosphide) occur in nature and as such cannot be patented.

New Technology - Organic Polymers

Our developing technology that translates electric signals into optical signals relies upon organic electro-optic materials, such as electro-optic polymers. Electro-optic polymers involve the material integration of specifically engineered organic (carbon-based) compounds. The molecular designs of these compounds are precise and do not occur naturally; thus they may be protected under patent law.

Polymer-based electro-optic modulators may provide considerable advantages over traditional inorganic fiber-optic technology in terms of:

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Cost

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Size and versatility

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Modulating/switching speed

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Optical transmission properties

.

Lower operating voltages

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Generate less heat

Competition

We are aware of only one company, Gigoptix, Inc., that competes directly with us. They have designed and patented potentially commercially feasible electro-optic polymers and hold an exclusive license to all electro-optic polymeric technology developed within the University of Washington.

As a result, no significant commercial market developments have occurred with electro-optic polymer devices. This is because all previously known electro-optic polymer design strategies incorporate molecular structures that adversely react to the requisite polymerization processes that thermally-stabilize the material matrix. This inherent design flaw causes the polymer to melt at unreasonably low temperatures, which corrupts the polymer's electro-optic performance.

Our Company holds an extensive amount of internally developed intellectual property in the field of electro-optic molecular design that, as a whole, attempts to fundamentally solve these and other problems associated with these molecular structures. We believe our provisional patents describe broad, highly unique techniques for novel paradigms in molecular design.

Our innovative solution lies in a very well known scientific phenomenon called aromaticity, which causes a high degree of molecular stability. Aromaticity is a molecular arrangement wherein atoms combine into multi-membered rings and share their electrons among each other. Aromatic compounds are extremely 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. Until now, to our knowledge, no one has been able to propose molecular designs that could effectively exploit aromaticity in the design of a high-performance electro-optic polymer.

We believe now that we have fabricated electro-optic molecular architectures that do in fact exhibit extremely high thermal stability, our technologies may soon replace inorganic electro-optic materials in the marketplace due to their considerable advantages over traditional inorganic fiber-optic materials.

Our Target Markets

Our proprietary electro-optic polymers are designed at the molecular level for potentially superior performance, stability and cost-efficiency and we believe may have the potential to replace more expensive, lower-performance materials used in fiber-optic ground, wireless and satellite communication networks. We believe our electro-optic polymers may have broad applications in civilian and military telecommunications and advanced computational systems. Potential future applications may include: (i) telecommunications; (ii) backplane optical interconnects; (iii) entertainment; (iv) medical applications; (v) satellite reconnaissance; (vi) navigation systems; (vii) radar applications; (viii) all-optical transistors and (ix) photovoltaic cells.

Telecommunications/Data Communications

Telecommunications is one of the primary initial target applications for electro-optic polymers.

Telecommunication companies are currently faced with the enormous challenge to keep up with the tremendous explosion in demand for bandwidth due to the popularity of Internet enabled devices accessing all forms of streaming media, along with voice messaging, text messaging and cloud based data access.

The challenge for these companies is converting digital information in the form of electric signals into optical information and back. Their networks rely upon optical modulators based around inorganic materials, such as lithium niobate, to accomplish this task. These existing legacy modulators have inherent limitations in terms of maximum data rates, error correction, and costs associated with their manufacture and other operating costs related to drive voltage and heat dissipation due to the complexities of producing single crystalline ingots of sufficient diameter (3 to 5 inches). Also, strict environmental controls must be enforced during the growth of the core crystalline material.

Replacing these inorganic materials with organic polymer materials made with Perkinamine™ chromophores would offer significant improvements in data rates; reduce form factor; require less error correction along with a significant

reduction in drive voltage leading to less heat dissipation and hence reduce the overall cost of operation with regard to site cooling. Polymers are not inherently costly to produce nor do they require such strict environmental conditions. Due to their material flexibility (e.g. ability to more easily mold into specific topologies) they are expected to enable smaller, cheaper, faster, less expensive, and more integrated network components. In many laboratory tests, electro-optic polymers have demonstrated substantial (3-10x) transmission data speed improvements over crystalline technologies (lithium niobate, gallium arsenide, indium phosphide).