The mission of the Center for Technology Licensing (CTL) is to bring the University’s scientific discoveries, technological innovations, and medical advances to the marketplace for societal benefit and to foster economic development within New York State and across the nation.

**NEW BUSINESSES**
Descriptions of the new businesses founded in FY2016

**TECHNOLOGIES**
Select emerging technologies developed at Cornell

**UPDATES**
Find out what’s been happening with select Cornell startups

**ACTIVITIES**
CTL’s FY2016 technology transfer activities

**OUTREACH**
Events hosted by CTL during FY2016

**PEOPLE**
Contact information for CTL offices and staff
A MESSAGE FROM THE EXECUTIVE DIRECTOR

I am delighted to present the FY2016 annual report from the Center for Technology Licensing (CTL). In this report, you will find the summary for disclosures, IP protection, licensing, startups and outreach, and stories about technologies. Here are a few highlights of these activities:

- CTL received gross revenue of $15.6 million in FY2016. It is the highest annual income for the program, excluding payments from litigation resolutions. It is a combination of running royalties from existing products and payments from new license agreements.

- Startup activities continue to be strong with 11 new ventures based on Cornell technologies established in FY16. There were also two successful acquisition events for Cornell startup companies in the fiscal year. Together with the new ventures from FY15 and FY14, a total of 37 startups were created in the past three years. In comparison to the numbers from previous years; 26 from FY11 to FY13 and 24 from FY08 to FY10, there is a significant increase in startup formation, an indication of improved entrepreneurship activities and processes at Cornell.

- The overall patent spending from CTL decreased by about $1 million while the same level of patent reimbursement was maintained. This was achieved through a better planning process of effective IP protection and coordination with licensees without compromising the strength of our patent portfolio.

Near the end of FY16, I became the Executive Director of CTL, after serving in the Interim role since the summer of 2014. I deeply appreciate the trust and support from leadership and the community. I am inspired to lead CTL to further enhance the impact of research and education at Cornell.

Building on the improvements and successes of the past several years, CTL will focus on broadening the connections with industry partners and venture communities to advance technology commercialization and research; engaging inventors and entrepreneurs more effectively in the venture creation and licensing process; and working closely with researchers from different campuses and colleges to push forward priorities in commercialization and partnerships.

I welcome suggestions from stakeholders and friends as we strive to build a stronger technology commercialization community together.

Alice Li, PhD, CLP
Executive Director, CTL
NEW BUSINESSES
11 New Businesses - 6 in New York State

Annapurna Therapeutics Limited
Dublin, Ireland
www.annapurnatx.com

Annapurna Therapeutics is a gene therapy company focused on discovering and developing new therapeutic products for people living with severe diseases. Annapurna’s product pipeline includes programs for alpha-1 antitrypsin (A1AT) deficiency, hereditary angioedema (HAE), and the cardiomyopathy associated with Friedreich’s ataxia and severe allergy.

CycloPure, Inc.
Encinitas, California
www.cyclopure.com

CycloPure is engaged in the design, development and commercialization of a new class of highly-adsorbent materials for use in the separation and removal of pollutants, volatile organic compounds (VOCs) and other organic compounds from water and air.

Embank Veterinary, Inc.
Ithaca, New York
www.embarkvet.com

Embank is a veterinary science-focused company specializing in canine genetics. Through the use of cutting-edge genetic testing and analysis, Embark offers 21st century pet wellness advice coupled with comprehensive ancestry, morphological trait, and genetic disease information for dog owners.

FERA Animal Health, LLC
Dryden, New York
www.feraanimalhealth.com

Fera Animal Health is a veterinary company producing the Accumast® diagnostic kit. The culture based system allows dairy farmers to quickly identify the six most prevalent causes of bacterial mastitis to determine appropriate treatment methods.

Ecolectro, Inc.
Willeysville, New York
www.ecolectro.com

Ecolectro develops novel thin films for use as alkaline anion exchange membranes (AAEM) for fuel cells which offer major improvements to the performance and durability of fuel cells. The films fill the ongoing and unmet need for conductive and solvent processable ionomers. Ecolectro’s fuel cells containing AAEMs reduce costs, conserve fuel, and maintain efficiency.

Fesarius Therapeutics, Inc.
New York, New York
www.fesariustherapeutics.com

Fesarius Therapeutics is developing engineered tissue scaffold products for the skin and dermal layers. The products are based off the patent-pending microstructure-containing gel scaffold technology developed at Cornell. The acellular skin replacement will aim to benefit those with wounds resulting from burns, plastic surgery, tumor removal, and other forms of trauma.
Lionano, Inc.
Raynham, Massachusetts
www.lionano.com

Lionano, Inc. is a material manufacturing company commercializing advanced drop-in enhancements for lithium-ion batteries. Lionano’s materials have been shown to increase the energy density, rate capability, and cycle life of Li-ion batteries, especially in the application of electric vehicles.

Quentis, Inc.
New York, New York

Quentis Therapeutics is an immuno-oncology company focused on developing small molecule therapeutics to relieve tumor-mediated suppression of dendritic cell and T-cell activity in solid tumors.

ReconnectNEURO, LLC
Claymont, Delaware

ReconnectNEURO is focused on the treatment of cognitive impairment through the use of deep brain stimulation methods. The stimulation systems work to increase consciousness in patients who are minimally conscious or who have reduced capacity due to trauma, stroke, or other diseases.

Symflor, SAS
Le Kremlin-Bicêtre, France

Symflor is a Cornell startup developing a new class of innovative probiotics for obesity treatment and prevention.

Xallent, LLC
Ithaca, New York
www.xallent.com

Xallent is developing the next generation of Scanning Probe Microscopes (SPM) to enable advanced, rapid, in-line testing of semiconductor devices and thin-films at the micro- and nano-scales. The “probe platforms-on-a-chip” are designed and fabricated using advanced nanoelectromechanical system (NEMS) technologies, enabling simple and cost-effective miniaturization to the nanoscale.
CORNELL STARTUPS: WHERE ARE THEY NOW?

Annapurna Therapeutics Limited

Annapurna Therapeutics, a gene therapy company focused on discovering and developing new therapeutic products for people living with severe diseases, merged with a publicly traded company, Avalanche Biotechnologies, to form Adverum Biotechnologies.

ArcScan, Inc.

ArcScan, a startup developing intelligent visualization technology, received FDA 510(k) clearance for their product, the Insight™ 100, for ophthalmic imaging.

GeneWeave Biosciences, Inc.

Medical diagnostics startup, GeneWeave Biosciences, Inc., was acquired by Roche Holding AG. The company is using GeneWeave’s Smarticles technology to strengthen their microbiological diagnostics.

Novomer, Inc.

The sustainable chemistry company, Novomer, announced a partnership with Ford for the use of the Converge® CO2-based polyols to reduce carbon emissions, pollutants, volatile organic compounds (VOCs) and other organic compounds from water and air.

Waltz Networks, Inc.

OUTREACH

CTL hosts, attends and supports many events and meetings at the Cornell Ithaca campus, NYS Agricultural Experiment Station in Geneva, the Weill Cornell Medicine campus, as well as locations throughout New York State and across the country to promote technology development and commercialization, entrepreneurship, innovations, and economic development.

Each year at the Entrepreneurship@Cornell Celebration event, CTL hosts a New Business & Emerging Technology Showcase™ in the Statler Hotel Ballroom on Cornell’s Ithaca Campus. Celebration is a milestone annual two-day entrepreneurship conference that brings together more than 1,000 alumni, faculty, staff, and students.

Select emerging technologies in the areas of physical and life sciences showcased included:
- Scalable Manufacturing Techniques for Soft Robotics Applied in Biomedical Implants and Orthotics;
- Smartphone Enabled Mobile Health;
- Microalgae for Fish-Oil Enhanced Chicken Meat;
- A Peptide-Based Delivery Template for Combination Therapy

Cornell startups showcased included:
- GrokStyle, LLC;
- ReconnectNEURO, LLC

Historically, CTL hosts the Cornell Technology Venture Forum™ (CTVF) each fall. CTVF was held for its ninth year on October 22, 2015. Last year, ten oral presentations were given. Select presentations included:

- Lionano, Inc., a material manufacturing company and Cornell startup, presented on their advanced drop-in enhancements for lithium-ion batteries.
- Cornell startup, Xallent, LLC, presented on their next generation of Scanning Probe Microscopes (SPM) for the advanced testing of semiconductor devices and thin-films at the micro- and nano- scales.
- Dr. Ehsan Afshari gave a presentation about "TeraCam"; a low cost, harmless, and high precision camera based on terahertz (THz) electromagnetic radiation.

Seminar & Social Hour™

July 1, 2015 – Diagnosing Sleep Apnea with Oximetry Data
April 19, 2016 – Exploring Startup Potential

IP&Pizza™

March 30, 2016 – The Inventor’s Role: Understanding the Tech Transfer Process
April 20, 2016 – Staking Claims: Invention and Commercialization Basics at Cornell
June 8, 2016 – The Inventor’s Role: Understanding the Tech Transfer Process
**HIF-Stabilization and the Prevention of Hyperoxia-Induced Neonatal Lung Disease**

Each year, an estimated 15 million babies are born before 37 weeks gestation worldwide. As a result of premature birth, many infants are diagnosed with respiratory distress syndrome (RDS) and are subsequently given supplemental oxygen to survive. However, the exposure to high levels of oxygen at infancy increases the risk of developing Chronic Lung Disease (CLD) later in life. Hyperoxia (high oxygen levels) induces breakdown of Hypoxia-inducible factor 1 (HIF-1) proteins, which are key to lung tissue development. This can lead to CLD. To protect against CLD, Weill Cornell researchers have identified a pharmacological method of stabilizing HIF-1, which can be delivered locally via oxygen supply.

*Randi Silver*

*Physiology and Biophysics, Weill Cornell Medicine*

**Adenosine Receptor Signaling Regulates the Drug Efflux Transporter, P-glycoprotein**

P-glycoprotein (P-gp) is an efflux transporter protein with a broad substrate spectrum that is expressed in many different cell types that actively pumps foreign substances, including drugs, out of cells. In some cancer cells, P-gp is highly expressed and leads to multi-drug resistance, while P-gp expression in brain endothelial cells makes more challenging drug delivery into the central nervous system. This technology is the use of A2A receptor agonists to increase the effectiveness of drugs for various types of disease, including cancer.

*Margaret Bynoe*

*Microbiology and Immunology*

**Surgical Compression Dressing with Topographical Cell Guidance**

Researchers in the Minimally Invasive New Technologies (MINT) Program have designed a novel compression dressing that utilizes compressive forces to treat small incision wounds. By removing excess fluid and blood from incision sites and providing an air-tight compression system, risk of wound infection is decreased. Furthermore, the topographical cell guidance feature in this technology promotes faster wound healing and decreases future scarring.

*John Cornhill*

*Surgery, Weill Cornell Medicine*

**Solid-State 3D-Nano-Integrated Battery**

Professor Wiesner's group has developed a solid-state nano-integrated 3D-battery that presents macroscopic dimensions and anode, electrolyte, and cathode layer thicknesses of below 20 nm. This invention exhibits secondary battery type cycling, with a reversible discharge plateau at 2.5 V with reversible capacity that has potential applications in energy storage and electrodes meant for high-power demanding applications.

*Ulrich Wiesner*

*Materials Science and Engineering*

**Tree-Like Tube Networks in Garment**

Cornell researchers have developed a new clothing system that integrates micro-scale tubing into apparel fabric for the individual wearer. The tube networks allow for movement of warmer or cooler air to regulate the individual’s temperature while wearing the garment.

*Jintu Fan*

*Fiber Science and Apparel Design*
An Authenticated Data Feed for Blockchains

Smart contracts are a new form of business logic automation implemented with blockchains. For most applications of interest, smart contracts must consume data about real world state or events—stock quotes, shipping manifests, weather data, and so forth. Today, however, trustworthy sources of such data are lacking in blockchain systems. "Town Crier" is an authenticated data feed system that acts as a trustworthy proxy between existing (HTTPS-enabled) servers and smart contracts without any need for users to trust the system’s operators. In addition, Town Crier supports private queries, which offer the critical property of confidentiality for data requests, and custom queries, which make secure use of users’ credentials. Applications include insurance contracts that protect consumer privacy, systems to trade online resources such as games for cryptocurrency, and much more.

Mindless Computing/Emotion Regulation

The concept of Mindless Computing allows the development of technologies to improve our behavior and feelings without requiring our explicit attention and effort. Based on this concept, Cornell researchers devised two technologies: EmotionCheck and MindlessPlate. EmotionCheck is a wearable device that can help individuals to lower their anxiety by manipulating their heart rate awareness. MindlessPlate influences people’s perception of the amount of food on a plate by using an optical illusion, which can help individuals to eat less without their awareness.

Acylsucrose-Producing Tomato Lines with Multiple Insect Resistance

Using specific quantitative trait loci (QTLs) affecting acylsugar structure in tomato, Cornell breeders have selected tomato lines with altered acylsugars. Acylsugars are broad-spectrum insect resistance sugar esters produced at very high levels by some accessions of the wild tomato, Solanum pennellii. Cultivated tomatoes, Solanum lycopersicum, on the other hand produce only extremely low levels of acylsucroses. These newly selected lines of tomato Solanum lycopersicum produce an increased level of acylsugar and present alterations of the sugar moiety of the acylsugar changing it from sucrose to glucose.

Ari Juels
NYC Tech

Martha Mutschler-Chu
Plant Breeding and Genetics
TECHNOLOGY TRANSFER ACTIVITIES*

COMMERCIAL LICENSES
In FY 2016, CTL completed the following licenses:

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014†</th>
<th>2015†</th>
<th>2016†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventions</td>
<td>43</td>
<td>58</td>
<td>48</td>
<td>64</td>
<td>46</td>
</tr>
<tr>
<td>Copyrights</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Copyrights (End-User)</td>
<td>75</td>
<td>33</td>
<td>14</td>
<td>†</td>
<td>†</td>
</tr>
<tr>
<td>Plants</td>
<td>59</td>
<td>70</td>
<td>91</td>
<td>47</td>
<td>51</td>
</tr>
</tbody>
</table>

† The total license numbers reported to AUTM are based on AUTM guidelines to accommodate different types of licenses.
‡ Starting FY 2015, CTL no longer tracks copyright end-user licenses individually. They are recorded in master agreements instead.

U.S. LICENSING BY STATE

* Technology transfer activity metrics may be different from those reported in previous reports due to minor post-report adjustments.
INTELLECTUAL PROPERTY DISCLOSURES
In FY 2016, CTL received 359 disclosures for 313 inventions.

PATENTS
In FY 2016, CTL filed 133 U.S. provisional patent applications, 145 U.S. nonprovisional patent applications, and 205 international patent applications, including Patent Cooperation Treaty (PCT) applications.

Cornell was issued a total of 319 patents - 107 U.S. and 212 international.

**Filed**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Provisional</td>
<td>203</td>
<td>183</td>
<td>146</td>
<td>124</td>
<td>133</td>
</tr>
<tr>
<td>U.S. Nonprovisional</td>
<td>120</td>
<td>147</td>
<td>141</td>
<td>177</td>
<td>145</td>
</tr>
<tr>
<td>International</td>
<td>198</td>
<td>251</td>
<td>258</td>
<td>244</td>
<td>205</td>
</tr>
<tr>
<td>TOTAL</td>
<td>521</td>
<td>581</td>
<td>545</td>
<td>545</td>
<td>483</td>
</tr>
</tbody>
</table>

**Issued**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>91</td>
<td>73</td>
<td>92</td>
<td>109</td>
<td>107</td>
</tr>
<tr>
<td>International</td>
<td>75</td>
<td>97</td>
<td>139</td>
<td>176</td>
<td>212</td>
</tr>
<tr>
<td>TOTAL</td>
<td>166</td>
<td>170</td>
<td>231</td>
<td>285</td>
<td>319</td>
</tr>
</tbody>
</table>
## REVENUES

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>5-YR TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing</td>
<td>$9,132,385</td>
<td>$7,655,259</td>
<td>$11,124,292</td>
<td>$8,420,247</td>
<td>$12,307,783</td>
<td>$48,639,966</td>
</tr>
<tr>
<td>Extraordinary*</td>
<td>$474,521</td>
<td>$196,863</td>
<td>$23,370</td>
<td>$9,456</td>
<td>$3,266</td>
<td>$707,476</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$12,644,399</td>
<td>$10,958,745</td>
<td>$14,328,495</td>
<td>$12,039,129</td>
<td>$15,557,644</td>
<td>$65,528,412</td>
</tr>
</tbody>
</table>

*Extraordinary income includes non-recurring items such as sale of equity and payments resolving patent litigation cases.

As of the end of FY 2016, Cornell holds private equity in 43 companies with licensed Cornell technology, the value of which cannot be reliably estimated at this time. Cornell holds promissory convertible notes in the principle amount of $8,500,000.

## EXPENSES

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>5-YR TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal</td>
<td>$5,386,858</td>
<td>$6,613,758</td>
<td>$7,110,038</td>
<td>$7,289,810</td>
<td>$6,068,924</td>
<td>$32,469,388</td>
</tr>
<tr>
<td>Extraordinary*</td>
<td>$193,154</td>
<td>$38,566</td>
<td>$12,428</td>
<td>$170,056</td>
<td>$181,219</td>
<td>$595,423</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$9,661,459</td>
<td>$11,337,020</td>
<td>$11,350,449</td>
<td>$11,723,241</td>
<td>$10,086,532</td>
<td>$54,158,701</td>
</tr>
</tbody>
</table>

*Extraordinary expenses include expenses for litigation.

## MANDATORY DISTRIBUTIONS

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>5-YR TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventor-Author Share</td>
<td>$3,197,335</td>
<td>$2,331,831</td>
<td>$2,389,036</td>
<td>$2,454,689</td>
<td>$3,318,066</td>
<td>$13,690,957</td>
</tr>
<tr>
<td>Joint Titleholders Share</td>
<td>$273,098</td>
<td>$309,248</td>
<td>$242,667</td>
<td>$434,727</td>
<td>$316,933</td>
<td>$1,576,673</td>
</tr>
<tr>
<td>Research Labs/College Share</td>
<td>$1,987,132</td>
<td>$1,699,428</td>
<td>$1,747,495</td>
<td>$1,930,104</td>
<td>$1,829,887</td>
<td>$9,194,046</td>
</tr>
<tr>
<td>CTL-University Share</td>
<td>$3,591,266</td>
<td>$3,258,147</td>
<td>$3,449,529</td>
<td>$3,916,194</td>
<td>$4,517,008</td>
<td>$14,215,136</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$9,048,831</td>
<td>$7,598,654</td>
<td>$7,828,727</td>
<td>$8,735,714</td>
<td>$9,981,894</td>
<td>$38,676,812</td>
</tr>
</tbody>
</table>
INTELLECTUAL PROPERTY GOVERNANCE BOARD (FY 2016)

ROBERT BUHRMAN
Senior Vice Provost for Research and Vice President for Technology Transfer, Intellectual Property, and Research Policy

MICHAEL KOTLIKOFF
Provost

AUGUSTINE M.K. CHOI
Interim Provost for Medical Affairs and Interim Dean of Weill Cornell Medicine

DAN HUTTENLOCHER
Vice Provost and Founding Dean of Cornell NYC Tech Campus

ADVISORY COMMITTEE (FY 2016)

KATHRYN BOOR
Ronald P. Lynch Dean of the College of Agriculture and Life Sciences

ROBERT BUHRMAN (CHAIR)
Senior Vice Provost for Research and Vice President for Technology Transfer, Intellectual Property, and Research Policy

AUGUSTINE M.K. CHOI
Interim Provost for Medical Affairs and Interim Dean of Weill Cornell Medicine

LANCE COLLINS
Joseph Silbert Dean of the College of Engineering

DAVID FISCHELL
Trustee Emeritus and Overseer

SAMUEL FLEMING
Trustee Emeritus and Overseer

STEVEN GAL
Visiting Associate Professor of Clinical Entrepreneurship

GREGORY GALVIN
Alumnus

STEVEN GROSS
Professor

LORRAINE GUDAS
Professor

ROBERT HARRISON
Chairman of the Board of Trustees and Overseers

DAN HUTTENLOCHER
Vice Provost and Founding Dean of Cornell NYC Tech Campus

MICHAEL KOTLIKOFF
Provost

ALICE LI (SECRETARY)
Executive Director of Center for Technology Licensing at Cornell University

MARCUS LOO
Trustee Emeritus

DAN LUO
Professor

JOEL MALINA
Vice President for University Relations

ALAN MATHIOS
Rebecca Q. and James C. Morgan Dean of the College of Human Ecology

KEVIN MCGOVERN
Trustee Emeritus

PHIL PROUJANSKY
Alumnus

PHILIP REILLY
Trustee Emeritus and Overseer

GENE RESNICK
Trustee

GRETCHEN RITTER
Harold Tanner Dean of the College of Arts and Sciences

PAUL STREETER
Vice President for Planning and Budget

LORIN WARNICK
Austin O. Hooey Dean of the College of Veterinary Medicine

JAMES MINGLE
University Counsel and Secretary of the Corporation

KENNETH MIRANDA
Chief Investment Officer

GREG MORRISETT
Dean of Faculty of Computing and Information Science

COLIN PARRISH
Professor
EXECUTIVE DIRECTOR
Alice Li
xl11@cornell.edu

TECHNOLOGY COMMERCIALIZATION
Ithaca Office
Phil Owh (Associate Director)
po62@cornell.edu
Jeff Fearn
jcf55@cornell.edu

Plant Varieties & Germplasm
Jess Lyga
jml73@cornell.edu

Physical Sciences & Engineering
Martin Teschl (Associate Director)
mt439@cornell.edu
Pat Govang
pjg26@cornell.edu
Carolyn Theodore
cat42@cornell.edu

WCM Office
Brian Kelly (Director, Technology Licensing)
bjk44@cornell.edu
Dan-Oscar Antson
da429@cornell.edu
Vibhu Sachdev
vs427@cornell.edu

COMMUNICATION & ADMINISTRATION
Laura Salter
lc12@cornell.edu

INTELLECTUAL PROPERTY SERVICES
Michelle Shields
mms67@cornell.edu

CONTRACT & FINANCE
Yalverton Luckain
yl2677@cornell.edu

GENERAL INQUIRIES
ctl-connect@cornell.edu
www.ctl.cornell.edu
CornellTechTransfer
@CU_TechTransfer