the Power of Discovery

BTI

2017

IN REVIEW

Mission
To advance and communicate scientific discovery in plant biology to improve agriculture, protect the environment, and enhance human health.

Values
Integrity, Mutual Respect, Excellence, Collaboration, Innovation

Vision
The Boyce Thompson Institute will be known internationally for research excellence in plant biology and discoveries that benefit society.

the Power of Discovery

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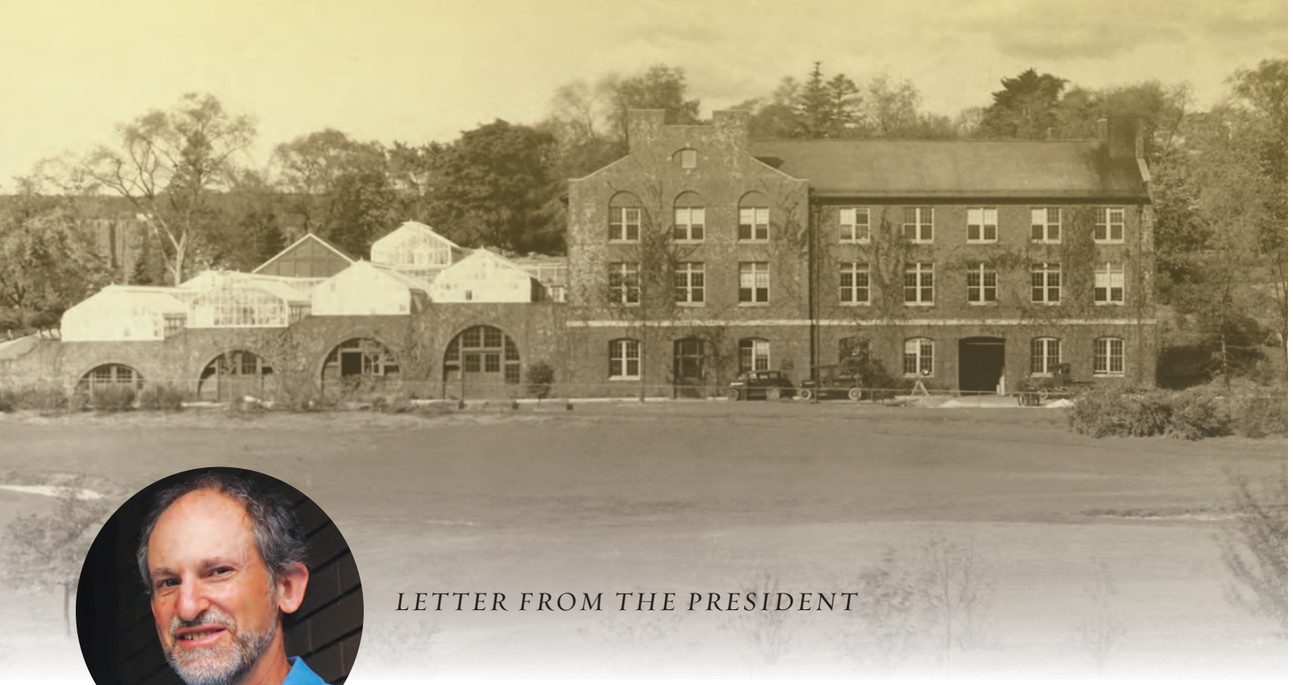
About the cover: In collaboration with scientists from Cornell University and Shandong University in China, the Fei group traced the apple's evolutionary journey along the historic Silk Road trading route. The discoveries could help breeders develop apples that feature improved disease resistance, taste, and larger fruits.



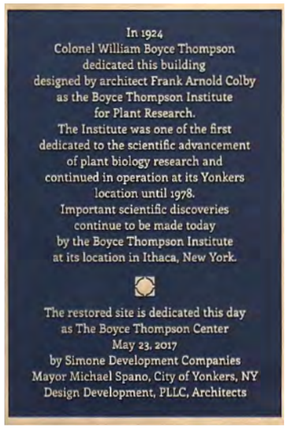
LETTER FROM THE PRESIDENT

David Stern

BTI was founded nearly a century ago in Yonkers, New York, on bluffs overlooking the Hudson River. The 315-mile arc of this storied river is a metaphor for discovery. It begins with small ponds and creeks, and ends in a large, magnificent estuary stretching nearly half the river's length. Discoveries, too, begin as small findings and surprises, yet their impact on our lives can be broad and deep. BTI exists to make discoveries, among them ones that will ultimately contribute to agriculture and a stable food supply.

BTI thrived in Yonkers for half a century, until a changing local landscape and better scientific opportunities dictated a move to the Cornell University campus, where we flourish today. Today's BTI scientists would find it unimaginable not to be surrounded by the intellectual and technical richness of Cornell, where our collaborations stretch across the university and beyond. During these years, the Yonkers site decayed, a silent witness to the march of time.

I, along with a curious and sometimes wistful contingent of staff, emeriti, donors, and friends, was thrilled to attend the May dedication of the Boyce Thompson Center in Yonkers. The mixed-use Center revives and enhances the legacy architecture, and places a great emphasis on the history and current importance and trajectory of plant science. To visit the Center and view the numerous exhibits and works of art dedicated to BTI science is to recall its origins, learn about the current incarnation of BTI, and share the magic of plant science discovery.



Plaque commemorating the opening of the Boyce Thompson Center on May 23rd, 2017.

In the process, we have looked back a century, and also ahead. While we have much to celebrate – a new Computational Biology Center, a human health spinoff, exciting findings on the history of the apple, insights into how fungi and plants do business, and much more – complacency is a stealthy enemy. BTI has operated under a series of strategic plans, but we felt that it was time to take stock of the future.

This year, we used a tool called scenario planning to imagine not just one, but four futures, 20 years ahead, around a theme of maximizing BTI's impact. Why four alternative futures? Because no one can predict the "real" future to use for planning purposes. The four scenarios range from a "renaissance" where science is broadly valued and supported, to a "critical" situation where scientists play whack-a-mole with an ever-expanding set of environmental and societal challenges. BTI can meet the needs of any scenario with its nascent plan, which calls for scientific excellence married to nimbleness, adaptation, a highly collaborative culture, and enabling infrastructure. You'll find more about this process, and the results, in the centerfold of this report. The completed plan will be featured on our website in mid-2018.

I invite you to share in these plans for the future, and the successes of 2017, as you explore this report. Thank you for your passion for science and your belief in the promise of discovery.

LETTER FROM THE BOARD CHAIR

Laura A. Philips

2017 marked the one-hundred-year anniversary of William Boyce Thompson's Red Cross expedition to war-torn Russia. Upon touring the country, Thompson witnessed, first-hand, the repercussions of an unstable food supply. He returned to the United States inspired to create an institute devoted to discoveries in plant science, which he hoped would sustain and improve the American way of life.

A century later, BTI continues to pioneer in new frontiers. The Board of Directors is proud of the Institute's founding mission, and we take pride in helping to sustain that vision and ensuring that the crucial research being done in Ithaca receives the support it deserves. I want to express my appreciation and congratulations to my colleagues for a third straight year of 100% board participation in BTI's annual fundraising campaign. Our collective contributions once again demonstrate the Board's commitment to BTI's research, and reinforce our belief that BTI is crucial in global efforts to support agriculture, the environment, and human health.

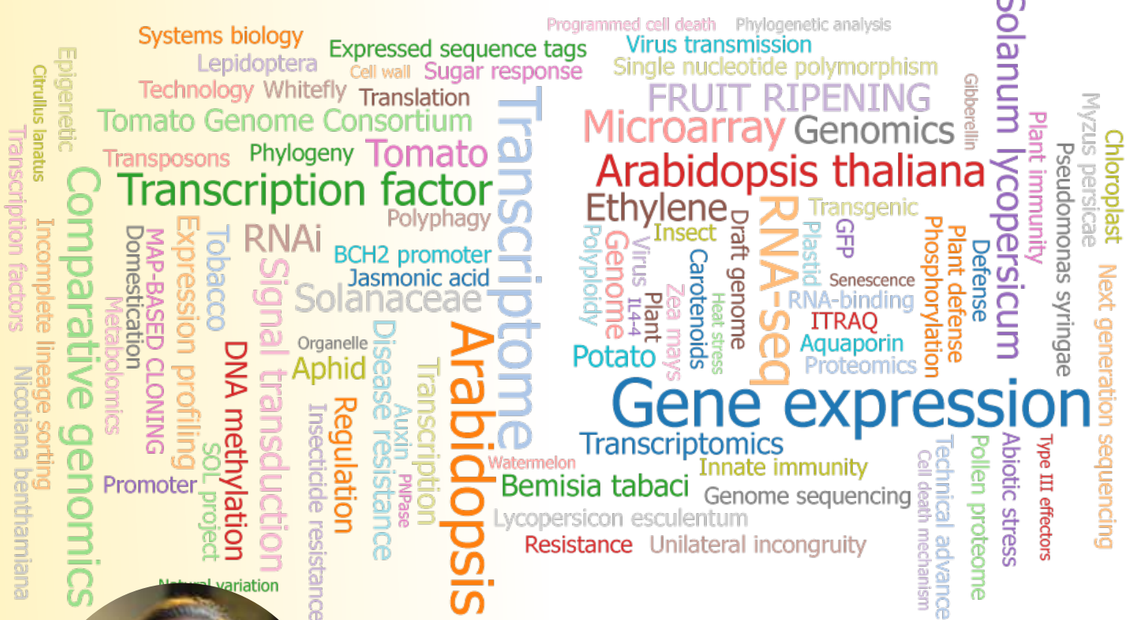
The Board also congratulates BTI's Institutional Advancement staff on leading a fundraising campaign that surpassed its goal by 40%, marking a 65% increase over last year's accomplishment, and demonstrating increased public engagement and awareness for the important research being done at BTI. Along the way, several goals were met that unlocked leadership-sponsored scholarships to first generation college students in various schools throughout the greater Ithaca area and in W.B. Thompson's home town of Butte, Montana. This outpouring of philanthropic support is inspiring and the Board is excited to see how this generosity fuels discovery at BTI.

The Board is also pleased to announce the addition of three new members in 2017. Christine Smart is the newly appointed director of Cornell's School of Integrative Plant Science (SIPS) and also serves on BTI's Scientific Advisory Board. Susan McCouch is an adjunct faculty member at BTI and Professor, Plant Breeding and Genetics Section in SIPS. Finally, Oliver Schulze, the great-great grandson of W.B. Thompson and a partner at Curo Pet Care, brings an entrepreneurial spirit and family connection to the Board. These three talented professionals each bring unique skillsets that expand the perspective that we can bring to advance the work of BTI.

We also participated in the strategic planning process, spending a day collectively imagining and planning for the future of the Institute. The experience was eye-opening as we pushed to envision different future research environments, and thought about how BTI would continue to thrive in the diverse conditions we may encounter. At the end of the day, the Board acknowledged that while the future will no doubt hold unanticipated challenges, BTI is a powerful and nimble organization prepared for whatever the future brings. We feel both steeped and grounded in our research landscape, and stand ready to provide guidance to the Institute, regardless of the research environment in which we find ourselves.

Past and present members of the BTI community united in celebration at the grand opening of the Boyce Thompson Center in May, 2017.

Photo provided by Simone Development LLC.



Eric Richards

LETTER FROM THE VICE PRESIDENT OF RESEARCH

The halls of BTI are bustling with 150+ people 'doing science', a phrase that encompasses many different activities. We are in the discovery business and the success of that mission requires a large community working in many different capacities— at the bench, in the greenhouse and other core facilities, and through the web of interactions that are required to execute less visible but essential tasks, like ordering materials, fixing equipment, and paying the bills. BTI scientists are grateful for the dedication of the staff and their exceptionally high level of service and support, which enables the scientists' work.

The underlying motivation for most practitioners is the joy of discovering something new—from figuring out a new technique to finding a missing puzzle piece or opening up a new field. Apart from the inherent delight and gratification of the scientific pursuit, we recognize that our discoveries ultimately connect to real-world problems. Throughout its history, BTI has balanced pure discovery and the practical applications of the resulting knowledge. Our founder recognized that plant research could increase food security and also provide fundamental knowledge with far-reaching implications outside of plants, including human medicine. The diverse projects that characterized the early days of BTI in Yonkers demonstrated a commitment to those dual motivations. For example, BTI scientists launched a program in the 1920s to study and combat the decline of estuaries in Virginia and North Carolina in response to a plea from members in the local community who were interested in preserving migratory bird life in those regions. At the same time, pioneering research was underway at BTI that helped establish the molecular nature of plant hormones.

BTI continues to hew to its founding vision to tackle fundamental questions while also addressing practical problems. In the 1990s, BTI invested heavily in the promise of plant molecular biology, and more recently in genomics, in an effort to define the mechanistic basis of plant processes. On the surface, this effort appeared to be a move decidedly toward fundamental science and one preoccupied with a subcellular view, which some feared might miss the forest for the trees. But that work allowed BTI scientists to apply the knowledge gained to real-world problems, notably by working with industry partners licensing BTI intellectual property. More recently, the tools of molecular biology and genomics, and the various "-omic" technologies that are now allied with those approaches, have allowed BTI to seek solutions to practical problems head-on. Current examples include Michelle Heck's work on citrus greening disease and her partnership with Lukas Mueller's group, in conjunction with collaborators outside BTI, to generate resources to fight this critical threat to the citrus industry. Another example is Georg Jander's work on plant-insect interactions and his leadership of a recently-funded collaborative project to deploy insect allies for protection of crops from rapidly emerging pests or diseases.

These snapshots illustrate how BTI research continues the legacy of exploring the fundamental processes that underpin biology but also grappling with practical problems. As we look forward to a successful 2018, I would like to express my gratitude for your support of BTI as well as your direct participation in its mission.

Scholars@Cornell has unveiled technologies, including keyword cloud visuals, that help to curate BTI's publications and research collaborations.

Meet the BTI Faculty

Gary Blissard
BTIscience.org/blissard
How do viruses interact with insects?

Carmen Catalá
BTIscience.org/catala
The making of a fruit: What are the processes involved in fruit formation?

Michelle Heck
BTIscience.org/heck
How do pathogens commandeer plants and insects to promote their own transmission?

Zhangjun Fei
BTIscience.org/fei
How can scientists access and use massive amounts of plant genomics data?

Jim Giovannoni
BTIscience.org/giovannoni
What is the genetic basis of fruit ripening and nutritional quality?

Maria Harrison
BTIscience.org/harrison
How do plants form symbiotic associations with fungi to access phosphate from the soil?

Georg Jander
BTIscience.org/jander
How do plants defend themselves against insect herbivory?

Daniel F. Klessig
BTIscience.org/klessig
Uncovering salicylic acid's roles at the crossroads of plant and human health

Fay-Wei Li
BTIscience.org/li
What are the evolutionary and genetic factors that shaped plant diversity?

Gregory Martin
BTIscience.org/martin
How do bacteria infect plants and how do plants defend themselves from attack?

Lukas Mueller
BTIscience.org/mueller
How can genomics contribute to improved crop breeding?

Eric Richards
BTIscience.org/richards
How does the three-dimensional organization of the genome within the cell affect gene activity?

Frank Schroeder
BTIscience.org/schroeder
Missing pieces in the chemistry of life: biogenic small molecules control development and aging.

David Stern
BTIscience.org/stern
How can combining genetics and Big Data help us understand and improve photosynthesis?

Joyce Van Eck
BTIscience.org/van-eck
How can biotechnology create better crops?

HONORING THE PAST

Two former faculty members passed away in 2017, and will be remembered fondly for their contributions to the Institute and the larger scientific community.

Dr. Edward (Ted) Buckley
BTI faculty member, 1965-1990
Ted led critical research projects involving estuarine ecosystem rehabilitation. He was a proud supporter of BTI's research and his wife, Janet, has continued in the philanthropic sentiment.

Dr. Klaus Apel
BTI faculty member, 2008-2016
Klaus' lab discovered the impacts of singlet oxygen in plant stress responses and its importance in signaling. His combination of expertise, inquisitiveness, and determination will be missed at BTI and around the world.

The Uncharted Course to Discovery

At one time, societies believed the Earth to be flat. People gazed out over the ocean, imagining a cliff at the end of the world. The Age of Exploration eventually squashed this theory, introducing Europe to land masses and raw materials they did not know existed. The ripple effect of these revelations cannot be understated. Ponce de Leon, Vasco da Gama, Magellan, and others explored for the sake of discovery and the hope for riches, unsure of what they would encounter. The vessel was their lab, the stars and navigation tools were their instruments, and if they were lucky, state-sponsored funding paid for it all.

500 years later, scientists represent our great explorers, hunting not for new land, but for understanding. For some, it's a journey into the deep abyss of molecular biology. For others, a quest to reveal the chemistry of life. Research charts a path to enlightenment, unlocking knowledge that can be used by colleagues around the world to improve and protect our way of life. This is the power of discovery.

For 93 years, the scientists at BTI have ventured into new corners of plant, fungal, insect and chemical biology. Their research has offered valuable insights into how we might maintain an adequate food supply, while protecting our most precious natural resources. 2017 was no exception, and marked another year in which BTI science honored its mission to support agriculture, the environment, and human health.

Fei Group's seasonal science makes headlines

Dr. Zhangjun Fei and his group members have developed an impressive reputation for analyzing genomic datasets. In 2017, they also produced several publications in perfect harmony with the seasons. In September, the Fei group and collaborators from Cornell University and Shandong University in China revealed the apple's evolutionary journey along the historic Silk Road trading route. This research offered several breakthroughs, including a better understanding of the common apple's true origin, as well as the revelation that the apple traveled both west and east along the Silk Road. Previous studies only identified the western travels to Europe. Fei's research stands to benefit apple breeders looking to improve taste and disease resistance. These apple revelations captured the imagination of the media as Fei lab's work was featured globally through outlets including *The Guardian, The Times of London, Food and Wine, BBC, Smithsonian,* and more.

Just in time for Halloween, and in collaboration with the National Engineering Research Center for Vegetables in Beijing, Fei published an analysis of the *Cucurbita maxima* and *Cucurbita moschata* genomes, two pumpkin species in high demand for their decorative appeal and nutrition. This revelation promises to have an impact on nations struggling with food insecurity. "Pumpkins are used as a staple food in many developing countries and are cultivated all over the world for their culinary and ornamental uses," said Fei, who was the senior author of the paper. "The high-quality pumpkin genome sequences will lead to more efficient dissection of the genetics underlying important agronomic traits, thus accelerating the breeding process for pumpkin improvement."

The power of algae fuels the Stern Lab

For several years, there has been a lingering hope that a breakthrough would occur involving algae as a legitimate successor to fossil fuels. As tests and trials have fallen short, research continues as scientists try to harness the power of this unique organism, which replicates at a feverish pace using only water and sunlight.

Enter BTI's Stern Lab, who, in a collaboration with Texas A&M University, released a paper focused on a revolutionary new concept: algal droplet bioreactors on a chip. The conversion to fuel rests upon two functions of algae, their ability to grow to high density, while maintaining a high content of useful oils. To date, scientists have been forced to study replication and hydrocarbon production separately, but this discovery changes the game. "This is the first microsystem that allows both lipid content analysis and growth rate measurement at high throughput, whereas previous work could only do one or the other," remarked senior author and engineer, Arum Han of Texas A&M University.

These bioreactors won't springboard the world to cars powered by algae just yet, but they do create a more efficient research environment in the hunt for algal strains with ideal characteristics. "The important thing is to develop a tool that can screen millions of cells in a short time frame and small space. In a chip which houses millions of droplets of cells, each droplet is like a flask or a bioreactor, and that's how we can get results faster from just a tiny chip," explained author and BTI post-doc, Shih-Chi Hsu. There is still much work to be done, and the Stern Lab's research is a step forward in identifying strains that could bring the potential of large-scale algal oil production to fruition.

At left: Chen Jian (left) and Shan Wu (right), postdocs in the Fei Lab, Above: postdoc Mahdiyeh Bigham (left) and visiting scholar Sara Shakir (right) in the Jander Lab.

New support for innovation in the Jander Lab

When it comes to exploring insect-plant interactions, few do it better than BTI's Jander Lab. In 2017, they successfully competed for awards from multiple government agencies. First, the National Science Foundation's (NSF's) Biological Science Directorate awarded a grant through the Enabling Discovery through Genomic Tools (EDGE) program. On top of that, the Jander Lab received an award from the Defense Advanced Research Projects Agency (DARPA) Insect Allies program.

The EDGE grant will allow Georg Jander and his collaborators, including BTI's Mueller Lab, to create genetic and genomic resources for common milkweed *(Asclepias syriaca)* and tropical milkweed *(Asclepias curassavica)*. While milkweed is an important host for insects such as monarch butterflies and bumble bees, its biology offers important insights for plant biologists. Of particular interest are the chemicals produced by milkweeds to communicate with insect partners and defend against attack from unwanted insects. "Using milkweed as a model will help researchers to transition from analyzing these plants at a macro scale to looking at their molecular makeup," said Jander.

"These tools will help bridge the gap between genomics and ecology. Looking at ecologically-relevant plants can help us determine how the main similarities and differences among lineages evolved, and how that can explain the metabolic diversity that we see today."

The DARPA award supports the Viruses and Insects as Plant Enhancement Resources (VIPER) project, which will help Jander and his collaborators to develop insect-vectored viruses that will help improve the adaptability and resistance of maize crops. Maize, or corn, is the most valuable crop in the United States, and 30% of it is lost to insect damage each year. "The biggest impact of the VIPER project will be the development of a toolkit to rapidly counter sporadic and emerging threats to this valuable crop," said Jander. While the benefits to maize are potentially extraordinary, the benefits created by the VIPER team are also expected to be transferrable to a variety of other important crops.

Heck Lab leading the charge against Citrus Greening Disease

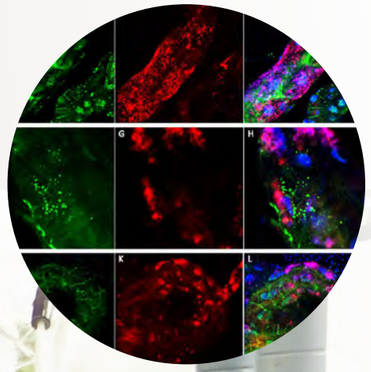
Citrus fruits are such a consistent part of many people's daily lives that many rarely consider that they might one day become scarce. One might be startled to hear that citrus greening disease has killed nearly 150,000 acres of Florida orange groves to date and the threat remains uncontained. The disease costs growers hundreds of millions in revenue each year, along with the elimination of over 8,000 jobs annually.

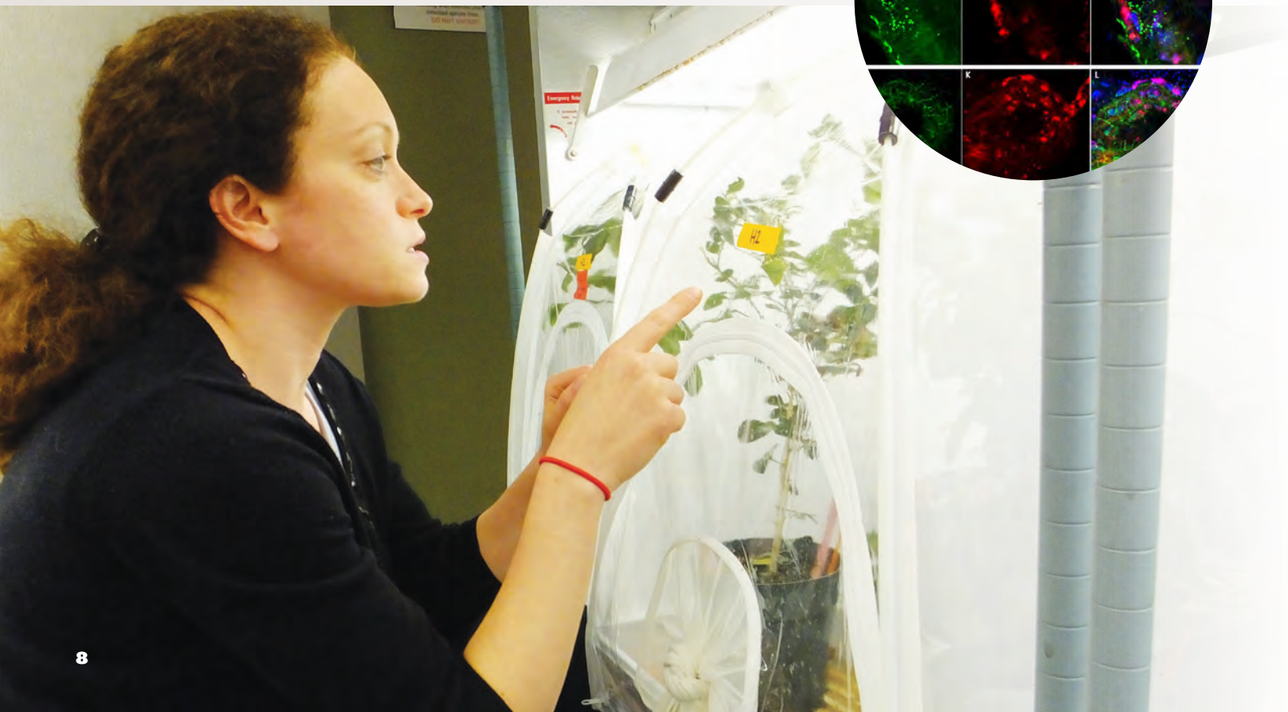
At BTI, Michelle Heck's lab works to unlock discoveries that will help bring an end to this epidemic. Heck has emerged as a global leader in the fight to defeat citrus greening, and last year her accomplishments were recognized at the highest level. One of the final actions by the outgoing Obama administration was to honor Michelle with the Presidential Award for Early Career Scientists. "I congratulate these outstanding scientists and engineers on their impactful work," said President Obama in a statement. "These innovators are working to help keep the United States on the cutting edge, showing that federal investments in science lead to advancements that expand our knowledge of the world around us and contribute to our economy."

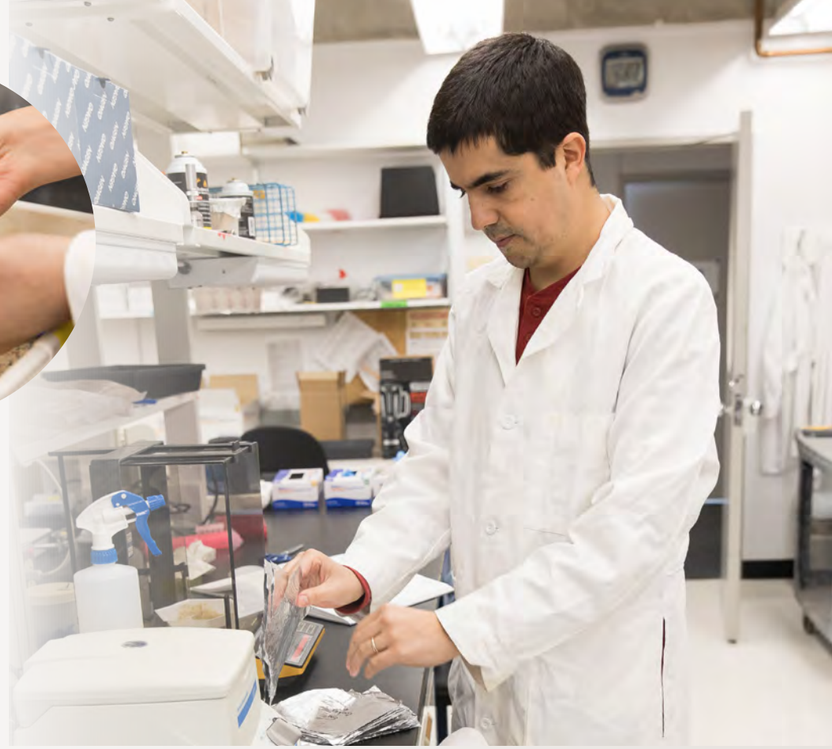
This praise marked a momentous start to a year where the Heck Lab would be at the heart of several publications that bring scientists closer to putting the brakes on citrus greening. The first focused on a revelation regarding the Asian citrus psyllid, the insect responsible for spreading the disease. The Heck Lab found that certain psyllids displayed blue abdomens, a sign of high levels of an oxygen-transporting protein called hemocyanin. They noted that the color changed based on the amount of hemocyanin present, as gray and yellow abdomens were also observed.

This "blue belly" on the insect could be a key indicator that the psyllid is infected with the bacterium that causes citrus greening. "The study is allowing you to look at your population of insects and say something about the immune system of the insect based on its color," said lead author John Ramsey. "There's the possibility that this could be a useful part of grove surveillance." The Heck Lab will continue to investigate whether the insect's color determines its ability to transmit citrus greening disease, and offers the hope of a long-term solution for the disease.

While citrus greening is a focus for many researchers, most attention is diverted to the bacterium that causes the disease, and not the insect that spreads it. To gain a better understanding of the Asian citrus psyllid, or ACP *(Diaphorina citri)*, BTI's Heck and Mueller labs teamed up with 21 partner institutions to publish a draft assembly and annotation of the ACP genome, comprising 530 manually curated gene models and 20,000 automatically predicted genes. "It is essential to have detailed genetic and genomic knowledge to tackle the psyllid,
but a lack of this information had been very problematic," according to Surya Saha, BTI senior bioinformatics analyst and project leader. "Now, an annotated ACP genome exists, containing a wealth of information needed to develop molecular-based solutions to combatting this pest."







Harrison Lab goes to the root of the problem

As political leaders, farmers, and scientists maintain collaborations to address the monumental challenge of feeding 9 billion people by 2050 on roughly the same amount of farm land, one cannot overestimate the need to develop more sustainable and efficient growing methods. Currently, farmers utilize massive amounts of phosphorous-rich fertilizer to provide nutrients to crops, which is often inefficient and the cause of many environmental problems such as water contamination. While the global population increases, access to phosphate, an important natural fertilizer, is decreasing. This begs a perilous question: how do we farm in a world where phosphate is a scarce, expensive resource?

Maria Harrison believes the answer to the question could lie within a 400-million-year old symbiotic relationship in the soil, between plant roots and a group of fungi called Glomeromycota. In exchange for the food it receives from the plant, the fungi transfer phosphate to the roots. Harrison has studied this relationship for several years, and new breakthroughs offer further insight into how these relationships can be managed to offer more plants a naturally-occurring conduit for nutrients.

The Harrison Lab recently revealed an exciting new understanding of the "food" the plants feed to the fungi. Existing theories suggested sugars as the lone menu item for fungi, but, in collaboration with Dr. Peter Dörmann at the University of Bonn, the lab found the existence of lipids, or fatty acids, as well. "Until recently, it has been assumed that the fungus obtains sugar from the plant and can manage to make other essential nutrients itself," Harrison explains. "However, this is not the full story." This crucial discovery shows the fungi are almost completely dependent on the plant for survival, versus simply obtaining a portion of their diet from the roots. "Without the basic lipids that are obtained from the plant, the fungi cannot produce the complex lipids that it requires to live," says the first author of the study, BTI postdoc Armando Bravo.

At left: Michelle Heck, and above: Armando Bravo, postdoc in the Harrison Lab.

The Harrison Lab also made strides in understanding the lifespan of the plant-fungus relationship, specifically the plant's decision to terminate the relationship if the fungi do not deliver phosphate (via a specialized form of the fungus, called an arbuscule). The plant's ability to break away from the fungi may be a key reason this symbiosis has existed for so long. To understand the process, the Harrison Lab studied the regulators that control it. "Regulation of arbuscule lifespan may provide an avenue for obtaining more effective symbiosis," proposed Harrison. "If you can extend arbuscule lifespan slightly, possibly by modifying when the degeneration program is triggered, then there is time for additional [phosphate] delivery."

Near the end of 2017, the Harrison Lab and collaborators heard that they will receive a $5 million National Science Foundation grant to study genes that help legumes access soil nutrients. Using gene editing to make precise changes in the plant genome, the Harrison Lab will develop *Medicago truncatula* mutants to identify the functions of genes they believe to be important for the relationship with arbuscular mycorrhizal fungi. With these new insights, researchers hope to reduce dependency on chemical fertilizers while finding alternative methods for delivering crucial nutrients to important crops.

The ripple effect of discovery

As scientists continue to sail into the uncharted areas of plant and insect biology, they may not always know what they are looking for. What they appreciate is that discovery is the revelation of something not yet known. Once knowledge surfaces, it must be shared. BTI accomplishes this through different means including scientific publications, public seminars, and technology transfer, allowing the entire scientific community, and beyond, to leverage new insights for education, further research, and technological innovations. That is the true power of discovery.

Technology Transfer

TRANSLATING RESEARCH INTO BENEFICIAL VENTURES

The famous French microbiologist, Louis Pasteur, once said: *"there is no such thing as applied science—there is only science and its applications".*

An important part of BTI's mission is to ensure that discoveries made at BTI have a positive impact on society and that technology is applied in ways that are most useful. The Technology Transfer office works with BTI researchers to identify potential new technologies developed in the labs, to protect those technologies, and to find the best ways to deploy them, often in conjunction with outside partners.

Of seven new 2017 invention disclosures, two examples are a new resistance gene for protecting tomatoes against disease, discovered in the Martin lab, and new methods developed in the Harrison lab for the growth of beneficial fungi that promote plant growth. The former could help tomato growers improve yields in the face of ever-changing disease threats to their crops, while the latter could help improve agricultural yields in an environmentally-friendly way with a reduction in the need to mine and apply phosphate-based fertilizers.

2017 also saw the birth of a start-up company, Ascribe Bioscience, whose platform uses BTI small molecule technology to boost the immunity of plants against a whole host of agricultural diseases. Ascribe is an Ithaca-based company and was co-founded by three BTI scientists and a local entrepreneur. BTI is working closely with the company to help it secure funding and grow into a competitive force in the agricultural biotechnology community.

In 2017, BTI also filed two new patent applications, and received two new issued patents. Two new license agreements were finalized this past year, and many commercial and academic entities launched into new evaluations of BTI technology.

Communicating Science

ENGAGING THE PUBLIC IN BTI RESEARCH

The communication of science is a pillar of BTI's mission and BTI continues to push the boundaries for what it means to engage the public and disseminate scientific knowledge.

2017 saw BTI science appear in over 1,600 news articles, reaching hundreds of millions of readers around the globe. Such publications included *Nature, The Smithsonian, The Economist, Food and Wine, The Guardian, Times of London, BBC, Phys.org, Science Daily,* and more.

Utilizing a diversity of digital content, the BTI social media communities all enjoyed significant growth in size and engagement.

A new podcast, the BTI Science Bomb, debuted in March and currently has a dozen episodes featuring faculty, post-doctoral scientists, donors, and interns.

For the first time in its 16-year history, BTI offered a livestreamed broadcast of the Plant Genome Research Program (PGRP) Summer Intern Symposium. Hundreds of family members, friends, and science enthusiasts from around the country were able to watch the impressive young scientists present their summer research. Livestreaming was utilized again in November's Giving Tuesday programming for a day-long broadcast that featured discussions with scientists from six different BTI labs, as well as local supporter Ron Cooper, and past BTI President, Charlie Arntzen.

BTI Communications teamed up with the Cornell Alliance for Science and Cinemapolis, an Ithaca-based theater, to present a screening of the documentary "Food Evolution." An audience of 100 people from the greater Ithaca community watched the movie, then engaged in a panel discussion with scientists, farmers, and science communicators, some of whom were featured in the film.

The BTI website was transformed to offer a more engaging and educational experience for visitors. The integration of real-time content feeds and publication metrics allow visitors to quickly understand the purpose and impact of BTI science.

BTI's 2017 communications efforts have positioned the Institute to be a leader in the increasingly important world of science communication, while successfully conveying the power of BTI's discovery research to the public and science community at large.


INDEPENDENT SINCE 1880

The Cornell Daily Sun

News Opinion Sports Arts & Entertainment Science Dining Multimedia Sunspots Interactive Projects

Heidi Schumann / New York Time

Petri dishes containing oil producing algae strains that could soon be experimented with using Prof. Davic Stern's bioreactor chip.


Smithsonian.com SUBSCRIBE SMARTNEWS HISTORY SCIENCE INNOVATION ARTS & CULTURE TRAVEL

How the Silk Road Created the Modern Apple

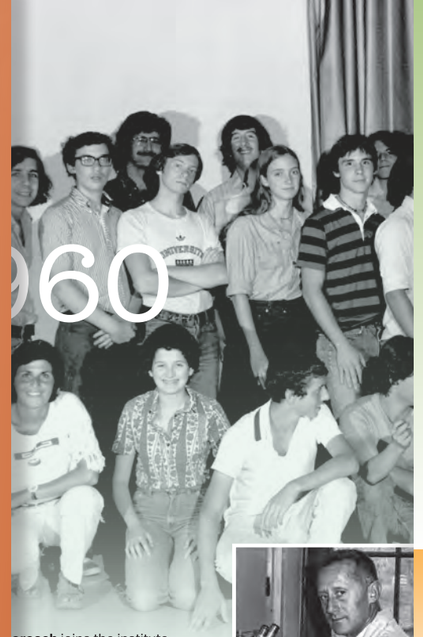
A genetic study shows how wild Kazakhstan apples disbursed by traders combined with other wild species to create today's popular fruit

Celebrating the Past

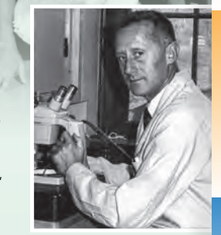
After the Boyce Thompson Institute relocated to Ithaca in 1978, the original building and grounds in Yonkers sat vacant for more than 40 years. That all changed in May, When Simone Development hosted a ribbon-cutting ceremony and official opening of the new Boyce Thompson Center. City officials, Simone representatives, business owners, as well as BTI staff, faculty, alumni, and friends united in celebration of the building's historic past and future success.

The new mixed-use Center features multiple landscape elements, works of art, and exhibits that pay homage to the history and contributions of BTI, including a timeline of the Institute's history in both Yonkers and Ithaca.

Oliver Schulze speaking to attendees at the opening of the Boyce Thompson Center. Schulze is an entrepreneur and partner at Curo Pet Care based in the San Francisco Bay area. He is also one of BTI's newest Board members and is the great-great-grandson of W.B. Thompson.



orosch joins the institute,
rector of Virology, he pioneers
to culture insect cells in the
ws that "yellows disease"
inside the insects that carry it,
plants. In 1980, Maramorosch
lf Prize, considered to be
Prize" for agriculture.



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Jean Pierre Vité leads work
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Planning for the Future

From August to November of 2017, BTI's faculty, staff, and Board participated in a series of facilitated activities to develop the Institute's strategic vision for 2018 – 2023. A tool called scenario planning was used to imagine four alternative futures, 20 years ahead, and create strategies that would maximize BTI's scientific and societal impact regardless of which of these very different scenarios predominate. The process was built through surveys and interviews, a faculty-staff retreat, Scientific Advisory Board input, a Board and leadership team retreat, additional faculty-led discussions, and other forms of engagement. Through this process, five key objectives emerged:

1. People

Reimagine workforce, organization, succession, and hiring, while maintaining a focus on scientific discovery in plant biology.

2. Space and Technology

Reimagine the discovery research environment and infrastructure, addressing BTI's physical space and technological platforms for communication and local or distance collaboration.

3. Resources and Outreach

Execute robust plans for relational and financial resource growth, growing private and public funding and collaborations through enhanced messaging and relationship building, increasing recognition of the Institute among the science community and potential funders, engage the next generation of scientists, and participating in promoting and explaining science to a sometimes-skeptical public.

4. Cornell University

Strategically strengthen the symbiotic relationship with Cornell by initiating and strengthening scientific, administrative, and facility partnerships.

5. Harnessing Discoveries

Translate discoveries to real world applications and value by strengthening the technology transfer pipeline, developing new funding sources, and potentially monetizing discoveries.

Celebrating our Past

1910

"By helping men to study plants, I may perhaps be able to contribute something to the future of mankind."
— Colonel William B. Thompson (1869 –1930)
Boyce Thompson Institute Founder

"I am going to build a laboratory to study some of the fundamental things. I want to do something to get at the bottom of the phenomena of life processes and I think a good place to study them would be in the realm of plants. Any principles concerning the nature of life that you can establish for plants will help you to understand man, in health and in disease."

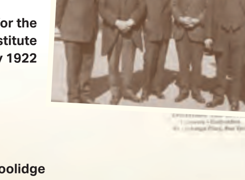
Colonel Thompson (seated), and Major Orrin S. Wightman of the American Red Cross Mission to Russia

1917
On the American Red Cross mission to Russia, William Thompson is deeply affected by the strife and starvation he encounters. His experience shapes his dedication to plant research as a way to contribute to a stable food supply.

1920

Official Opening of the
Boyce Thompson Institute
for Plant Research
on Wednesday, September 24, 1924
1086 North Broadway

1924
The Institute site includes 28 state-of-the-art greenhouses built by Lord & Burnham Co. of Irvington, NY, some of which have special glass to let in different wavelengths of light.



Groundbreaking for the Boyce Thompson Institute —May 1922

President Calvin Coolidge sends a message to the opening ceremonies for the Institute, expressing his appreciation.

The original building is L-shaped until a new wing is added in 1930.

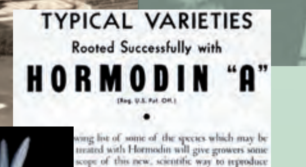
1930

The Great Depression marks the worst economic collapse since industrialization began. BTI continues to expand, offering valuable jobs in a time of scarcity. Research focuses largely on how environmental factors affect plant growth and health.

1924-1932
Louis Kunkel shows that "yellows disease," which devastates crops, such as lettuce, carrot, tomato, and celery, is spread by leafhopper insects.

Greenhouse with gantry cranes. The rolling cages are outfitted with lightbulbs and fit over the greenhouse.

1935
William Crocker shows ethylene gas, which ripens fruit, is a plant hormone. The fruit and vegetable industry use the gas to control fruit ripening and reduce food waste.



Percy Zimmerman, Frank Wilcoxon, and Alfred Hitchcock discover a compound that stimulates plant and root growth and works like a plant hormone. Sold to home gardeners and commercial growers as "Hormodin," it is still widely used today.

***Westchester in Pictures*, a feature about**

1939: Women in Science

Wanda Farr pioneers research into how plants construct cellulose, a carbohydrate that gives strength and support to plants. Cotton fabric and paper are made of cellulose.

Helen Purdy Beale establishes new tools to detect different plant viruses and monitor their spread using antibodies and the electron microscope. These techniques are now standard practice for research and diagnostics in the field of virology.

1940

1941-1945
WWII dominates the first half of the 1940s. War Gardens, or "Victory Gardens" in homes and parks help ensure a nutritious, local food supply while labor and transportation are tied up in the war effort. The Institute collaborates with local government to lead Victory Garden workshops for the public.

1945
Percy Zimmerman and Alfred Hitchcock publish the first report that the herbicide 2,4-D mimics auxin, a natural hormone in plants. 2,4-D is one of the oldest and most commonly used weed killers.

1948
Clyde Chandler begins her experiments with flower and tree breeding, such as the hybridize larch tree, which grows from seed to thirty feet in ten years.

1950

During the 1950s, Yonkers experiences increasing urbanization and air pollution, creating both challenges and opportunities for BTI research. Pollution makes Yonkers unfit for some experiments, but leads to new research into how air pollution impacts plants.

Percy Zimmerman, Alfred Hitchcock and Len Weinstein investigate the effects of different pollutants on plants as part of the environmental biology program. At this time, BTI is the world's center for research on fluoride, a contaminant released by aluminum smelters.

A researcher applies chemicals to plants to test their response to pollutants.

The Morsemere Garden Club of Yonkers adopts the Terrace City Lily as its symbol to honor lily expert Norma Pfeiffer, who develops several hybrid varieties at BTI.

1960

1961
Karl Maramorosch joins the institute, where, as Director of Virology, he pioneers techniques to culture insect cells in the lab and shows that "yellows disease" can multiply inside the insects that carry it, as well as in plants. In 1980, Maramorosch wins the Wolf Prize, considered to be the "Nobel Prize" for agriculture.

Vité surveying trees near Lake Tahoe.

The 1960s and 70s bring greater awareness of the impacts of pollution on the natural world and human health. In response, BTI research focuses on forest conservation, ecology, and the effects of air pollution.

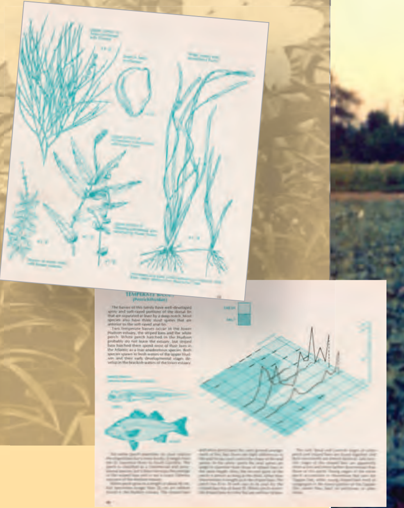
1968
Jean Pierre Vité leads work on bark beetles in BTI's California and Texas forest research stations. A bark beetle is only the size of a grain of rice, but in large groups, they destroy entire forests of pine trees. The work leads to the identification of pheromones of several species. These pheromones, which the beetles use to guide their mass attacks, are now used to manipulate behavior and protect individual trees.

1968-1977
In an effort to encourage interest in scientific research, BTI hosts training programs for high school students in the Yonkers area. BTI continues to host high school interns today.

"I was with the Boyce Thompson Institute eleven years and enjoyed every minute of it!"
— Dr. Zohara Yaniv, State of Israel, Ministry of Agriculture.

While at the Institute, Yaniv directs the National Science Foundation high school student training program from 1975-1977.

1970



Cover and interior illustrations described things growing in this part of the Hudson River.

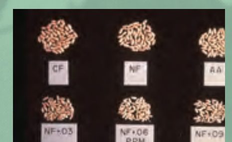
1977
Edward Buckley completes "An Atlas of the Biologic Resources of the Hudson Estuary," a survey of life in the Hudson River from Poughkeepsie to where it meets the ocean in New York Harbor. The atlas helps public officials and citizen-groups to make decisions about the estuary's management, in order to protect the significant numbers of ecologically important native plants and animals.

1980

In the 1980s, pollution and biotechnology are on everyone's mind. BTI research focuses on how environmental factors, such as acid rain, impact crops and other plants. Some BTI scientists study novel ways to control insect pests without chemical pesticides, while others begin working with emerging genetic technologies.

Robert Kohut collaborates with the Environmental Protection Agency to assess the effects of ozone and other pollutants on agricultural production. His work shows that air pollution is decreasing wheat harvests.

Bob Kohut and Bob Amundson inspecting experimental wheat.



Wheat yields when exposed to different levels of ozone.

1978
BTI moves to Cornell University's campus in Ithaca, NY. This move allows BTI access to more graduate student researchers, closer collaboration with Cornell scientists, and a more rural environment that facilitates research on crops and other plants.

1990

BTI embraces new technologies and expands their research scope into the molecular biology of plants and insects.

By studying DNA, proteins, and other molecules, scientists make discoveries to benefit human health, agriculture and the environment.

Charlie Arntzen develops an edible hepatitis B vaccine that grows in potato plants and works in mice. The potatoes become part of the first human clinical trial of a plant-based vaccine, paving the way for the future of plant-based vaccines.

1994
Carl Leopold finds that seeds with high levels of sugars can survive long periods in dry storage by maintaining a "glassy state" that resists degradation. The patented discovery aids in the development of drug delivery systems, such as inhalable insulin for diabetics.

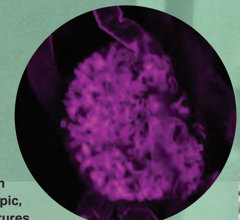
2012
Jim Giovannoni, Zhangjun Fei, Joyce Van Eck and Lukas Mueller
An international consortium of researchers from 14 countries complete the sequence of the tomato genome. Decoding the genome yields insights into ways to improve the taste, color, disease resistance and productivity of tomato and many other crops.

1989
H. Alan Wood leads research into the development of an insect virus that kills destructive caterpillars, but breaks down quickly to spare beneficial insects, offering an environmentally friendly way to control crop pests (left). Aerial view of the site of the first U.S. release of a genetically engineered virus in Geneva, NY at the New York State Agricultural Experiment Station. The insect virus was released in the center of the 2-acre cabbage field (above).

2000

During the 2000s, BTI science focuses on the study of insects, fungi, bacteria and viruses that injure or sometimes aid their plant hosts. In addition, BTI helps pioneer the field of plant genomics, which characterizes and studies the complete genetic inventory of different plants.

Maria Harrison and her lab bring greater understanding of the mutually beneficial interactions between plants and soil fungi. These discoveries may one day lead to the breeding of crops that rely on their fungal partners for nutrients rather than on added fertilizers.



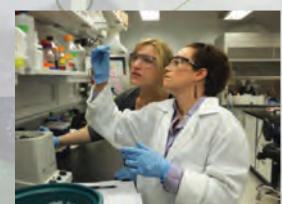
Some fungi can form microscopic, tree-like structures inside plant root cells, seen in this image in purple. These structures enable the fungus to transfer soil nutrients to the plant.
Photo: M.J. Harrison

2009
Robert Granados and his lab develop cell cultures in the 1990s from the eggs of the cabbage looper, an insect pest that feeds on the cabbage family. Named High Five™ cells, they are especially efficient at producing foreign proteins.The cells are used to help make the Cervarix® vaccine, which protects against viruses that cause cervical cancer. This vaccine is approved by the FDA in 2009.

2010

2012
Researchers embrace the benefits and challenges of "Big Data." As the cost of DNA sequencing drops, so much data becomes available that computer programmers must develop tools to harness that information. These tools enable scientists to answer new biological questions and will help crop breeders worldwide to develop better crops for small farms and impoverished farmers.

2016
Jim Giovannoni is elected to the National Academy of Sciences for his work on tomato fruit ripening and its impact on nutritional quality and flavor.



2017
Michelle Cilia receives the Presidential Early Career Award for Scientists and Engineers, in recognition of her transformative work to understand how insects spread plant viruses and bacteria, and its applications toward finding a solution for citrus greening disease.

Visit BTIScience.org today

A Plan for Any Scenario

Four possible future scenarios were developed by the Plant Science Research Network and described in their document, *Imagining Science in 2035: Strategies for Maximizing the Value and Impact of Plant Science, and Beyond.*

Targeted Science

Climate change and food insecurity contribute to geopolitical instability

Increased investments in deep understanding of climate and organisms

Investments enable scientists to respond to the challenges of the moment

Public support allows researchers to adequately prepare for the future

Critical Science

Environmental stresses create geopolitical instability around the globe

Researchers abandon deep level understanding to focus on the crisis of the moment

Quality control suffers under the pressure to reach conclusions quickly

Corporations control information and data underlying an unhealthy majority of scientific results

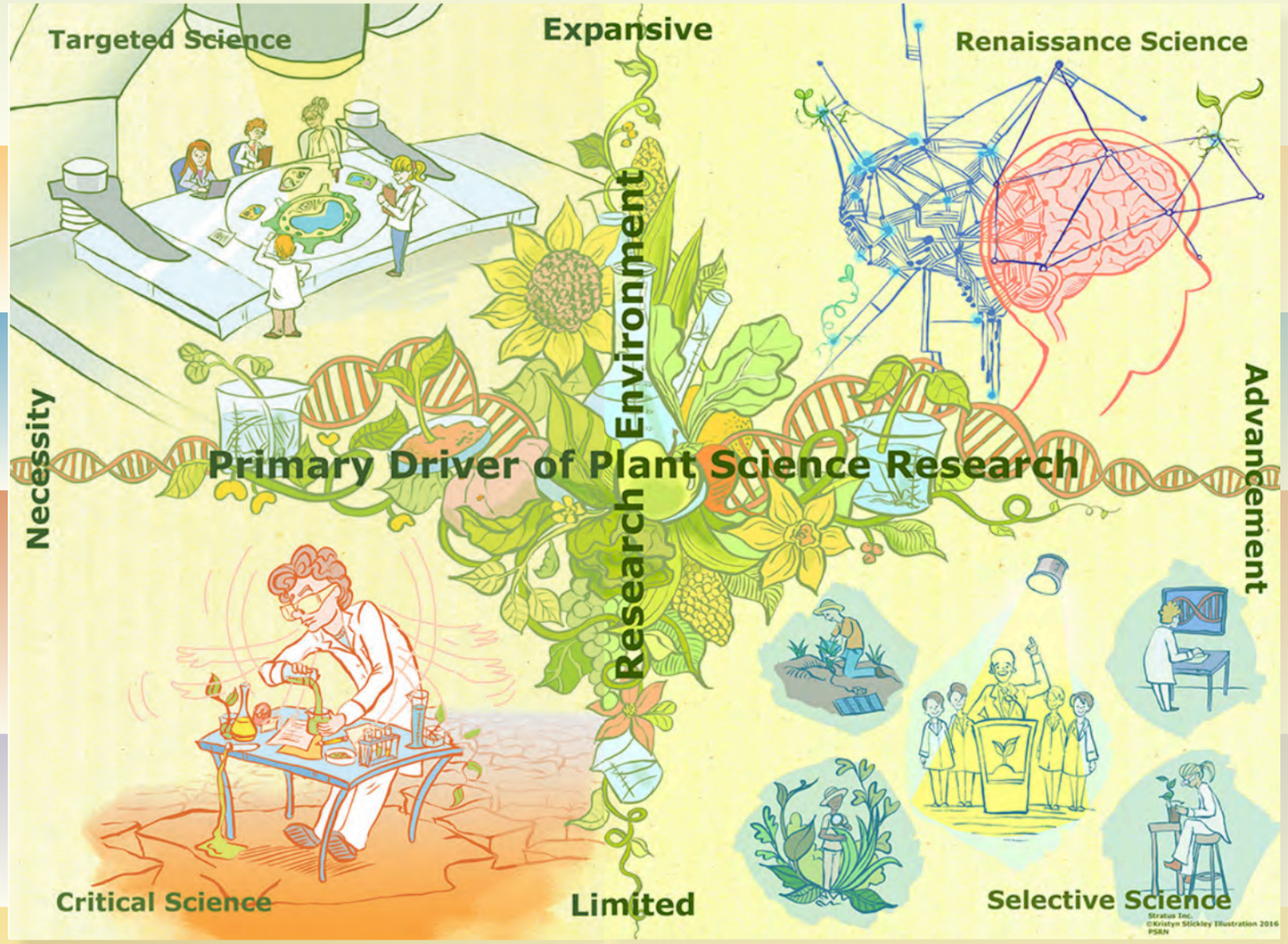


Illustration by Kristyn Stickley, Kristyn Stickley Illustrations 2016

Renaissance Science

Dedicated time to pursuit of knowledge and understanding

Ample opportunity for big-picture thinking

An era of unprecedented discovery and innovation

Advances in Artificial Intelligence thrusts research into new frontiers

Selective Science

Computers and intelligent machinery handle most of the lab work

Individual labs survive through large group collaboration

Only the most established research areas garner attention

Focus is mostly on high-impact areas that offer the best apparent return on investment

Education and Outreach

NURTURING THE SCIENTISTS OF THE FUTURE

Curriculum Development

In 2017 BTI supported 55 classrooms across the country, reaching more than 2,250 students with kits designed to bring BTI science into the classroom. 40% of the two kits, titled "Beet Army Worm Invasion" and "Algae to Energy: Optimizing Systems," went to "high-needs" school districts and were distributed equally between urban, suburban and rural school districts.

Driven by research in the Jander Lab (Beet Army Worm) and the Stern Lab (Algae to Energy), both classroom kits are intended to provide students with hands-on plant biology experiments designed to introduce the scientific method while discovering real-world applications.

With a newly renovated Boyce Thompson Center, the BTI Education and Outreach team wanted to connect the Institute with the Yonkers community. In October, David Stern, Vanessa Greenlee and Delanie Sickler guided 20 Yonkers City School District teachers in implementing the Algae to Energy lesson plan for their classrooms. With support from an NSF award to BTI and Texas A&M University, these classrooms will receive materials to build their own photo-bioreactors and learn the possibilities for algae-produced fuels and other bioproducts to increase sustainable energy and materials production in the U.S. and around the world.

BTI also participated in the NY State Agricultural Literacy week, partnering with the Van Eck lab to teach second graders from the Ithaca-area Newfield and Groton school districts. Through a children's book entitled *The Grapes Grow Sweet,* and accompanying activities and discussion, students learned the agricultural value of grapes in their region and how the Van Eck lab is discovering solutions to protect this vital state crop from viruses that attach their root systems.

Plant Genome Research Program (PGRP)

BTI hosted 32 students for the 17th PGRP summer internship program. This program continues to draw exceptional young people interested in plant biology and bioinformatics, who often are stimulated by their multifaceted summer experience to pursue STEM-related careers. During the summer, interns live on campus, work in labs on their own projects, and present their work in an August symposium. They also benefit from one-on-one mentorship from experienced researchers, as well as a variety of seminars and other opportunities. This program is possible with funding from the National Science Foundation and is a collaboration between BTI, Cornell and the USDA. The high school internship program is funded through generous donations.

2018 Class at a Glance

- **32** students, 25 undergraduate and 7 high school students
- **20** states represented including the territory of Guam
- **42%** underrepresented groups in science
- **100%** reported that internship prepared them for jobs or graduate school
- **66%** female participants
- **80%** of undergraduate interns plan to attend graduate school
- **17** labs participated, including 45 mentors

INTERN SPOTLIGHT

Patrick Mendoza

Originally from Santa Ana, California, Patrick is majoring in horticulture at Iowa State University. He worked as a financial analyst for over a decade, until his passion for horticulture inspired him to return to school. His interests include plant molecular biology and mutualism between insects, fungi, and plants. He presented on his BTI experience at the 2017 Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) conference. "My experience as a summer REU intern has been phenomenal. I've made friends and contacts that will help me through my academic career and beyond." Patrick will be pursuing a Ph.D. at Cornell University beginning Fall 2018.

Postgraduate Society

FOSTERING COMMUNITY AND PROFESSIONAL DEVELOPMENT FOR GROWING SCIENTISTS

BTI supports graduate and postgraduate students in sharpening their research, communication and networking skills, to prepare them fully for a variety of career options that would draw on their scientific experience. The Postgraduate Society (PGS) seeks to promote professional development, foster a sense of community and facilitate communication throughout BTI.

Science Symposium

This annual one-day event fosters inter-lab communication and stimulates collaborations between various BTI research areas. Themed "Plant Development and Evolution," the event featured speakers from BTI, the USDA, Cornell SIPS, and the Department of Chemistry and Chemical Biology (CCB). A poster session allowed BTI researchers to showcase their work.

Career Symposium

Highlighting non-academic scientific careers, this event featured BTI staff, alumni, and guests in both a panel discussion as well as workshops. Presentations ranged from technology transfer and biotechnology startups, to consulting and publishing. Presenters included Paul Debbie (BTI), Michael Kamarck (Willow Creek Biotech), Parag Mahanti (IMS Consulting Group), Richard Pattison (Nature Communications), Lori Adams-Phillips (University of Iowa), and Michael Roach (Cornell University).

Guest Speakers

BTI's Distinguished Lecture Series gives members the opportunity to interact and network with renowned scientists. 2017 lecturers included Elizabeth Kellogg (Donald Danforth Science Center) and Martin Chalfie (Columbia University). The PGS also organized a seminar series entitled "PGS Fests." Seminar speakers included Polly Holmberg (Cornell Alliance for Science), Hening Lin (CCB), and Michael Raissig (Stanford University).

Mentoring Program

PGS organized a pilot mentoring program linking members with professionals in career areas that are of interest to them. Mentors help to guide and inspire PGS mentees to make practical steps in preparation for their careers, and are able to provide insight into career options outside of academia. Twelve PGS members were paired with mentors from a variety of sectors, and thanks to the positive feedback received by both mentors and mentees, this program will continue into 2018.

Alumni Spotlights

Dr. Sarah (Refi) Hind

In May of 2017, BTI gathered to congratulate and bid farewell to Sarah Hind who had worked as a postdoc and research associate in the Martin Lab at BTI for six years. Sarah moved to Illinois with her family to join the University of Illinois at Urbana-Champaign as Assistant Professor in the Department of Crop Sciences.

Dr. Hind's new position began on June 16th and her research explores how the plant immune system detects pathogenic bacteria that cause diseases on tomato and other crops. Her research helps scientists better understand how plants and microbes interact, contributing to the development of agricultural crops that are more resistant to infection.

Things are progressing well in her new role; in fact, she has already added several new members to her lab and is starting a new research project working on pumpkin. When BTI reached out to Sarah this past October, she reported that her family has "been settling in well, enjoying life in the Midwest" and added that she really enjoys "being the boss" of her own research group.

Education:
Ph.D. Molecular, Cell, and Developmental Biology,
University of South Carolina-Columbia, 2010
B.S. Biological Sciences,
University of South Carolina-Columbia, 2005

Dr. Jiayang Li

Our most sincere congratulations to BTI alumnus, Jiayang Li, who recently received first prize at the National Awards for Natural Sciences from the Chinese government. This is the highest award for Natural Sciences in China and was awarded to him by President Xi Jingping and Prime Minister Li Keqiang.

Dr. Li has made seminal contributions to establishing genetics approaches to improve rice and understand rice growth habit. He has identified and characterized key transcription factors and hormonal signals that determine rice architecture, and he has demonstrated that this fundamental knowledge can contribute to the development of improved rice varieties through marker assisted breeding.

Dr. Li was a postdoc at BTI from 1991-1994. Dr. Li is currently the Vice Minister of Agriculture in China and President of the Chinese Academy of Agricultural Sciences. He is also Professor and Principal investigator at the Institute of Genetics and Development at the Chinese Academy of Sciences.

Education:
Ph.D., Biology, Brandeis University, 1991
M.S., Institute of Genetics, Chinese Academy of Sciences, 1984
B.S. Agronomy, Anhui Agricultural College (now Anhui Agricultural University), 1982

What is a BTI Alum?

Anyone who has previously worked at the Boyce Thompson Institute at any level (high school, undergraduate, graduate, postdoctoral) is considered a BTI alum. This includes former interns, researchers, professors, and students. To learn more, visit BTIscience.org/alumni.

Photo provided by The Royal Society.

Donor Support & Giving

YOU HELP TO PLANT THE SEEDS OF DISCOVERY

BTI is grateful to the following individuals and organizations who have shown generosity during 2017, providing the capacity that helps to make the research and programs of BTI possible.

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Rheonix, Inc.
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Ithaca Garden Club
Stephanie Meyer & Jose Andres
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Nancy E. Rawson
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Bob & Johanna Granados
Hancock Estabrook, LLP
Stephen & Elizabeth Howell
Lynn Bradley Leopold
Susan & Gregory Martin
Michael Moore
Alan & Anne Renwick
Donald & Marcia Slocum
Ruth Stern & Morton Levy

To make a gift to BTI, please contact BTI development at (607) 288-3554 or email bti-dev@cornell.edu.

Visit BTIscience.org/give to make a secure online contribution.

Every effort has been made to ensure the accuracy of these lists. If we have unknowingly made an error, please notify the development office.

Photo provided by Simone Development LLC.

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Amazon Smile Foundation
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Azeus Convene
Jayne & Jeff Bakos
Holly & Don Beermann
Brian Bell
Evelyn Berezin
Rae & Pat Bottino
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Cynthia Ulbing
Charles & Jane Walcott
Wegmans
Fred A. (Ben) Williams
Marissa Zuckerman

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2017 Designations

Education & Outreach
Ithaca Garden Club
Robert & Roberta Kohut
Legacy Foundation of Tompkins County
Carolyn W. Sampson
Triad Foundation, Inc.

STEM Scholarships for High School Students
Sophia & Nick Darling
Vanessa & John Wyatt Greenlee
Stephanie Meyer & Jose Andres
Laura Philips & John Elliott
Melissa & Eric Richards
David & Karen Stern

Postgraduate Society Initiatives
Laboratory Product Sales (LPS)

Research
American Endowment Foundation
Triad Foundation, Inc.

2017 Memorials and Tributes

In Honor of

Clare L. Simpson
Donna Esposito

In Memory of

Edward H. Buckley
Janet Buckley

A. Carl Leopold
Lynn Bradley Leopold

Leonard H. Weinstein
David and Libbie Silberman
Robert and Roberta Kohut
Sylvia Weinstein

Sylvia Weinstein
Lynn Bradley Leopold

2017 Sustainers

BTI is fortunate to receive support from a very special community of committed, long-term donors, and we recognize and are most grateful for their loyalty. The following individuals and organizations have given gifts over the course of ten or more years, showing dedicated support of BTI's mission. Many have also given the gifts of time and guidance, and will forever leave their mark on the Institute.

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Christian C. & Nora R. Hohenlohe
Triad Foundation, Inc.

$50,000 - $99,999
Philip & Anette Goelet
Charles T. Schulze

$20,000 - $49,999
Evelyn Berezin
Mr. & Mrs. Roy H. Park, Jr.
Laura Philips & John Elliott
Carolyn W. Sampson
David & Karen Stern
Leonard & Sylvia Weinstein*

Up to $19,999
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Stephen & Elizabeth Howell
André and Jean Jagendorf
Robert & Roberta Kohut
Lynn Bradley Leopold
Susan & Gregory Martin
Robert M. Pennoyer
Alan & Anne Renwick
Donald & Marcia Slocum
Richard & Mildred Staples
Kathryn W. Torgeson
Fred A. (Ben) Williams

Monthly Givers
Patti & Owen Baynham
Zhangjun Fei & Xuemei Tang
Vanessa & John Wyatt Greenlee
Ryan Gutierrez
Kelli Monce
Aurora Ulbing

**Deceased*

SUSTAINERS REMEMBERED

Dr. Robert and Mrs.Virginia Miller
Robert's father, Dr. Lawrence P. Miller, was an esteemed biochemist and among the first researchers at BTI. In Yonkers, BTI was a source of many friends for the Miller family, who have many family photos from picnics on the grounds. Robert and Virginia continued to help BTI thrive long after its time in Yonkers.

Dr. André Jagendorf
Dr. Jagendorf was a passionate and distinguished scientist, President of the American Society of Plant Physiologists, a BTI collaborator, and more. Best known for his work in photosynthesis and chloroplast molecular biology, Andre is remembered fondly for his enthusiasm for discovery.

Dr. Leonard "Len" and Mrs. Sylvia Weinstein
The Weinsteins were iconic members of the BTI community for over 50 years. Among Len's many roles were dedicated employee, board member, and sustaining donor. He led a colorful career, and remained active in his research long after retirement. Leonard's most esteemed research focused on the impact of fluorides on plant development. After Len's passing, Sylvia maintained her generosity to BTI until her recent passing, and she will be missed.

2017 LEGACIES REMEMBERED

The memories of the following deceased individuals, who, over the course of the Institute's history, have included BTI in their estate plans, will endure through the work being done to honor W.B. Thompson's vision for the future.

Charles & Margaret Abell
John & Madgolina Bank
Anthony (Andy) Grefig
John & Mayfred Hirshfeld
George & Helen Kohut
George & Elizabeth McNew
William Boyce Thompson

2017 W.B. THOMPSON LIVING LEGACY SOCIETY

BTI recognizes living individuals who have expressed intent to remember BTI in their estate plans or with other methods of planned giving. Through their generosity and foresight, W.B. Thompson Living Legacy donors help to secure the future of the Institute. BTI would like to thank them for announcing their commitment to BTI, and appreciate them in their continued generosity and passion for the Institute's mission.

Evelyn Berezin
Brian & Claire Federici
David & Karen Stern

DONOR SPOTLIGHT

Ithaca Garden Club

BTI's summer research internship program offers valuable opportunities for undergraduate and high school students to experience hands-on research in plant biology. While program internships for undergraduate students are primarily funded by the National Science Foundation (NSF), high school student inclusion is made possible by sponsors and individual donors.

Founded in 1922, the Ithaca Garden Club (IGC) has a long history of supporting local beautification projects and programs that focus on environmental conservation and education. Among their many community contributions, the Ithaca Garden Club has sponsored local high school students' participation in BTI's summer research internship program since 2011.

Georg Jander, Beatrice Szekely (IGC Historian), Asha Duhan, and Susie Backstrom (IGC President).

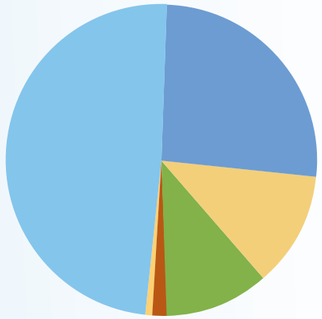
Last summer a participating student intern from Ithaca High School, Asha Duhan, was designated as recipient of the Club's 2017 sponsorship. To honor the Club's continued dedication to affording these valuable opportunities for local students, Asha was named as the program's inaugural Ithaca Garden Club Scholar.

Selected Financials

This is an unaudited financial report. The audited report will be available in June, 2018. Please contact BTI's Development department at bti-dev@cornell.edu or (607) 288-3554 if you would like to review the audited report.

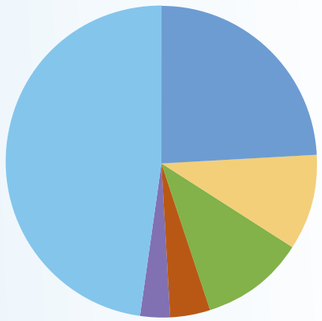
2017 New Grants (Total award less subcontracts)*

Government		
National Science Foundation	$3,756,631	49%
Defense Advanced Research Projects Agency	$2,014,927	26%
National Institute of Health	$946,638	12%
United States Dept. of Agriculture	$854,903	11%
Department of Energy	$120,000	2%
Corporate, Foundation & Other		
Foundation funding	$10,000	<1%
TOTAL	**$7,703,099**	



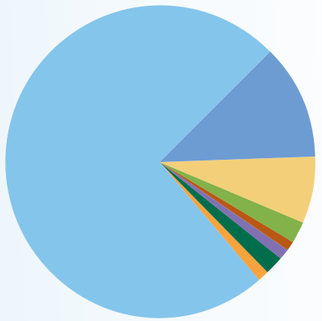
Sources of Funds (Income)

US Government	$7,887,000	48%
Institute endowment	$3,910,000	24%
New York State	$1,662,000	10%
Foundations	$1,804,000	11%
Other private sources	$652,000	4%
Unrestricted revenues	$399,000	3%
TOTAL	**$16,314,000**	



Use of Funds (Expenses)

Research	$12,115,000	74%
Administration	$1,914,000	12%
Research support	$1,097,000	7%
Equipment & facility	$308,000	2%
Non-research	$240,000	1%
Development	$281,000	1%
Communications	$257,000	2%
Education & Outreach	$102,000	1%
TOTAL	**$16,314,000**	



** unaudited*

* We are grateful for the dedicated service of **Machi Dilworth** (2014 through 2017).

She supported and enriched the Board of Directors, the Scientific Advisory Board, the Institute and its staff by challenging our beliefs and always seeking a better way. We are better for having shared her expectations for professionalism, challenges for excellence, commitment to diversity and furtherance of the mission of the Institute.

To view an interactive version of this report, including live links to content and videos, visit **www.BTIscience.org/annualreport**

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