The Atkinson Center builds a better future through the vision, hard work, and achievements of our researchers. Cornell experts are discovering and implementing sustainable solutions to world needs for reliable energy, a resilient environment, and responsible economic development.

Our innovative, diverse faculty, investigators, postdocs, and students are the faces of sustainability at Cornell.

Discover more Faces of Sustainability throughout this report.

atkinson.cornell.edu/faces
A Diverse Future

Ecologists value biodiversity because a high number of species can confer stability on ecosystems, in the same way that a diverse financial portfolio delivers more stable returns. Anthropologists, historians, and artists similarly celebrate the diversity of human cultures, languages, and expression, which collectively give us a fuller appreciation of how people understand their relationship to other humans and species and the physical environment.

In recent years, universities have realized that bringing diverse disciplines to bear on difficult questions leads to better diagnoses of sustainability problems. At the Atkinson Center, we have also discovered that partnerships with diverse practitioner organizations outside the university are an important pathway leading from diagnoses to robust solutions. We embrace all of these aspects of diversity because we want our children and grandchildren to enjoy as diverse a planet as we do. We strive for improved policies, products, and practices that will allow both humans and the environment to flourish.

In this annual report, we feature major strides in energy, environment, and economic development that are driven by increasingly strong partnerships between Atkinson Center researchers and our partner organizations. The emerging solutions we describe come from diverse people with diverse expertise united by a common purpose: to create a world in which future generations can thrive. We invite you to learn more about 2016’s discoveries and achievements—and the diverse faces that created these innovations.

David Lodge
Director
New Faces

The Atkinson Center welcomed new faculty leadership this year. Kieran Donaghy, a professor in Cornell’s Department of City and Regional Planning, joined us as faculty director of economic development in July, replacing Wendy Wolford. Donaghy’s research examines how globalization affects regional economies and how New York communities can rebuild failing infrastructure to support economic development and sustainable lifestyles.

Farming for Change

An AVF-funded curriculum uses farmer-to-farmer teaching to promote climate adaptation, health, and social equity in East Africa.

4 languages
1,000 farmers trained as community mentors

Tasha Lewis
Textile Scientist
Turning used clothing into new fashion textiles with a $149,000 grant from Walmart Foundation’s Innovation Fund.

Academic Venture Fund

Our major grant program funds researchers across Cornell.

50 new researchers join proposal teams each cycle
2016
$1.5 Million
250 unique researchers funded since 2008

Every $1 brings $8 in follow-on funding to Cornell

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Earth and Atmospheric Science professor Natalie Mahowald begins her term as faculty director of environment in January, taking over for Alexis Travis. One of Mahowald’s recent projects, with 2016 Academic Venture Fund support, explores how extreme weather events and changing agricultural landscapes could mean more frequent and devastating crop epidemics that threaten world food security.

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Nations everywhere are converting from fossil fuels to renewable energy—but not fast enough to fight climate change. We need to accelerate the transition and transform our energy infrastructure. Atkinson Center experts are developing new sources, markets, and policy solutions for smart, reliable power and a healthier planet.

Energy Smart Community

A future with smaller electric bills and fewer power plants may be a step closer for local homeowners. Cornell researchers are using a $1 million grant from the National Science Foundation (NSF) to create, test, and optimize new residential electric storage systems as part of the Energy Smart Community initiative.

“Smart meters—which measure and manage residential electricity in real time—are already in about 40 percent of U.S. homes,” said Todd Cowen, Atkinson Center faculty director of energy and the project’s principal investigator, “but they have not yet met the pledge of smaller electric bills and engaged consumers.”

Linking Cornell researchers and industry partners, the cutting-edge collaboration will test whether adding rechargeable batteries to residential smart meters can increase benefits, including bolstering power grid flexibility, integrating renewable energy sources, reducing household electricity costs, and empowering homeowners to reduce their greenhouse gas emissions. Innovative virtual storage will bring these advantages to many more local homes.

“We’re looking to help homes create a reservoir of energy, so that when electricity prices are low, the smart meters will automatically charge their batteries with the cheaper energy to use at a later time,” Cowen explained. “This system also creates potential business opportunities for electric storage providers, smart-system service software, and residential-sector financing—not to mention creating an infrastructure for the emerging retail energy market.”

Jumping off from New York State’s Reforming the Energy Vision plan, Cowen brought together Avangrid (NYSEG’s parent company), BMW North America, SolarCity, and Distributed Sun to develop a pilot program for Ithaca and other locations throughout Tompkins County.

“The Energy Smart Community initiative is an excellent example of the Atkinson Center’s role in developing pioneering partnerships with external organizations,” noted David Dieterich, Atkinson’s executive in residence. “These types of public-private collaborations are vital to answering our greatest sustainability challenges.”

The grant is funded through NSF’s Partnerships for Innovation: Building Innovation Capacity program, which supports university-industry partnerships.
Earth Source Heat at Cornell

Cornell is pursuing a project with the potential to slash our annual carbon footprint and establish one of the country’s most advanced geothermal systems to heat the 745-acre Ithaca campus. Earth Source Heat could provide a blueprint for using enhanced geothermal almost anywhere in the world.

The initiative will combine Cornell’s leading energy and sustainability researchers with the living laboratory of Cornell’s facilities. Atkinson-funded research is helping to lay the groundwork for Earth Source Heat, and our faculty fellows across campus are carrying out related research. Atkinson Center director David Lodge, Todd Cowen, and several faculty fellows are among the leaders guiding Cornell’s climate direction.

After a preparation phase, researchers plan to launch Earth Source Heat with a single test well reaching more than two miles below the surface to tap the Earth’s vast heat reservoir. The next phase will add a second well, creating a well pair to serve 20 percent of campus.

Water will circulate in a closed loop through a heat exchange facility to supply heat to the campus district heating system. During cold weather, heat from a biomass gasification facility can supplement the geothermal system for a second source of renewable energy. This innovative hybrid system could be key to making Cornell carbon-neutral by 2035.
Monarch Research Takes Flight

New Yorkers witness the monarch butterfly’s epic migration to Mexico every September—but these days, fewer of the colorful travelers pass through. Nobody is sure why. Many have blamed a decline in milkweed, an essential food source, for the iconic butterfly’s dwindling numbers.

Not so fast, says Cornell ecologist Anurag Agrawal.

With Academic Venture Fund support, Agrawal and his team tracked monarch migration patterns over the past two decades, pulling in population data from citizen scientists and conservation organizations. Their ground-breaking study found that monarch numbers are actually stable through the summer, when the breeding butterflies and caterpillars rely on milkweed. Instead, the problem starts when the butterflies set out on their fall migration.

“Planting native milkweeds won’t hurt, but it also won’t fix the problem,” Agrawal explains. “Our findings point to a lack of flower nectar sources during the southern migration. The butterflies also seem to be having trouble finding and settling in at the remote, degraded overwintering sites.”

In Mexican sanctuaries, where the monarchs hibernate in spectacular clusters on mountain fir trees, butterfly numbers have been dwindling over the past 20 years. The downward trend continues in the southern United States when the monarchs make their return journey—but then the population bounces back during the milkweed season.

Over several summer generations, monarchs today build up surprisingly large populations before migration, comparable to past levels that once held relatively steady through the year. This new pattern of bigger ups and downs is a puzzle that may provide clues for future conservation efforts. A major report released by the U.S. National Academies of Sciences in 2016 cited the researchers’ findings.

The monarchs’ story will reach a broader audience of butterfly lovers when Agrawal’s new book comes out in April 2017. It’s a story all of us need to take to heart. “Monarchs are sentinels for the health of our continent,” Agrawal says.
The Atkinson Center's flagship funding program supports cross-disciplinary research in novel technologies and approaches with the potential for game-changing impact. The Academic Venture Fund topped $1.5 million in 2016.

2016 Projects

**Crop Disease and Climate Change**
Some plant pathogens spread through the air—and the effects on staple food crops can be devastating. Climate change could mean more frequent plant epidemics, as extreme weather may move pathogens more easily across continents. This project brings together experts in atmospheric science, plant pathology, and computational sustainability to model how climate change, weather events, and changing agricultural landscapes will influence the long-distance transport of fungi affecting global food security, such as wheat stem rust. The team is coordinating with Cornell's Durable Rust Resistance in Wheat program to safeguard the world's wheat.

Led by Natalie Mahowald

**Hydropower and Ecosystem Services**
The Andean Amazon is in the midst of a hydropower boom. More than 150 new dams are proposed across several countries, with more already under construction. Environmental impacts are assessed for individual dams—but what is the combined cost of the hydropower explosion for biodiversity, fisheries, navigation, and other benefits provided by intact rivers? This multidisciplinary team is developing a framework for evaluating cumulative impacts in areas of rapid hydropower growth. The new models will guide design of more sustainable dam networks that meet hydropower targets while preserving key ecosystem services.

Led by Alexander Flecker

**Building Better Cities**
Cities are getting denser every day. Buildings currently produce one-third of the world’s carbon emissions—so urban development is both a problem and an opportunity to mitigate climate change. Urban designers need next-generation modeling tools that move past single-building analysis to support master planning for energy efficiency, solar power, light, and ventilation. The researchers are developing software tools to model energy and climate impacts of hundreds of buildings together. These easy-to-use tools will help planners create more livable and sustainable urban habitats.

Led by Timur Dogan
New Tech for an Ancient Food
Basic 3-D printing technology could make the tools rice farmers need to grow more rice sustainably. This team aims to demonstrate that 3-D printing can help manufacture quality weaders, transplanters, and harvesters for low-water rice production—simply, cheaply, and locally. The researchers are working with commercial printers in the United States to design simple, sturdy farming tools and identify the manufacturing technology baseline required to create parts on site. Partners in Mali, India, and Malaysia will pilot test the manufacturing process and work with farmers to refine the tools.

Led by Derek Warner

Power in the Wind
Uncertainty about the lifetime power potential at a proposed wind farm site raises financing costs and the level of risk for investors. This team is developing new computational tools to improve projections of annual electricity yields from potential wind farms—a first step toward tools to forecast the impact of climate change and variability on wind resources and operating conditions. More reliable short-term and lifetime projections of wind installations’ potential will reduce investment risk and enhance the financial competitiveness of wind energy. A renewable energy financing company is a partner.

Led by Sara C. Pryor

Big Pool, Little Pool
Flooding in urban areas is a growing problem, as the world’s cities expand and storms become more intense and variable. Piscinões (big pools) are São Paulo’s primary strategy for reducing flooding. While often effective for flood control, they also divide neighborhoods, concentrate pollutants, and require costly maintenance. With officials and experts in Brazil, this team is creating landscape-based design guidelines for piscinões that work at large and small scales to enhance human communities and urban ecosystems. These multifunctional pools offer a new model for urban living with water.

Led by Brian Davis

Coffee: What’s Fair?
How much does sustainable coffee cost to grow? Fair-trade certification gives consumers peace of mind, but small coffee growers bear hidden expenses that could mean they don’t get a fair price. Partnering with Fair Trade USA, the researchers are collecting real-world production costs and building an online coffee calculator to compare coffee production systems—for informed decisions and a more inclusive coffee industry.

Led by Miguel Gómez

Wild Seafood, Healthy Harvest
Twenty percent of the world’s wild seafood is harvested with fishing gear that operates along the seafloor. Marine reserves that prohibit fishing are the dominant policy tool for managing seafloor impact, but improved fishing gear may provide a sustainable alternative. Working with industry stakeholders, this team is developing tools for modeling how the seafloor responds to different types of fishing gear to find the best ways to reduce our seafood’s habitat impacts.

Led by Suresh Sethi

Imagining Energy Transitions
With joint funding from Cornell’s Einaudi Center for International Studies, this project is seeding a multi-disciplinary approach to renewable energy at Cornell. Through the Energy Transitions Collaboratory, scientists and engineers, humanists, social scientists, and artists are working together to engage the public with effective stories and new visual approaches to sustainable energy solutions. One part of the initiative disseminates public art on hot-button renewable energy issues.

Led by Anindita Banerjee
From CO₂ to Fuel
Capturing carbon dioxide to keep it out of the atmosphere is a promising strategy for combating climate change, but CO₂ has little value. Unless new carbon policies change the equation, industry won’t bet on the carbon capture market. This team is building an ultracompact reactor powered by the sun that converts CO₂ to higher-value methanol. This easily scalable technology is a three-way win: it runs on solar, captures carbon, and yields a valuable liquid fuel. The researchers are partnering with local clean energy entrepreneurs to develop green methanol for commercialization.

Led by David Erickson

Detecting Toxic Chemicals in Fracking Water
Many chemicals used in or evolved from hydraulic fracturing gas wells are unknown, so water quality monitoring is exceedingly difficult. This team is identifying unknown chemicals of concern in water collected throughout the fracking process. The innovative detection method first identifies toxic effects in samples and then defines chemical structures using mass spectrometry. The technique could lead to important advances in environmental water monitoring and better wastewater treatment strategies.

Led by Damian Helbling

Boosting Maize Yields Sustainably
Farming systems that use ecological principles are helping African farmers raise more food sustainably. One method protects maize from destructive moths with two partner crops: a legume that repels the hungry moths and a grass that attracts them for a tasty meal. This “push-pull” approach improves soil fertility and can triple yields, but some farms have seen much smaller gains. This team is finding out why. Understanding how soil and surrounding landscapes affect results will help more farmers benefit from sustainable practices that are helping their neighbors.

Led by Katja Poveda

Conservation Incentive Programs for Latin America
Some biodiversity hotspots in Latin America have lost half of their forests to agricultural development. Several nations are considering market-based conservation solutions to forest restoration. Programs that reward environmentally sustainable practices—growing coffee and other crops beneath trees, for example—can support struggling rural communities, slow forest loss, and help countries meet international carbon commitments. Working with Rainforest Alliance and industry partners in Nicaragua, the researchers are developing practical incentive programs to help Nicaragua meet its international pledge to restore 2.8 million hectares of degraded lands.

Led by Amanda Rodewald

Fighting Bacteria with Better Dairy Practices
Reducing unnecessary antibiotic use in food animals is a public health goal and a critical step for sustainable agriculture. This team is studying the common industry practice of administering antibiotics to cows at the end of lactation to cure existing infections and prevent mastitis. The researchers are surveying local dairy farmers and screening colostrum (first milk) to detect antibiotic residues and resistance genes that reach calves at their first feeding. Low-risk cows might do just as well with no treatment—making dairy production more cost-efficient and slowing the spread of antibiotic-resistant bacteria.

Led by Daryl Nydam
"I believe . . . there is such a thing as being too late. And when it comes to climate change, that hour is almost upon us," said President Obama at the 2015 COP21 climate talks in Paris. Atkinson Center researchers in the social sciences, humanities, and arts are finding compelling new ways to communicate about climate change, so that people around the world will take action now.

Framing Climate Change

Some climate change messages are too gloomy for us to handle. With funding from the Atkinson Center, political communication expert Adam Levine analyzed how the personal relevance of climate information affects people’s willingness to take political action, such as signing a petition or joining an environmental advocacy group.

Messages about how climate change threatens personal well-being grab listeners’ attention, he discovered, but end up being less motivating than hopeful messages about the benefits public policy could achieve.

“Framing climate change in terms of threats to personal health or food availability,” Levine explained, “leads people to dwell on those threats. This might seem persuasive, yet it turns out that focusing on fears makes people less willing to engage in collective advocacy.”

Levine is using his results to find better ways to communicate urgent sustainability messages. He reached out to a broad audience in a widely discussed Huffington Post feature about his study.

Speaking on the World Stage

Atkinson Center researchers joined critical global discussions at COP22 in Marrakech and the IUCN World Conservation Congress in Hawaii. We dispatched real-time news around the world through social media, increasing the impact of these leading sustainability events.

With primary funding from the Atkinson Center, Cornell sent a delegation of 14 faculty, students, and media contacts to the United Nations’ COP22 climate conference in November, days after COP21’s historic Paris Agreement setting global climate goals entered into force.

From carbon sequestration to indigenous knowledge to climate-adaptive design, Cornell-sponsored sessions, presentations, and an exhibit shared Atkinson Center research with world decision makers and experts. The delegation created connections and tracked on-the-spot developments with Facebook, Twitter, and numerous blog entries during the two-week event.

In September, an Atkinson-trained media team of 22 early-career researchers and professionals from 15 countries covered the World Conservation Congress. Team members learned cutting-edge social media skills, then attended media briefings and reported on the Congress’s 1,300 sessions. Cornell analytics show the team sent well over 500 posts, reaching 700,000 readers.
Medium as Message

Jack Elliott’s oak sculpture, Animus, suggests that climate justice is not only a human affair. The work was installed on the Ag Quad in May, during Elliott’s semester in residence at the Atkinson Center. Now in its second year, our faculty-in-residence program supported 10 scholars in the social sciences, humanities, and arts in 2016.

Acting for Climate

Communication PhD candidate Carrie Young traveled to Malawi to work with farmers training to use drama to communicate about climate change and social equity. More than 500 farmers in Malawi and Tanzania pilot tested the new participatory curriculum, launched with Atkinson Center funding.
Giving

In fiscal year 2016, the Atkinson Center raised $2.8 million from more than 120 donors.

We are grateful for the generous support of all our friends and donors. A top fundraising priority in 2016 has been endowing the Atkinson Center's three faculty directorships at the half-time level. A Boston-area couple—longtime supporters of our seed funding programs—stepped up to endow the faculty director of energy position with a gift of $2 million, leveraging the Atkinsons' $1 million challenge match. We continue to seek vital endowment support for the directorships in environment and economic development.

Other important gifts in FY16 included $100,000 from the Everett and Carpenter families to fund our topical lunch program for the next five years. A gift from Laurie and Duane Phillips ’78 will support the CARE-Cornell external collaboration and our thriving faculty-in-residence program in the social sciences, humanities, and arts.

Chris Miller
Development Director

Financial Report

The Atkinson Center finished fiscal year 2016 in a solid financial position. Our expenses totaled $5.6 million, an increase of 24 percent over FY15. We expanded research and program spending by 21 percent, to $3.4 million, with new collaborative research projects with external partners; our new in-residence program for faculty in social sciences, humanities, and the arts; and higher levels of funding for our postdoc fellowships.

FY16 revenues totaled $6.1 million. These strong revenues will allow us over the next few years to implement new initiatives and support collaborative research projects with The Nature Conservancy, Environmental Defense Fund, and the Smithsonian, while we work to achieve planned longer-term development goals.

We continue to benefit from the generosity of our founders, David and Pat Atkinson, Cornell University, and many other supporters as we build strong, comprehensive strategic partnerships with external organizations, strengthen existing programs, and create new cross-campus opportunities to stimulate sustainability collaborations and research.

Graham Kerslick
Executive Director

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Executive Director

Growing Gifts

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External Advisory Board

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atkinson.cornell.edu/people
H₂O Hero

Shannan Sweet—our newest Cornell–Nature Conservancy NatureNet postdoc—studied how climate change is affecting Alaska’s arctic tundra. Here she examines a mass of ice formed by flows of freezing groundwater near Toolik Field Station. During New York State’s historic drought in 2016, Sweet interviewed local farmers about their water use. Her research will build geospatial maps of the state’s climate-driven water vulnerabilities and help farmers adapt to climate change.