2016 Academic Venture Fund Awards

Academic Venture Fund awards topped $1.5 million in 2016, with a record 14 grants to seed new approaches to some of the world’s greatest sustainability challenges. Several projects explore market-based solutions to sustainability problems, with benefits for people and the environment. Many proposals combine on-the-ground research with computational sustainability, using big data sets to create models to guide human behavior toward more sustainable oceans, forests, and energy resource management.

### 2016 Funding by the Numbers

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<th>$1.5 Million</th>
<th>8 Colleges</th>
<th>26 Departments</th>
<th>43 Researchers</th>
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### Wild Seafood, Healthy Harvest

Twenty percent of the world’s wild seafood is harvested with fishing gear that operates along the seafloor with the potential to disturb seabed ecosystems. Marine reserves that prohibit fishing are the dominant policy tool for managing seafloor impact. Improved fishing gear that reduces bottom contact may provide a biologically and economically sustainable alternative. Working with fishery managers and fishing industry stakeholders, this team will weigh the trade-offs between these approaches. The researchers will develop 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.

**Investigators:** Suresh Sethi, Natural Resources; Patrick Sullivan, Natural Resources; Miguel Gómez, Applied Economics and Management

### 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 will develop 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 on this project.

**Investigators:** Sara Pryor, Earth and Atmospheric Sciences; Rebecca Barthelmie, Mechanical and Aerospace Engineering

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New Tech for an Ancient Food

Basic 3-D printing technology could make the tools rice farmers in Asia and Africa need to grow more rice sustainably. This team aims to demonstrate that 3-D printing can help manufacture quality weeder, transplanter, and harvesters for low-water, climate-smart rice production—simply, cheaply, and locally. The researchers will work 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.

Investigators: Derek Warner, Civil and Environmental Engineering; Erika Styger, International Programs; Robert Shepherd, Mechanical and Aerospace Engineering

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 will develop 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.

Investigators: Alexander Flecker, Ecology and Evolutionary Biology; Carla Gomes, Computing and Information Science; Patrick Reed, Civil and Environmental Engineering; Gregory Poe, Applied Economics and Management; Scott Steinschneider, Biological and Environmental Engineering

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 future long-distance transport of fungi affecting global food security, such as wheat stem rust fungus. The team will coordinate with Cornell’s Durable Rust Resistance in Wheat program and international disease management programs to safeguard the world’s wheat.

Investigators: Natalie Mahowald, Earth and Atmospheric Sciences; Gary Bergstrom, Plant Pathology and Plant-Microbe Biology; William Fry, Plant Pathology and Plant-Microbe Biology; Christopher Myers, Physics

Coffee: What’s Fair?

How much does sustainable coffee cost to grow? Fair-trade certification gives consumers peace of mind that the supply chain meets a standard of fairness for workers and farmers—but small coffee growers bear many hidden expenses that could mean they don’t get a fair price. Partnering with Fair Trade USA and coffee cooperatives, the researchers will collect real-world production costs and build an online tool to compare the costs and benefits of coffee production systems. This coffee calculator will be a step toward informed production decisions and a more inclusive, environmentally sound coffee industry.

Fighting Bacteria with Better Dairy Practices

Reducing unnecessary antibiotic use in food animals is an important public health goal and a critical step for sustainable agriculture. Working with local dairy farms, the researchers will study the common industry practice of administering antibiotics to cows at the end of their lactation to cure existing infections and prevent mastitis. The team will survey farmers and screen 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.

Investigators: Daryl Nydam, Population Medicine and Diagnostic Science; Lorin Warnick, Population Medicine and Diagnostic Science; David Just, Applied Economics and Management

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, these single-purpose basins also divide neighborhoods, concentrate pollutants, and require costly maintenance. With officials and experts in São Paulo, this team will create landscape-based design guidelines for piscinões that can 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.

Investigators: Brian Davis, Landscape Architecture; Raymond Craib, History; Tammo Steenhuis, Biological and Environmental Engineering; Thomas Whitlow, Horticulture

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. Using state-of-the-art techniques in chemistry and environmental toxicology, the researchers will identify unknown chemicals of concern in water collected throughout the fracking process. The team’s 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 monitoring of groundwater and surface water, as well as better wastewater treatment strategies.

Investigators: Damian Helbling, Civil and Environmental Engineering; Anthony Hay, Microbiology

Conservation Incentive Programs for Latin America

Some biodiversity hotspots in Latin America have lost more than 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, restore degraded land, slow forest loss, and help countries meet international carbon commitments. Working with Rainforest Alliance and industry partners in Nicaragua, the researchers will develop a portfolio of practical incentive programs to help Nicaragua meet its international pledge to restore 2.8 million hectares of degraded lands.

Investigators: Amanda Rodewald, Lab of Ornithology/Natural Resources; Mark Milstein, Johnson School; Viviana Ruiz Gutierrez, Lab of Ornithology; Miguel Gómez, Applied Economics and Management; Stephen DeGloria, Soil and Crop Sciences
Boosting Maize Yields Sustainably

Farming systems that use ecological principles—rather than expensive chemicals—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 will find out why. Their answers about how surrounding landscapes and soil affect results will help more smallholder farmers benefit from sustainable practices that are helping their neighbors.

Investigators: Katja Poveda, Entomology; Andre Kessler, Ecology and Evolutionary Biology; Laurie Drinkwater, Horticulture; Magdelene Laba, Soil and Crop Sciences

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 will develop 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.

Investigators: Timur Dogan, Architecture; Howard Chong, Hotel Administration; Kavita Bala, Computer Science

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 CO₂, and yields a valuable liquid fuel. The researchers are partnering with local clean energy entrepreneurs to develop green methanol for commercialization.

Investigators: David Erickson, Mechanical and Aerospace Engineering; Tobias Hanrath, Chemical and Biomolecular Engineering

Imagining Energy Transitions

With joint funding from Cornell’s Einaudi Center for International Studies, this project will seed a truly multidisciplinary approach to renewable energy at Cornell. Through the Energy Transitions Collaboratory, scientists and engineers, humanists, social scientists, and artists will work together to engage the public with effective stories and new visual approaches to sustainable energy solutions we can all share. One part of the initiative will disseminate public art on hot-button renewable energy issues to shape public opinion and reach thought leaders.

Investigators: Anindita Banerjee, Comparative Literature; Albert George, Mechanical and Aerospace Engineering

The Academic Venture Fund is supported by generous contributions from David and Patricia Atkinson, Kathleen Marble, David Drinkwater, and other donors.