2015 Academic Venture Fund Awards

For the second year in a row, the Academic Venture Fund crossed the $1 million mark, awarding 11 new projects a total of $1.2 million for cross-disciplinary research in novel technologies and approaches that have the potential to be game-changing.

The seed projects, selected from a pool of 37, share a number of key qualities, including a clearly defined pathway to impact and a strong team of multidisciplinary talent.

The projects cover the Atkinson Center for a Sustainable Future’s three Es—energy, environment, and economic development—at home and abroad. Close to home, researchers will support campus efforts to reduce Cornell’s carbon footprint, while an additional team investigates emerging geoengineering strategies to fight global warming in the Arctic.

Water is a big theme this year, with four projects on water quality, including one that is testing a new organic polymer that cleans contaminated water faster and more efficiently than widely used water-purifying sorbents. Another project will study the movement of glyphosate—the active ingredient in Roundup—in water from agricultural fields and test the impacts of trace levels on beneficial microbes, such as those in soil and human digestive tracts.
Tracking Seismic Activity

Earthquakes usually occur along well-known faults like the San Andreas, but the Earth’s crust experiences some background seismicity almost everywhere. Researchers will deploy seismometers on campus to search for ultra low-level seismic activity, including any previously unrecognized faults, as a guide to understanding seismic risk in the eastern U.S. The tracking will provide a benchmark to assess potential changes in seismic risk due to activities such as groundwater injection, hydraulic fracturing, geothermal development, and lake level changes, locally and in geologically similar areas. Researchers will also investigate public attitudes and perceptions related to seismic risk in an area unfamiliar with such events.

Investigators: Larry Brown, Earth and Atmospheric Sciences; Katie Keranen, Earth and Atmospheric Sciences; Katherine McComas, Communication; Jefferson Tester, Chemical and Biomolecular Engineering

Real Savings from Home Retrofits

Three-quarters of U.S. homes could save substantial energy with a retrofit—but with high up-front costs, homeowners want to know how much they will save on energy bills. Policymakers and retrofit installers claim annual savings of $700, but this impressive estimate is based on simulations. The researchers will deploy data loggers in hundreds of pre- and post-retrofitted homes to measure actual building performance and energy savings. The team will share the data with policymakers, utilities, installers, and customers to understand the data details that shape environmental decisions and the practical roadblocks to stakeholder acceptance.

Investigators: Howard Chong, Hotel Administration; Albert George, Mechanical and Aerospace Engineering

Quick Clean-up of Contaminated Water

With population growth, industrialization, and climate change, communities are turning to drinking water resources tainted by agricultural runoff and wastewater. The researchers have invented a promising new polymer that removes trace water contaminants, including pesticides and pharmaceuticals, more quickly than widely used sorbents like activated carbon. The new material saves both energy and money by being easy to reuse. The team will analyze the polymer’s performance on dozens of common and emerging contaminants, demonstrate scalability, and launch a pilot test—the next steps toward real-world application in the developed and developing worlds.

Investigators: William Dichtel, Chemistry and Chemical Biology; Damian Helbling, Civil and Environmental Engineering

Cornell Climate Plan Reflections

Cornell has embraced a carbon-neutral campus by 2035. Establishing forests on campus lands and transitioning to biofuels are options for reducing carbon emissions, but the carbon calculation is not straightforward. Forests and biofuel crops could reduce the land’s surface reflectivity, or “albedo”—an important but complex climate feature—and the warming effect may counterbalance the biofuels’ benefits. The researchers will develop an accounting tool to assess the net climate benefits of land management plans with more accurate climate projections. By revealing the trade-offs in land-use decisions, this much-needed tool has the potential for broad application beyond Cornell.

Investigators: Timothy Fahey, Natural Resources; Natalie Mahowald, Earth and Atmospheric Sciences; Christine Goodale, Ecology and Evolutionary Biology; Lawrence Smart, Horticulture–Geneva; Peter Hess, Biological and Environmental Engineering

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Solar Power’s Shadow Costs

Concentrating solar power (CSP) systems use massive mirrors to focus sunlight, amplifying the sun’s rays for renewable energy—but potential ecosystem costs, including bird deaths and heavy water use, are raising public concern. Another unknown is how important insects are affected. The researchers will measure impacts on plant-pollinating bees at the world’s largest CSP facility, the Ivanpah plant in California’s Mojave Desert, a global bee hotspot. Measuring insect biodiversity in the power plant zone will inform their broader economic and environmental cost-benefit analysis and allow for accurate comparison between the Ivanpah facility and other energy plants.

Investigators: Monica Geber, Ecology and Evolutionary Biology; Jefferson Tester, Chemical and Biomolecular Engineering

Reviving Oysters

A keystone species that clarifies water and builds critical reef habitats, eastern oysters are central to coastal restoration plans in New England. Restoring oyster beds near urban areas has been slow, however, in part because public health regulations protecting consumers and the harvest industry are at odds with conservation goals. Oyster health is another issue, as hatchery-raised oysters are needed to supplement populations, but using them potentially limits success by reducing genetic diversity. This blended project will improve chances for successful oyster restoration by investigating risk perception on the human side and minimizing hatchery impacts on the mollusk side.

Investigators: Matthew Hare, Natural Resources; Katherine McComas, Communication; Jon Conrad, Applied Economics and Management

Ecological Calendars for Climate Change

A time-tested tool for climate adaptation—ecological calendars—helped generations of indigenous and rural societies anticipate seasonal patterns for farming, herding, hunting, and fishing. These calendars rely on natural cues, such as the arrival of birds and nascence of flowers. This transdisciplinary team will use ecological calendars to guide communities as they adapt to climate change. Working in partnership with Great Plains Native Americans and rural communities near Oneida Lake, the researchers will identify key climate vulnerabilities, document existing ecological calendars, and revitalize or develop new calendars for local use by combining folk knowledge with cutting-edge climate forecasting.

Investigators: Karim-Aly Kassam, Natural Resources/American Indian Program; Christopher Dunn, Cornell Plantations; Art DeGaetano, Earth and Atmospheric Sciences; Amanda Rodewald, Lab of Ornithology; David Wolfe, Horticulture

Geoengineering on a Regional Scale

The National Academy of Science recently called for more research on geoengineering, including controversial climate interventions like reflecting sunlight away from the Earth. With significant impacts projected from global warming and melting ice, the Arctic is a critical region for evaluating possible future global cooling techniques, such as injecting aerosols into the stratosphere to boost “albedo” and reflect some of the sun’s energy. Combining social science, engineering, and communication, this team will engage Arctic communities in a participatory discussion about these emerging technologies, identify public concerns, and evaluate regionally specific geoengineering strategies that address them.

Investigators: Douglas MacMartin, Mechanical and Aerospace Engineering; Bruce Lewenstein, Communication
Wind Energy, More Efficiently

The northeastern United States has high electricity prices, large demand centers, and good wind resources, yet wind energy makes only a modest contribution to the region’s electricity production. The researchers plan to reduce risks posed by three sources of uncertainty in wind turbine operation in the Northeast, removing important bottlenecks that are impeding the growth of wind-generated electricity in the region. The team will develop and deploy a cost-efficient new measurement technology that uses data from seismographs to better quantify wind loading on turbines, optimize wind farm design, and monitor the condition of turbine components.

Investigators: Sara Pryor, Earth and Atmospheric Sciences; Larry Brown, Earth and Atmospheric Sciences; Rebecca Barthemlie, Mechanical and Aerospace Engineering

Reassessing Roundup

Annual agricultural and commercial use of the herbicide glyphosate, the active ingredient in Roundup, exceeds 1.25 million pounds in New York alone. Conventionally considered safe—rapidly immobilized in soil and easily degraded—glyphosate has recently been detected at low levels in agricultural runoff, surface waters, and even rain. This team will measure glyphosate’s movement in Northeastern fields and surface waters and test the impacts of trace levels on beneficial microbes, such as those in soil and human digestive tracts. Partners include the U.S. Geological Survey, New York State Department of Environmental Conservation, and Natural Resources Conservation Service.

Investigators: Brian Richards, Biological and Environmental Engineering; Tammo Steenhuis, Biological and Environmental Engineering; Rebecca Schneider, Natural Resources; Ludmilla Aristilde, Biological and Environmental Engineering; Anthony Hay, Microbiology; Kenneth Simpson, Vet Clinical Sciences

Rapid Test for Waterborne Diseases

In the developing world, people’s impressions about water quality drive decisions about personal consumption and community infrastructure. Water sources are rarely tested, and traditional tests do not assess the pathogens that cause diarrhea, a health threat that greatly influences consumption decisions. The researchers will develop and pilot a test kit for quick detection of multiple common waterborne pathogens—bacteria, viruses, and protozoa—that cause diarrhea, a leading childhood killer. They will work with communities in Kenya and Honduras to compare actual and perceived water quality for informed decision making and a safer water supply.

Investigators: Ruth Richardson, Civil and Environmental Engineering; Monroe Weber-Shirk, Civil and Environmental Engineering; Sera Young, Nutritional Sciences

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