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# ANNOUNCEMENT
## Academic Venture Fund Awards
May 2012

The Atkinson Center for a Sustainable Future (ACSF) announces its spring 2012 **Academic Venture Fund** awards. Designed to stimulate original, cross-disciplinary research in sustainability science, the annual AVF seed awards emphasize research with potential to grow by engaging external partners, including industry, government, foundations, and NGOs, and create viable solutions to our world's most pressing problems. The 31 proposals submitted represent a vibrant, innovative, and interdisciplinary research effort under way at Cornell. Ten proposals were ultimately selected, for total funding of approximately $735,000.

The AVF is primarily intended to support proposals that would not be funded by traditional granting organizations because the proposed research is interdisciplinary, still early in development, high risk, or some combination of these factors. The 31 submissions were rigorously reviewed by three panels, each composed of six distinguished faculty with expertise from across the university. Many more promising proposals were submitted than could be funded.

In the current round of selections, researchers from three colleges—Engineering, Agriculture and Life Sciences, and Arts and Sciences—combine talents to tackle a complex technological hurdle that is holding back the conversion of algae to biofuels. A second project brings together two engineers, an urban architect, and several labor economists to create a new index to guide New York policy makers in creating green jobs. In another regionally focused project, a Vet School scientist joins a CALS team to investigate the health and heartiness of New York's native bees. Projects also span the globe, with a team of nutritional scientists, plant pathologists, and toxicologists investigating whether early exposure to a toxin-laced mold associated with common crops like peanuts and corn is contributing to childhood malnutrition in Zimbabwe.

This round of seed awards includes investigators from CALS; Engineering; Human Ecology; Art, Architecture, and Planning; Veterinary Medicine; the ILR School; and Arts and Sciences. Ninety percent of the selections feature investigators from three or more departments, and 80 percent encompass two or more of the Center's sustainability themes of **energy, environment, and economic development**.

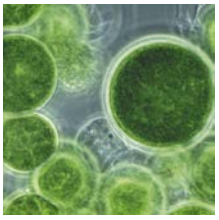
The Atkinson Center for a Sustainable Future advances multidisciplinary research and cultivates innovative collaborations within and beyond Cornell to foster a sustainable future for all. To learn more about the Atkinson Center and the AVF awards, visit our website at www.acsf.cornell.edu/AVF.

## Impacts of Pathogens and Pesticides on Wild Pollinators in Eastern Apple Orchards

Bees make our lives sweet in more ways than one: they provide an essential ecosystem service as pollinators of our crops, including apples. Growers typically rely on managed colonies of a single nonnative species, the European honey bee—a species in decline—but evidence suggests that wild bees are also at work. The investigators have detected more than 100 species of native bees in commercial apple orchards in central New York. This study will measure the impact of pesticides and pathogens—two major threats to native bee survival—on wild bees in the genus *Osmia* (mason bees). The research promises to improve the profitability and sustainability of New York orchards by establishing how management practices can help wild bees to thrive.

*Investigators:* Bryan Danforth (ENT), Motoko Mukai (VTPMD), Eric Nelson (PLPA), Andre Kessler (EEB)
*Funding:* $99,581 *Duration:* 14 months

## Improving Energy Cost and Scalability of Algal Biofuels



While liquid transportation fuel—particularly for aviation—is a critical part of the world's energy requirements, most forms of alternative energy cannot meet this need. Biofuels can. Biodiesel derived from microalgae is an important alternative to plant-based biofuels, offering 300 times more oil per acre of land. Yet algal biofuel technology has a major limitation: current methods for removing water from the algae at harvest expend more energy than is harvested. A multidisciplinary team of Cornell investigators aims to solve the "dewatering" problem for an efficient and scalable algal energy harvest. Moving from modeling to experiments with living algae systems, this research promises a major advance in the search for sustainable transportation fuels.

*Investigators:* Susan Daniel (CHEME), Roseanna Zia (CHEME), Beth Ahner (BEE), Itai Cohen (PHYS)
*Funding:* $110,000 *Duration:* 24 months

## A Hydrogen Test Bed at Cornell: Distributed-Scale Biorenewable Hydrogen Generation


At least five auto manufacturers plan to release hydrogen-powered fuel cell electric vehicles (FCEVs) before 2016. These hydrogen-electric hybrids—offering a driving range of more than 250 miles and refill times under five minutes—require compressed hydrogen fuel, but relatively little is known about renewable methods of hydrogen production, such as making hydrogen from biomass. The industry has recently focused on electrolysis (separating water into hydrogen and oxygen using an electric current) as the most promising method of hydrogen production for commercial use. This timely research will determine if an alternative, biorenewable way to produce hydrogen—converting biomass to synthesis gas (syngas), and then to hydrogen—can compete economically with electrolysis, offering more efficient regional production and delivery of compressed hydrogen fuel.

*Investigators:* Elizabeth Fisher-York (MAE), Paul Mutolo (EMC2), Alfred Center (CHEME)
*Funding:* $50,000 *Duration:* 9 months

## Sustainable Production of Staple Leafy Green Vegetable Crops in Sub-Saharan Africa

Sukuma wiki is a leafy green vegetable that makes an important nutritional contribution to the diet in sub-Saharan Africa, but leaf damage from "black rot" is widespread and can result in market losses of more than 50 percent for smallholder farmers. Research is under way at Cornell to transfer resistance to black rot, caused by the bacteria *Xanthomonas campestris*, into sukuma wiki following hybridization with resistant cabbage lines. Working with partners in Kenya and Tanzania, the research team will field test sukuma wiki with enhanced resistance to black rot, develop

production guidelines to suppress the disease, and introduce American collard greens. These contributions stand to improve vegetable crops enjoyed by millions of people.

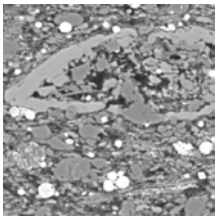
*Investigators:* Phillip Griffiths (HORT), Jenny Kao-Kniffin (HORT), Helene Dillard (CCE), Miguel Gómez (AEM)
*Funding:* $77,280 jointly funded by ACSF and CIIFAD *Duration:* 12 months

## Does a Healthy Diet Lead to a Healthy Environment?

Industrial agriculture, one of the major sources of greenhouse gas emissions and nitrogen pollution, places significant stress on the planet. Rising obesity rates pose a similar threat to public health. This holistic project suggests that what is better for human health may also be better for the environment—and changing our diet could be one of the most effective ways to handle environmental problems from agriculture. A team of nutritionists, agronomists, engineers, and biogeochemists will work together to assess how diet shifts, waste reduction, and organic agriculture can affect greenhouse gas emissions, nitrogen pollution, and land use, yielding crucial information about the best diet for both human and environmental health.

*Investigators:* Robert Howarth (EEB), Christina Stark (NS), Ian Merwin (HORT), Laurie Drinkwater (HORT), Jennifer Wilkins (NS)
*Funding:* $75,000 *Duration:* 12 months

## Probing the Micromechanics of Shale under Varying Fluid Compositions



Shale gas has emerged as a large and growing part of the nation's energy production, but persistent concerns remain about whether the hydraulic fracturing process and the fluids injected to cause the fracturing introduce contaminants into the environment. Accurate predictions of fracture behavior could help to minimize environmental impacts, but the mechanical behavior of shale is poorly understood. Shale is a sedimentary rock—a natural composite of mineral particles and organic materials. This pilot study will apply nanoscale methods developed for manmade composites to examine the fracturing behavior of shale, and then test alternative "fracking fluids" to determine how they interact with the rock. The research may lead to more precise control of fracturing and improved fluid treatments that reduce environmental risks.

*Investigators:* Teresa Jordan (EAS), Shefford Baker (MSE), Alan Zehnder (MAE), James Bisogni (CEE)
*Funding:* $46,400 *Duration:* 16 months

## Developing Species-Specific and Environmentally Friendly Insect Control

A fundamental problem with pest control is that most pesticides affect many organisms. Using double-stranded RNA (dsRNA) to interfere with gene transcription has become a powerful scientific tool, with phenomenal potential for insect control. Targeting appropriate genes leads to the death of the insect—and only the intended insect. Unfortunately, real-world application of this technology to provide pest-specific insecticides has been limited, because dsRNA is highly unstable under field conditions. This project will demonstrate that a modified form of existing biodegradable encapsulation technology works to stabilize dsRNA. The research promises to transform pest control by providing a practical technique for species-specific, sustainable control with virtually no adverse environmental effects.

*Investigators:* Jeffrey Scott (ENT), Dan Luo (BEE), Michael Hoffmann (ENT)
*Funding:* $99,873 *Duration:* 12 months

## Assessing Mycotoxin Exposure in Pregnant Zimbabwean Women

Malnutrition is responsible for more than two million deaths annually among children under five. Inadequate food may be only part of the reason. Exposure to mycotoxins—toxins produced by molds that can multiply in peanuts, corn, and other crops—during pregnancy and the first two years of life may cause child stunting and other effects of malnutrition. The investigators will work with mothers and their babies in rural Zimbabwe to measure the relationship between the mother's mycotoxin exposure during pregnancy and the child's growth, conducting interviews to estimate the level of contamination in each family's diet. The project will lay the groundwork for additional research to identify a causal mechanism—a breakthrough that could transform how the global health community fights childhood malnutrition.

*Investigators:* Rebecca Stoltzfus (NS), Rebecca Nelson (PLPA), Dan Brown (ANSCI), Karyn Bischoff (VTPMD)

*Funding:* $34,300 *Duration:* 12 months

## Climate Protection as a Driver for Job Creation in New York State


New York State's Climate Action Plan (CAP) requires reducing greenhouse gas emissions by 80 percent, based on 1990 levels, by 2050. Meanwhile, unemployment in the state remains shockingly high. Uniting climate protection and job creation, this project will build a Jobs-GHG Mitigation Index, a tool for policy makers designed to assess the type and number of jobs needed to meet New York State's climate protection goals. The investigators will use the new index to develop a basic policy and administration architecture for a New York State climate jobs program modeled on New Deal public works programs. An effective climate jobs program will help New York State make the transition to a low-carbon economy—while putting New Yorkers to work.

*Investigators:* Sean Sweeney (GLI), Lara Skinner (GLI), Huaizhu Gao, (CEE), Kevin Pratt (ARCH), Brandon Hencey (MAE)

*Funding:* $100,000 *Duration:* 12 months

## Energy Harvesting from High-Density, Small-Scale Turbines in Urban Areas

Large wind turbines have become familiar sights in the countryside and at sea. This project will bring wind turbines built on a much smaller scale into the city. The research group will design and test mini-turbines packed together into attractive visible arrays, combining engineering, architecture, and art. The vertical axis wind turbines (VAWTs)—mounted on building walls and roofs, in alleys, or even inside buildings and elevator systems—will interfere with each other constructively, creating wind flow for significantly increased power extraction. Incorporating reflective surfaces, color, and low-energy lighting, artistic arrays of mini-turbines have the potential to bring renewable energy production to the urban environment, while serving as memorable sustainability outreach tools.

*Investigators:* Charles Williamson (MAE), Todd Cowen (CEE), Kevin Pratt (ARCH)

*Funding:* $71,648 *Duration:* 24 months

**The Atkinson Center for a Sustainable Future is supported by a generous gift from David and Patricia Atkinson.**