



# Annual Report 2016-17



## Actionable Research ...



## From the Director: A Fond Look at 2016-17

I'm proud to say that the Institute for Sustainability, Energy, and Environment (iSEE) has taken its place as a valuable asset to the University of Illinois at Urbana-Champaign in the 2016-17 academic year.

iSEE proved that it can have a game-changing effect on research funding at Illinois, collaborating with the Carl R. Woese Institute for Genomic Biology (IGB) and 17 partner institutions to land a \$104 million, five-year grant for a U.S. Department of Energy Bioenergy Research Center. In addition, the Institute's seed-funded research projects made an impact by attracting new grants and endowments, publishing several papers, and applying for a patent during the past year.

On the campus sustainability front, Illinois remains an exemplary institution — as evidenced by a third STARS Gold designation — with iSEE helping lead the way on innovative programs, supporting student initiatives, and even by creatively funding future energy conservation, emissions reductions, and other Illinois Climate Action Plan efforts.



Our sustainability minor saw its first graduates — and added a new twist by bringing in corporate partners for future capstone research experiences. iSEE also started a new academic venture, partnering on an undergraduate Certificate in Environmental Writing program.

The Institute continues to contribute to local and world grand challenge conversations with events on the Illinois campus; our fourth annual Congress will be a discussion about global climate change adaptation.

As its fourth anniversary approaches, the Institute has even bigger plans on the horizon for research, campus sustainability, and education and outreach. And with a new Associate Director on board, I look forward to closing the circle between our three missions — with funding at the core.

Please enjoy our look back, but know that we at iSEE are looking forward eagerly.

Sincerely,  
Evan H. DeLucia,  
Baum Family Director, iSEE

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# Thanks to Our Benefactors ...

The Institute's missions receive continued support from:

- iSEE founding benefactor the Alvin H. Baum Family Fund, under the administrative leadership of Joel Friedman. The Baum Fund has given more than \$2 million to support iSEE and its Baum Family Director, Evan H. DeLucia. Baum also supported iSEE's predecessors, the Center for a Sustainable Environment and the Environmental Change Institute.



• Illinois alumnus Stuart L. Levenick and wife Nancy J. Levenick of Peoria, whose \$500,000

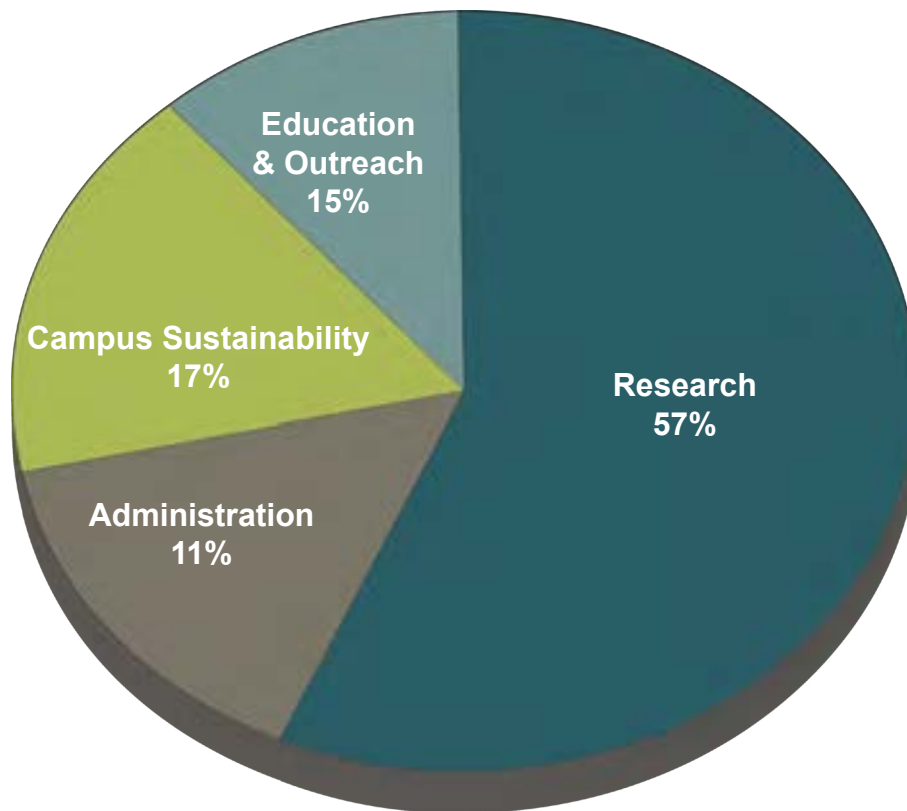
endowment supports the Levenick iSEE Fellows Program of scholars, research fellows, teaching fellows, and environmental and policy fellows. (*More on researchers, page 22; more on teaching fellows, page 23.*)

- A \$436,079 match by Caterpillar Inc. and an additional \$100,000 from the Student Sustainability Committee (SSC) will help build the iSEE Collaboratory, a new facility for education, communications, and collaboration to support the Fellows and iSEE. (*More on the Collaboratory, page 37.*)



S. LEVENICK

## FY17 iSEE OPERATIONS BUDGET BREAKDOWN



## Carbon Credits Sale to Fund Future Campus Sustainability Projects

In 2017, iSEE brokered a sale of campus certified carbon credits for more than \$177,000 as part of the Carbon Credit and Purchasing Program through Boston-based nonprofit organization Second Nature.

Proceeds from this and two previous sales are held in a campus fund that will be used for further sustainability efforts and greenhouse gas emissions reductions at the University of Illinois at Urbana-Champaign. (*More on the sale on page 33.*)

# External Funding Grant Requests

During 2016-17, the Institute submitted proposals totaling more than \$167.4 million in support of its own research, Illinois research teams, and new collaborative centers and teams put together by iSEE.

Two proposals, totaling **\$104,495,000**, have been approved for funding thus far with more pending.

Proposals were submitted to the following organizations in 2016-17: seven to the U.S. Department of Agriculture (USDA); six to the National Science Foundation (NSF); and one each to the U.S. Department of Energy (DOE), the Centers for Disease Control and Prevention (CDC), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), and the California Institute of Technology Jet Propulsion Lab.

For its existing seed-funded research projects, iSEE has submitted the following full proposals:

- Three, totaling \$1.5 million, for the Agroforestry for Food project. Two were not awarded, but co-Principal Investigator Wendy Yang received a **\$495,000**, three-year award from the USDA National Institute of Food and Agriculture (NIFA). (*More, pages 14-15.*)

- Four, totaling \$12.2 million, for the Stormwater and Mosquito Control project. Two were not funded; two, including an NSF proposal for more than \$1 million, remain under review. (*More, pages 18-19.*)

- Two NSF proposals, totaling \$4.7 million, for the Critical Infrastructure and Transportation project, were not funded. (*More, pages 20-21.*)

Other iSEE funding proposals include:

- A \$125 million request to the DOE to start a Bioenergy Research Center; **\$104 million** was approved. (*More in the box, above right.*)

- Seven requests, totaling \$23.6 million, for researchers or projects not related to iSEE seed funding.

iSEE also helped facilitate more than a dozen proposals totaling more than \$20,627,255 for its seed-funded researchers, of which \$3,214,992 was funded, with some decisions pending. They include:

- A **\$2.43 million** proposal to NSF for the Critical Infrastructure and Transportation project and PI Ximing Cai, and a **\$310,992** proposal from USDA NIFA for co-PI Madhu Khanna. The funding was approved on both. (*More, pages 20-21.*)

## iSEE, IGB Partner on DOE Bioenergy Center Grant

In July 2017, the U.S. Department of Energy announced it is funding a

**\$104 million** Bioenergy Research Center (BRC), a collaboration between iSEE, the Carl R. Woese Institute for Genomic Biology (IGB), and 17 partner institutions.



Evan H. DeLucia, the G. William Arends Professor of Plant Biology and Baum Family Director of iSEE, will serve as the Director for the Center for Advanced Bioenergy and Bioproducts Innovation (CABBI).

Over five years, CABBI researchers will develop fuels and products by integrating three highly interconnected DOE priority areas: Feedstock Development; Conversion; and Sustainability.

Read more at [bit.ly/CABBI-funded](http://bit.ly/CABBI-funded).

- **\$274,000** for the Crops *in silico* project and Principal Investigator Amy Marshall-Colón from the Foundation for Food and Agriculture Research (FFAR). This proposal was funded. (*More, pages 8-9.*)

- **Two sets of awards worth \$100,000 each** for the Stored Solar Stove project startup company Sun Buckets, from the Ocean Exchange and the Clean Energy Trust Challenge. Both sets of awards were funded. (*More, pages 10-11.*)

- Six proposals, totaling \$17,049,000, for the Smart Water Disinfection project from federal funding agencies and other nongovernment organizations. None were funded, but the team is working on three more proposals that will total more than \$12 million. (*More, pages 16-17.*)

- One proposal, totaling \$366,263 from the NIH, for the Stormwater and Mosquito Control project under review. (*More, pages 18-19.*)

Added to the \$40,138,824 applied for in FY14-16, iSEE has made or facilitated more than \$228 million in external funding requests thus far, with **more than \$109 million** funded.

## iSEE-affiliated Center

# CACHE

The Center for Applied Collaboration on Human Environments (CACHE) was established in early 2016 by seed funding from iSEE, the Department of Civil and Environmental Engineering (CEE), and the College of Engineering.

CACHE is directed by Tami Bond, a CEE Professor and MacArthur Fellow. At its core, the mission of the Center is to identify and mitigate negative environmental consequences caused by and found within households, communities, and cities worldwide. Research initiatives in three thrust areas build upon one another to



**BOND**

shape the understanding of emissions at scales as small as one household system and as large as the world's atmosphere.

During the 2016-17 fiscal year, CACHE celebrated several milestones:

• **Development Effectiveness Workshop** —

The Center's first outreach event was held Sept. 29-Oct. 1, 2016, at the ACES Library and Alumni Center and brought together 30 minds from academia and nongovernment organizations to collectively explore the tripping up points for international development projects, and why those stumbling points have not been addressed.

Over three days, participants discussed major challenge themes and brainstormed immediate actions they could each take to change their approach to development as soon as they returned to their respective offices.

• **"BrainstormThis" Forum Launched** — Following up on the intriguing discussions at the fall workshop, CACHE launched the "BrainstormThis" online forum to encourage researchers, implementers, and funders to continue a dialogue about best development practices. Discussion prompts are posted semi-monthly. Visit the discussion board at <http://brainstormthis.freeforums.net>.



Tami Bond photo

**Baby goats gather around an indoor fire for warmth in the Nepalese village of Sano Guan.**

• **emPOWER Collective Pilot Project** —

CACHE-affiliated researchers in the United States and implementers from the Center for Rural Technology in Nepal (CRT-N) have joined forces to pilot a research project to challenge the presumptive and prescriptive mindsets often employed in international development work. The emPOWER Collective's purpose is to use an empathy-based approach to overcome some limitations observed in previous development projects by deeply integrating insights from behavioral sciences, designs with community input, and sound engineering practices.

In January 2017, Bond visited the village of Sano Guan to gauge residents' interest in participating in a program like this, and in April several project leaders conducted a personal agency development workshop — helping villagers recognize their personal potential and guiding them through personal and community goal-making exercises.

Read more about CACHE and its projects at <http://publish.illinois.edu/humanenvironments/>.

## iSEE-affiliated Center

# Leverhulme C3M

As part of the Leverhulme Centre for Climate Change Mitigation (LC3M), University of Illinois researchers are conducting field trials for enhanced weathering of basalt at the Illinois Energy Farm.

Natural silicate mineral weathering is responsible for capturing a portion of the atmospheric carbon dioxide and trapping it as bicarbonate and carbonate in rivers and oceans. The process can be enhanced by pulverizing basalt rock and spreading the material on agricultural land, where the interaction of increased surface area, temperature, moisture, and plant roots speed up the process.

Test crops for this experiment are the conventional corn/soybean rotation and the perennial second-generation bioenergy grass *Miscanthus x giganteus*. Corn/soybean agriculture represents the dominant ecosystem in a large portion of the Midwest United States, where approximately 90 million hectares of land are used for food, animal fodder, and biofuels.

Enhanced weathering experiments at the Energy Farm address three questions:

- What is the weathering rate of basalt in these soils?
- Can weathering basalt be reliably identified and monitored as it interacts with soil and water?
- How does basalt affect agricultural quality and productivity?

In 2017, these questions will be addressed by field application of basalt to prime central Illinois agricultural land planted in maize. Basalt from Pennsylvania was applied to fields after harvest in fall 2016, and tilled into the soil during post-harvest cultivation — the first of five annual applications of weathering substrate.

Basalt movement and weathering rate are quantified by strontium isotope analysis in soil and water. Soils will be monitored for the presence of agriculturally important byproducts of basalt weathering, including calcium and magnesium, and for changes in acidity resulting from the liming

effect of basalt application. Maize plots are being measured for surface-atmosphere exchange of carbon, water, and energy with and without basalt treatment, and corn fields are being measured for nitrogen loss. Vegetation measurements and tissue analysis are tracking plant growth and the effect of basalt on tissue chemistry.

Researchers have selected experimental fields for basalt application to mature, perennial *Miscanthus* in 2018, and baseline measurements are underway.

The Energy Farm experiments are just one facet of the LC3M. Other themes at partner universities in the UK and Australia examine basalt weathering on a microscopic scale, the effects of basalt application on palm and sugarcane plantations in tropical and subtropical ecosystems, the economic costs and benefits of enhanced weathering, and global scale models of the potential to affect atmospheric CO<sub>2</sub> concentrations over time.

LC3M research at the U of I receives \$972,441 from the Leverhulme Trust. The Illinois team consists of Plant Biology Professor Evan H. DeLucia, Plant Biology and

Crop Sciences Associate Professor Carl Bernacchi, iSEE Postdoctoral Research Associate Ilsa Kantola, Department of Plant Biology Technician Michael Masters, and two field technicians who are joining the team for 2017: Haley Ware, an undergraduate student in Natural Resources and Environmental Sciences; and Konrad Taube, a 2015 U of I graduate in Molecular and Cellular Biology.

Read more about the Illinois research for the Centre at <http://lc3m.org/research/theme-3/>.

### Publications in 2016-17 ...

- “Potential of Global Croplands and Bioenergy Crops for Climate Change Mitigation through Deployment for Enhanced Weathering,” by team members Kantola, Masters, DeLucia, and others, was published in *Biology Letters* in July 2016.



DeLUCIA



BERNACCHI

## Thematic Research: Climate Solutions

# Crops *in silico*

Predicting crops' responses to climate change is crucial in solving the grand food security challenge. This project seeks to computationally mimic the growth and development of crops at the molecular, cellular, plant, and ecosystem levels.

Creation of an *in silico* — computer simulation — platform that can link models across different biological scales has the potential to provide faster and more accurate simulations of plant response to the environment than any single field model.

### Second-year progress ...

*Cis* Principal Investigators Stephen P. Long, Gutzell Endowed Professor of Crop Sciences and Plant Biology, and Amy Marshall-Colón, Assistant Professor of Plant Biology, had major progress to report.

Among the technical developments ...

- The molecular model developed by Balaji Panneerselvam, a Chemical & Biomolecular Engineering Postdoc, was used to simulate the phosphorylated and unphosphorylated states of a key nitrate transporter and characterize the nitrate transport cycle. This model will soon be combined with the work by Stuti Shrivastava, a Plant Biology Ph.D. Candidate, whose gene-level model was optimized to determine the effects of changing nitrate uptake rate and cellular concentrations on protein levels for the nitrate transporters and their regulators. Shrivastava has also identified punitive transcription factors that can potentially regulate the expression of nitrate transporter genes.

- Plant Biology Ph.D. Candidate Kavya Kannan improved her gene-level model of the metabolite pools of photosynthesis in response to elevated CO<sub>2</sub> by accounting for mRNA translation and degradation rates. This model was merged with Carl R. Woese Institute for Genomic Biology Postdoc Yu Wang's metabolic model that simulates the processes of photosynthesis un-

der elevated CO<sub>2</sub> and temperature and with IGB Postdoc Venkat Srinivasan's system-level model that simulates carbon partitioning between the leaf and roots, and sugar-starch partitioning under elevated CO<sub>2</sub>.

- The rendering of plant- and canopy-level data derived from the system model and measured field data of soybean over the course of a growing season was updated by AJ Christensen, a visualization programmer for the National Center for Supercomputing Applications' Advanced Visualization Lab, to include seed pod development and leaf senescence.

- Yiwen Xu, an M.S. Candidate in Computer Science, developed algorithms to reconstruct 3D plant models from video images. Her prototype system can precisely reconstruct 3D plant models from videos with little human interaction.

Read more at [bit.ly/Cropsinsilico](http://bit.ly/Cropsinsilico).



LONG



MARSHALL-COLÓN

### Funding applications ...

The Foundation for Food and Agriculture Research (FFAR) awarded PI Marshall-Colón and other team members \$274,000 to continue their research in support of *Cis*.

The team intends to approach FFAR, the Gates Foundation, and private software companies with future funding proposals.

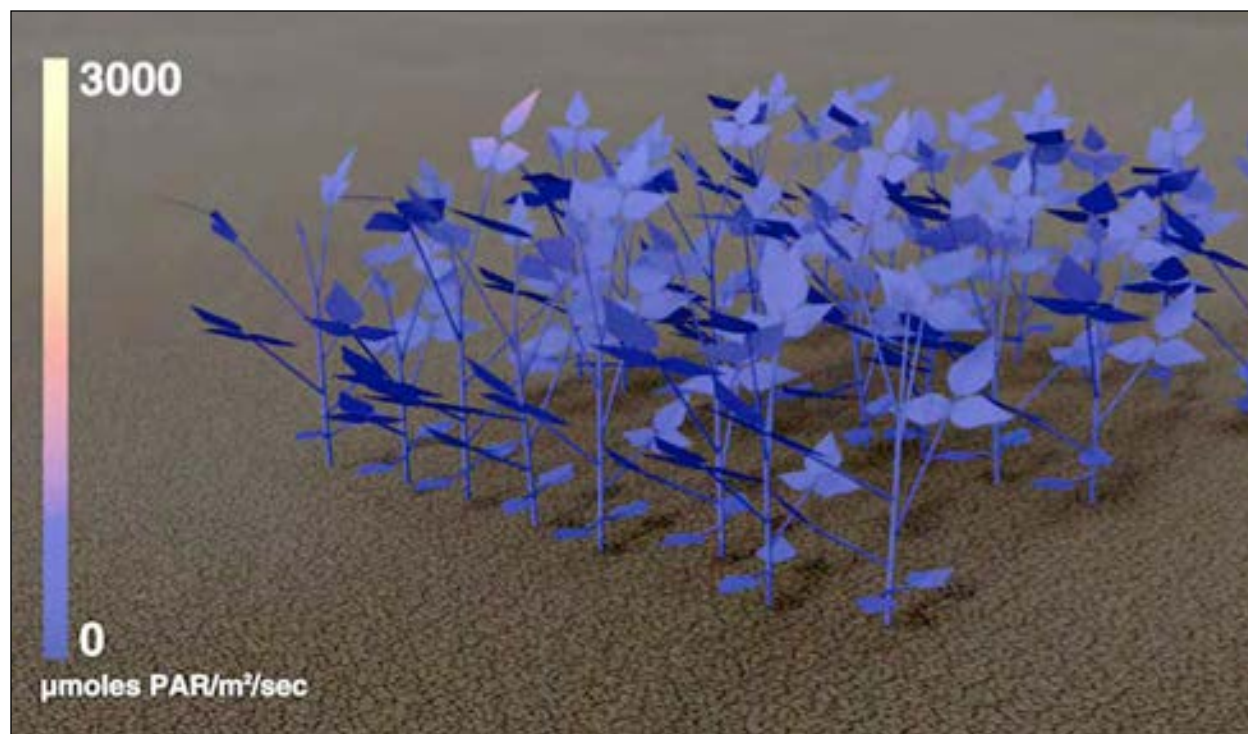
### Publications in 2016-17 ...

- "Crops *in silico*: Generating Virtual Crops Using an Integrative and Multi-scale Modeling Platform," a white paper from the 2016 *Cis* Symposium and Workshop — written by Long, Marshall-Colón, 13 other team members, and several other experts who attended the workshop — in *Frontiers in Plant Sciences*.

### *Cis* Symposium & Workshop ...

The second annual Crops *in silico* Symposium and Workshop was June 26-28, 2017, in Oxford, England.





**A Crops *in silico* computer simulation of how soybeans absorb canopy light over a one-day period.**

**2016-17 CROPS *IN SILICO* TEAM  
Principal Investigators and Co-PIs**

Stephen P. Long (PI)	Professor, Crop Sciences and Plant Biology
Amy Marshall-Colón (PI)	Assistant Professor, Plant Biology
Donna Cox	Professor, Art + Design; NCSA Director, Advanced Scientific Visualization Laboratory
John Hart	Professor, Computer Science
Christine Kirkpatrick	Executive Director, National Data Service, NCSA
James O'Dwyer	Assistant Professor, Plant Biology
Diwakar Shukla	Assistant Professor, Chemical and Biomolecular Engineering
Matthew Turk	Assistant Prof, Info Sciences; Assistant Research Prof, Astronomy; Research Scientist, NCSA

**Operating Team: Scientists, Postdocs, and Students**

Kalina Borkiewicz	Visualization Programmer, Advanced Visualization Lab, NCSA
AJ Christensen	Visualization Programmer, Advanced Visualization Lab, NCSA
Apollo Ellis	Ph.D. Candidate, Computer Science
Kavya Kannan	Ph.D. Candidate, Plant Biology
Meagan Lang	Postdoctoral Research Associate, National Center for Supercomputing Applications (NCSA)
Balaji Panneerselvam	Postdoctoral Researcher, Chemical and Biomolecular Engineering
David Raila	Senior Research Programmer, National Data Service, NCSA
Stuti Shrivastava	Ph.D. Candidate, Plant Biology
Venkat Srinivasan	Postdoctoral Researcher, Carl R. Woese Institute for Genomic Biology
Yu Wang	Postdoctoral Researcher, Carl R. Woese Institute for Genomic Biology
Yiwen Xu	M.S. Candidate, Computer Science

**Advisers**

Gabrielle Allen	Associate Professor, Astronomy; NCSA Director, Computing and Data Sciences
Victor Jongeneel	Director, Bioinformatics, Carl R. Woese Institute for Genomic Biology (IGB)
Daniel Katz	Assistant Director, Scientific Software and Applications, NCSA
Bertram Ludäscher	Professor, Library and Information Science; Director, Center for Informatics Research
Donald Ort	Professor, Plant Biology
Cameron Pittelkow	Assistant Professor, Crop Sciences
H. Edward Seidel	Director, National Center for Supercomputing Applications (NCSA)
Xinguang Zhu	Group Leader, Institute of Computational Biology, Chinese Academy of Science

**Project Manager**

Rachel Shekar	Grant Program Manager
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## Thematic Research: Energy Transitions

# Stored Solar Stove

Nearly 3 billion people rely on solid fuels like wood, charcoal, animal dung, and grasses to cook daily meals. The resulting indoor air pollution causes 4 million deaths each year — more than malaria, tuberculosis, and HIV/AIDS combined.

By developing a technology to collect, concentrate, store, and recover abundantly available solar thermal energy at near-flame temperatures, this project hopes to eliminate harmful emissions from cooking with a product called Sun Buckets.



- Members are working with Underwriters Laboratory for independent safety testing.

- The team is exploring partnerships with organizations that can facilitate marketing, distribution, fabrication, and financing.

Said Litchfield: “We see significant opportunities for research and development of long-term thermal storage. That is, storing energy for days, weeks, or months (e.g., through a rainy season).”

Read more on the project at [bit.ly/sunbuckets](http://bit.ly/sunbuckets).

### Third-year progress ...



**LITCHFIELD**

Principal Investigator Bruce Elliott-Litchfield, Professor of Agricultural and Biological Engineering (ABE), reports several new developments:

- A patent application was submitted May 28, 2017, with claims for the product and the process used to make Sun Buckets.

- Team member Sam Lindgren traveled to Les Cayes, Haiti, with a representative of the Sun Buckets partner company there, and installed and did training on several new solar stoves. “The units are working well, and we are learning from the pilot installations,” Litchfield said. “Our partner there has purchased 24 systems to equip six of their homes.”

- The team has met with three fabricators based in Illinois to get quotes for manufacturing 100 units. The bids will help the startup company better understand production costs and help prepare for delivery of the first commercial units.

- Team member Matthew Alonso is working with a professional welder to develop automated welding of the inner vessel, a critical part of the fabrication process.

### Funding applications ...

The team continues to receive support from the ADM Institute for the Prevention of Postharvest Loss as it researches food drying techniques.

Student team members earned two sets of awards totaling \$100,000 each:

- In November 2016, Sun Buckets received The Ocean Exchange’s Gulfstream® Navigator Award for “an outstanding innovation that demonstrates positive impact on the environment, economies, and health while respecting cultures around the world and has applications across multiple industries.”

- The team earned four awards in May 2017 at the Clean Energy Trust Challenge in Chicago: the ComEd Female Founder award (\$20,000); the Hanley Family Foundation award (\$20,000); the Power Clean Cities award (\$20,000); and \$40,000 from the Clean Energy Trust’s discretionary fund.

In addition, Sun Buckets continues to negotiate with potential investors Decision Point Global and One Earth Designs.

### Upcoming publicity ...

The Big Ten Network continues to record the Sun Buckets process for a documentary.



**Stored Solar Stove team members Samantha Lindgren and Joe Bradley with a bevy of cooking vessels.**

**2016-17 STORED SOLAR STOVE TEAM  
Principal Investigators and Co-PIs**

Bruce Elliott-Litchfield (PI)	Professor, Agricultural and Biological Engineering (ABE)
Tami Bond	Professor, Civil and Environmental Engineering (CEE)
Madhu Viswanathan	Professor, Business
Joe Bradley	Teaching Associate, Illinois Engineering First-Year-Experience (IEFX)

**Operating Team: Students**

Matthew Alonso	Ph.D. Candidate, Agricultural and Biological Engineering (ABE)
Keilin Jahnke	Ph.D. Candidate, Agricultural and Biological Engineering (ABE)
Samantha Lindgren	Ph.D. Candidate, Agricultural and Biological Engineering (ABE)
Emily Floess	M.S. Candidate, Environmental Engineering
Moosa S Al-Nimer	Undergraduate, Computer Engineering
Blake Banks	Undergraduate, Chemical Engineering
Calvin Smith	Undergraduate, Civil Engineering
Tyler Traywick	Undergraduate, Electrical Engineering
Brendan Wolan	Undergraduate, Materials Science and Engineering
Catherine Zhou	Undergraduate, Chemical Engineering
Omeed Salo	Student, University High School
Rahi Salo	Student, University High School

## Thematic Research: Energy Transitions

# Nano-CarboScavenger

As demand for petroleum increases, so will the transport of oil — leading to inevitable spills and environmental disasters. The aim of this project is to optimize a Nano-CarboScavenger (NCS), a particle designed to clump oil molecules together for easy removal from water using nets and booms and in some cases to disperse oil for natural digestion by microorganisms.

Chemical dispersants and coagulant treatments for oil spills create environmental problems of their own when they are added to water bodies. In contrast, the NCS leaves behind no residual footprint because it degrades in the environment and in living systems with no harmful effects to organisms.



PAN

### Second-year progress ...

Principal Investigator Dipanjan Pan, an Associate Professor of Bioengineering, reports:

- The team evaluated the potential of a second NCS material to remove oil dissolved in seawater:
  - Oil-contaminated seawater samples were treated with NCS for six-time point measurements over eight days.
  - Triplicate measurements of total organic carbon (TOC), fluorescence spectroscopy (EEM), and Acute Toxicity by MicroTox were performed at each time point, and the team extracted non-polar organics at select time points and analyzed extracts by gas chromatography mass spectrometry.
- The following findings were made:
  - Addition of NCS material to seawater with and without contamination increased the dissolved TOC — and reduced the fluorescence tendencies of the three components — in the water fraction.
  - The team confirmed that addition of NCS material to contaminated seawater had no significant effect on acute toxicity of the water fraction. Nor did addition of NCS material to seawater alone.
  - The addition of NCS material to oil contaminated seawater shows a ~40% reduction in the total petroleum hydrocarbon content in the water.

- Using the NCS platform technology, a “smart water purification system” for remediation of pharmaceuticals, hormones, polyaromatic hydrocarbons and other contaminants was developed. Several batches of second-generation NCS samples were successfully tested in new collaborator Wei Zhang’s lab at the Illinois Sustainable Technology Center (ISTC).

- The team also developed mineral-rich algal nanoparticles from biomass (algae) for biomedical application in possible cancer treatments.

Read more about the project at [bit.ly/NCS-project](http://bit.ly/NCS-project).

### Funding applications ...

The team submitted proposals to several institutes, including one to the Strategic Environmental Research and Development Program (SERDP) for remediation of per- and polyfluoroalkyl substance (PFASs) contaminated groundwater, but no funding was attained.

The team is submitting a proposal with new collaborators at Zhejiang University in China to support a chiral carbon nanoparticle project for carbon dioxide sequestration. In addition, Pan and his team plan to submit proposals to the U.S. Department of Energy and the National Science Foundation this fall.

### Publications in 2016-17 ...

- “ $\alpha$ -Amino Acid Rich Photo-phytonic Nanoparticles of Algal Origin Serendipitously Reveals Anti-migratory Property against Cancer,” by Pan, ISTC Senior Research Engineer B.K. Sharma, postdoc Santosh Misra, grad students Fatemeh Ostadhossein and Enrique Daza, and others in *American Chemical Society Applied Materials & Interfaces*.
- “Nanosalina: A Tale of Saline-Loving Algae from the Lake’s Agony to Cancer Therapy,” by Pan, Sharma, Misra, Ostadhossein, and others in *ACS Applied Materials & Interfaces*.



Olivia Harris/iSEE

**NCS team member Santosh Misra, a Postdoctoral Researcher in Bioengineering, checks a water sample.**

**2016-17 NANO-CARBOSCAVENGER TEAM**

**Principal Investigators and Co-PIs**

Dipanjan Pan (PI)	Associate Professor, Bioengineering
B.K. Sharma	Senior Research Engineer, Illinois Sustainable Technology Center (ISTC)
John Scott	Senior Analytical Chemist, Illinois Sustainable Technology Center (ISTC)

**Operating Team: Postdocs and Students**

Santosh Misra	iSEE Postdoctoral Researcher, Bioengineering
Indu Tripathi	Postdoctoral Visiting Scholar, Bioengineering
Enrique Daza	M.S. Candidate, Bioengineering; M.B.A. Candidate
Fatemeh Ostadhossein	M.S. Candidate, Bioengineering
Zhaolu Wang	M.S. Candidate, Bioengineering

## Thematic Research: Secure & Sustainable Agriculture

# Agroforestry for Food

Agroforestry is the practice of farming with fruit- and nut-bearing perennial trees and shrubs rather than resource-intensive annual crops like corn and soybeans. This project examines the ecological, economic, and climate benefits of perennial mixed-crop agriculture.

The 30-acre project site features roughly 12,000 seedling nut and fruit trees and shrubs of 10 different species. Forage crops like alfalfa and hay grow between the rows of trees and bushes.

In addition to providing food and fiber in abundance, these alternative systems are expected to offer environmental benefits such as permanent wild-life habitat, efficient use of nutrients, and storage of carbon — all of which the team is measuring. Team researchers are also accounting for all costs and income streams to compare with a conventional corn-soybean rotation.

### Third-year progress ...



LOVELL

Principal Investigator Sarah Taylor Lovell, an Associate Professor of Crop Sciences, said her team had several accomplishments, among them:

- Improved varieties of chestnuts were grafted onto the seedling rootstock, and grafted apples were planted in designated treatments.
- Harvest of hay from the alleyway has continued throughout the growing season — and this past summer, Aronia berries (pictured, above) were the first fruit harvested.
- Assessment of water quality and quantity continued with resin lysimeter samples in different seasons, soil moisture tubes in rows and alleys, and wells to monitor water table depth.
- Performance trials for individual crop species included a replicated study of black currants growing under varying levels of shade, hazelnut



accessions procured and asexually propagated, an extensive study of eastern filbert blight resistance in hazelnuts, and trials on alley crop alternatives to study light interactions.

- The team found greater carbon sequestration in woody polycultures than in traditional row crops (but less than adjacent forests).
- A study of fertilization effects, nutrient leeching, and greenhouse gas emissions at three working woody polyculture farms.
- And a preliminary Life Cycle Assessment model is complete.

Read more about the project at [bit.ly/ag4food](http://bit.ly/ag4food).

### Funding applications ...

Co-PI Wendy Yang, an Assistant Professor of Plant Biology, was the lead on a \$495,000 U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA) award, for a study titled “Transforming the Midwest U.S. with Woody Polycultures for Food Production and Ecosystem Service Enhancement.”

The team submitted one other full proposal:

- \$500,000 for Lovell and others from USDA NIFA for a study titled “Productive Agroforestry Systems as a Sustainable Agriculture Alternative.”

And the team submitted two pre-proposals: one of them for \$1 million to the Foundation for Food and Agriculture Research; the other to the Walton Foundation.

### Publications in 2016-17 ...

- “Temperate Agroforestry Research: Considering Multifunctional Woody Polycultures and the Design of Long-term Field Trials,” by Lovell, grad students Ron Revord, Kevin Wolz, and Erik Stanek, and others in *Agroforestry Systems*.

Team members also organized a session at the Ecological Society of America’s 101st Annual Meeting and made three other presentations there.



**Agroforestry for Food team member Michael Douglass, a Research Specialist in Crop Sciences, plants grafted apple trees on the project's farm plot.**

**2016-17 AGROFORESTRY FOR FOOD TEAM  
Principal Investigators and Co-PIs**

Sarah Taylor Lovell (PI)	Associate Professor, Crop Sciences
Nick Paulson	Associate Professor, Agricultural and Consumer Economics (ACE)
Michelle Wander	Professor, Natural Resources and Environmental Sciences (NRES)
Wendy Yang	Assistant Professor, Plant Biology
Jeremy Guest	Assistant Professor, Civil and Environmental Engineering (CEE)
Bruce Branham	Professor, Crop Sciences

**Operating Team: Staff, Postdocs, and Students**

Tito Lavaire	Researcher and Technician, Natural Resources and Environmental Sciences (NRES)
Michael Douglass	Research Specialist, Crop Sciences
Sophie Fruchter	iSEE Field Technician, U.S. Department of Agriculture study
William Eddy	Postdoctoral Researcher, Plant Biology
Dane Hunter	Ph.D. Candidate, Natural Resources and Environmental Sciences (NRES)
Ronald Revord	Ph.D. Candidate, Crop Sciences
Kevin Wolz	Ph.D. Candidate, Program in Ecology, Evolution, and Conservation (PEEC) Biology
Ian Goller	M.S. Candidate, Environmental Engineering
Erik Stanek	M.S. Candidate, Crop Sciences
Matthew Wilson	M.S. Candidate, Crop Sciences
Eric Wolske	M.S. Candidate, Crop Sciences
Osenkyerewa Bannerman-Blankson	Undergraduate, Molecular and Cellular Biology: Work Study/Hourly
Taylor Bozman	Undergraduate, Integrative Biology: Work Study/Hourly
Harley Carlson	Undergraduate, Agricultural Leadership and Science Education: Work Study/Hourly
Sylvia Gewont	Undergraduate, Agricultural and Consumer Economics: Work Study/Hourly
Audrey Gomez	Undergraduate, Bioengineering and Pre-Medicine: Work Study/Hourly
Sharell Hicks	Undergraduate, Molecular and Cellular Biology: Work Study/Hourly
Kelsey Pugh	Undergraduate, Agricultural Communications: Work Study/Hourly
Kathleen Ross	Undergraduate, Molecular and Cellular Biology: Work Study/Hourly
Brianna Sarley	Undergraduate, Molecular and Cellular Biology: Work Study/Hourly

## Thematic Research: Water & Land Stewardship

# Smart Water Disinfection

Billions of people rely on drinking water sources contaminated with disease-causing organisms, but viruses have been largely ignored. This project seeks a more detailed understanding of how viruses become noninfectious after contact with common disinfection treatments, including ultraviolet (UV) light exposure and chlorine. The hope is to find new ways to control viruses at the molecular level.

Researchers are also creating a real-time sensor that can be dipped into a water sample and indicate if infectious viruses are present.

### Third-year progress ...

Updates from Principal Investigator Benito Mariñas, Professor and Head of Civil and Environmental Engineering:

- Researchers are studying the individual steps of the virus replication cycle to determine which proteins are being mutagenized by free chlorine, thus inactivating adenovirus.

- They found that different UV wavelengths have different mechanisms of viral inactivation.

- Team members have also found that viruses are more susceptible to disinfection if treated sequentially with UV and monochloramine. “This is unexpected and may provide a new strategy for treating drinking water,” Mariñas said.

- The team continues to study the DNA aptamers of infectious adenovirus to transform them into fluorescent sensors for quantitative detection.

- To lower costs for on-site and real-time detection, the team will label the DNA aptamer with an enzyme so the sensing system will generate glucose, measurable by a glucose meter. For rapid detection, the team is engineering the sensor to change color.

- And it will continue testing the performance of the sensors in water.

Read more about the project at [bit.ly/smrtwtrdis](http://bit.ly/smrtwtrdis).

### Funding applications ...

The team submitted six proposals:

- \$6 million to the U.S. State Department

Population Refugee Migration. The project, titled “Improving Livelihoods and Well Being Through Entrepreneurship in Refugee Settlements and Beyond,” was submitted through the NGO Climate and Health Research Network.

- \$5 million to Barclay’s International for a Living Learning Education Center, a Uganda-based Illinois technology testbed and training center.

- \$3 million to the National Science Foundation (NSF) Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) fund for a study titled “Enhancing Food-Energy-Water System Resilience in Mid-size Cities through Technology Innovation, Institutional Reform, and System Optimization.”

- \$1,989,000 to the U.S. Environmental Protection Agency for a study titled “Influence of Biofilms on Water Quality in Building with Water Conservation Practice.”

- \$1 million to the NSF Ecology and Evolution of Infectious Diseases (EEID) fund for a study titled “Viral Transmission Dynamics at the Human-Wildlife Interface in Western Uganda.”

- \$60,000 to the National Institutes of Health’s National Institute of General Medical Sciences (NIGMS) for “Integrated Physical Characterization and Selective Recognition of Pathogens.”

The team has three more proposals in progress, including \$7 million to the Aga Khan Foundation and \$5 million to Rotary Club International for the proposed Living Learning Education Center, as well as a major initiative with the Metropolitan Water Reclamation District of Greater Chicago. The team also intends to propose an NSF Science and Technology Center this fall.

### Publications in 2016-17 ...

- “Size-Dependent Modulation of Graphene Oxide-Aptamer Interaction for Amplified Fluorescent Detection of Aflatoxin B1 with Tunable Dynamic Range,” by Chemistry Professor Yi Lu and others in *Analyst*.

Four more publications are also in preparation.



MARIÑAS





Olivia Harris/iSEE

**Smart Water Disinfection researcher Bernardo Vazquez Bravo, a Ph.D. Candidate in Environmental Engineering, prepares samples of virus-contaminated water for infrared treatment.**

**2016-17 SMART WATER DISINFECTION TEAM  
Principal Investigators and Co-PIs**

Benito Mariñas (PI)	Professor and Head, Civil and Environmental Engineering (CEE)
Yi Lu	Professor, Chemistry
Joanna Shisler	Associate Professor, Microbiology
Madhu Viswanathan	Professor, Business

**Operating Team: Students**

Bernardo Vazquez Bravo	Ph.D. Candidate, Environmental Engineering
Kelley Goncalves	Ph.D. Candidate, Molecular and Cellular Biology
Wen Cong	M.S. Candidate, Civil and Environmental and Engineering (CEE)
David Patel	MBA Candidate

## Thematic Research: Water & Land Stewardship

# Stormwater & Mosquito Control

Mosquito-borne diseases pose a major threat worldwide despite substantial global eradication efforts. This project studies how “green infrastructure” — technologies that manage stormwater, runoff, and contaminants — can be used to limit the number of aquatic breeding habitats for mosquitoes to keep their numbers low.

The team also studies how the aquatic microbiome can be manipulated to “starve” larvae to control mosquito populations.

### Second-year progress ...

Principal Investigator Brian Allan, an Associate Professor of Entomology, said his team has been highly productive in several major areas:



**ALLAN**

- “We have successfully integrated the mosquito control, hydrological modeling, and cyberGIS experts on our team in an ambitious project to forecast for the

continental U.S. what will be the extent of the adoption of green stormwater infrastructure and what likely will be the impact of the widespread adoption of green infrastructural practices for mosquito control,” Allan said. The team has solved a number of challenges related to this task, including:

- the assembly of several very large data sets using “big data” approaches; and
- the development of novel quantitative methods for estimating variation in runoff due to stormwater practices.

- Stormwater and Mosquito Control team members are preparing their first publication from this large-scale undertaking.

- The arrival of Zika virus in the Americas created research opportunities directly relevant to the efforts of this research theme. “We have started a research program using ‘social sensing’ (i.e., the use of geo-located social media activity data) to model networks of human movements and contacts to recreate the pattern of spread of Zika virus in the Americas and apply this to future outbreaks,” Allan said.



- The research findings to date have motivated several additional field and laboratory studies, including surveys of green and conventional stormwater infrastructure in Illinois to explore the consequences of the adoption of green technologies for mosquito control and the impact of the stormwater environment on the assembly of the mosquito microbiome. “These additional efforts in part form the Ph.D. research of several graduate students affiliated with our project, including Elijah Juma, Chris Holmes, and Allison Parker,” Allan said.

Read more on the project at [bit.ly/stormmosq](http://bit.ly/stormmosq).

### Funding applications ...

The team has submitted two pre-proposals in the past year, and both were invited for full proposals in Fall 2017:

- A \$1 million grant from the National Science Foundation’s Division of Environmental Biology for a study with PI Carla Cáceres and team members Allan, Allison Hansen, and Juma Muturi, titled “Community Assembly across Scales of Spatial Organization.”

- A \$366,263 grant from the National Institutes of Health’s National Institute of Allergy and Infectious Diseases for a study by former team member Allison Gardner, with assistance from current project postdocs Andrew Mackay and Aiman Soliman, and including Allan and Shaowen Wang. This proposed study going before the NIH’s Vector Biology panel is titled “Social Sensing: A Novel Tool to Predict the Transmission and Spread of Mosquito-borne Disease.”

### Publications in 2016-17 ...

Allan says the team has several papers in preparation, including two for top-tier journals.



Olivia Harris/iSEE

**Stormwater & Mosquito Control researcher Allison Parker (center), a Ph.D. Candidate in Entomology, works with undergraduate students Charmaine Dortch and William Marshall to collect mosquito egg and larva samples from backyards in Champaign.**

### 2016-17 STORMWATER & MOSQUITO CONTROL TEAM

#### Principal Investigators and Co-PIs

Brian Allan (PI)	Associate Professor, Entomology
Carla Cáceres	Professor, Animal Biology; Director, School of Integrative Biology
Allison Hansen	Assistant Professor, Entomology
Juma Muturi	Research Scientist, U.S. Department of Agriculture
Marilyn O'Hara Ruiz	Clinical Associate Professor, Pathobiology
Arthur Schmidt	Research Assistant Professor, Civil and Environmental Engineering (CEE)
Shaowen Wang	Professor, Geography and Geographic Information Science (GIS)

#### Operating Team: Faculty, Scientists, Postdocs, and Students

Derek Wildman	Professor, Molecular and Integrative Physiology
Anand Padmanabhan	Senior Research Scientist, CyberInfrastructure and Geospatial Information Laboratory
Aiman Soliman	Postdoctoral Researcher, Supercomputing Applications
Andrew Mackay	Postdoctoral Researcher, Entomology
Chris Holmes	Ph.D. Candidate, Animal Biology
Surendra Karki	Ph.D. Candidate, Pathobiology
Do Hyup Kim	Ph.D. Candidate, Entomology
Allison Parker	Ph.D. Candidate, Entomology
Elijah Juma	M.S. Candidate, Entomology

# Thematic Research: Sustainable Infrastructure

## Critical Infrastructure & Transportation

Changes in the availability of water and fuel, in energy production methods and regulation, and in community interactions have made the interdependencies between critical infrastructure systems in the United States an important topic of study.

This project focuses on developing an analytical framework for modeling and analyzing these Interdependent Critical Infrastructure (ICI) systems, incorporating both renewable energy and national transportation systems. The results will be used to create a wealth of knowledge that will drive future energy and environmental policies, infrastructure design and management, and educational curricula.

### Second-year progress ...

Principal Investigator Ximing Cai, the Lovell Endowed Professor of Civil and Environmental Engineering (CEE), and his team report the following successes:

- Researchers are developing optimal thermal variance rules for different hydrological and meteorological conditions with an Illinois case study — and ongoing work for the country.
- Team members are identifying multiple tradeoffs between water quantity, water quality, and biofuel development through an Illinois watersheds case study (illustration above right).
- Researchers are jointly determining demand and pricing in the coupled power grid and transportation network to minimize the social cost of electronic vehicles.
- They are also assessing costs and benefits of strategies for reducing carbon emissions, and proposing economic incentives and policies to achieve low-carbon fuel greenhouse gas reduction targets.
- And team members are selecting optimal electronic vehicle options state-by-state in the United States through life cycle analysis.

Read more on the project at [bit.ly/ICI-project](http://bit.ly/ICI-project).

### Funding applications ...

Cai and others were awarded a \$2.43 million National Science Foundation (NSF) Innovations at the Nexus of Food, Energy and Water Systems



(INFEWS) grant for a study titled “Advancing Food-Energy-Water System Resilience in the Corn Belt by Integrated Technology-Environment-Economics Modeling of Nutrient Cycling.”

Co-PI Madhu Khanna, Professor of Agricultural and Consumer Economics (ACE), and others were awarded \$310,992 from the U.S. Department of Agriculture’s National Institute of Food and Agriculture (NIFA) for a study titled “Incentivizing Feedstock Supply for the Bioeconomy: Implications for Ecosystem Services and Policy Design.”

Khanna and others also received a \$150,000 North Central Region Sun Grant from the U.S. Department of Energy to study “Achieving Conservation and Renewable Energy Goals with the Conservation Reserve Program.”

Two other NSF proposals were submitted, each one totaling approximately \$2.5 million:

- A Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP) grant for “Interdependent Critical Infrastructure Systems for Synergized Utilization of Multiple Energy;” and
- A second INFEWS grant for “Meeting the Demands for Food, Bioenergy and Environmental Services in the Mississippi River Basin.”

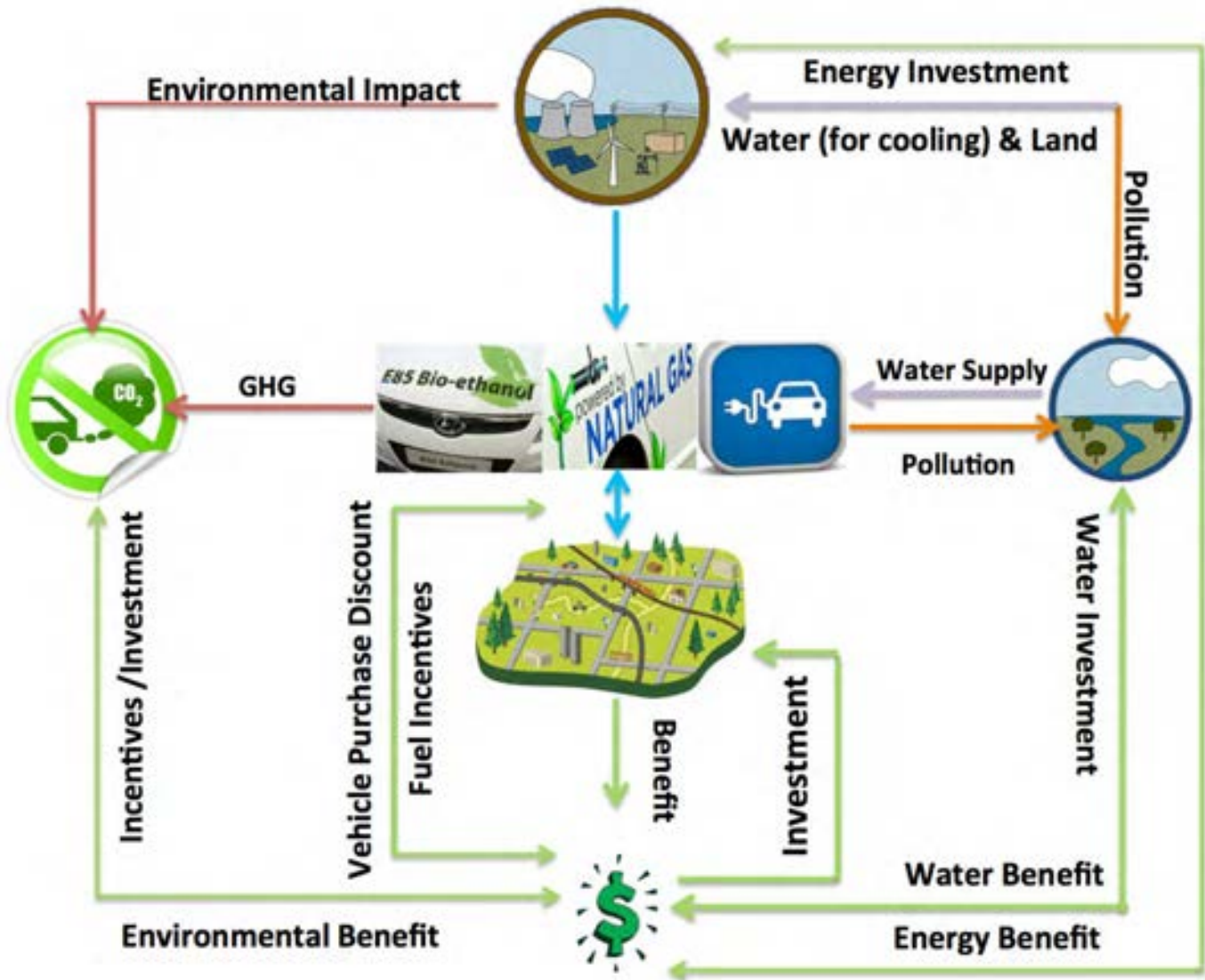
The team plans to apply for a \$5 million U.S. Department of Defense grant in the near future.

### Publications in 2016-17 ...

- “Maintaining Electric Grid Reliability under Hydrologic Drought and Heat Wave Conditions,” by CEE Ph.D. Candidate William Lubega and CEE Assistant Professor Ashlynn Stillwell in *Applied Energy*.
- Seven more publications are also in preparation.



CAI



Postdoctoral researcher Pouria Ahmadi's overview of how Interdependent Critical Infrastructure factors — such as water and land use — affect what type of fuels cars run, as well as what environmental and socioeconomic factors play a role on the way to consumer choices of transportation.

### 2016-17 CRITICAL INFRASTRUCTURE & TRANSPORTATION TEAM

#### Principal Investigators and Co-PIs

Ximing Cai (PI)	Professor, Civil and Environmental Engineering (CEE)
Madhu Khanna	Professor, Agricultural and Consumer Economics (ACE)
Yanfeng Ouyang	Associate Professor, Civil and Environmental Engineering (CEE)
Ashlynn Stillwell	Assistant Professor, Civil and Environmental Engineering (CEE)

#### Operating Team: Faculty, Scientists, Postdocs, and Students

Hadi Meidani	Assistant Professor, Civil and Environmental Engineering (CEE)
Albert Valocchi	Professor, Civil and Environmental Engineering (CEE)
Shaowen Wang	Professor, Geography and Geographic Information Science
Hao Zhu	Assistant Professor, Electrical and Computer Engineering (ECE)
Pouria Ahmadi	Postdoctoral Research Associate, iSEE
William Lubega	Ph.D. Candidate, Civil and Environmental Engineering (CEE)
Desiree Phillips	Ph.D. Candidate, Electrical and Computer Engineering (ECE)
Majid Shafiee-Jood	Ph.D. Candidate, Civil and Environmental Engineering (CEE)
Jia Zhong	Ph.D. Candidate, Agricultural and Consumer Economics (ACE)
Kaiqing Zhang	M.S. Candidate, Electrical and Computer Engineering (ECE)

# Thematic Research: Sustainable Infrastructure

## Mapping Resilient Communities

The Mapping Resilient Communities team was brought together in 2015 by iSEE, which helped secure funding that year and in 2016 through the U.S. Army Construction Engineering Research Laboratory (CERL).

The project employs a “capability approach” to explain what residents can do after natural events such as earthquakes, tsunamis, and hurricanes as well as human actions like terrorist attacks or interventions.



OUYANG

team submitted a manuscript to the journal *Computer-Aided Civil and Infrastructure Engineering*, with title “Vulnerability of Interdependent Urban Infrastructure Networks: Equilibrium after Failure Propagation and Cascading Impacts.”

In addition, Ouyang and his students made a presentation titled “Interdiction and Restoration of Interdependent Infrastructure Systems in Military Operations” on Nov. 15, 2016, at the Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting in Nashville, Tenn.

### Second-year progress ...

In April 2017, PI Yanfeng Ouyang and the

#### 2016-17 MAPPING RESILIENT COMMUNITIES TEAM Principal Investigators and Co-PIs

Paolo Gardoni (PI)	Associate Professor, Civil and Environmental Engineering (CEE)
Yanfeng Ouyang (PI)	Associate Professor, Civil and Environmental Engineering (CEE)
Colleen Murphy	Associate Professor, Law; Associate Professor, Philosophy
<b>Operating Team: Students</b>	
Liqun Lu	Ph.D. Candidate, Civil and Environmental Engineering (CEE)
Armin Tabandeh	Ph.D. Candidate, Civil and Environmental Engineering (CEE)
Yi (Victor) Wang	Ph.D. Candidate, Civil and Environmental Engineering (CEE)
Zhaodong Wang	Ph.D. Candidate, Civil and Environmental Engineering (CEE)

## Updates on Other iSEE Research Initiatives ...

A quick glance at some of the other science supported by the Institute:

### Major Bioenergy Center

iSEE Director Evan DeLucia will lead a newly funded U.S. Department of Energy Bioenergy Research Center. The Center for Advanced Bioenergy and Bioproducts Innovation (CABBI) received \$104 million over the next five years. (*More on the newly funded Center, page 5.*)



over campus. “Energy at Illinois” — [energy.illinois.edu](http://energy.illinois.edu) — now features more than 130 scientists.

Meantime, “Water at Illinois” — [water.illinois.edu](http://water.illinois.edu) — includes more than 105 water scholars from across campus.

### Levenick iSEE Research Fellows

Levenick iSEE Research Fellow Erica Myers, an Assistant Professor of Agricultural and Consumer Economics (ACE), and Levenick iSEE Research Scholar Mateus Nogueira Meirelles de Souza, a Ph.D. Candidate in ACE, continue to research “Behavioral Interventions for Campus Energy Consumption.” Their ongoing project is to identify behavioral energy savings opportunities and educational campaigns for campus community members. (*More about the Levenick gift, page 4.*)

### Energy and Water Scholars

The Illinois Energy Scholars website, a listing of the numerous energy experts on the University of Illinois’ Urbana-Champaign campus across dozens of disciplines, continues to add members from all

## Corporate Partnerships Enhance Sustainability Capstone Experience

University of Illinois students, regardless of major, can enroll in the Sustainability, Energy, and Environment Fellows Program — a campuswide undergraduate minor in sustainability that prepares them for careers in the corporate sector and with nonprofit organizations, government agencies, and environmental advocacy groups.

In the final piece of the minor degree, the SEE Fellows will apply sustainability assessment tools — such as life-cycle analysis, cost-benefit methods, and impact analysis — to real-world problems related to sustainability to be developed in collaboration with campus, Facilities & Services, local sustainability planners, private firms and non-government organizations.

For the first time in fall 2017, the ENVS 492 course will be offered to pair students with capstone partners and proposed projects. Until now, capstone experiences have been completed as independent study projects. In Spring 2017, students preparing for the capstone met with the potential real-world partners to discuss projects. Among them: Accenture, Ameren Illinois, the U.S. Army Corps of Engineers' Construction Engineer-

ing Research Laboratory (CERL), Chip Energy Inc., Johnson Controls, and The Land Connection.

In January, iSEE named Animal Biology Professor Ken Paige and Civil and Environmental Engineering Professor Jeffery Roesler the first Levenick iSEE Teaching Fellows who will teach ENVS 492.



PAIGE



ROESSLER

Paige, an expert in evolutionary ecology, and Roesler, whose research is primarily focused on construction materials and transportation engineering, will combine talents to engage students to address broad societal challenges related to sustainability. Course activities will be a blend of case study discussion, problem identification, site visits, and analysis. Team projects will develop collaboration skills, communication skills, and project management skills.

The Levenick iSEE Fellows Program is supported by a \$500,000 gift from Illinois alumnus Stuart L. Levenick and his wife Nancy J. Levenick, both of Peoria. It contributes to iSEE's mission of actionable research — that is, work that leads to lasting, real-world solutions to the world's current and future sustainability-, energy-, and environment-related issues. (*More about the Levenick gift, page 4.*)



Olivia Harris/iSEE

The Land Connection's Cassie Carroll discusses a potential capstone project with SEE Fellows.



## iSEE Partners on New Undergrad Certificate in Environmental Writing

In March, iSEE announced a partnership with the School of Earth, Society and Environment (SESE) and the Department of English to offer a new Certificate in Environmental Writing (CEW) for students wanting to engage the latest research in sustainability science — and to build their skills in environmental communication.

The Certificate, which debuts in Fall 2017, is at the cutting edge of interdisciplinary sustainability programs in the nation. The motto of the CEW is “turning data into narrative” — learning about the latest scientific research on the environment and how to communicate it effectively to the public.

Students enrolled in the newly developed CEW

capstone course (ESE/ENGL 498) will submit their work for publication in the new iSEE online magazine for student environmental writing, *Green Century*. If successful, those students will work closely with the editors and production staff of *Green Century* on developing the article to a professional, publishable standard.

The CEW will be administered by iSEE Affiliate Professor Gillen D’Arcy Wood, the Langan Professorial Scholar of Environmental Humanities of English. He will serve as Editor of *Green Century*. (*More about Wood on page 38*).

Read more about the CEW at [sustainability.illinois.edu/cew/](http://sustainability.illinois.edu/cew/).





Tony Mancuso/iSEE

Steve Koonin's Congress 2016 keynote was titled 'Can We Ever Get to a Zero-Emissions World?'

## Congress '16 an Energy Discussion; '17 Event to Address Climate Resilience

Each fall, iSEE hosts a major scientific Congress highlighting a specific global challenge. The Institute assembles leading national and international experts from varying disciplines to foster discussions and collaborations toward solutions to these challenges. A look back and a look ahead:

- **Energy 2030:** In September 2016, iSEE convened its third Congress, "Energy 2030: Paths to a Sustainable Future," for a discussion of improvements in energy efficiency, alternative forms of renewable energy, and other low-carbon sources of energy to meet societal needs for electricity, transportation, and heating more sustainably in the future.

The Congress was highlighted by keynotes from former U.S. Department of Energy Undersecretary for Science Steve Koonin and Illinois alumnus KR Sridhar, the principal co-founder, President, Chairman and CEO of Bloom Energy.

Congress 2016, which had more than 300 attendees over the course of three days, received support from the Office of Public Engagement and the Center for Global Studies at the University of Illinois at Urbana-Champaign.

- **Building Resilience to Climate Change:** Former Director of the White House Office of Science and Technology Policy John Holdren and environmental journalist Justin Gillis are among the



keynote speakers who will visit Illinois on Sept. 18-20 for the fourth annual iSEE Congress, "Building Resilience to Climate Change."

The conference, which will be in the Alice Campbell Alumni Center, will feature more than two dozen local, national, and international speakers with expertise in multiple disciplines. It will focus on the impacts of climate change on agriculture, ecosystem services, and human livelihoods — and how best to adapt to them.

The upcoming Congress is receiving funding from the Office of the Vice Chancellor for Research as a symposium in recognition of the Illinois Sesquicentennial — "The Research University at 150: Celebrating the History and the Future of Interdisciplinary Research at Illinois." Read more about it at [sustainability.illinois.edu/isee-congress-2017/](http://sustainability.illinois.edu/isee-congress-2017/).



Olivia Harris/iSEE

Students learn more about recycling on campus after dropping off their recyclable items during a Sustainability Week 2016 event on the Quad.

# Recycling Campaign Highlights

## Campus Sustainability Week

The Institute led the Campus Sustainability Week 2016 celebration on campus with an outreach campaign aimed at increasing student awareness and involvement in individual recycling.

The “Bin It” campaign included YouTube videos of well-known faces on campus like Director of Bands Barry Houser — which generated 26,000 social

media impressions — as well as a recycling competition, games and handouts at various campus sites, which reached nearly 300 students.

Visit the Bin It website to view the videos, learn more about the competition, and read up on recycling: [publish.illinois.edu/bin-it-recycling/](http://publish.illinois.edu/bin-it-recycling/).

The recycling competition

prize winners were announced at the Campus Sustainability Celebration, a culmination of Sustainability Week that also featured recognition of iSEE’s latest Gold Certified Green Offices (the Cline Center for Democracy and the Mitchell Lab), Facilities & Services awarding its Energy Conservation Incentive Program (ECIP) winners, and updates from iSEE’s Sustainability Working Advisory Teams on Illinois Climate Action Plan progress. More than 150 people attended the Celebration.



# Lectures Headline Earth Week

Earth Week is an annual tradition of celebrating the planet that sustains us. Primarily led by Students for Environmental Concerns (SECS), the events scheduled during Earth Month included a used clothing swap, an environmental “alternative facts” booth hosted by the Green Observer Magazine, the annual plant sale by SECS, bike repairs by the BikeFace student organization, and an Arbor Day celebration of Illinois’ second straight year as a Tree Campus USA.

A highlight of Earth Week 2017 for many was a bike ride through campus with UI Chancellor Robert J. Jones.

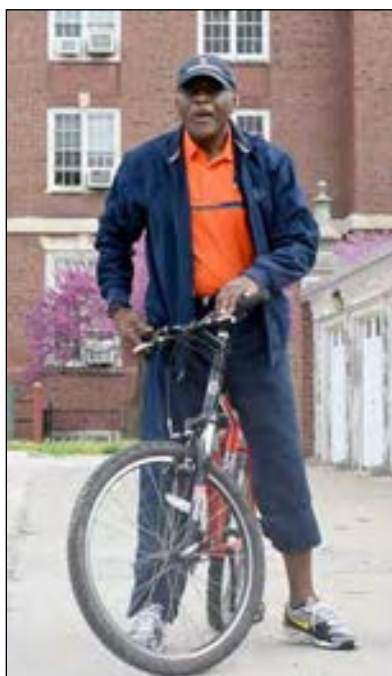
In addition, four climate change-related lectures occurred during Earth Week, two organized by iSEE:

- **Keeling Lecture 2017:** Illinois Atmospheric Sciences Professor Emeritus John E. Walsh, former Director of the NOAA/Alaska Cooperative Institute for Arctic Research, delivered the 2017 Charles David Keeling Lecture, “The Arctic: Ground Zero for Climate Change,” on April 18 in the NCSA Auditorium. More than 100 people attended Walsh’s talk, which drew upon his nationally and internationally recognized research into climate change in polar regions, arctic sea ice, and extreme weather events at the poles. View the video of the Keeling Lecture at [www.youtube.com/watch?v=pHp8WgTtqak](http://www.youtube.com/watch?v=pHp8WgTtqak). The Keeling Lecture is also sponsored by the School of Chemical Sciences (SCS), the School of Earth, Society and Environ-



Olivia Harris photos/iSEE

**ABOVE: John Walsh delivers the 2017 Keeling Lecture. BELOW: Chancellor Robert J. Jones participates in an Earth Week bike ride through campus.**



ment (SESE), the Department of Chemistry, and the Department of Atmospheric Sciences.

- **MillerComm Lecture:** Kim Cobb, Professor of Earth and Atmospheric Sciences at Georgia Tech, delivered a CAS MillerComm Lecture titled “Corals and Climate Change: Life after Death

on a Remote Pacific Reef” on April 20 at Spurlock Museum’s Knight Auditorium. In addition to describing how climate change is contributing to severe coral bleaching and mortality, Cobb issued a strong challenge to the more than 120 faculty, students, and community members in the auditorium to be courageous and active in the fight against climate change. The MillerComm lecture is hosted by the Center for Advanced Study at Illinois.

Also part of Earth Week: the Department of Atmospheric Sciences’ Yoshi Ogura Lecture, a talk by Katharine Hayhoe, Associate Professor at Texas Tech, titled “Mitigate, Adapt or Suffer: Connecting Global Change to Local Impacts and Solutions;” and the Department of Civil and Environmental Engineering’s Ven Te Chow Hydrosystems Lab Seminar by Ramakrishna Nemani, Senior Earth Scientist at NASA, titled “The Green Discount at a Steep Price.”

## Campus Sustainability Leadership



### NEW! CHAMPAIGN COUNTY CLIMATE RESILIENCE TASK FORCE

As a 2016 signatory of the Second Nature Climate Resilience Commitment, the University of Illinois through iSEE has created a new committee of community members and campus experts to address what must be done to prepare Champaign County for vulnerabilities to extreme weather and other results of climate change.

On April 7, 2017, iSEE convened the first meeting of the Champaign County Climate Resilience Task Force. Community members on the team represent organizations that are in charge of implementing and coordinating sustainability-related activities and planning for hazard mitigation. The subject matter experts from the U of I are working on various dimensions of the ways climate is expected to impact communities

and strategies for developing resilience to them.

iSEE expects to add other campus and community members to the Task Force, which will help ensure joint action to increase resilience to climate impacts.

The purpose of the group is to lead a campus and community climate resilience assessment, and to create a Climate Action Plan that will identify thresholds of resilience and outline milestones for increasing resilience in Champaign County. Topics of the first Task Force meeting included likely climate impacts for Champaign County; knowledge on assessment of the level of vulnerabilities; state of preparedness to deal with climate hazards and risks; priorities for addressing vulnerabilities; and strategies for adaptation.

The Task Force members:

NAME	TITLE
Jim Angel	State Climatologist
Rita Black	Champaign County Regional Plan Commission
Paolo Gardoni	Professor, Civil & Environmental Engineering, University of Illinois at Urbana-Champaign
Morgan Johnston	Director of Sustainability at Facilities & Services, University of Illinois at Urbana-Champaign
Madhu Khanna	Associate Director of Education & Outreach at iSEE, University of Illinois at Urbana-Champaign
Warren Lavey	Adjunct Assistant Professor of Natural Resources and Environmental Sciences, University of Illinois
Marilyn O'Hara Ruiz	Clinical Associate Professor of Pathobiology, University of Illinois at Urbana-Champaign
Lacey Rains	City of Champaign Sustainability Planner
Holly Rosencranz	Assistant Professor of Clinical Medicine, University of Illinois
Scott Tess	City of Urbana Environmental Sustainability Manager
Molly Woloszyn	Extension Climate Specialist, Illinois-Indiana Sea Grant; Midwestern Regional Climate Center

# Campus Sustainability Leadership

## 2016-17 SUSTAINABILITY COUNCIL

The Sustainability Council is made up of top-tier leaders on the University of Illinois' Urbana-Champaign campus with the Chancellor as its Chair. It provides strategic direction and oversight of the campus sustainability initiative, including major campus policies regarding sustainability, energy conservation, and eco-friendly practices. The 2016-17 Council members:



NAME	TITLE
Robert J. Jones (Chair)	Chancellor, University of Illinois at Urbana-Champaign
Evan H. DeLucia (Vice Chair)	Baum Family Director, Institute for Sustainability, Energy, and Environment (iSEE)
John Wilkin	Interim Vice Chancellor for Academic Affairs and Provost
Ed Ewald	Senior Vice President for Development
Renée Romano	Vice Chancellor for Student Affairs
Peter Schiffer	Vice Chancellor for Research
Andreas Cangelaris	Dean, College of Engineering
Jeffrey Brown	Dean, College of Business; Director of Center for Business & Public Policy
Kim Kidwell	Dean, College of Agricultural, Consumer, and Environmental Sciences
Feng Sheng Hu	Dean, College of Liberal Arts & Sciences
Helen Coleman	Interim Executive Director, Facilities & Services
Gay Miller	Chair, Senate Executive Committee
Ron Lewis	President, Illinois Student Senate
Paul Couston	Chair, Student Sustainability Committee (SSC)
Ximing Cai (Nonvoting)	Associate Director for Campus Sustainability, iSEE; Chair, iCAP Working Group
Jenny Kokini (Secretary)	Managing Director, iSEE

## 2016-17 iCAP WORKING GROUP

The Illinois Climate Action Plan Working Group (iWG) is made up of representatives from major stakeholder groups across campus. The iWG was tasked with a) reviewing Sustainability Working Advisory Team (SWATeam) recommendations and transmitting them to the affected units or to the Sustainability Council, as appropriate; and b) initiating a process for meeting 2015 iCAP goals. The 2016-17 members:

NAME	TITLE
Ximing Cai (Chair)	Associate Director for Campus Sustainability, representing iSEE
Morgan Johnston	Associate Director of Facilities & Services/Director of Sustainability, F&S, representing F&S
Robyn Deterding	Director of Campus Recreation, representing Student Affairs
Matthew Tomaszewski	Associate Provost for Capital Planning, representing Office of the Provost
Gary Kling	Chair of Senate Committee on Campus Operations, representing Academic Senate
Joseph Edwards	Undergraduate, Chair of the Student Sustainability Leadership Council
Rob Fritz	Beckman Institute Director of Facilities, representing college-level facility managers
Sean Reeder	Interim Dir. of Capital Prog./Real Estate Serv., representing Office of Business and Financial Serv.
Scott Willenbrock	Provost Fellow for Sustainability
Micah Kenfield (Secretary)	iSEE Sustainability Programs Coordinator

# Campus Sustainability Leadership

## 2016-17 SUSTAINABILITY WORKING ADVISORY TEAMS

Each fall, iSEE charges six teams consisting of faculty, staff, and students to examine the six broad themes within the Illinois Climate Action Plan. Among their duties, these Sustainability Working Advisory Teams (SWATeams) recommend concrete steps the campus should take to meet iCAP targets — and members also suggest revisions and updates to the plan. The people who served on the 2016-17 teams:

### ENERGY CONSERVATION AND BUILDING STANDARDS

Name	Title
Marian Huhman (Chair)	Assistant Professor, Communication
Yun Kyu Yi	Assistant Professor, Architecture
Fred Hahn	Associate Director of Engineering Services, Facilities & Services
Karl Helmink	Energy Conservation and Retrocommissioning, Facilities & Services
Dhara Patel	Undergraduate Student, Civil and Environmental Engineering
Alex Dzurick	Graduate Student, Communication
Diliya Murtazina (Clerk)	Undergraduate Student, Mechanical Engineering

### ENERGY GENERATION, PURCHASING, AND DISTRIBUTION

Name	Title
Yu-Feng Forrest Lin	Adjunct Prof., Civil and Environmental Engineering, Natural Resources and Environmental Sciences
Xinlei Wang	Professor, Agricultural and Biological Engineering
Mike Larson (Chair)	Director of Utility Operations, Facilities & Services
Tim Mies	Deputy Operations Director, Illinois Energy Farm
Jack Morrissey	Undergraduate Student, Civil and Environmental Engineering
Catherine Yee	Undergraduate Student, Earth, Society and Environmental Sustainability
John Flanagan (Clerk)	Undergraduate Student, Mechanical Engineering

### TRANSPORTATION

Name	Title
Yanfeng Ouyang (Chair)	Associate Professor, Civil and Environmental Engineering
Imad Al-Qadi	Professor, Civil and Environmental Engineering
Brian Farber	Executive Assistant to the Vice Chancellor for Student Affairs
Peter Varney	Director of Transportation & Automotive Services, Facilities & Services
Claire Dodinval	Undergraduate Student, Civil and Environmental Engineering
Ankit Singhai	Graduate Student, Civil and Environmental Engineering
Joshua Feldman (Clerk)	Undergraduate Student, Mechanical Engineering

### WATER AND STORMWATER

Name	Title
Rabin Bhattarai	Assistant Professor, Agricultural and Biological Engineering
Art Schmidt (Chair)	Research Assistant Professor, Civil and Environmental Engineering
Keith Erickson	Utility Distribution, Facilities & Services
Kishore Rajagopalan	Associate Director for Applied Research, Illinois Sustainable Technology Center
John Berens	Undergraduate Student, Civil Engineering
Lauren Excell	Undergraduate Student, Civil and Environmental Engineering
Stephanie Cash (Clerk)	Undergraduate Student, Civil and Environmental Engineering

### PURCHASING, WASTE, AND RECYCLING

Name	Title
Dilip Chhajed	Professor, Business Administration
Warren Lavey	Adjunct Professor, Natural Resources and Environmental Sciences
Joy Scrogum	Emerging Technologies Resource Specialist, Illinois Sustainable Technology Center
Marcy Wright	Administrative Associate in Strategic Procurement, Office of Business and Financial Services
Fanxing Liu (Chair)	Undergraduate Student, Civil and Environmental Engineering
Bélen Muñiz	Undergraduate Student, Integrative Biology
Meghan Killinger (Clerk)	Undergraduate Student, Integrative Biology

### AGRICULTURE, LAND USE, FOOD, AND SEQUESTRATION

Name	Title
Bruce Branham	Professor, Crop Sciences
Jennifer Fraterrigo	Associate Professor, Natural Resources and Environmental Sciences
Brent Lewis (Chair)	Campus Landscape Architect, Facilities & Services
Thurman Etchison	Assistant Director of Dining, Equipment and Facilities, Housing Dining Services
Joseph Edwards	Undergraduate Student, Natural Resources and Environmental Sciences and Integrative Biology
Adriana Noboa	Undergraduate Student, Agricultural and Biological Engineering and Horticulture
Chibu Asonye (Clerk)	Undergraduate Student, Earth, Society and Environmental Sustainability

# The SWATeam/iWG Process: Campus Sustainability in Action

The 2016-17 academic year marked the third year of existence for the Illinois Climate Action Plan (iCAP) Working Group.

During the past year, the iCAP Working Group (iWG) considered 13 recommendations for improving sustainability on the Urbana-Champaign campus.

Here is a look at some of the key campus Sustainability Working Advisory Team (SWATeam) recommendations from 2016-17:

- **The Energy Conservation and Building Standards (ECBS) SWATeam** recommended funding a full-time Green Labs Coordinator position. This recommendation has been transmitted to the Office of the Vice Chancellor for Research (OVCR), and initial meetings have been held with key stakeholders to discuss the possibility further.

The ECBS SWATeam also recommended continuing the highly successful Illini Lights Out program, and iSEE will take on the task of organizing future events starting in Fall 2017. (*More details on Illini Lights Out, page 34.*)

- **The Energy Generation, Purchasing, and Distribution (EGen) SWATeam** recommended multiple solar initiatives, including a campuswide Rooftop Solar Standard as well as the construction of a large-scale Solar Farm 2.0. Both recommendations remain in progress.

Team members also recommended expanding conversations with the OVCR and/or the National Center for Supercomputing Applications (NCSA) to plan a budget and procurement plan to offset emissions from the Blue Waters National Petascale Computing Facility. The recommendation is being forwarded to the OVCR.

- **The Water and Stormwater SWATeam** recommended that a greywater meter be installed at the Business Instructional Facility (BIF) to monitor both total water use and the amount of water used by the raw water system. Data collected could be used as supporting documentation in proposed changes to building standards. The proposal was sent to Facilities & Services (F&S).

## More about Campus Sustainability Teams and Leadership ...

**Sustainability Council:** [sustainability.illinois.edu/campus-sustainability/icap/sustainability-council/](http://sustainability.illinois.edu/campus-sustainability/icap/sustainability-council/)

**iWG:** [sustainability.illinois.edu/campus-sustainability/icap/icap-working-group/](http://sustainability.illinois.edu/campus-sustainability/icap/icap-working-group/)

**SWATeams:** [sustainability.illinois.edu/campus-sustainability/icap/swateams/](http://sustainability.illinois.edu/campus-sustainability/icap/swateams/)

- **The Purchasing, Waste, and Recycling (PWR) SWATeam** recommended that the campus continue or expand current battery recycling efforts. As a result of this effort, a student in the Sustainability, Energy, and Environment Fellows Program — the campuswide undergraduate minor (*see more about the SEE FP on page 23*) — is examining battery disposal options as a capstone project for degree completion.

The PWR SWATeam also recommended an explicit recycled paper policy be implemented into the Campus Administrative Manual, and that was forwarded to F&S.

Finally, the PWR team recommended that the recycling video created by the University Ethics and Compliance Office receive further publicity and outreach, and iSEE has taken on that task.

- **The Agriculture, Land Use, Food, and Sequestration (ALUFS) SWATeam** recommended a campus tree inventory be conducted. This recommendation was transmitted to F&S in July and has been referred to one of the team members for implementation; iSEE and F&S have agreed to budget \$50,000 in campus-level funds for the inventory.

Another ALUFS recommendation was made to convert 2 acres of turf grass at the corner of Race and Windsor to a forestry tract. This recommendation has been transmitted to the College of Agricultural, Consumer, and Environmental Sciences (ACES) for review.

# Campus Takes on Green Energy Initiatives in 2016-17

The University of Illinois at Urbana-Champaign continues to embrace — and explore — clean energy sources, and iSEE has helped lead the charge by facilitating proposals and funding for greener energy on campus. Two major examples in the past academic year:

## Wind power purchase agreement

The campus took a major step toward one of its Illinois Climate Action Plan (iCAP) goals in late 2016 via a 10-year power purchase agreement (PPA) with EDP Renewables North America LLC for at least 25,000 megawatt hours (MWh) a year of wind-generated electricity.



This purchase of wind power — when combined with energy generated by the 20.8-acre, 4.68 MWAC solar farm brought online in late 2015 — will increase campus' clean energy total to 33,200 MWh/year, nearly 9 percent of projected FY17 annual electricity consumption.

“Lowering emissions from energy use is a monumental piece of the iCAP and its stated goal for campus to be carbon neutral by 2050, and I am proud to see Facilities & Services taking the steps needed to make it happen,” iSEE Director Evan H. DeLucia said.

The iCAP includes an objective to increase purchasing of clean energy to 120,000 MWh per year by 2020. The new PPA pushes campus past more than one-fourth of that objective.

The wind PPA was made possible in part through the urging of iSEE's Energy Generation, Purchasing, and Distribution SWATeam, which submitted a formal proposal to “pursue Power Purchase Agreements with one or more Wind Farms as soon as possible” to campus and Facilities & Services administrators in 2014.

## Biomass boiler on Energy Farm

Campus also increased its renewable energy use



through the addition of a biomass-fueled heating system in the main greenhouse at the Illinois Energy Farm south of campus. After more than a year of preparation, the 198 kW Heizomat boiler installation was completed in June 2017.

In addition to the direct elimination of fossil fuel use at the greenhouse, the boiler project is intended to serve as a case study and educational tool for University facilities personnel and students.

The system is expected to produce an equivalent to the energy needs of 16 average homes or an office building, day and night.

The purchase of the boiler and its installation were supported by grants from the Illinois Clean Energy Community Foundation (ICECF), the Student Sustainability Committee (SSC), the Dudley Smith Initiative, the F&S Revolving Loan Fund, and proceeds from the 2015 campus sale of verified carbon credits to Chevrolet.





# Certified Green Office Program Continues

In March 2017, iSEE staff members completed a face-lift of the Certified Green Office Program — expanding the list of elective green actions offices can take to reach certification. iSEE also streamlined the enrollment and reporting processes, responding to feedback from previous participants.

Six offices achieved Gold certification in 2017: University Library Collection Management Services; Facilities & Services



(F&S) Capital Programs; F&S Engineering and Construction Services; iSEE; the School for Integrative Biology; and F&S Customer Relations and Communications.

Through the Program, iSEE invites campus faculty and staff to make a pledge to reduce resource use and improve overall sustainability in the day-to-day practices of the office or laboratory. To date, 33 offices with more than 1,500 employees have participated.

## Carbon Credits Sale Helps Bolster Campus-level Sustainability Fund

By selling certified carbon credits each year, iSEE has taken a novel approach to fund future sustainability on campus.

A 2017 sale of certified carbon credits — as part of the Carbon Credit and Purchasing Program (C2P2) through Boston-based nonprofit organization Second Nature — has added more than \$177,000 to a nearly \$1 million account held at the campus level. The account was started when iSEE brokered carbon credit sales in both 2015 and '16. iSEE and Facilities &

Services (F&S) will work together to allocate funds from that account for new projects that will improve campus energy efficiency and greenhouse gas emissions reductions — including the purchase and retirement of carbon offset credits.

The \$177,000 came from the sale of the second half of 2016's campus carbon credits — greenhouse gas emissions reductions made at Illinois, mainly through the energy-saving and emissions-reducing efforts of F&S. *(More on the sale on page 4.)*

## Recognition Continues for U of I Campus

The University of Illinois at Urbana-Champaign has continued its legacy of environmental and sustainability leadership in 2016. Among the accolades:

- A third consecutive Gold ranking from the Association for the Advancement of Sustainability in Higher Education (AASHE).

Illinois is one of 25 schools — and one of two in the Big Ten — to achieve Gold in the latest, most stringent version of the Sustainability Tracking, Assessment, and Rating System (STARS) 2.1 tool.



- AASHE's Sustainable Campus Index 2016 recognized Illinois in two categories: Buildings (No. 2 overall) and Water (No. 3 overall).

- Illinois placed 33rd overall out of 201 four-year higher education institutions — and No. 1 among Big Ten universities — in Sierra Club Magazine's "Cool Schools" rankings in 2016.

- For a second year in a row, the Arbor Day Foundation awarded the Urbana-Champaign campus — which features more than 20,000 trees — the official designation of Tree Campus USA for its commitment to effective urban forestry.



## Illini Lights Out: Small Actions Add up to Energy and Cost Savings

During seven Illini Lights Out events on Friday evenings throughout the 2016-17 school year, teams of student volunteers turned off a total of more than 11,000 light fixtures in buildings on or near the Illinois Main Quad.

One bulb at a time, this small action taken by more than 200 student volunteers during the year saved campus about \$3,400 in energy costs — not to mention lengthened the lifespan of several thousand light bulbs.

Organized by iSEE's Energy Conservation and Building Standards Sustainability Working Advisory Team, Illini Lights Out aims to demonstrate the immense energy-saving impact of simply turning off lights when you leave a classroom, lab, or study space.



The initiative began as a one-off event in spring 2016 — at which students managed to turn out 1,500 lights in just 40 minutes — and expanded to a monthly happening during 2016-17, with the support of a grant from the Student Sustainability Committee. (*Read more about SSC on pages 36-37.*)

iSEE plans to continue the program in the 2017-18 school year under the leadership of its campus sustainability interns.

# Styrecycle Program Grows

In its second year, Styrecycle, an iSEE-supported and student-pioneered program at Illinois, has continued to increase the recycling of expanded polystyrene (more commonly known by the Dow Chemical trademarked name Styrofoam) for the campus community.

Two new centralized collection locations were established in the Chemistry Life Sciences Laboratory (CLSL) and the Edward R. Madigan Lab to bring long-term storage closer to the buildings that create the most Styrofoam waste. Now, smaller loads from labs across campus are emptied to these central spaces before being collected in bulk by local recycler Community Resource Inc. for densifying and



eventual recycling.

Plans are also ongoing for a semi-permanent constructed shelter behind CLSL, where the Styrofoam collected in an outdoor bin is often blown away by

strong winds.

To read more about the program, visit the iSEE webpage at [sustainability.illinois.edu/styrecycle/](http://sustainability.illinois.edu/styrecycle/) or the Facebook page at [facebook.com/Styrecycle](https://facebook.com/Styrecycle).

## Illinois Biodiesel Initiative Students Convert Waste Cooking Oil into Quality Fuel, Soap

The student-led Illinois Biodiesel Initiative (IBI) trains students to process waste cooking oil from University Housing and Dining Services into biodiesel fuel for the University fleet and glycerin hand soap.

During the spring 2017 semester, students produced 100 gallons of biodiesel fuel and 2 gallons of prototype soap.

In parallel with student efforts, the Department of Chemistry offered a new course (CHEM 199 GD;GL) in biofuel production. Taught by Chemistry Professor and iSEE Assistant Director for Special Projects Ben McCall, the course exposed students to bioreactor technology, sustainable energy concerns, and principles of organic chemistry.

IBI is funded in part by the Student Sustainability Committee (SSC). iSEE continues to support the student group by handling the financial logistics for



purchases of reactants and sales of the final products.

Read more about IBI at [sustainability.illinois.edu/actionsinitiatives/getting-involved/illini-biodiesel-initiative/](http://sustainability.illinois.edu/actionsinitiatives/getting-involved/illini-biodiesel-initiative/).



Fiber by Fresh Press

**Fiber by Fresh Press, a project started in 2016 and supported by a grant from SSC, makes paper from farm harvest waste such as leftover stalks and vines, as well as native prairie grasses.**

# SSC: The Year in Review

During the 2016-2017 academic year, and the second year housed under iSEE, the Student Sustainability Committee (SSC) allocated \$933,301 to 21 projects.

The funded projects ranged from educational forums on environmental (in)justice to fly ash phosphorous filtration. SSC reviewed a record amount of applicants — 56 — during Fiscal Year 2017, including a number of student-led initiatives. Comparatively, the Committee received 52 project proposals (23 funded) in FY2016 and 39 project proposals (21 funded) in FY2015.

SSC separates its projects into five categories: Land & Water; Transportation; Food & Waste; Energy; and Education. In FY17, Committee members allocated the most funding to the Food & Waste and Energy categories. Projects in these categories included: Illini Electric Car; a thermal response test for geothermal energy; fresh juice processing equipment; and on-campus timber milling equipment. In the Education category, SSC agreed to provide final funding for the iSEE Collaboratory communications, classroom, and collaboration space. (*See more about that project on page 37.*)



After expediting the review process for student-led projects for less than \$10,000, SSC collected a multitude of proposals in that category. For example, Project Paplet is a paper recycling campaign that turns once-used paper into recycled notebooks for children in need.

The Lincoln Avenue Residence Hall's Sustainable Living Learning Community (LLC) received funding to plant native plant species around its building.

Beyond its granting responsibilities, SSC participated in campus programming. The Committee tabled at Quad Day, hosted informational sessions, and held application workshops.

SSC proudly screened "Before the Flood," starring Leonardo DiCaprio and produced by Martin Scorsese, and held a post-screening discussion.

Through its Facebook, Twitter, and Instagram accounts, SSC highlighted sustainable student leaders on campus, actively praising Illinois students' commitment to sustainability.

For more details, including full summaries of all SSC-funded projects, visit [ssc.sustainability.illinois.edu](http://ssc.sustainability.illinois.edu).

# Committee Hires New Coordinator

Cathy Liebowitz has been hired to guide student members of the Student Sustainability Committee (SSC) as they allocate more than \$1.1 million of student fee-generated revenue to support campus sustainability projects.

Prior to joining the staff on July 16, 2017, as SSC Coordinator, Liebowitz worked with Greek undergraduate student communities at the University of Maryland in College Park, Md.

Finding a niche at the intersection of higher education and sustainability, she advised and supported her residents on sustainability projects to better the campus community.

She also co-designed a Green Chapter program for the Greek community there and managed



**LIEBOWITZ**

two Greek chapter houses.

Having worked professionally with students for more than two years, she says she most

admires their tenacity, problem solving, and passion for sustainability.

Liebowitz earned her B.A. in Environmental Studies from Dartmouth College and her M.A. in Higher Education Administration, Student Affairs & International Education Policy from the University of Maryland.

Outside of work, you'll find her cooking, volunteering on service projects, and staying active outdoors. She said she looks forward to supporting U of I students as they continue to transform the Urbana-Champaign community toward a greener future.

iSEE looks forward to working with Liebowitz and SSC in the coming months and years.

## SSC Grant Completes Funding for iSEE Collaboratory

In Spring 2017, the Student Sustainability Committee approved \$100,000 to complete the funding needed for the Institute for Sustainability, Energy, and Environment to start building the \$1 million iSEE Collaboratory.

The Institute had already raised \$900,000 through philanthropy (including a \$436,079 gift match from Caterpillar, Inc.), endowments, and the Office of the Provost toward this renovation to the National Soybean Research Center. Expected to debut sometime in the Fall 2018 semester, it will include space for experiential learning, a collaboration incubator, and a communications laboratory to serve up to 500 students annually.

The Collaboratory will also provide space for student sustainability groups and other registered student organizations to facilitate group activities, with state-of-the-art communications capabilities for research, collaboration, and conferencing. By providing advanced teleconferencing capabilities, the collaboratory will reduce

campus carbon emissions derived from travel.

The teaching/collaboration space will provide an i-flex classroom setting with dual-camera, high-definition(HD) video and multiple wide-screen HD monitors. The media/communications center will be used for the production of multimedia pieces describing new sustainability solutions and technical advances developed by students in iSEE and will be equipped with full visual — still, graphic, and video — and audio communications capabilities.

The Collaboratory will be used by instructors, including those for the undergraduate minor Sustainability, Energy, and Environment Fellows Program and the undergraduate Certificate in Environmental Writing. (*See more about both programs on pages 23-24.*) The space will also be used by faculty and student Levenick iSEE Fellows and other iSEE research fellows, scholars, environmental fellows, and policy fellows for meetings, teleconferencing, and communications.

## iSEE Adds New Leadership, Staff Member in Spring '17

During the Spring 2017 semester, the Institute made changes to its leadership and added a sustainability professional to its staff.

Ximing Cai, Lovell Endowed Professor of Civil and Environmental Engineering at Illinois, was hired as the new Associate Director for Campus Sustainability.

In this position, Cai will lead iSEE's efforts related to the Illinois Climate Action Plan (iCAP).

"We're confident that Ximing's vision for campus sustainability will bring iSEE's mission arms closer together, completing the circle between research, campus sustainability, and education and outreach," iSEE Director Evan H. DeLucia said. "The efforts he leads will provide excellent research projects and learning experiences for students — and also much-needed data to drive sustainable decision-making on campus and beyond."



CAI

McCALL

WOOD

Cai led an effort to begin taking inventory of all the sustainability projects and facilities on campus and will seek to tie them to major research funding opportunities.

Outgoing Associate Director Ben McCall, a Professor of Chemistry at Illinois, transitioned to a role as Assistant Director for iSEE Special Projects, where he will continue to help lead the Urbana-Champaign campus toward certain campus sustainability objectives — many of them involving Illinois' continued reduction of carbon emissions.

In addition, iSEE welcomed new faculty affiliate Gillen D'Arcy Wood, environmental author and Professor of English at Illinois, as an Institute Faculty Affiliate.



KENFIELD

Wood, the Langan Professorial Scholar of Environmental Humanities of English, will provide leadership for the new campuswide Certificate in Environmental Writing program co-created by iSEE, the School of Earth, Society and Environment (SESE), and the Department of English. He will also serve as editor of *Green Century*, a new environmental magazine featuring student works that will be published by iSEE (*More about the new certificate on page 24*).

Finally, iSEE welcomed Micah Kenfield as its new Sustainability Programs Coordinator.

In this role, Kenfield will guide iSEE's programs that engage students, faculty, and staff in the campus' overall goals for a zero-carbon future — including the Certified Green Office Program and the Sustainability, Energy, and Environment Fellows Program, a campuswide undergraduate minor in sustainability.

Before joining the iSEE team, Micah served as the Student Sustainability Committee (SSC) Coordinator for two years, facilitating Illinois students' efforts to identify and finance impactful projects on campus using a \$1.1 million fund generated by an annual student fee (*More on SSC, pages 36-37*).



Tony Mancuso/iSEE

From left, the Institute's Ben McCall, Jenny Kokini, Olivia Harris, Madhu Khanna, and Evan H. DeLucia ham it up during the Sustainability Week Celebration in October 2016.

## 2016-17 iSEE DIRECTORS, STAFF

Name	Title
Evan H. DeLucia	Baum Family Director
Ximing Cai <sup>^</sup>	Associate Director, Campus Sustainability
Madhu Khanna	Associate Director, Education & Outreach
Ben McCall	Associate Director, Campus Sustainability//Assistant Director, Special Projects
Jenny Kokini	Managing Director
Morgan Johnston	Associate Director of Facilities & Services (F&S)/Director of Sustainability, F&S
Olivia Webb*	Sustainability Programs Coordinator
Micah Kenfield <sup>^</sup>	Sustainability Programs Coordinator
Cathy Liebowitz+	Student Sustainability Committee (SSC) Coordinator
Tony Mancuso	Communications and Public Affairs Coordinator
Amy Rosenbery	Office Administrator
Olivia Harris	Communications Specialist
Catherine Yee*	Student Intern for Campus Sustainability
Julia Chang+	Student Intern for Campus Sustainability
Kate McQueen*	Graduate Student Intern for Communications
Katie Watson	Student Intern for Communications

\* No longer with iSEE, but worked in 2016-17; <sup>^</sup> Hired Spring 2017; + Hired Summer 2017

# Our People from Across Campus

## 2016-17 iSEE STEERING COMMITTEE MEMBERS

Name	Title	Academic Unit
Brian Allan*	Associate Professor	Department of Entomology
German Bollero	Professor/Head	Department of Crop Sciences
Jeff Brawn	Professor/Head	Department of Natural Resources and Environmental Sciences
Carla Cáceres	Professor/Director	Department of Animal Biology/School of Integrative Biology
Arnab Chakraborty	Associate Professor	Department of Urban and Regional Planning
Don Fullerton	Professor	Department of Finance
Sharon Hammes-Schiffer	Professor	Department of Chemistry
Praveen Kumar	Professor	Department of Civil and Environmental Engineering
Bruce Elliott-Litchfield*	Professor/Assistant Dean	Department of Agricultural and Biological Engineering
Wen-Tso Liu	Professor	Department of Civil and Environmental Engineering
Sarah Taylor Lovell*	Associate Professor	Department of Crop Sciences
Stephen P. Long*	Professor	Departments of Crop Sciences and Plant Biology
Benito Mariñas*	Professor/Head	Department of Civil and Environmental Engineering
Stephen Marshak	Professor/Director	Department of Geology/School of Earth, Society and Environment
Dipanjan Pan*	Associate Professor	Department of Bioengineering
Jesse Ribot	Professor	Department of Geography and Geographic Information Systems
Peter Sauer	Professor	Department of Electrical and Computer Engineering
Rizwan Uddin	Professor	Department of Nuclear, Plasma and Radiological Engineering
Don Wuebbles	Professor	Department of Atmospheric Sciences
Paul Couston	Undergraduate (Student Sustainability Committee Chair)	

\* Primary Investigator on iSEE-funded project (see pages 8-21)

## 2016-17 iSEE FACULTY AFFILIATES

- **Brian Allan**, Associate Professor, Entomology
- **German Bollero**, Professor and Head, Crop Sciences
- **Bruce Branham**, Professor, Crop Sciences
- **Jeff Brawn**, Professor and Head, Natural Resources and Environmental Sciences
- **Carla Cáceres**, Professor, Animal Biology; Director, School of Integrative Biology
- **Ximing Cai**, Professor, Civil and Environmental Engineering; Associate Director, iSEE
- **Arnab Chakraborty**, Associate Professor, Urban and Regional Planning
- **Don Fullerton**, Professor, Finance
- **Jeremy Guest**, Assistant Professor, Civil and Environmental Engineering
- **Sharon Hammes-Schiffer**, Professor, Chemistry
- **Allison Hansen**, Assistant Professor, Entomology
- **Madhu Khanna**, Professor, Agricultural and Consumer Economics; Associate Director, iSEE
- **Praveen Kumar**, Professor, Civil and Environmental Engineering
- **Bruce Elliott-Litchfield**, Professor, Agricultural and Biological Engineering
- **Stephen P. Long**, Professor, Plant Biology and Crop Sciences
- **Sarah Taylor Lovell**, Associate Professor, Crop Sciences
- **Yi Lu**, Professor of Chemistry, Biochemistry, Bioengineering, and Materials Science and Engineering
- **Benito Mariñas**, Professor and Head, Civil and Environmental Engineering
- **Stephen Marshak**, Professor, Geology; Director, School of Earth, Society and Environment
- **Amy Marshall-Colón**, Assistant Professor, Plant Biology
- **Ben McCall**, Professor, Chemistry and Astronomy; Assistant Director, iSEE
- **James O'Dwyer**, Assistant Professor, Plant Biology
- **Yanfeng Ouyang**, Professor, Civil and Environmental Engineering
- **Dipanjan Pan**, Associate Professor, Bioengineering
- **Nick Paulson**, Associate Professor, Agricultural and Consumer Economics
- **Jesse Ribot**, Professor, Geography and Geographic Information Science
- **Peter Sauer**, Professor, Electrical and Computer Engineering
- **Edward Seidel**, Professor, Physics and Astronomy; Director, National Center for Supercomputing Applications
- **Joanna Shisler**, Associate Professor, Microbiology
- **Ashlynn Stillwell**, Assistant Professor, Civil and Environmental Engineering
- **Rizwan Uddin**, Professor, Nuclear, Plasma, and Radiological Engineering
- **Madhu Viswanathan**, Professor, Business
- **Michelle Wander**, Professor, Natural Resources and Environmental Sciences
- **Shaowen Wang**, Professor, Geography and Geographic Information Science
- **Scott Willenbrock**, Professor, Physics
- **Gillen D'Arcy Wood**, Professor, English; Certificate in Environmental Writing, iSEE
- **Wendy Yang**, Assistant Professor, Plant Biology and Geology





Photo courtesy of John Marlin

Illinois Gov. Dan Walker addresses students at a Students for Environmental Concerns 'Stop the Dam' protest on the Quad in the early 1970s.

## iSEE Sesquicentennial Series Examines U of I's History of Environmentalism

In honor of the University of Illinois sesquicentennial, the iSEE Communications Department is publishing a series of stories spotlighting the rich history of ecological and environmental research and breakthroughs on campus.

The articles, photos, and videos touch on student, faculty, and staff activism and leadership on behalf of Mother Earth in the past 150 years — which have ramped up considerably in the past few decades! And the series will explore the future of sustainability, clean energy, and environmental efforts at Illinois and abroad.

### Already published

- Sights and Sounds from the Illinois Sesquicentennial Celebration Kickoff
- SECS: 'Saving the Earth Since 1969'
- Bicycling, Advocacy at Illinois: A Marriage Made

on Campus

### Upcoming coverage

- The surprising history of the Illini Grove
- A complete history of the Student Sustainability Committee
- A closer look at the Florida Avenue Prairie Zone
- Illinois Alum Charles David Keeling (1928-2005): the Man Who Tied Human Actions to Climate Change
- Q&A videos with iSEE Director Evan H. DeLucia on the past and future of sustainability and environmentalism on campus and beyond
- And more!

To stay up to date with iSEE stories commemorating the 150th year of Illinois, visit <http://sustainability.illinois.edu/category/illinois-sesquicentennial/>.



# Keep Up with iSEE and its Partners

Be a part of the sustainability story at Illinois by contacting us directly, checking us out online, or engaging with us on social media. Here's how:

## CONTACT US

iSEE office phone: 217-333-4178

iSEE mailing address: 1101 W. Peabody, Suite 350 (NSRC), MC-635 Urbana, IL 61801

iSEE email address: [sustainability@illinois.edu](mailto:sustainability@illinois.edu)

Campus sustainability email address: [campus-sustainability@illinois.edu](mailto:campus-sustainability@illinois.edu)

Certified Green Office Program email address: [greenoffice@illinois.edu](mailto:greenoffice@illinois.edu)

Styrecycle email address: [illinois.styrecycle@gmail.com](mailto:illinois.styrecycle@gmail.com)

Illini Lights Out email address: [illinilightsout@illinois.edu](mailto:illinilightsout@illinois.edu)

Sustainability, Energy, and Environment Fellows Program email address: [see-fellows@illinois.edu](mailto:see-fellows@illinois.edu)

Student Sustainability Committee (SSC) office phone: 217-300-6429

SSC mailing address: 1101 W. Peabody, Room 291 (NSRC), MC-635 Urbana, IL 61801

SSC email address: [sustainability-committee@illinois.edu](mailto:sustainability-committee@illinois.edu)

## ON THE WEB

iSEE main website: [sustainability.illinois.edu](http://sustainability.illinois.edu)

Energy at Illinois website: [energy.illinois.edu](http://energy.illinois.edu)

Water at Illinois website: [water.illinois.edu](http://water.illinois.edu)

ICAP Portal website: [icap.sustainability.illinois.edu](http://icap.sustainability.illinois.edu)

Student Sustainability Committee (SSC) website: [ssc.sustainability.illinois.edu](http://ssc.sustainability.illinois.edu)

Center for Applied Collaborations on Human Environments website: [publish.illinois.edu/humanenvironments](http://publish.illinois.edu/humanenvironments)

Leverhulme Centre for Climate Change Mitigation website: [lc3m.org/research/theme-3/](http://lc3m.org/research/theme-3/)

Agroforestry for Food website: [agroforestry4food.com](http://agroforestry4food.com)

Crops *in silico* website: [cropsinsilico.org](http://cropsinsilico.org)

Sun Buckets website: [www.sunbuckets.com](http://www.sunbuckets.com)

Cooking with Sun Buckets blog: [cookingwithsunbuckets.com](http://cookingwithsunbuckets.com)

## FACEBOOK

iSEE Facebook page: [facebook.com/iSEEatUofI](https://facebook.com/iSEEatUofI)

Sustainability @ Illinois Facebook group page: [facebook.com/groups/123074238038372/](https://facebook.com/groups/123074238038372/)

SSC Facebook page: [facebook.com/UIUCssc](https://facebook.com/UIUCssc)

Styrecycle Facebook page: [facebook.com/Styrecycle](https://facebook.com/Styrecycle)

Illinois Biodiesel Initiative (IBI) Facebook page: [facebook.com/illinibiodiesel](https://facebook.com/illinibiodiesel)

Agroforestry for Food Facebook page: [facebook.com/AgroforestryForFood](https://facebook.com/AgroforestryForFood)

Sun Buckets Facebook page: [facebook.com/Sun-Buckets](https://facebook.com/Sun-Buckets)

## TWITTER

iSEE Twitter page: [twitter.com/sustainILLINOIS](https://twitter.com/sustainILLINOIS)

SSC Twitter page: [twitter.com/ssc\\_uiuc](https://twitter.com/ssc_uiuc)

Agroforestry for Food Twitter page: [twitter.com/Agforestry4Food](https://twitter.com/Agforestry4Food)

## OTHER SOCIAL MEDIA

iSEE YouTube channel: [bit.ly/iSEEyT](https://bit.ly/iSEEyT)

iSEE LinkedIn page: [linkedin.com/groups/8519947](https://linkedin.com/groups/8519947)

~ NEW ~ iSEE Instagram page: [instagram.com/sustainillinois/](https://instagram.com/sustainillinois/)

~ NEW ~ iSEE Snapchat channel: [sustainillinois](https://sustainillinois)



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