

KANSAS

EPSCoR

Partners in Science
& Technology



September, 2010 Volume 1, Issue 2

Many Kansas scientists focusing on KNE's major research project, *Climate Change and Energy: Basic Science, Impacts and Mitigation*

In the ten months since the *Climate Change and Energy: Basic Science, Impacts and Mitigation* project at Kansas NSF EPSCoR was officially launched, more than 175 Kansas scientists (faculty, students and other personnel) have rolled up their sleeves and begun work.

The scientists represent many disciplines and four institutions: Kansas State University, the University of Kansas, Wichita State University and Haskell Indian Nations University.

The *Climate Change and Energy* project is a major endeavor, in which the scientists will collaborate through September, 2014, targeting solutions for a cleaner environment by advancing the science of renewable energy sources. The project was funded by the National Science Foundation, with matching funds contributed by the Kansas Technology Enterprise Corporation (KTEC).

The scientists are working in teams on interrelated research initiatives: *Nanotechnology for Renewable Energy*; *Biofuels and Climate Change*; *Climate Change and Mitigation*; and *Climate Change in Indigenous Communities*. (See inset at right.)

Nanotechnology for Renewable Energy

Led by Judy Wu, University Distinguished Professor of Physics at KU, four teams of scientists are looking at:

- Energy Capture and Catalysis at the Nanoscale
- Energy Conversion-Solar Electric
- Cost Effective Conversion of Biomass into Biofuels and co-products
- Holistic Systems Design

NRE hosted an Annual Symposium June 13–15, which was attended by 70 people, 21 of whom presented posters.

An early key accomplishment of NRE is progress that has been made in growing algae for biofuels in outdoor bioreactors (see "Growing high-yield algae in treated wastewater," P. 3).

NRE also had an ambitious Research Experiences for Undergraduates program over the summer. One of the REU students was a *Workforce Development* intern in summer 2009 (see story, P. 2).

Biofuels and Climate Change

Led by Dietrich Earnhart, professor of economics at KU, this project has a diverse group of scientists, including many social scientists, who are examining farmers' values and attitudes to determine what goes into farmers' land-use decisions.

The project has also generated a comprehensive land-use land cover dataset

(see "Mapping tool developed for crop decision research," P. 3)

Climate Change and Mitigation

Led by Charles (Chuck) Rice, University Distinguished Professor of Soil Microbiology at K-State, CCM has three subprojects:

- Modeling Climate Change Variables: focusing on improving climate change modeling specific to Kansas and the central Great Plains.
- Kansas Farmlands: assessing climate change adaptation strategies. Initial interviews of farmers have been completed (see "Interviewing some of the climate change stakeholders," P. 3).
- C-Sequestration: currently, a baseline for soil organic carbon is being established.

Climate Change in Indigenous Communities

HERS students present research at "Living Earth Festival"

Undergraduate interns from the Haskell Environmental Research Studies Institute (HERS) were invited to present their research at the Smithsonian's National Museum of the American Indian (NMAI), Aug. 6–8, as part of the "Living Earth 2010 Festival."

HERS is a 10-week summer program directed by Joane Nagel, University Distinguished Professor of Sociology, KU, and Dan Wildcat, HERS director.

All 13 of the HERS interns presented posters at the NMAI. One student, Abigail Jones, also served with Wildcat on a panel at the event.

HERS is funded by Kansas NSF EPSCoR as the *Climate Change in Indigenous Communities* project that is part of the *Climate Change and Energy* initiative.

The HERS interns were mentored by KU graduate students from the NSF IGERT, C-Change (Integrative Graduate Education and Research Traineeship: Climate Change, Humans, and Nature in the Global Environment.)



Faculty and students from HERS and the KU IGERT, C-Change, at a three-day retreat in June at the Konza Prairie Biological Station, near K-State.

From Kristin Bowman-James, KNE Project Director:

Kansas NSF EPSCoR now has three major initiatives underway

Greetings from Kansas NSF EPSCoR! It is very exciting to be able to watch the launching of our new and highly promising research projects. This includes our Track 1 major initiative *Climate Change and Energy: Basic Science, Impacts and Mitigation* (P. 1), and our joint project with Oklahoma, Collaborative Research: EPSCoR RII Track 2 Oklahoma and Kansas: *A cyberCommons for Ecological Forecasting*. Both of these initiatives are now well on their way. The first annual cyberCommons for Ecological Forecasting symposium was held in Lawrence on September 3, 2010.

The just breaking news is that our C2 proposal *Prairie Light: Next Generation Optical Networking for Mid Continent Science* was funded! The award goes to the three major research universities in Kansas, Kansas State University (Daniel Andresen, co-PI), Wichita State University (Ravi Pendse, co-PI), and the University of Kansas (Donald F. (Rick) McMullen, co-PI).

However, its influence will reach far beyond to other institutions of higher learning, including Emporia State University, Pittsburg State University, and Johnson County Community College. The project partners with KanREN (Kansas Research and Education Network), a non-profit consortium of learning institutions and other organizations in Kansas that facilitates inter-institutional communication, and will allow for an upgrade of KanREN's network from 2 to 10 Gbytes. The result will be a vastly improved data network that will directly impact a number of educational and research initiatives throughout Kansas. More will follow in the next newsletter.

I am also delighted to report that this summer's internship program at Haskell Indian Nations University has been a tremendous success (P. 1). This year, in addition to students from Haskell, students from Diné College attended the summer program. What is particularly

appealing with this program, is that it is truly a "pathway" in the sense that former trainees return to mentor new interns and to help to lead them along the path. We also have two graduates of the program, Michael Dunaway and Paula Smith, now both graduate students in Geology at KU.

We have also reinstated what was previously a very successful program known as First Awards (P. 4). While this award was discontinued in the previous Phase, it was brought back by huge demand. I am especially pleased that this year the awards are rather equally distributed among our three major research universities and across a breadth of disciplines, including the biological and physical sciences, engineering, and possibly for the first time mathematics.

In all, it has been a very eventful year and kudos go out to the active researchers who have been responsible for the success of these projects.



► Photos (from left)

- Four McNair Scholars supported by Kansas NSF EPSCoR: Gene Cody, Diana Restrepo, Lauren Zagorski and Dagoberto Heredia.
- Johannes Feddema, Geography, KU, Chunsheng Ma, Mathematics and Statistics, WSU, and Chris Brown, Geography and Environmental Studies, KU, working together on the KNE Strategic Plan.
- Lina Zhao, Caitlin Rochford and Guowei Zu shared top poster honors at the June Nanotechnology for Renewable Energy Symposium.
- HERS and IGERT students at a workshop on the Konza Prairie Biological Station.

► For the Calendar

Kansas NSF EPSCoR Statewide Conference

Monday, October 4, 2010 • Adams Alumni Center, KU

www.nsfepscor.ku.edu/2010-stateconference.html

NSF Day

Tuesday, October 5 • Kansas Union, KU

www.rgs.ku.edu/nsf

Building links and making connections through an REU program

Work is continually underway to build links between the four interrelated research initiatives for *Climate Change and Renewable Energy*.

Workforce Development and Climate Change in Indigenous Communities, at Haskell Indian Nations University and *Nanotechnology for Renewable Energy*, with scientists based at KU, KSU and WSU, has connected through an ambitious Research Experiences for Undergraduates (REU) program. One of the REU students this summer is a recent Haskell graduate who participated as in intern in *Workforce Development* in summer 2009.

Michael Dunaway will pursue a master's degree in geography at the University of Kansas. He and the other 21 REU students spent the summer studying alternative energy.

Dunaway's research focuses on projects that could have significant impact to the economy and culture of tribal lands.



Michael Dunaway in the Nanotechnology and Thin Film Lab at KU.

RESEARCH NOTES

► Growing high-yield algae in treated wastewater



Algae promise to be a major renewable energy problem-solver. They grow fast, trap carbon dioxide and have the potential for high lipid contents which can result in high oil yields. Algae can also grow on land not suitable for agriculture, and don't displace food crops.

There are hurdles to mass algae production that science must still address. It is difficult to grow algae in outdoor settings and still get consistently high oil yields. Lots of fresh water must be used, so environmental costs could potentially outweigh the benefits.

Kansas NSF EPSCoR researchers Belinda Sturm, assistant professor of environmental engineering, Val Smith and Jerry deNoyelles, professors of ecology and evolutionary biology, and Susan Williams, associate professor of chemical and petroleum engineering (all of KU) are partnering with the Lawrence, KS water treatment plant. They are looking at ways to develop sustainable and consistently high oil yields from algae grown in outdoor bioreactors filled with treated wastewater (sewage).

Initial results have been promising and both the scientists and the wastewater plant professionals are pleased about yet another environmental benefit. The wastewater-grown algae consume the nitrogen and phosphorus in the wastewater, and these pollutants are removed when the algae is harvested. This is a big plus, because the Midwest's water treatment plants are under pressure to send less nitrogen and phosphorus downstream to the Gulf of Mexico.

► Interviewing some of the climate change stakeholders in Kansas: farmers and ranchers

John Harrington Jr., professor of geography at Kansas State University, believes that the response of farmers and ranchers to ongoing climate change now will lead to new agricultural practices. This will help farmers and, also, help us all through the food they produce.

Harrington and his team of student researchers embarked this summer on a project to figure out what, exactly, farmers and ranchers are observing and thinking about the weather, climate and other environmental changes.

The students interviewed about 50 farmers/ranchers in the northern Flint Hills and the Smoky Hills of Kansas, about

► Mapping tool developed for crop decision research

A mapping tool developed in the past several months is a novel dataset that documents land-use and land-cover over the entire state of Kansas.

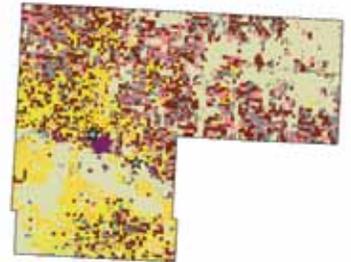
The level of detail in this new dataset is unprecedented, both in space (field level) and time (the annual maps will span the years 2000 through 2014).

Scientists working on the *Biofuels and Climate Change* initiative are assessing how farmers make cultivation choices and will rely on this new tool.

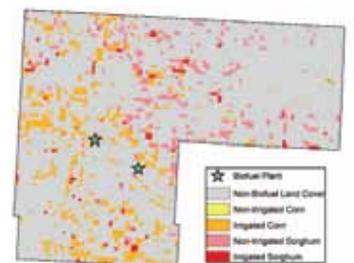
Climate specialists will use the data to define the various biophysical qualities of the state as they run climate models to depict the affect of climate change on agriculture.

As illustrated by the maps on the right, researchers can explore the possibility of developing models to predict the effects of biofuel plant establishment on surrounding cropping practices.

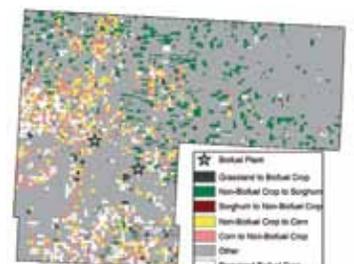
Finney County, Kansas (stars represent biofuel plants)



All crops



Irrigation status



Changing biofuel status

“Local Ecological Knowledge.”

The team will use their results to identify better ways scientists might

communicate information about climate change with farmers and ranchers, and develop better tools for doing so.



Four of the students who interviewed farmers and other stakeholders, from left: Jordan Waechter, Courtney Estes, Lisa Tabor and Iris Wilson.



Kansas NSF EPSCoR is funded by the National Science Foundation Grant No. EPS-0903806 and the State of Kansas. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

The Kansas NSF EPSCoR newsletter is published by Kansas NSF EPSCoR, University of Kansas, Foley Hall, 2021 Constant Avenue, Lawrence, KS 66047. For additional copies of this newsletter, write to us, call us at 785/864-6120, or e-mail us at nsfepscor@ku.edu.

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EPSCoR PEOPLE

▶ EPSCoR project director named ACS Fellow



Kristin Bowman-James, right, receives her ACS Fellows award

Kristin Bowman-James, University Distinguished Professor of Chemistry at KU and also project director for Kansas NSF EPSCoR, has been named to the 2010 class of American Chemical Society (ACS) Fellows.

ACS Fellows are recognized for their contributions to chemistry and also their outstanding service to ACS.

Bowman-James' research is in the field of supramolecular chemistry, particularly involving synthetic macrocycles as ligands for both anions and transition metal ions. She is recognized in particular for her contributions to the field of anion coordination chemistry.

▶ Scientist recognized for work to clean up fumes from faulty drywall

Kenneth J. Klabunde, University Distinguished Professor of Chemistry at K-State, and founder of NanoScale Corporation in Manhattan, KS, was recognized recently by the NSF for a nanomaterial that is used to break down corrosive chemicals in imported drywall.



Ken Klabunde

Nanoscale developed a cartridge, called OdorKlenz, which takes the place of the existing air filter in a home, to clean up contaminants while homeowners await replacement of the corrosive drywall. Nanoscale originally developed the cleaner to fight toxic wastes.

Klabunde is currently working with Kansas NSF EPSCoR as a member of the *Nanotechnology for Renewable Energy* project.

First Awards fund young faculty members' research

An important component of the EPSCoR mission is encouraging and assisting young faculty members in their quest for research funding. Earlier this summer, KNE made awards to eight Kansas faculty members, through our First Awards Program. The awardees are:



Caroline Chaboo

Caroline Chaboo, KU, assistant professor of entomology, for *Phylogenetic Research in the Hyperdiverse Leaf Beetle Family, Chrysomelidae (Coleoptera)*.



Preethika Kumar

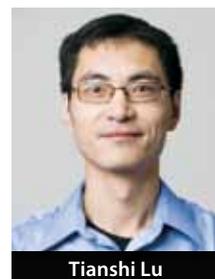
Preethika Kumar, assistant professor of electrical engineering and computer science, WSU, for *Investigating and Evaluating the Effects of Relative Phase in Different Architectural Layouts of Qubits for Different Quantum Systems*.

Christopher Depcik, assistant professor of mechanical engineering, KU, for *Adaptive Lean NO_x Trap Kinetics for Lean Phase Operation and Cost Savings*.



Christopher Depcik

Tianshi Lu, assistant professor of mathematics and statistics, WSU, *Modeling and Algorithms of Multiphase Magnetohydrodynamics in Tokamaks*.



Tianshi Lu



Gregory Houseman

Gregory Houseman, assistant professor of biological sciences at WSU, for *Can Spatial Variability Created by Dispersal Explain the Accumulation of Biodiversity?*



Gregory Rudnick

Gregory Rudnick, assistant professor of physics and astronomy, KU, *Isolating the Environmental Effects on the Evolution of Galaxies over Cosmic Time*.

Andrew Ivanov, assistant professor of physics, K-State, *Towards New Discoveries at the Energy Frontier*.



Andrew Ivanov

Richard Todd, assistant professor of plant pathology, K-State: *The Mechanism of Regulated Nuclear Export of the Aspergillus Nidulans Nitrogen Transcription Factor AreA*.



Richard Todd

Do you have an item for EPSCoR people?

Call or e-mail Jill Giele, Communications Coordinator, Kansas NSF EPSCoR, at 785-864-6120/jgiele@ku.edu.

For more information on these First Award projects, visit www.nsfescor.ku.edu/first-awards.html