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KANSAS PHASE IV INITIATIVES UNDERWAY

Nearly six months into Kansas NSF EPSCoR's Phase IV Award, scientists at Kansas State University, the University of Kansas, and Wichita State University are hard at work developing a stronger research infrastructure for the new life sciences research initiative.

The initiative focuses on three closely interwoven scientific areas — bioinformatics, lipidomics, and ecological genomics — new fields on the scientific frontier.

Informatics is an emerging field that studies, develops, and implements structures and algorithms to improve the communication, understanding, and management of information. Its ultimate objective is to access and synthesize data, knowledge, and tools as they are needed to make decisions. Many disciplines are contributing to informatics and creating new specialties such as bioinformatics, medical informatics, public health informatics, and biodiversity informatics.

Lipidomics is the study of non-water-soluble biological substances that provide the structural backbones for membranes, energy for metabolism, and mediators for regulating cell functions. Lipidomics researchers investigate the role of lipids in living organisms, including how lipids respond to biotic and abiotic stresses and how lipids affect nutrition and development.

Ecological genomics is an interdisciplinary field that seeks to understand the genetic basis for the responses of living systems to global environmental changes. By examining the responses of individual organisms, communities, and ecosystems to environmental change scientists will identify how the environment affects genes and how genes affect an organism's response to the environment.

In fulfilling its mission to maintain U.S. leadership in scientific discovery, the National Science Foundation will help Kansas develop research capacity in these new disciplines.

NSF EPSCoR looks for leveraged partnerships, and the Kansas Phase IV proposal delivered. The Phase IV proposal called for collaboration with the world-class Stowers Institute for Medical Research in Kansas City, and for integration of research programs that will be supplied by new research facilities authorized by the Kansas Legislature.

"The \$9 million, three-year funding award made to Kansas NSF EPSCoR marks the

beginning of a new research era in Kansas," said Thomas N. Taylor, project director. "This is a terrific opportunity for the State of Kansas, and the hundreds of faculty members and students who will participate in future research endeavors."

Read the first of a three-part series on the new research focus areas in this newsletter, "Kansas Poised as Leader in New Field of Research", (this page).

KANSAS POISED AS LEADER IN NEW FIELD OF RESEARCH



THE KONZA PRAIRIE NEAR MANHATTAN IS THE IDEAL LOCATION FOR CARRYING OUT THE EXTENSIVE RESEARCH CALLED FOR IN THE ECOLOGICAL-GENOMICS INITIATIVE OF KSU ASSOCIATE PROFESSORS LORETTA JOHNSON AND MIKE HERMAN.

For seven years, studying the plants of the tallgrass prairie has been a fascination of KSU Associate Professor of Ecology Loretta Johnson. This year, Johnson and a fellow researcher have a reason to dig

deeper into Kansas soil.

The National Science Foundation (NSF), through the life science initiative of Kansas NSF EPSCoR, is funding research that will for the first time link ecology and genomics.

The project will give Johnson, and Co-PI Mike Herman, an Associate Professor of biology at KSU, an opportunity to identify genes that are directly involved in how plants and animals respond to a changing global environment. Ecological genomics couples the tools of molecular genetics with ecology by taking advantage of the research platform and ongoing experimental work at the Konza

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FROM THE DIRECTOR

Dear Colleagues:

I am pleased to report that Phase IV (2003-2006) of Kansas NSF EPSCoR is now underway. This collaborative effort to improve the state's research infrastructure involves the NSF, Kansas Technology Enterprise Corporation (KTEC), and Ph.D. granting institutions in Kansas. The grant provides more than \$14 million to researchers in three thrust areas: the interface between ecology and genomics, lipidomics, and bioinformatics. Already, new faculty, graduate students and postdoctoral fellows are working and new equipment, such as a confocal microscope at KU, is installed.

Letters of Intent for the First Award competition, designed to increase the research competitiveness of early career faculty, are due in October. In early November, participants in the ecological genomics thrust area will hold a symposium in Kansas City; participants in the lipidomics thrust area will meet in 2004. In partnership with NIH – BRIN, Kansas NSF EPSCoR will expand bioinformatics in the state. A bioinformatics specialist has been hired to support to faculty and students, and another bioinformaticist will be added next year. Education and human resource development will continue on many fronts.

The National EPSCoR Conference, hosted by the Nevada EPSCoR program in early September, provided opportunities for the discussion of state, national, higher education, professional society, media, technology/entrepreneur, and agency perspectives. Like science, EPSCoR must continually meet new challenges, answer new questions, seek new collaborations, and increase opportunities for women and underrepresented groups. As a part of our collective responsibility, we need to ask: who will train the next, and the next, and the next generation of scientists, technologists, engineers,



THOMAS N. TAYLOR,
PROJECT DIRECTOR

and mathematicians? As each of us strives to push back the frontiers in science, we must also expend the same energy in helping to create new opportunities for those who wish to enter a career in science.

NONINVASIVE BLOOD GLUCOSE MONITOR IN DEVELOPMENT

Linda Olafsen, University of Kansas Assistant Professor of Physics and Astronomy is among the team of researchers receiving an award from the National Institute of Diabetes and Digestive and Kidney Diseases. The four-year, \$2.5 million grant will be used to develop a less painful, less invasive blood glucose monitor for diabetes management.

Dr. Olafsen is working on an optical technique device that will measure blood glucose levels. The device will attach to the skin and determine the absorption of infrared light in the fluid that lies just below the surface of the skin. Glucose levels found in this level of skin will then be correlated with levels in the blood.

The source and detector of the infrared light will be semiconductor devices that are being fabricated at KU. A Deep Ultraviolet/

Infrared Mask Aligner, instrumentation obtained through a Materials Research Grant from NSF, plays a major role in the development of these devices. Dr. Olafsen has collaborators at the University of Iowa and Ohio University who work on other aspects of the research.

Dr. Olafsen's first appointment to the faculty at KU was partially supported by a Faculty Start Up Grant from Kansas NSF EPSCoR. In 2000 she was a First Award Program recipient for her research on mid-infrared semiconductor heterostructures.

"Dr. Olafsen's success has demonstrated the value of the First Award Program. As seed money, EPSCoR support helped launch her now, well-funded research program," said Thomas N. Taylor, Kansas NSF EPSCoR Project Director.

AEROSPACE ENGINEERING ASSISTANT PROFESSOR RECOGNIZED

A "surprise patrol" stopped by the office of KU Assistant Professor Richard Hale in mid-August. The patrol delivered a \$5,000 Kemper Award in recognition of excellence in teaching and advising.

The W.T. Kemper Fellowships for Teaching Excellence recognize outstanding teachers and advisers at KU as determined by a seven-member selection committee.

Following a successful career in industry, Hale joined the KU aerospace engineering faculty in 1998. He was named the Aerospace Engineering Educator of the Year for 1999-2000 and 2001. In 2002 he received the Henry E. Gould Award for Distinguished Services to Undergraduate Education.

In 2000, Hale and collaborators at Kansas State University were awarded a Special Initiatives Grant from Kansas NSF EPSCoR for research to develop new design and structure of three-dimensional textile composites which can handle more pressure, more weight, and maintain a longer lifecycle.



RICHARD HALE, KU ASSISTANT PROFESSOR OF AEROSPACE ENGINEERING, EXAMINES BRAIDING ON A COMPUTERIZED LOOM. DR. HALE RECEIVES RECOGNITION FOR BOTH HIS RESEARCH AND TEACHING CAPABILITIES.

NSF recognizes the importance of excellence in teaching and encourages faculty to integrate their research discoveries into their classrooms. In addition, NSF's focus on human resource development emphasizes the significant need to educate the next generation of scientists.

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KANSAS POISED AS LEADER IN NEW FIELD OF RESEARCH

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Prairie Biological Station near Manhattan.

Five years ago ecological genomics studies were not even on the horizon, explained Johnson and Herman. "Being a leader in a new field that NSF is excited about and interested in funding is important to Kansas," Johnson said.

Herman added, "There are three aspects of this project that make it exciting. The first is the science. The second is that today we know more about genes but we don't necessarily know what they do. For example, mutated genes, are they relative to nature or environment?"

A third compelling aspect of the new research is the interaction between the two groups of biologists — those with ecological interests and those with genetic interests. "Typically they don't interact," Herman said. "Now they have light bulbs going on."

"The recent explosion of knowledge in the field of genomics made this project feasible now," Herman said. "Scientists have determined the entire gene sequence of several organisms — including the model systems we will use — in order to understand the biological function of genes."

As departmental colleagues with different training and perspective on living organisms, Johnson and Herman realized that bringing their two fields together could be a productive and fruitful line of research.

"We hope to extend the long-term ecology studies (on the Konza) to a new level by investigating, for the first time, the genetic responses of plants and animals to impending environmental changes," Johnson said. "Someday we hope to be able to predict organisms' responses to a changing environment and the genetic pathways responsible for the responses."

At least two of the genome-world's superstars have major roles in ecological genomics research as it unfolds: the roundworm *Caenorhabditis elegans* and the wild mustard plant *Arabidopsis thaliana*. This roundworm is famous as the first organism to have its genome sequenced. It graced the cover of *Science* magazine in April 2000 when the sequence was published.

In addition, Johnson hopes to take advantage of the genomes of model plants such as rice and the wild mustard and to determine if the same genes that regulate root growth in the model organisms can help them under-

stand root growth in prairie grasses.

Nearly 50 scientists, postdoctorals, graduate students, and undergraduates from nine departments at KSU, KU and WSU will participate as the 3-year study unfolds. Currently, there are 15 research projects underway — eight at KSU, six at KU, and one large collaborative effort between

WSU, KU and KSU.

In November, a symposium in Kansas City will feature selected speakers in this new field from all over the country, NSF funding specialists, and grant-writing specialists. The program will also include the results from 12 Kansas ecological genomics projects already underway.

NEW FACULTY ACCELERATE RESEARCH ACTIVITIES WITH FIRST AWARDS

For a new faculty member, early research results can pave the way to expanded funding from federal agencies.

To assure early success, the Kansas NSF EPSCoR program offers First Awards to new faculty at Kansas State University, the University of Kansas and Wichita State University. The First Award Program requires submission of proposals to the National Science Foundation, improves the quality of proposals and accelerates the pace of research. Funding provides for supplies, equipment, research assistants, postdoctoral fellows, and other items that strengthen the research objectives.

Seventeen proposals were considered for the Spring 2003 award cycle. Ten were funded at a total amount of \$399,029. Stefano Vidussi of the KSU Mathematics Department received an award from the National Science Foundation, and was therefore disqualified from receiving a Kansas NSF EPSCoR First Award.

"Dr. Vidussi's NSF award is great news," said Thomas N. Taylor, Kansas NSF project director. "The First Award Program is designed to encourage faculty to apply for NSF funding early in their careers. Dr. Vidussi did that with great success."

First award recipients and their research focus include:

 Mikhail V. Barybin, KU Chemistry, investigates the synthetic chemistry of metal isocyanides, which are of interest because of their potential impact on radiologic medicine, liquid crystal design, and non-linear optics.

 Dale Bremer, KSU Horticulture, studies the emissions of nitrous oxides from turfgrass to determine its contribution to climate change and the greenhouse effect.

 Mikel Foss, KSU Mathematics, examines the properties of minimizers for variational problems arising in nonlinear elastostatics, which is important to the theory of partial differential equations and continuum mechanics.

 Jennifer Gleason, KU Ecology and Evolutionary Biology, studies the genetic and molecular basis of sexual selection in the female fruitfly.

 Marianne Korten, KSU Mathematics, investigates how the processes of temperature-dependent melting and freezing, and diffusion or seepage in certain porous media may predict the behavior of materials in design molds. Results can help in designing industrial molds and procedures.

 Mark Mort, KU Ecology and Evolutionary Biology, studies *Crassulaceae*, a group of South African succulent-leaved plants, to understand the processes of floral evolution leading to plant diversity.

 Kirsten Nicolaysen, KSU Geology, explores the behavior of hafnium in lavas, volcanic eruptions and the resulting subduction.

 Jon Tunge, KU Chemistry, studies the biological transformations that result from the incorporation of chloride and bromide into complex molecules, and their potential therapeutic benefits.

 Mehmet Yildirim, WSU Industrial and Manufacturing Engineering, investigates methods to control traffic congestion by developing tolls that encourage more efficient network utilization.

 Ludek Zurek, KSU Entomology, probes the microbial ecology and movement of flies to assess their role in food-borne and animal pathogens.

“NEW DIRECTIONS” TOPIC FOR NATIONAL EPSCoR MEETING

The 17th Annual NSF EPSCoR National Conference, “EPSCoR 2005 - 2010: New Directions” was held September 7-9, 2003 in Las Vegas, NV. The three-day event included keynote speakers and panelists from across the nation addressing future initiatives and opportunities in research and development critical to the on-going success of NSF EPSCoR.

The conference attracted representatives from national and state government, academia, and private industry and emphasized partnerships and collaborative activities between these sectors.

Presentations focused on EPSCoR



KANSAS ATTENDEES AT THE NATIONAL EPSCoR CONFERENCE IN LAS VEGAS, NV, INCLUDED WSU RESEARCH ASSOCIATE VICE PRESIDENT GERALD ‘SKIP’ LOPER, REPRESENTATIVE JO ANN POTTORFF, (R-WICHITA), REPRESENTATIVE MELVIN NEUFELD (R-INGALLS), THOMAS N. TAYLOR, AND JON JOSSERAND, KU GOVERNMENTAL RELATIONS.

States’ best practices and new initiatives; strategies and conditions for promoting state economic growth; partnerships and collaborations; and new research opportunities and future developments.

State Representative Barbara Ballard participated in a panel discussion of “State Perspectives” on EPSCoR and Thomas N. Taylor, Project Director, chaired a panel on “Professional Society Perspectives.”

Additional attendees from Kansas included State Representatives Melvin Neufeld and Jo Ann Pottorff; Jon Josserand and Richard Fyffe-KU; and Gerald “Skip” Loper and Pal Rao-WSU.

TRAVEL AWARDS ENHANCE STUDENT LEARNING

Enhancing graduate education is a key component of Kansas NSF EPSCoR’s efforts. The importance of placing students in professional situations that provide a stage for presentation of research results and opportunities to learn from other researchers has immense value.

For the second year, Kansas NSF EPSCoR earmarked funds for a Travel Program for Graduate Students. Under the program, students enrolled in biology, chemistry, physics, astronomy, mathematics, computer science, geology or engineering and presenting a research paper and/or poster at a professional meeting may apply for up to \$500 for travel expenses. The awards require a one-to-one

match by the student’s department or university.

Awards were made to 33 students and funds were exhausted for this fiscal year.

Eric Matson, a Ph.D. student in computing and information sciences at Kansas State University attended the International Conference on Artificial Intelligence in Nevada. He said the trip was rewarding as the conference is an international gathering of academicians in the field of artificial intelligence and other computer science fields. He presented a research paper, receiving feedback that will augment further research.

Venkata Gade, a graduate research assistant in mechanical engineering at the

University of Kansas attended the 2003 Summer Bioengineering Conference in Florida. More than 600 participants gathered for the meeting. Gade presented a poster based on his graduate thesis work, “Variation of Reposition Sense of Lumbar Spine with Torso Flexion and Moment Load.” The presentation received second place in the student competition at the master’s level.

Additional graduate students attending conferences this summer included: Jason Emry, Kurt Henkhaus, Gregory King, Cheryl Murphy, and Antonis Stylianou from KU; and Ganesh Bora, Liubo Chen, Kiran Devaram, Kyeong Hwan Lee, Quentin Stoll, Sunil Varghese, and Lin Wang from KSU.

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