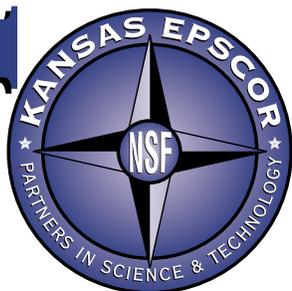


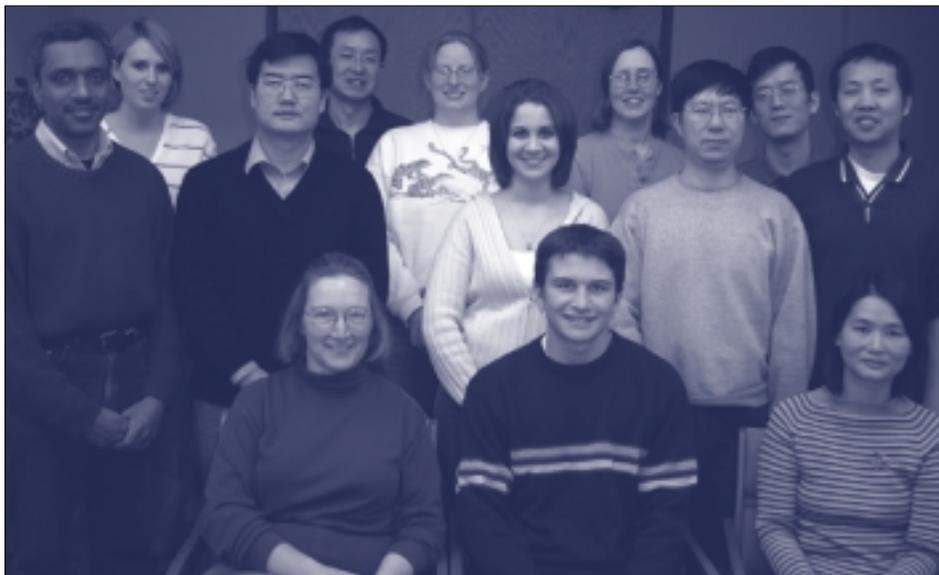
FOCUS



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LIPIDOMICS CENTER EXPANDS LIFE SCIENCES RESEARCH



FACULTY, POSTDOCTORAL SCHOLARS, AND STUDENTS ARE WORKING TOGETHER TO BETTER UNDERSTAND LIPIDS. MEMBERS OF THE KANSAS LIPIDOMICS RESEARCH CENTER TEAM AT KSU INCLUDE: FRONT ROW (L TO R): MARY ROTH (RESEARCH SPECIALIST); ETHAN BAUGHMAN (UNDERGRADUATE STUDENT); YUEYUN HONG (GRADUATE STUDENT). MIDDLE ROW: SHIVAKUMAR DEVAIAH (POSTDOCTORAL SCHOLAR); JIAN ZHAO (POSTDOCTORAL SCHOLAR); GINA RAGUSA (UNDERGRADUATE STUDENT); WEIQI LI (GRADUATE STUDENT); MAOYIN LI (GRADUATE STUDENT). BACK ROW: TARA WOOD (UNDERGRADUATE STUDENT); SAM WANG (LIPIDOMICS PROJECT DIRECTOR); ALLISON ROW (UNDERGRADUATE STUDENT); RUTH WELTI (ANALYTICAL LABORATORY DIRECTOR); WENHUA ZHANG (POSTDOCTORAL SCHOLAR).

When Kansas NSF EPSCoR won its Phase IV Award in April 2003, several new initiatives were launched. A year later, these initiatives and ideas have created fledgling programs, productive labs, and successful researchers.

The Kansas program is considered one of the most innovative in the country with its focus on new fields on the scientific horizon, including bioinformatics, lipidomics, and ecological genomics. (In the Fall 2003 issue of *FOCUS*, we looked at ecological genomics; in this issue we direct our attention to the lipidomics research.)

The Kansas Lipidomics Research Center is part of a multi-faceted effort to create a stronger infrastructure for life science research in Kansas. The center, headquartered at Kansas State University, received Kansas NSF EPSCoR funding in the spring 2003. The award marked the beginning of a

new research era. The facility includes three components: the analytical lab to provide comprehensive profiles, a technology development component to develop more advanced methods of analysis, and a scientific research component to promote statewide collaboration.

One of the major advances in modern biology has been the realization that lipids

play pivotal roles in regulating a wide variety of cellular processes. The work of the center may help answer basic biological questions and provide an underpinning for biotechnology that will have a big impact on agriculture and human medicine in the future.

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. Researchers investigate the role of lipids in living organisms, including how they respond to biotic and abiotic stresses and how lipids affect nutrition and development.

Originally established as the only center in the country to provide plant lipid profiling, great strides have been made in the last six months, adding yeast lipid profiling, and soon, animal lipid profiling.

Currently, the lab is a training ground for about ten undergraduate and graduate and post-doctoral scholars with direction from eight faculty members (five at KSU and three at KU). Collaborative research with ten other institutions around the country is focused on functions of lipids in animals, and the roles of lipids in hereditary diseases, such as globoid cell leukodystrophy, and infectious diseases, such as toxoplasmosis.

Results of a recent lipid profiling study identified the function of a plant gene that breaks down particular lipids when plants are exposed to freezing. The identification of relevant genes is an important step in crop engineering.

The new lipidomics capability in Kansas opens a new dimension in the investigation of the functions of genes and proteins. Research scientists in various disciplines, including pathology, genetics, cell biology, and bioinformatics, are beginning to look at interdisciplinary research that can be undertaken. Insights developed from this research will lead to improvements in plant and animal science and medicine.

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FROM THE DIRECTOR

Dear Colleagues:

We completed Year 1 of the three-year NSF EPSCoR Research Infrastructure Improvement award to Kansas, and based on accomplishments have just received Year 2 funding. The ecological genomics and lipidomics thrust areas have held workshops and been evaluated by outside specialists who report that the projects are making excellent progress. We will sharpen the focus of the thrust areas by adding new researchers and students to complement existing areas or to offer expertise needed to answer new questions. The ability to make swift changes in research agendas and alter research trajectories while continuing to build research infrastructure and capacity is a cornerstone in the EPSCoR venture.

As we begin Year 2, special thanks are due to Loretta Johnson, Mike Herman, Bob Cohen, Sam Wang, Ruth Welti, and Paul Kelly who have played key roles in developing the focus areas. Despite difficult budget projections, EPSCoR continues to receive matching funds from the State. I am especially appreciative of the Legislature's support and the support of Tracy Taylor, Kevin Carr, and Wendi Lucero who make our partnership with KTEC such a viable one. It is obvious to me and to NSF EPSCoR in Washington that Kansas NSF EPSCoR is not only working but also setting a very high standard for all EPSCoR programs.

On a recent trip to Washington, it was obvious that the Kansas congressional offices are aware of the value of EPSCoR. They know about a number of university research programs and understand the value of both basic and applied research. They appreciate the dedication of the research community in Kansas and understand that research success is more than a patent or novel device. Your contributions to the research enterprise have helped to instill



THOMAS N. TAYLOR,
PROJECT DIRECTOR

a new enthusiasm for research and scholarship in our state. Congratulations to all of you — you are making a difference and NSF EPSCoR is pleased to be a part of the total state research enterprise.

ECOLOGICAL GENOMICS SYMPOSIUM ATTRACTS 100 RESEARCHERS

Working through a tightly packed agenda over one and one-half days, scientists and researchers from three states showcased scientific progress at the first *Annual Ecology in Genes, Genes in Ecology Symposium*. No, it isn't a typo. The symposium name was chosen specifically to highlight the emerging links between ecology and genes and vice versa.

KSU Associate Professors Loretta Johnson and Mike Herman took a lead in organizing the meeting November 1-2, 2003 in Overland Park. Drs. Johnson and Herman are Co-Principal Investigators of the Kansas NSF EPSCoR Ecological Genomics initiative now underway at KSU, KU, and WSU.

"The forum was a tremendous opportunity for scientists, graduate students, undergraduate students, post-doctoral scholars, NSF program officers and specially invited speakers

to make the contacts necessary to jump start this new discipline of ecological genomics," said Thomas N. Taylor, Kansas NSF EPSCoR Project Director.

National Science Foundation program officers Drs. Fae Korsmo and Saran Twombly updated participants on the current and emerging funding opportunities at NSF. Dr. Leonard Krishtalka, Director of KU's Natural History Museum and Biodiversity Research Center, presented valuable strategies for writing successful NSF grant proposals. A question and answer session with the NSF officers was deemed to be "extremely valuable" by attendees.

In addition, the symposium provided a stage for oral and poster presentations of researchers' work that enhances career and professional development and generates new discussion.

KANSAS NSF EPSCoR LAUNCHES ON-LINE DATABASE

Tracking results from federally- and state-funded research and development has become a high priority for NSF and the universities participating in Kansas NSF EPSCoR. Are we making progress in the research areas that we have strategically targeted?

With dozens of funded projects involving hundreds of faculty, postdoctoral scholars, and students at three universities, reporting has been a daunting task requiring reams of paper.

Recently, this task became simpler thanks to a database developed by Doug Herbers, a Master's degree student in Electrical Engineering and Computer Science at KU. Now, project leaders can log onto a secure website, enter information about their research or education project, and have the information automatically tallied by the computer.

"The on-line database makes it easier to respond to NSF inquiries as well as those that come from the universities and Kansas legisla-

ture," said Barbara Paschke, Kansas NSF EPSCoR Assistant Director.

The database resides at the University of Kansas Information Technology and Telecommunications Center, which maintains the system.



DOUG HERBERS, KU MASTER'S DEGREE STUDENT IN ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, WORKED CLOSELY WITH THE KANSAS NSF EPSCoR ASSISTANT DIRECTOR TO DEVELOP AN ON-LINE DATABASE FOR PROJECT TRACKING.

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KTEC CONTINUES FIRST AWARDS

The extremely successful First Award program did not miss a step in 2002 while Kansas NSF EPSCoR prepared a new request for funding from NSF.

Recognizing the importance of the program, the Kansas Technology Enterprise Corporation (KTEC) stepped up to assist.

In that year, KTEC awarded Kansas NSF EPSCoR \$750,000 to underwrite the program. Eleven First Awards were made over the next 14 months. It was an excellent investment for KTEC and for the state. Those 11 researchers have since received extramural funding totaling more than \$1.6 million.

The First Award Program is designed to help early career faculty become competitive for funding from the research directorates at the National Science Foundation. The program was started in 1996 and has proven successful in accelerating the pace of research and the quality of proposal submissions over the years.

The First Awards, funded by the special KTEC grant, targeted living systems research, an area of strategic importance to the State of Kansas. The key is to produce new knowledge that will benefit the state and the country.

Interesting research and results included:

- a better understanding of how proteins in the body interact with artificial surfaces, such as hip replacements;
- new computing techniques that will assist in optimizing vehicle routing and airline scheduling;
- a greater understanding of the evolution of bees and related insects that have significant economic value; and
- new knowledge about the interactive effects of flooding which is important to managing water quality.

The next round of First Award proposals are under review and will be awarded in late Spring 2004.

SHERRY FARWELL NAMED HEAD

In February 2004, the National Science Foundation named chemist and veteran administrator Sherry O. Farwell to head NSF's Experimental Program to Stimulate Competitive Research (EPSCoR). Dr. Farwell, currently at the South Dakota School of Mines and Technology, will assume the position full-time in July.

DECADE OF INVESTMENT REAPS HUGE REWARDS



PROFESSORS DARYLE BUSCH (LEFT) AND BALA SUBRAMANIAM (RIGHT) HAVE COLLABORATED FOR YEARS ON VARIOUS CATALYST PROJECTS THAT SERVE AS THE FIRM FOUNDATION FOR THE NEW ENGINEERING RESEARCH CENTER. THE TWO WILL JOINTLY LEAD THE CENTER.

The concept of "green chemistry", also known as chemical processes friendly to the environment, has been on the horizon for many years. For more than a decade, KU Professors Daryle Busch and Bala Subramaniam have concentrated on "green chemistry" with assistance from Kansas NSF EPSCoR and successfully laid the foundation for the latest NSF grant.

In September 2003 the National Science Foundation (NSF) recognized the collaboration and mission of the **Center for Environmentally Beneficial Catalysis (CEBC)**, awarding a \$17 million, five-year grant to support the new engineering research center. Catalysts are key to enabling chemical reactions essential to the production of many of the medicines, food products, and even car gasoline that people rely on.

Kansas NSF EPSCoR served as the catalyst for much of the groundwork leading up to the engineering center grant.

As early as 1992, Busch was leading Kansas NSF EPSCoR projects in molecular design and establishing the Kansas Advanced Synthesis Laboratory. Likewise, Subramaniam directed a Kansas NSF EPSCoR project on petroleum process catalysts. Between 1995 and 1998, the two teamed up as principal investigators on an EPSCoR project, "The Design, Function and Dynamics of Supramolecular Materials."

In 1999 Busch and Subramaniam set their sights on establishing an engineering research center at KU, and they were invited to submit a full proposal. Review team recommendations encouraged KU to recruit more industrial partners, and once again Kansas NSF EPSCoR stepped in and assisted with a planning grant. Although several more steps were necessary to score the ERC, KU now has the prestige of being home to one of only 21 engineering research centers supported by NSF.

The three-state collaboration, including the University of Iowa and Washington University in St. Louis, 35 faculty members, 15 major chemical companies, and a commitment of 12,300 square feet of modern administration and laboratory space at KU's Life Science Research Laboratory, paves the way for new scientific, educational and economic opportunities for Kansas.

"This award is a testament to the university's commitment to bring together technology and industry to produce tangible innovations," said KU Chancellor Robert Hemenway. "Environmental issues related to chemical production cost the chemicals industry \$10 billion each year. We can be a player in their solutions."

The new CEBC will benefit the chemical industry of tomorrow, and it will offer hands on opportunities for students who are the next generation of engineers and scientists.

FOR MORE INFORMATION ABOUT
CURRENT FUNDING OPPORTUNITIES AND FUNDED PROJECTS, SEE:

WWW.NSFEPSCOR.KU.EDU

NEWSLETTER WINS COMMUNICATIONS AWARD

The Kansas NSF EPSCoR newsletter *FOCUS* received an Award of Merit at the 2003 IABC Bronze Quill Awards ceremony held Oct. 8 in Topeka. The newsletter was one of 30 winners in two categories, Award of Excellence and Award of Merit.

The event, "Victory! Celebrating Winning Communications" is an annual communications competition sponsored by the Topeka

Chapter, International Association of Business Communicators. Nearly 100 entries were judged in eight categories including publications, writing, design, video and audio, and internet communications.

Kansas NSF EPSCoR has distributed a newsletter to stakeholders and researchers throughout Kansas for about eight years. The newsletter name was changed to

FOCUS in 2000.

The newsletter is written and edited by Janie Rutherford, a communications consultant from Topeka; Bonnie Hall, President of The Design Element Inc., of Lawrence, oversees the design of the newsletter; and, Barbara Paschke, Assistant Director of Kansas NSF EPSCoR, directs the content, production and distribution of the newsletter.

VIRTUAL REALITY MODELS MANUFACTURING PROCESSES

The website is mostly numbers right now.... <http://156.26.32.212:8080/machining>

However, by fall 2004, this site could be one of the most useful classroom tools ever developed for industrial and manufacturing engineering students at Wichita State University.

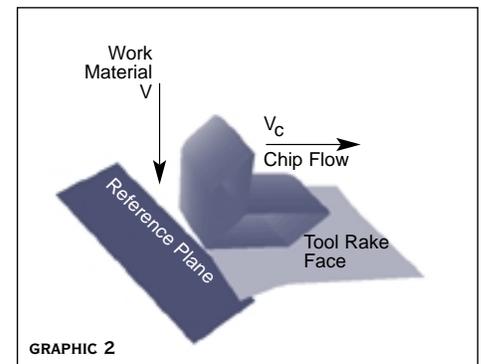
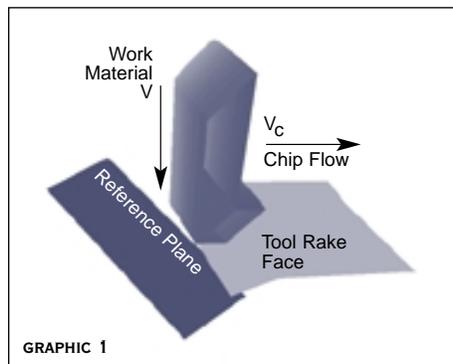
For example, by selecting the machining process, Oblique Cutting with Single Cutting Edge, students can input various formulas, allow the computer to do the math, and then view a 3-D animation of the process. The process can be viewed from any angle by right-clicking on the graphic and manipulating it. The models generated by the program will show not only the kinematics of these processes, but also their mechanics and physics.

WSU associate professor Vis Madhavan has been working on his Kansas NSF EPSCoR funded project, "Virtual Reality Models of Manufacturing Processes", for

about a year. He said the 3-D turning operations and V-bending of sheets used in aviation will be one of the most probable applications. By varying operating parameters, students can study their influence on outputs and can better design and develop manufacturing processes.

Madhavan sees the Visualization of Machining Processes and the use of the

Virtual Reality Development Lab as great tools for developing interactive 3-D models of assembly processes and 3-D models of other manufacturing operations. For students, the online computer modeling results in quicker learning, better understanding, and better retention of concepts. The project also improves the students' understanding of the mechanics of metal cutting.



THE VIRTUAL REALITY PROGRAM (1) DYNAMICALLY GENERATES THE CHIP GEOMETRY AND AN ANIMATION OF THE INCOMING MATERIAL, AND (2) IT SHOWS THE ACTUAL SHAPE OF THE SHEAR SURFACE AND THE OUTFLOWING CHIP.

