

Oklahoma NSF EPSCoR Research Connection

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Quarterly Newsletter for the Oklahoma National Science Foundation
Experimental Program to Stimulate Competitive Research

July 2005



State Awarded \$6 Million NSF EPSCoR Research Infrastructure Improvement Grant

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The National Science Foundation (NSF) Experimental Program to Stimulate Competitive Research (EPSCoR) has awarded \$6 million to Oklahoma to improve its scientific research infrastructure. The Research Infrastructure Improvement (RII) grant, matched by the Oklahoma State Regents for Higher Education with an additional \$3 million, will contribute to Oklahoma's scientific community by providing equipment and human resources needed to boost research competitiveness.

The RII will build upon Oklahoma's research strengths in genomics, bioinformatics and nanomaterials sciences and will create a new field of science uniting plant virus biodiversity and ecology.

"The RII award will help continue the momentum that Oklahoma scientists have gained in genomics and nanosciences from past NSF and

State Regents support and will help develop a critical mass of researchers in the state while stepping up to the next level of competitiveness," said Dr. Frank Waxman, EPSCoR director.

Additionally, the grant will provide a strong set of educational outreach initiatives to strengthen the human infrastructure needed to increase competitiveness for R&D dollars. The RII will also foster partnerships between the academic community and the private sector, Waxman said.

The EPSCoR grant will offer educational and research opportunities for faculty and students, and will further encourage collaboration and development within Oklahoma's scientific community. The RII aims to impact the quantity and quality of students and graduates prepared to enter Oklahoma

emerging high-technology businesses.

"This grant comes at a time when research in areas such as biotechnology, nanotechnology and genomics is helping Oklahoma move one step closer to becoming the 'Research Capital of the Plains.' The State Regents are pleased to be able to provide financial support for this very worthwhile research, and we wish Oklahoma EPSCoR continued success," Chancellor Paul G. Risser said.

U.S. Rep. Ernest Istook, R-Okla., a supporter of the Oklahoma EPSCoR program, said, "This is great news for Oklahoma. Oklahoma institutions and our researchers, like Dr. Waxman, have proven time and time again that they can compete successfully for major research grants when simply given the opportunity."

Inside this issue:

FGRC Research News	2
Education and Human Resources Outreach News	2
NanoNet Research News	3
New Science Emerges from the Tallgrass Prairie (continued)	3
Upcoming Events	4

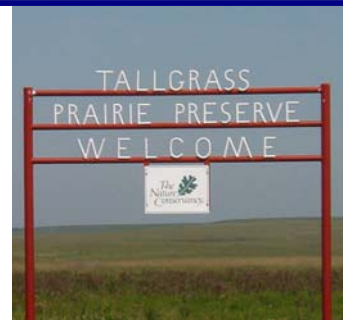
New Science Emerges from the Tallgrass Prairie

Submitted by: Janet Varnum,
Oklahoma State University

Recent funding of the NSF EPSCoR Research Infrastructure Improvement Award will make it possible for Oklahoma scientists to embark on the creation of a new field of science. Plant Virus Biodiversity and Ecology conceived through statewide collaboration of university researchers will utilize the Tallgrass Prairie Ecological Research Station in Pawhuska, which opened in

2004 and is managed by The University of Tulsa.

For Mike Palmer, Oklahoma State University botany professor, who has studied plant diversity for most of his life, each two-hour journey to Oklahoma's Tallgrass Prairie Preserve brings a wealth of scientific information unavailable virtually anywhere else. He and more than 30 other OSU scientists have been studying plant diversity at the preserve.



The preserve located 55 miles northwest of Tulsa and owned by The Nature Conservancy is one

Continued on Page 3

Functional Genomics Resources Consortium (FGRC) Research News

Submitted by: Dr. Ulrich Melcher, FGRC Project Coordinator



Dr. Jose-Angel Conchello

Genomic studies have allowed scientists to know the precise order of the four nucleotide building blocks of DNA in many model organisms, including humans. Bioinformatics suggests which nucleotides cluster together to form genes. With tens of thousands of these genes, how to do we figure out what each one does? Functional genomics (FG) addresses this question.

A standard approach of FG is to knockout each one of those genes to see what effect the knockout has on the organism. Many knockouts produce individuals with developmental defects. Merely seeing a defect in the mature organism, however, does not tell the scientist what the missing function of the gene was. For that, researchers need to follow the fates of each cell throughout development. Pinpointing which cell

behaves abnormally and when it does so is critical to understanding the function of the knocked out gene.

The nematode, *Caenorhabditis elegans*, is ideally suited for such studies since the complete fates (births and deaths of all cells) have been cataloged, the genome sequence is known, and knock-outs have been generated. However, *C. elegans*, like other organisms, is three-dimensional, in which a simple microscope cannot see all cells in focus at one time.

This problem is being attacked by the NSF EPSCoR-supported High Content Rapid Screening Systems program headed by Dr. Michael Dresser at the Oklahoma Medical Research Foundation (OMRF). NSF EPSCoR investigator, Dr. Jose-Angel Conchello is addressing the problem of fuzzy images. Dr. Conchello is an engineer at OMRF who develops algorithms to extract three-dimensional information from a series of carefully chosen fuzzy images. He has worked on images from wide-field

microscopes, confocal scanning microscopy and multi-photon fluorescence excitation microscopy applying such methods to improve images.

Recently, Dr. Conchello has done the same for structured illumination microscopy, which uses an ordinary microscope modified so that it projects a single-spatial-frequency grid onto the specimen, and then a simple arithmetic operation removes out-of-focus light. Dr. Conchello has developed an algorithm to further improve the resolution of this microscope allowing one to visualize distinctly two objects (350 and 300 nm in diameter) separated by only 150 nm. Without his algorithm the two objects merge into one fuzzy blurb.

This NSF EPSCoR-supported research is an example of interdisciplinary cooperation in attacking research questions. Here, a mathematician working at a medical foundation is solving a problem in the physics of optics that is of use to developmental biologists and geneticists.

Education & Human Resources Outreach News

Submitted by: Ms. Shelley D. Wear, OK EPSCoR Special Programs Coordinator

Outreach activities are in full swing this spring with programs and events to heighten awareness of science and technology in the state and encourage the exchange of scientific information and ideas.

Research Day at the State Capitol was held on March 31. Seventeen undergraduate students from twelve colleges and universities showcased competitive research posters to state legislators and the general public. Tracy Washington of OU-Norman presented the winning poster on limb regeneration. Mr. Washington was awarded a



\$4,000 summer research internship that he is completing at the OU-Norman campus.

The 2nd Annual Virtual Science Fair was held April 13. The event utilized cutting-edge videoconferencing and Internet2 technology that allowed 21 fourth through twelfth grade students to participate in a statewide science fair without leaving their home schools. Twenty-one university faculty stationed around the state interacted with students and served as judges for this virtual event.

EPSCoR sponsored an NSF Grants Workshop May 18 at the Wes Watkins Center located at OSU. A total of 132 faculty, students, and administrators participated in this workshop aimed at improving the quantity and quality of future proposals submitted to the National Science Foundation.

EPSCoR's Annual State Confer-

ence held May 19 highlighted research in nanotechnology, functional genomics, and plant virus biodiversity and ecology. The event hosted 220 faculty, post-docs, students and private sector scientists and featured Oklahoma and nationally known speakers in these research areas. Highlights of the event included a poster session that enabled scientists to share their research results and to initiate the exchange of ideas and future collaboration.

Visit www.okepscor.org/events.htm for information on these and other outreach programs and events.



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Oklahoma Experimental Program to Stimulate Competitive Research



Upcoming
2005 Events
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www.okepscor.org

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*\$6 million NSF; \$3 million OSRHE

SEPTEMBER

Sep. 26-28 — National NSF
EPSCoR Conference, Puerto Rico

OCTOBER

Oct. 27-28 — OK BIOS
Conference, location TBA

TBA — EPSCoR & i2E
sponsored Entrepreneurial
Workshop, OKC

TBA — OU Supercomputing
Symposium, Norman

TBA — UCO Research Day for
Regional Universities, Edmond

NOVEMBER

TBA — Women in Science

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