

Oklahoma NSF EPSCoR Research Connection

Volume 1, Issue 3 Quarterly News from the Oklahoma NSF Experimental Program to Stimulate Competitive Research January 2005



K-12 science education enriched through EPSCoR museum partnerships

Mission of NSF EPSCoR

EPSCoR identifies, develops, and utilizes a state's academic science and technology resources in ways that ultimately will support a more productive and fulfilling way of life for its citizens.

To achieve this end, the NSF cooperates with state leaders in government, higher education, and business to establish productive long-term partnerships in support of common goals. Such partnerships are designed to stimulate local action that will result in lasting improvements to the state's academic research infrastructure and increased national R&D competitiveness.

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

Student development is one of the critical elements needed to build research capacity in Oklahoma. Students must first be interested in science before they can choose science-related careers. The EPSCoR field trip initiative is one way to introduce students to science in real-world applications.

Over the past year, Oklahoma EPSCoR has formed partnerships with the Oklahoma Children's Discovery Center Network Museums in effort to provide hands-on enrichment experiences for students. The Network includes five of the State's science museums: Omni-

plex, Tulsa Air and Space Museum, Jasmine Moran Children's Museum, Leonardo's Discovery Warehouse, and the Museum of the Great Plains. Each museum has developed special hands-on science labs or demonstrations especially for schools receiving field trip grants from EPSCoR.

Last year, EPSCoR supported field trips to the Omniplex for more than 3,200 students from 30 public schools. Expansion to all five museums will provide a variety of science experiences for students while allowing rural schools the opportunity to participate.

Network Coordinator, Beth Bussey, explains that "more than 80 percent of Oklahoma's 3.5 million people are no more than a 90 minute drive from a Network museum."

Grants for entrance fees and/or transportation for field trips to partnering museums are currently available to public schools. Interested teachers or administrators can contact the EPSCoR office at (405) 225-9287 to see if their school qualifies for the field trip grant funds.



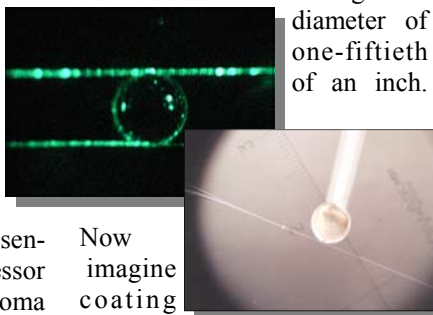
High-tech materials create small lasers

Submitted by: Dr. James P. Wicksted, Associate Director, EPSCoR

Many Oklahoma researchers are involved in cutting-edge research in the area of nanoscale materials. The Oklahoma Network for Nanostructured Materials (NanoNet) is comprised of nearly 40 researchers from around the state. Dr. Albert Rosenberger, Associate Professor of Physics at Oklahoma State University is one of the

NanoNet researchers interested in practical applications of nanostructured materials.

Picture a small glass bead, having a diameter of one-fiftieth of an inch.



Now imagine coating this bead

with a mixture of small particles called quantum dots, which are about a hundred thousand times smaller than the bead. These types of new, high-tech materials are being used by Dr. Rosenberger, to make a small laser system.

Light from a large normal-sized) laser is delivered to one of these coated "microsphere" beads

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Functional Genomics Resources Consortium (FGRC) Research News

Submitted by: Dr. Ulrich Melcher, FGRC Project Coordinator

Whiteley joins OUHSC faculty and remains asset to State's FGRC



Dr. Marvin Whiteley

Bacteria are everywhere, in the soil, in the air and in the water. There are certain places that we don't want them to call home. *Pseudomonas aeruginosa* is a common cosmopolitan bacterium. It can cause disease in animals and plants. In humans, it occurs in wound infections and in urinary tract infections. It is a serious complication of individuals with cystic fibrosis (CF), a genetic disease in which mucus accumulates in the lungs.

It is the latter which drew the attention of Dr. Marvin Whiteley at the University of Oklahoma's Department of Botany and Microbiology, one of the first two faculty hires in the Functional Genomics Consortium program. To understand how *P. aeruginosa* colonizes the airways, Dr. Whiteley has focused on the ability of the microbe to form

biofilms, mats of intercommunicating bacteria sticking to surfaces. Microarray hybridization analysis of gene expression has provided his group with one way of understanding the adaptation that the bacteria undergo as they begin to form the biofilm. These studies, initiated in an in vitro system, have been extended to the situation in whole organisms. Use is made of in vivo expression technology (IVET). Here, easily assayable reporter genes are used to identify genetic controlling elements those expression changes when in a live body.

The group also aimed to better understand the interaction between the nutrient environment (as lung sputum from CF patients) and the nutrient requirements of the pseudomonad in the lung. Dr. Whiteley says "We have discovered that *P. aeruginosa* uses branch chain and aromatic amino acids to grow in lung sputum. By understanding the growth and physiology of *P. aeruginosa* in vivo, we hope to design new treatment strategies for CF and identify new molecular targets for

drug discovery."

Iron is another important nutrient for bacteria. Dr. Whiteley's studies have led to an interesting discovery about the wars between bacterial species. In most environments, bacteria compete for limited resources. In competition for limiting iron *P. aeruginosa* was found to lyse *Staphylococcus aureus*.

Dr. Whiteley received his B.S. south of the Red River in Austin, his Ph.D. from the University of Iowa and postdoctoral training at Stanford University. In addition to being one of the first two NSF-EPSCoR Functional Genomics consortium investigators in Oklahoma, he has been an NIH COBRE investigator and is receiving support from OCAST (Oklahoma Center for Advancement of Science and Technology). His success in investigating pathogenesis has led to his graduation from the NSF-EPSCoR program. He is now a faculty member in the Department of Microbiology and Immunology at the University of Oklahoma Health Sciences Center. Thus, the state has retained a valuable member of its functional genomics community.

Education & Human Resources Outreach (EHRO) News

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

Oklahoma EPSCoR outreach programs have been in full swing this quarter with initiatives serving students and faculty throughout the state.

October 6-7, Dr. Henry Neeman, Director, OU Supercomputing Center for Research & Education, chaired the annual OU Supercomputing Symposium in Norman. The symposium served to encourage faculty integration of supercomputing into research and hosted nearly 270 participants from 22 universities and 14 states. Dr. Sangtae Kim, Division Director, Shared Cyber Infrastructure of the National Science Foundation gave the keynote address.

EPSCoR and i2E co-sponsored an interactive workshop "Who wants to be an entrepreneur?" on October 22 at the Presbyterian Health Foundation Con-

ference Center in OKC. Thirty students and faculty attended the workshop that featured tips from successful entrepreneurs about the entrepreneurial process, including how to write a business plan. Many participants indicated intent on entering the 2005 Donald W. Reynolds Governor's Cup Collegiate Business Plan Competition in February, also co-sponsored by EPSCoR.

UCO Research Day for Regional Universities was held in Edmond on October 29. This event was co-sponsored by NSF EPSCoR, Oklahoma State Regents for Higher Education, Oklahoma Center for the Advancement of Science & Technology, NIH IN-

BRE, and General Motors of Oklahoma City. More than 600 attended annual



Research Day, which showcased 337 undergraduate students' scientific posters and offered opportunities for interinstitutional research collaboration and recruitment of graduate students by Oklahoma universities.

The quarter ended on a positive note with the Women in Science Conference, chaired by Dr. Sonya Williams, Associate Professor of Biology at Langston. Held November 19 at Langston University, the conference hosted 140 participants and featured Dr. Ruta Sevo, Senior Program Director for the Research on Gender in Science and Engineering Program at NSF, along with

Oklahoma Network for Nanostructured Materials (NanoNet) Research News

Submitted by: Ms. Julie Davis Market Analyst/External Communications, SouthWest Technologies, Inc.

South West NanoTechnologies' new reactor brings nanotube commercialization into reality



Norman, OK— South West NanoTechnologies, Inc. (SWeNT™) has begun operation of its

Dr. Daniel Resasco fully automated fluidized bed reactor. The new reactor will not only increase SWeNT's production capabilities to 20 grams per day but more importantly has the distinct ability to produce single-walled carbon nanotubes (SWNT) of a uniquely narrow distribution of diameters and chiralities.

"This is a significant achievement

for the nanotube industry. This introduction validates the commercial feasibility of the CoMoCAT process while allowing SWeNT to lead the world in producing quality nanotubes with very high selectivity," says Dr. Daniel Resasco, Chief Scientist of SouthWest NanoTechnologies.

Unlike SWeNT's patented CoMoCAT process, other single walled carbon nanotube manufacturing processes have been unable to selectively manufacture nanotubes of uniform size and can often contain more than 50 different varieties. SWeNT discovered that by varying the catalyst composition and operating conditions of the CoMoCAT process, the company is able to produce in a controlled manner, nanotubes of specified diameter and chirality. This unique process will allow SWeNT to tailor nanotubes to specific

applications.

The proprietary manufacturing technology was developed at the University of Oklahoma under the direction of Daniel E. Resasco, Ph.D. SWeNT has been so successful in part due to the continued support from Oklahoma organizations. In particular, "the EPSCOR program has allowed us to expand the impact of the unique quality of our nanotubes by fostering strong collaborations with other researchers in Oklahoma. Particularly fruitful has been the collaboration with Professor Warren Ford of OSU. Such collaborations will lead to the development of novel applications of carbon nanotubes," says Dr. Daniel Resasco.

In October, the Oklahoma sections of the American Chemical Society awarded Dr. Resasco the 2004 Oklahoma Chemist Award.

Rosenberger: small lasers

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using an optical fiber. The light skims around the bead's surface some 50,000 times, traveling the length of a football field and interacting many times with the very small quantum dots on the surface. The process creates a new laser light, which is different from that of the large laser. Because of the spherical nature of the bead and the special way in which the large laser light is transmitted into the microsphere, the lasing action occurs very efficiently. What is truly remarkable about this research project is the ability to obtain this "microlaser" at normal room temperatures. The type of laser light created can be changed by simply changing the size of the small

quantum dots on the surface of the glass bead. The system is very simple and small in design, as well as being inexpensive.

Dr. Rosenberger's research, which is supported by the National Science Foundation and has many benefits including training opportunities for undergraduate and graduate students, three of whom are members of underrepresented groups. The work is multidisciplinary and requires knowledge of physics, optics, and chemistry. This project also has potential applications in telecommunications and sensing, thus providing benefits beyond the laboratory.

For more information please contact Dr. Rosenberger at atr@okstate.edu.

Oklahoma EPSCoR K-12 Virtual Science Fair

Regional Competitions
February 23 & 24, 2005

Statewide Finals
April 13, 2005

What is a virtual science fair?

Applied Internet2 technology will allow K-12 students from all over Oklahoma to showcase science projects and compete for prizes without ever leaving their campuses.

A panel of Oklahoma scientists from various colleges and universities will serve as judges for the scheduled events. Judges will not only select outstanding projects to receive recognition, but will also provide positive feedback and will encourage students' interest in science.

How can I participate?

All you need to have is H.323 video conference equipment at your school and be registered to participate.

There is still time to register!

Registration ends on January 15. There is a limit of two students per school. To register go to: <http://www.okepscor.org/sciencefair/register.asp>.

For more information contact:

Ms. Kristen Byers, Internet2 Coordinator at (918) 360-3081
<http://www.okepscor.org/sciencefair/>

Return Address:



225C Noble Research Center
Stillwater, OK 74078

Mark Your Calendar 2005



WE'RE ON THE WEB!
WWW.OKEPSCOR.ORG

JANUARY

Jan. 5 — NSF Grants Workshop, OSU-Stillwater

FEBRUARY

Feb. 23 & 24 — Virtual Science Fair, Regional Competition, Via Internet2

MARCH

Mar. 21 — Research Day at the Capitol, OKC

APRIL

Apr. 13 — Virtual Science Fair, Statewide Finals, Via Internet2

MAY

May 19 — Annual State Conference, OSU-Stillwater

For information on upcoming events or other EPSCoR programs, visit www.okepscor.org or contact:

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