Oklahoma NSF EPSCoR Research Connection

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Workshop Equips College Students to Develop and Implement Business Plans

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

Oklahoma college students and faculty members with dreams of starting their own businesses came out in great force on October 27 to attend the "Who Wants to be an Entrepreneur?" workshop held on the campus of the University of Oklahoma Health Sciences Center located in Oklahoma City. Workshop organizers received nearly 200 registrations from 14 colleges and universities, exceeding room capacity at the Robert M. Bird Library Auditorium. The event was moved across campus to the College of Medicine's West Lecture Hall in the Basic Science Education building at the last minute, in order to accommodate the large group of future entrepreneurs.

The annual event sponsored by Oklahoma EPSCoR, Oklahoma State Regents for Higher Education, and i2E, Inc., aimed to equip interested students and faculty to develop and implement high-tech businesses within the state.

Workshop presenters painted an accurate picture of the commercialization process with special emphasis on developing business plans that will succeed. The workshop also served as a kick-off to the Donald W. Reynolds Oklahoma Governor's Cup Statewide Collegiate Business Plan Competition 2007. Staff from i2E, Inc., informed prospective student teams about the guidelines for participation in the competition which has jump-started eight companies in the last two years.

Mr. Barry Moltz, serial entrepreneur, investor, national speaker and author of "You Have to Be a Little Crazy" gave the keynote address that enlightened students on "What Not to Say in a Business Plan!" Participants received complimentary signed copies of Moltz's book to further encourage the development of business plans that are solid and that include critical information necessary to attract investors.

Other prominent Oklahoma business men and women shared valuable information on topics such as: The Planning Process, The Entrepreneur's Dream, Funding Your Dream, and Do you Have What it Takes? (The agenda and presentations can be found at: www.okepscor.org/Events/events2006.htm)

According to one UCO graduate student and event participant, Liviu Pop, "the workshop has opened my eyes to new ideas, new ways of approaching things, and got me seriously thinking about starting a business of my own in the not too distant future."

The EPSCoR and i2E staff are encouraged by the student and faculty response to the event and anticipate increased participation in future years.

For more information regarding the upcoming Donald W. Reynolds Oklahoma Governor's Cup Statewide Collegiate Business Plan Competition, please visit: http://www.okgovernorscup.org.

Networking was part of the "Who Wants to Be an Entrepreneur?" program. Oklahoma students and faculty packed the West Lecture Hall at the OUHSC College of Medicine on October 27, 2006.

New 454 Sequencing Instrument Makes Quantum Leaps in Knowledge for Plant Virus Researchers

Submitted by: Dr. Ulrich Melcher, Plant Virus Biodiversity & Ecology Project Coordinator

A quantum leap in knowledge of the information stored in the DNA and RNA of the world's organisms is happening now in Oklahoma. Oklahoma investigators, led by Dr. Bruce Roe of the University of Oklahoma's Advanced Center for Genome Technology (ACGT), are leading the way in adapting the new technology to the demands for high throughput sequencing of the bases on the polynucleotide strands that are the organism's genes. In January of this year, ACGT acquired a novel DNA sequencing instrument from the 454 company.

Left: Graham Wiley, in Dr. Bruce Roe's lab, loads the new 454 sequencing instrument capable of analyzing three– to four-hundred thousand templates in one day. ***Photo courtesy Bruce Roe.***

The strategy behind the new instrument relies on a sequential flow of reagents past a reaction chamber to determine the sequence of bases. The standard technique, in place for many years, relied on separation of DNA molecules differing in length by single bases. Such separation was done by electrophoresis through gels, most recently gels in capillaries. The new strategy allows hundreds of thousands of templates to be analyzed at the same time. In a good run, three- to four-hundred thousand templates can be processed in a day. The ACGT crew, through careful trouble shooting, has trebled the average number of units identified per template to over 300 and is leading the nation in improving the protocols associated with sample preparation. As a result, in one run, the Oklahoma scientists can "read" over 100 million bases.

The 454 instrument capacity is such that entire genomes of bacteria have been determined in a week (preparation of samples adds days to the single day of running the instrument). Some genomes, such as those of viruses, are so small that it would be tremendous overkill to obtain their sequences this way. However, some Oklahoma researchers need to determine sequences of many viruses at the same time. One of these investigators, Dr. Marilyn Roossinck, of the Samuel Roberts Noble Foundation of Ardmore has teamed with Dr. Bruce Roe to modify the 454 protocol so that templates from multiple samples can be analyzed in one run. Both are members of the Plant Virus Biodiversity and Ecology scientific theme area supported by Oklahoma's NSF EPSCoR Research Infrastructure Improvement grant. The pair has obtained funding from the National Science Foundation for their project, which they call "5000 Viral Genomes".

Upcoming Events 2006-2007

2006 Events

December 1 — **Oklahoma Research Day**
University of Central Oklahoma, Edmond

2007 Events

Spring (TBA) — **Women in Science Conference**
Oklahoma City

February 23 — **Communicating Science Knowledge: Implications for Oklahoma and Beyond**
Oklahoma State University, Stillwater

March 12 — **Donald W. Reynolds Oklahoma Governor's Cup Statewide Collegiate Business Plan Competition**
Written Plans submitted to i2E, Inc., Oklahoma City

March 18 — **Big 12 Educational Research Conference**
Renaissance Hotel & Cox Convention Center, Oklahoma City

March 18-20 — **Regional NSF Grants Conference**
Renaissance Hotel & Cox Convention Center, Oklahoma City

April (TBA) — **Oklahoma Sci-Tech Student Reporting Awards**
Oklahoma State Regents for Higher Education, Oklahoma City

April 2 — **Research Day at the Capitol**
4th Floor rotunda, State Capitol, Oklahoma City

April 12-14 — **National Conference on Undergraduate Research (NCUR) 2007**
Dominican University of California, San Rafael, CA

April 19-20 — **Tallgrass Prairie & Konza Prairie Retreat**
Oklahoma & Kansas

April 26 — **Donald W. Reynolds Oklahoma Governor's Cup Statewide Collegiate Business Plan Competition Awards Gala**
Oklahoma City

May 17 — **Annual State EPSCoR Conference**
Oklahoma State University, Stillwater

For more information please visit the website or contact Ms. Shelley D. Wear, Outreach Coordinator at 405.225.9287 or swear@osrhe.edu.

www.okepscor.org/events.htm

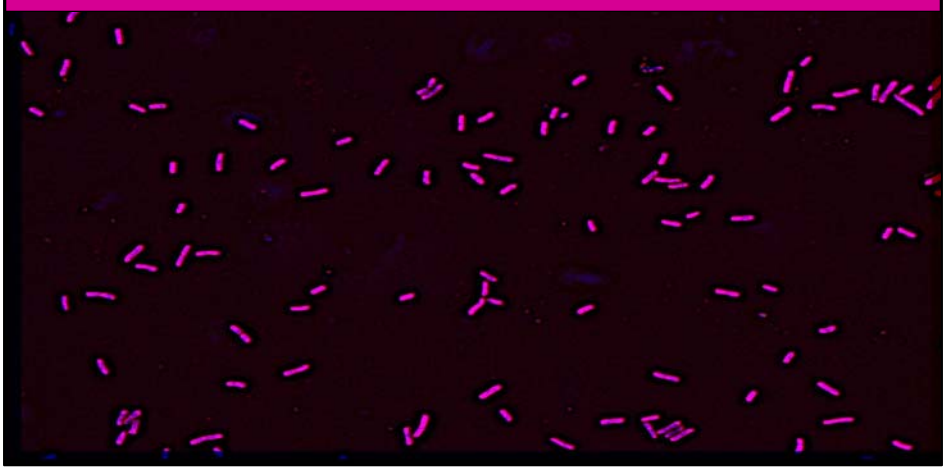
Oklahoma Scientists Investigate Use of Nanocrystals to Detect Bioweapons

Submitted by: Dr. Ken Roberts, Assistant Professor of Chemistry and Biochemistry, The University of Tulsa

Dr. Ken Roberts of The University of Tulsa and Dr. Lloyd Bumm of the University of Oklahoma, members of the Oklahoma Network for Nanostructured Materials (NanoNet), have united their research groups to investigate the use of nanocrystals to detect bioweapons.

Roberts' and Bumm's research groups were recently awarded a $750,000 DEPSCoR grant to develop a novel biosensor for the detection of microbial warfare agents. Current studies are being conducted on non-pathogenic model systems of anthrax and *E.coli* utilizing highly luminescent semiconducting nanocrystals linked to pathogen-specific DNA aptamers that are complemented to strands of DNA bearing a gold nanoparticle. Investigators expect to show that the nanoparticles can be used to detect the presence or absence of biological agents.

Genetically modified *E.coli* illuminated with quantum dots taken in Dr. Roberts' laboratory at The University of Tulsa. Epilfluorescence image, 800X magnification.



In the absence of the target pathogen, proximity of the gold nanoparticle quenches the quantum dot photoluminescence (signal off—negative test). In the presence of a pathogen, the binding affinity of the aptamer for the pathogen displaces the gold nanoparticle which allows the quantum dot to luminesce (signal on—positive test).

Roberts and Bumm aim to achieve optimal on/off switching and hope to create a biosensor that is rugged and reliable. Special considerations are being given in the sensor design that involves synthesis and stepwise characterization of the biosensor by near-field scanning optical microscopy, confocal Raman microscopy, low-temperature luminescence spectroscopy, and capillary electrophoresis.

The researchers are also designing the quantum dots with a special silica coating to provide oxidative protection that will preserve the luminescence efficiency of the nanocrystals in harsh environments. Once initial design criteria have been met, the researchers hope to package the sensor into a portable system for use in a variety of military and civil defense settings.

Dr. Roberts heads a team of biosensor researchers that consists of a postdoctoral fellow, research associate, two graduate students, and several undergraduates. Dr. Bumm's team consists of himself, a graduate student, and undergraduates.

Southwest Nanotechnologies Ink Nanotube License Agreement with NEC

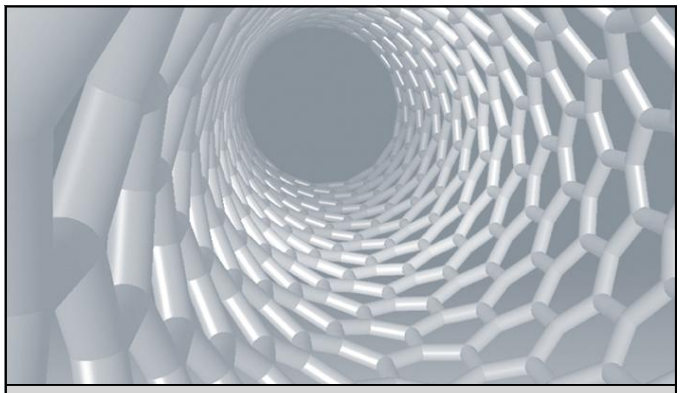
Submitted by: Dr. Daniel Resasco, Professor of Chemical Engineering, University of Oklahoma

NORMAN, Okla. – Norman-based South-West NanoTechnologies Inc. has been granted a non-exclusive license by NEC Corporation (NEC) covering the carbon nanotube.

With its world headquarters in Tokyo, NEC is a leading provider of Internet, broadband network and enterprise business solutions. NEC holds basic patents for single- and multi-walled carbon nanotubes.

SouthWest NanoTechnologies (SWeNT) is a privately held independent specialty chemical company that manufactures high-quality single wall carbon nanotubes for a broad array of specialty products. The company was created in 2001 to spin off nanotube research developed at the University of Oklahoma by chemical engineering professor Daniel Resasco, who serves as SWeNT's lead scientist.

SWeNT CEO David Arthur said, "SWeNT's mission is to make commercial nanotubes a reality by focusing on quality, scalability and integration. We are pleased to announce our license agreement with NEC. This is another strong indication of SWeNT's strategic intent to become the global market leader in the production of single wall carbon nanotubes."



Single-walled carbon nanotubes consist of a hollow cylinder of carbon ~ 1nm in diameter, up to 1,000 times as long as it is wide. This structure has remarkable optical & electronic properties, tremendous strength & flexibility, and high thermal & chemical stability. As a result, carbon nanotubes are expected to have dramatic impact on several industries including displays, electronics, health care and composites. ***Graphic Courtesy of SWeNT Technologies.***

The carbon nanotube is drawing significant attention worldwide as a core material for nanotechnology. Because of its extremely fine structure and superior physical and chemical properties, the carbon nanotube is expected to be used for such varied applications as high-resolution AFM probes, flat panel displays, extremely lightweight and high-strength materials, high performance transistors, interconnect materials, fuel cells, ultra-sensitive sensors and absorbents.

SWeNT has pioneered a catalytic method called CoMoCAT™ that produces single wall carbon nanotubes at very high selectivity and remarkably narrow distribution of tube diameters and chirality. This unique selective synthesis capability makes it possible to grow customized nanotubes for specific applications. Also, the CoMoCAT™ process is inherently scalable to mass production of nanotubes. By using larger-scale fluidized bed reactors, SWeNT plans to make CoMoCAT™ nanotubes available to the masses at dramatically lower prices. Several patents on the technology have been issued or are pending.

For more information about SWeNT, visit http://www.swnano.com . For more information about NEC, visit http://www.nec.com .

Editor's Note: SWeNT's lead scientist, Dr. Daniel Resasco, is a member of the Oklahoma NanoNet and serves on the Nanoscale Science & Engineering Executive Committee for the NSF EPSCoR Research Infrastructure Improvement Grant.

Museum Without Walls Project Encourages Natural Curiosity and Drive to Learn in K-6 Students

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

In October, the Stillwater Children's Museum (SCM) kicked-off the Museum Without Walls program which takes interactive science, literacy, and history exhibits into public schools encouraging students to learn in fun and exciting ways. The pilot program is being implemented in the local Stillwater School District during the 2006-2007 school year, with future plans for outreach to the other districts.

According to Ms. Ruth Cavins, Executive Director of SCM, "The mission of the Stillwater Children's Museum is to educate and entertain children while serving as a resource for parents, educators, and all who seek to enrich the lives of children."

Cavins continued, "The implementation of the Museum Without Walls supports this mission as we begin to raise the necessary financial support from the community through private foundations and individual donors, which is needed to build a permanent facility."

Photo by Mika Matzen. Courtesy Stillwater NewsPress.

The "Smart Start to Science and Literacy" exhibit is geared toward children in pre-Kindergarten through second grades and is the first of many exhibits to come. SCM will begin offering a "Plant Virus Exploration" (PVE) module to elementary and middle school students in January 2007. Additionally, an exhibit entitled "Journey Back in Time" is planned for implementation in April 2007.

Facilitator, Rachel Sproul, asked elementary school students to explain what they learned during a lesson that focused on buoyancy.

The PVE exhibit was designed in collaboration with Oklahoma State University (OSU) scientists. Dr. Ulrich Melcher, the Robert J. Sirny Professor of Agricultural Biochemistry, and Dr. Stephen Marek, Assistant Professor in the department of Entomology and Plant Pathology, contributed to the development of the curriculum and hands-on experiments that will engage fifth and sixth graders in the upcoming spring semester.

Dr. Melcher is co-project coordinator for the plant virus biodiversity and ecology research group currently funded by the Oklahoma NSF EPSCoR Research Infrastructure Improvement grant, which is enabling Oklahoma scientists to investigate plant viruses and their ecological impacts at the Nature Conservancy's Tallgrass Prairie Preserve located in northern Oklahoma. The PVE exhibit will provide students with exposure to the scientific process through experimentation.

Ms. Amy Dolezal, a participating teacher at Highland Park Elementary in Stillwater indicated that, "The children have really enjoyed the interaction with someone new coming into the classroom. These experiences have enhanced the science curriculum I am currently using, which is a plus."

In addition to serving K-6 grade students and teachers, the Museum Without Walls project serves as a training ground for OSU undergraduate students interested in careers in education. The museum employs undergraduate students through a federal work study program.

Rachel Sproul, an exhibit facilitator, said of the Museum Without Walls project, "I love it! It's a great

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(continued from page 6

experience for students, teachers, and me. It's preparing me for my career." Sproul is an OSU freshman and elementary school education major.

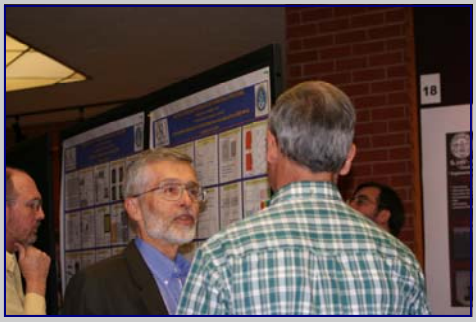
The Smart Start to Science and Literacy and Plant Virus Exploration exhibits are co-sponsored by Oklahoma EPSCoR, Oklahoma State Regents for Higher Education, The National Science Foundation, Smart Start Payne County and the NASA Oklahoma Space Grant. The Museum Without Walls exhibits are expected to be used by museum staff as outreach tools even after the opening of the permanent facility, which is projected for March 2010.

For more information on the Stillwater Children's Museum visit their website at: www.stillwaterchildrensmuseum.org or contact Ruth Cavins at 405.533.3333 or email ruthc@brightok.net.

Stillwater students test various objects' ability to sink or float during a Museum Without Walls exhibit. Students were surprised by the results of their experiments.

Current Trends in Research Highlighted at OK EPSCoR Annual Conference

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



Nearly 200 Oklahoma scientists from around the state attended the Oklahoma EPSCoR Annual State Conference held at the University of Oklahoma in Norman. The event held May 18, 2006 hosted college faculty and students, along with industry researchers who discussed current and future research trends in nanotechnology, and plant virus biodiversity and ecology, a new interdisciplinary field of science created through the Oklahoma's NSF EPSCoR Research Infrastructure Improvement grant.

Dr. Frank Waxman, OK EPSCoR Director, welcomed participants along with special guest, Dr. Sherry Farwell, NSF EPSCoR Office Head, who briefed attendees on the importance of EPSCoR and collaborative partnerships within and outside of the state. Dr. Farwell highlighted NSF's co-funding program benefits to Oklahoma's researchers and hinted that the direction of future EPSCoR grants would be strength-based research initiatives.

Oklahoma was fortunate to host such a distinguished group of speakers, including Dr. Suxiang Tong, research scientist at the Center for Disease Control and Prevention along with several External Advisory Board members from both theme areas.

Dr. Young, and Dr. Alison Power, Professor of Ecology and Evolutionary Biology and Science and Technology Studies at Cornell University and Dr. Karen Garrett, Associate Professor of Plant Pathology at Kansas State University are EAB members who presented research trends from the PVBE theme area.

Dr. James Wicksted, Associate Director of OK EPSCoR, expressed, "I was also delighted to see three invited talks given by members of the NanoNet External Advisory Board."

NanoNet EAB members and conference presenters included Dr. Kenneth Klabunde, a distinguished Chemistry Professor at Kansas State University, gave a informative talk on the company he started in Manhattan, Kansas, known as Nanoscale, Dr. Rodney Ruoff, John Evans Professor of Nanoengineering in the Department of Mechanical Engineering at Northwestern University, talked about the characteristics of the interfaces in carbon nanotubes and graphene-based materials, and Dr. Ray Baughman, Director of the Nanotech Institute at the University of Texas at Dallas, discussed carbon nanotube yarns and transparent sheets.

In addition to presentations, the conference hosted a scientific poster session featuring 60 faculty and graduate student research posters. Oklahoma EPSCoR and the Oklahoma Nanotechnology Initiative also sponsored an undergraduate nanotechnology symposium in which 14 undergraduate research posters were presented during the annual conference poster session.

Visit the Oklahoma EPSCoR website to view the full agenda and link to available presentations at http://www.okepscor.org/Events/events2006.htm.

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