

Oklahoma NSF EPSCoR Research Connection

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Semi-annual Newsletter for the Oklahoma National Science Foundation
Experimental Program to Stimulate Competitive Research

Spring 2007



Who wants to be an Entrepreneur? Producing the Next Generation of Innovative Ideas

Submitted by: Greg Main, President and Chief Executive Officer, i2E Inc.

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It is a blustery, grey late October day. The wind has a sharp edge, a harbinger of winter to come. Some two hundred people from more than a dozen different Oklahoma college campuses converge on the campus of the University of Oklahoma Health Sciences Center in Oklahoma City.

They are students. Some are determined, some are just curious. They are drawn by the seminar title, "Who wants to be an Entrepreneur?" They spend the day hearing from entrepreneurs; learning about the key success factors that make or break young technology companies; discovering that a great idea is not enough, that market dynamics, business models and capital must be integrated to make a coherent whole.

They also get their entrepreneurial appetites whetted by descriptions of the Donald W. Reynolds Governor's Cup State-wide Collegiate Business Plan Competition.

They go home fulfilled; EPSCoR has produced another successful event.

Fast forward to February. Thirty-five teams declare their intention to compete for the Governor's Cup and the more than \$150,000 in cash and services that go to the winners. They submit their written plans in March.

Some of the innovative ideas include tissue engineering technology to replace diseased organs, a technologically

advanced "intelligent" oil well pumping system, using bio-markers as a diagnostic management tool for Prostate Cancer, a voicemail system providing speech-to-text



First place Undergraduate Division winners Molecuprint receive their trophy from Governor Brad Henry April 24th at the 2007 Donald W. Reynolds Governor's Cup Awards Dinner held at the Bricktown Events center in Oklahoma City.

capabilities, and microprocessors that self reconfigure to increase speed or decrease power consumption.

In April, the twelve undergraduate semifinalist teams and the six graduate finalists spend two grueling days presenting their hopes and dreams and answering tough questions from the judges.

The culmination is the awards event; a multi media gala. The thrilling announcements of the winners are greeted with wild cheering by the crowd of more than 450 students, faculty, judges, friends and family.

Importantly, all six winning teams declare their intention to start businesses

Continued on page 4

Oklahoma Scientists Identify New Plant Viruses to Prevent and Control Emerging Diseases

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

So far, scientists have found evidence of the presence of viruses in about 30% of plants sampled at the Oklahoma Tallgrass Prairie Preserve. They recognize the viruses because the sequences of nucleotides resemble known viruses. However, the sequences also show that the Preserve viruses found are clearly different from other known viruses. The result suggests that there are many more species of virus in the world than we currently recognize. The viruses found came from plants that did not have easily noticeable symptoms of infection. If they cause disease, it is probably in another plant.

When most people think of viruses, they think of invisible things that cause disease. The view of this project is that most viruses do not cause disease in their natural hosts. Why the difference? Most viruses known to science are those that capture our attention just because they cause disease. Researchers suspect that natural

settings harbor many viruses, mostly unknown to science, whose effects on their host are hard to observe. Results to date from a National Science Foundation EPSCoR-funded project in Oklahoma support this suspicion.

Oklahoma scientists have gone to The Nature Conservancy's Tallgrass Prairie Preserve where the land has never been plowed and management is limited to grazing by bison and burning. The Preserve is host to more than 700 species of plants. Samples of most of those have been taken and distributed to several state laboratories to determine whether they have viruses and, if so, what kinds of viruses. A primary tool is the determination of the sequences of nucleotides that make up the genetic material of the viruses.

The work is revealing that plants are complex environments. A plant may be infected with a virus, but also have a fungus in it. The fungus may have a virus. Evidence of the presence of bacteria is also frequent. Dodder is a parasitic plant. Some dodder plants contain fungi which are infected with viruses. The same fungi are found in the plant hosts of the dodder.

The work is important. Viruses in natural settings are likely the source of future emerging diseases. Knowing about them in advance helps prevent or control their emergence. For example, one would not want to plant a new kind of crop in a field where neighboring wild plants sheltered viruses whose effects on the new plant crop would be devastating.

Imagine that a major Oklahoma crop suddenly develops a disease threatening its economic value. A virus pathogen is isolated. Was it put there by an ecoterrorist? Or is it just the natural emergence of a native virus? To answer these



***Cuscuta pentagona*, also known as Prairie Dodder, is shown growing on *Ambrosia psilostachya* commonly known as Western Ragweed.**

CONGRATULATIONS!!!



Ms. Valerie Pogue, Oklahoma EPSCoR Program Manager, was appointed as Chair of the National Science Foundation EPSCoR Project Administrators (PA) group. As Chair, Pogue coordinates the national PA meetings and acts as a liaison for the PAs to the NSF EPSCoR office.

questions, scientists need to know what the "native" viruses are. That is exactly what EPSCoR researchers are accomplishing.

Specific viruses will be monitored over time and space at the Preserve and plants in the vicinity of the plant hosts of the viruses will be catalogued. Such studies may reveal effects of virus infection on the ability of the host plant to compete with other plants, both of the same species and of other species. Investigating such phenomena can lead to natural means to control weeds and other pests in agricultural settings.

NanoNet Researcher Lands DOE EPSCoR State-National Laboratory Partnership Grant for Solar Energy Project

Submitted by: Dr. John Mintmire, Professor of Physics, Oklahoma State University

Solar energy is our only long-term renewable energy source. The major emphasis of the U. S. Department of Energy's Solar Energy Technologies Program is to sponsor research and development to use energy from the sun to provide heat, light, hot water, electricity, and even cooling for homes, businesses, and industry. Research and development of photovoltaics is one of the two primary research efforts in this program. Photovoltaic technology (semiconductor technology that converts solar energy into electricity) makes use of the abundant energy in the sun. The use of photovoltaics has minimal detrimental impacts on the environment and can be used in a wide range of products, from small consumer items such as calculators and wrist-watches, to more complex systems providing power for communications satellites, water pumps, and the lights, appliances, and machines in homes and workplaces. Due in large part to federally funded research in this area, the cost of electricity from photovoltaics has dropped from more than \$2 per kilowatt-hour in 1976 to \$0.18-\$0.23 per kilowatt-hour today, but still needs to drop to \$0.05-\$0.10 per kilowatt-hour to be competitive with current costs of conventional power sources.

Most solar panels are currently made from crystalline silicon materials, and silicon-based panels remain relatively expensive to make, increasing the total cost per kilowatt-hour.

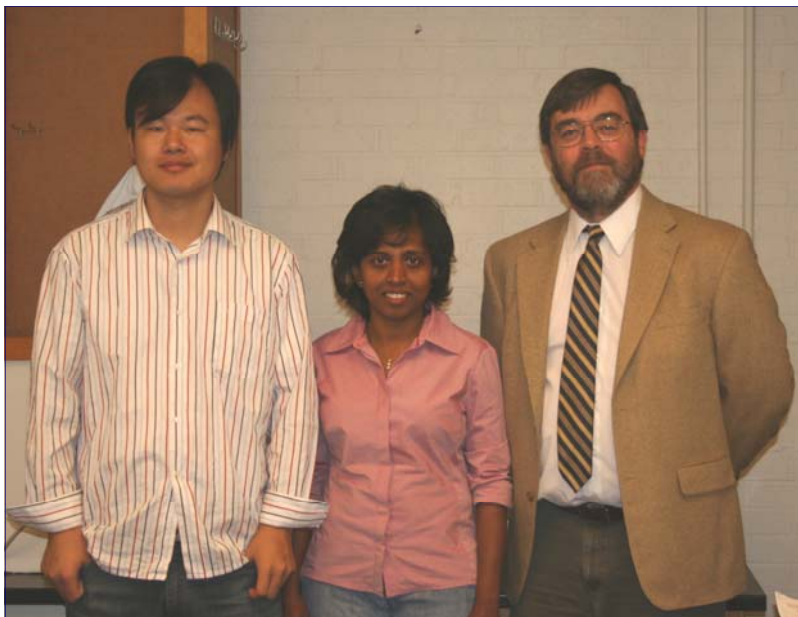
Photovoltaic devices based on carbon-based nanostructures offer the possibility of developing low-cost, easily processed thin films of polymeric materials for photovoltaic devices. Dr. John Mintmire's computational materials physics research group at Oklahoma State University is currently studying these materials using computational models for their

electronic structure and charge transfer properties. This work is supported by new funding from the US Department of Energy (DOE) EPSCoR State-National Laboratory Partnership program, and is a collaborative effort with members of the Computational Chemical Sciences group at Oak Ridge National Laboratory. In photovoltaic materials, incoming light excites electrons in

semiconductor materials into excited electron-hole pairs, with the electron and hole then moving to different regions of the semiconductor. If they are brought back together through external electrical circuits, they will recombine so that their excess energy generates electricity. A major problem in all photovoltaics is that if the electron and hole are not separated quickly enough, they can recombine immediately with their excess energy going into waste heat in the semiconductor instead of useful electrical energy. The research in Mintmire's group will focus on using computational and

theoretical methods for understanding how the electron and hole are created and move away from each other in polymeric materials, providing theoretical guidance for finding superior polymeric materials for photovoltaic applications.

As well as having direct impact on DOE programs involving photovoltaic conversion of solar energy into electricity, this research builds on the strong commitment to nanoscience research in the overall Oklahoma EPSCoR program. According to Mintmire, "My ability to attract funding in this area from the Department of Energy has benefited immensely from being part of the NSF EPSCoR NanoNet program in Oklahoma." He plans to present some of the initial research results from this project as an invited keynote speaker at the International Conference on Nanoscience & Technology, China 2007 in Beijing, China during June.



Graduate student Junwen Li (left) and post-doctoral associate Thushari Jayasekera (middle) carry out simulations of materials with photovoltaic device application in Dr. John Mintmire's (right) computational materials physics research group at Oklahoma State University.

Who Wants to be an Entrepreneur?

(continued from cover)

Submitted by: Greg Main, President and Chief Executive Officer, i2E, Inc.

and implement their business plans. We will support them. They are Oklahoma's future.

GRADUATE WINNERS

Graduate First Place

\$20,000 and \$25,000 of in-kind commercialization services

University of Oklahoma

The Intelligent Asphalt Compaction Analyzer (IACA) is a revolutionary monitoring device integrating speed, temperature, pressure and displacement variables resulting in a real-time measure of the compaction density in the field.

Faculty Advisor: Lowell Busenitz, Ph.D.

Team Leader: Allison Greco
Jesse Belville
Heather Want

Graduate Second Place

\$10,000

The University of Tulsa

Lunchman is a user-friendly web application offering personalized dining suggestions using a unique suggestive logic feature, Internet Protocol location identification and viral marketing cookies to provide a variety of features for both users and restaurants.

Faculty Advisor: John Hale

Team Leader: Duc Pham
Corey Redington
Matthew Wroblewski
Cody Pollet
George R. Louthan IV
Andrew Kongs

Graduate Third Place

\$5,000

University of Oklahoma

Veracity provides outsourced billing solutions for cellular telephone companies utilizing an easy to use web interface that can be kept up to date with current roaming contracts. Veracity's service bills partner cellular carriers for roaming charges incurred on the customer's network.

Faculty Advisor: Lowell Busenitz, Ph.D.

Team Leader: Alex Adriaanse



WorkSmart team leader Allison Greco watches as team member Heather Want answers questions from the judges during the April 14th Oral Competition held at the Presbyterian Health Foundation Conference Center in Oklahoma City. WorkSmart won first place in the 2007 Donald W. Reynolds Governor's Cup Graduate Division.

UNDERGRADUATE WINNERS

Undergraduate First Place

\$20,000 and \$25,000 of in-kind commercialization services

The University of Tulsa

Molecuprint develops and employs the use of bio-markers as a minimally invasive diagnostic tool for the management of Prostate Cancer, leading to a custom tailored and more effective medical strategy that is specific to each patient's condition.

Faculty Advisor: Claire Cornell

Team Leader: Kenneth Knoll
Matt Ralston
Ryan Hughes

Undergraduate Second Place

\$10,000

University of Oklahoma

OPTima Solutions is a physical therapy management solution that integrates all clinical and businesses functions into a

unified software suite, reducing paperwork, simplifying insurance claims, and increasing reimbursement revenue.

Faculty Advisor: Lowell Busenitz, Ph.D.

Team Leader: Devan Eagon
Travis Webb
Ryan Benn
Cheyenne Martin
Kimberly Stenstrom

Undergraduate Third Place

\$5,000

Oral Roberts University

Krygen Technologies has developed a portable, environmentally friendly, and effective cooling solution to be used in medical, sampling, and small lab environments.

Faculty Advisor: Charles Atkins

Team Leader: Philip Lasley
Patrick Dunagan
Josh Luth
Larry Coleman
Steve Twyman
Andreas Haukas

Undergraduate Students Meet With Legislators at Research Day at the Capitol 2007

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

Research Day at the State Capitol was held on April 2, 2007. This event sponsored by Oklahoma EPSCoR, Oklahoma State Regents for Higher Education and the National Science Foundation was developed to increase public awareness about the high quality research taking place in Oklahoma colleges and universities. Twenty-one of Oklahoma's top undergraduate students were selected to represent fifteen of the state's higher education institutions at the State Capitol.

During the event, students met with state legislators to discuss their individual research projects and also displayed scientific research posters to the public. Students also competed in a poster competition for cash prizes and a summer research internship valued at \$4,000 to be completed at an Oklahoma college or university of the winner's choice.



Students gather with their legislators at the State Capitol.

Photo Courtesy Oklahoma Legislative Service Bureau.



Michael Landoll (right) of Elgin, Okla. pictured above with State Representative Joe Dorman (left) was selected to represent the University of Oklahoma Health Sciences Center at Research Day. Landoll's research poster on proteins won fourth place in the poster competition and a \$100 cash prize. Landoll is currently a student at Cameron University.

Photo courtesy Oklahoma Legislative Service Bureau.



Oklahoma Chancellor of Higher Education, Dr. Glen D. Johnson, congratulates the winners of the Oklahoma EPSCoR Research Day at the Capitol scientific poster competition. (Left to Right) Kandice Beverly representing OU Health Sciences Center (1st place winner of \$500 plus a summer research internship), Heather Rice of OU-Norman (2nd place winner of \$500 cash prize), Chancellor Johnson, and Anthony Barber from The University of Tulsa (3rd place winner of \$250 cash prize) are pictured above. Fourth place winner, Michael Landoll is pictured left with State Representative Joe Dorman.

EPSCoR Field Trip Grants

Enrich Science Learning Through Hands-on Labs

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

In the past two years combined, an estimated 9,000 students from 98 schools have had science enrichment experiences outside of the regular classroom as a result of the EPSCoR sponsored K-12 Science Field Trip Grants initiative. The initiative was developed in response to the state's budget crisis which caused many schools to cancel field trips to the state's science museums due to lack of funds.

Recognizing the importance of hands-on science experiences, EPSCoR in partnership with the Omniplex (Oklahoma's largest science museum) began sponsoring field trips in 2004 to help ensure that students from both rural and inner city schools continued to have opportunities to engage in these valuable science experiences in fun and non-traditional learning environments.

Since the initial program began, EPSCoR expanded the program forming partnerships with four other science museums (Tulsa Air and Space Museum-Tulsa, Leonardo's Discovery Warehouse-Enid, Jasmine Moran Children's Museum-Seminole and The Museum of the Great Plains-Lawton). Each of the museums have developed interactive science demonstrations or labs (aligned with Oklahoma Priority Academic Student Skills) that students participate in during their visits to the museum facilities.

Schools interested in applying for field trip grants must meet a minimum of two out of four criteria: 1) Receives Title VII (Indian education funding); 2) at least 70% of school body is eligible for the free and reduced lunch program; 3) at least 25% of the student body comes from underrepresented groups (American Indian, Hispanics or African-American) OR schools are from un-



Students experiment with an exhibit on magnetism at the Jasmine Moran Children's Museum located in Seminole, Oklahoma.

dereserved rural districts; 4) placement or standing on the State's Department of Education School Improvement List. Eligible schools can apply for field trip grants to cover transportation, entrance fees or a combination of the two. Grants are issued on a first-come, first-served basis. Schools are encouraged to apply early to increase chances of receiving funding. Historically, grant funds are allocated by early September. EPSCoR does place eligible schools on a waiting list in the event that additional funds become available.

Oklahoma EPSCoR plans to continue this program during the year 2007-2008 school year, contingent upon renewed funding of Oklahoma's National Science Foundation EPSCoR Research Infrastructure Improvement Award.

For more information about this and other K-12 programs, or to download a field trip grant application please visit www.okepscor.org/programs/k12.html or contact Ms. Shelley D. Wear, Outreach Coordinator at 405.225.9287 or swear@osrhe.edu.



This student can see how her own bones work in this interactive exhibit at the Jasmine Moran Children's Museum.

Other K-12 Outreach Opportunities

- ◆ Summer Science & Technology Academies
- ◆ Women in Science Conferences at Omniplex
- ◆ OSU Upward Bound Math & Science Center
- ◆ Stillwater Children's Museum—Museum Without Walls Exhibits for K-12 classrooms

www.okepscor.org/programs/oabout/oabout_k12.html

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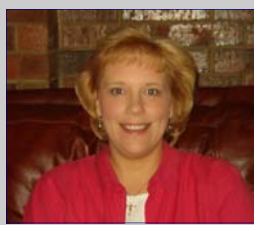
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