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Arkansas Catalyst, May 2013

University of Arkansas, Fayetteville

UNIVERSITY OF ARKANSAS
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The Arkansas Catalyst

May 2013

University Faculty Initiated Into Inventors Academy

University of Arkansas Faculty and Staff Honorees

The University of Arkansas recognized 16 current and former faculty and staff members on May 1 at the inaugural Inventors' Appreciation Banquet hosted by Technology Ventures, the Fayetteville campus' technology licensing office.

The event, held at the Inn at Carnall Hall, saluted the accomplishments of inventors who have been issued patents during their tenure at the university. They were initiated into the National Academy of Inventors, a nonprofit organization that accepted the University of Arkansas as a charter member last fall.

"We wanted to recognize the incredible effort and sacrifice it takes to successfully develop world-class technology," said Jeff Amerine, director of Technology Ventures. "The marketable ideas U of A researchers have developed have the potential to change the world, and can act as the foundation for great ventures that will employ the best and brightest U of A graduates."

Faculty and staff who were initiated into the academy were Simon S. Ang, professor, electrical engineering; Bob Beitle Jr., professor, chemical engineering; Laurent Bellaiche, professor, physics; W.D. Brown, Distinguished Professor emeritus, electrical engineering; Jia Di, associate professor, computer science and computer engineering; Ingrid Fritsch, professor, chemistry and biochemistry; Huaxiang Fu, associate professor, physics; Ralph Henry, Distinguished Professor, biological sciences; Ajay P. Malshe, Distinguished Professor, mechanical engineering; Hameed Naseem, professor, electrical engineering; Errol Porter, research associate, electrical engineering; Josh Sakon, associate professor, chemistry and biochemistry; Leonard Schaper, professor emeritus, electrical engineering; Scott C. Smith, associate professor, electrical engineering; Ryan Tian, associate professor, chemistry and biochemistry; and Vijay Varadan, Distinguished Professor, electrical engineering.

SEC, Vice Provost Award Research Grants

The university awarded research grants to eight professors this spring through programs sponsored by the vice provost for research and economic development and the Southeastern Conference.

In April, four faculty were selected for $5,000 grants through the vice provost's Arts and Humanities Seed Funding Program. The grants are intended to enrich the research and professional growth of the faculty member and the university and result in new opportunities for research or other creative endeavors. The money will be used on items that will further a project, such as materials, supplies and travel.

Those selected for the grants are Michael Hevel, College of Education and Health Professions; Frank Jacobus, Fay Jones School of Architecture; Han-Seok Seo, Dale Bumpers College of Agricultural, Food and Life Sciences; and Bethany Springer, J. William Fulbright College of Arts and Sciences.

In January, the U of A presented four $2,500 travel grants to faculty who plan to conduct research at other institutions in the Southeastern Conference. The SEC Visiting Faculty Travel Grant Program is intended to enhance faculty collaboration that stimulates scholarly initiatives among the conference's 14 member universities.

The U of A faculty selected for travel grants were Dennis Beck, College of Education and Health Professions; Andrew Braham, College of Engineering; Nathan Parks, J. William Fulbright College of Arts and Sciences; and the team of Patricia Amason and Lynne Webb, Fulbright College.

Engineers Develop Device to Mitigate Blackouts

Widespread power blackouts such as those that hit the northeast United States in 2003 could be prevented in the future, thanks to a new piece of equipment developed by engineering researchers at the University of Arkansas. The

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GRANT AWARD WINNERS

The following is a sampling of faculty awards in April, with the principal investigator, the award amount and the sponsor. An asterisk (*) indicates the continuation of a previous award.

— Gisela Erf, $338,462, National Institutes of Health

device regulates or limits the amount of excess current that moves through the power grid when a surge occurs.

Alan Mantooth, University of Arkansas

"We didn't invent the fault current limiter," said Alan Mantooth, Distinguished Professor and executive director of the National Center for Reliable Electric Power Transmission, based at the university. "But we have developed the first one using a silicon-carbide semiconductor device and technology, which we have developed over the past five years. The significance of this material cannot be overestimated. It is much more durable and responds so much faster than materials currently used in systems on the U.S. power grid."

A fault current limiter can be thought of as a giant surge protector. When excess current travels through a power line, the limiter absorbs it and then sends only what is necessary farther down the line, Mantooth said.

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Geologist Receives NSF Early Career Award

Gregory Dumond, University of Arkansas

Gregory Dumond, an assistant professor of geosciences at the University of Arkansas, has received a $226,543 Faculty Early Career Development Program award from the National Science Foundation to further his research of major intracontinental strike-slip faults in Earth's lower crust.

— John Wilson, $129,564, Weyerhaeuser
— Xianghong Qian, $96,647, National Science Foundation
— Andrew Braham, $40,000, Mead Westvaco Corp.
— Denise Airola, $35,000, Winthrop Rockefeller Foundation

Dumond is analyzing the Canadian Shield, an area in northern Saskatchewan, Canada, that was formed by local strains and major intracontinental faults deep inside the planet. He hopes the work will answer questions about the formation of Tibet, a major plateau in Asia.

"We will study a field area in Canada that has crust and faults that were once very deep, as much as 50 kilometers, but are now exposed at the surface," Dumond said. "This grant gives us an opportunity to study how these important faults work at depth. I am hoping to understand how the crust under Tibet works by using the field area in Canada as an analogy for the deep crust beneath it."

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University of Arkansas Arkansas Newswire

Researchers Develop Device to Mitigate Blackouts, Prevent Equipment Damage

Solid-state design improves on existing fault current limiters

Friday, April 19, 2013

Alan Mantooth, University of Arkansas.

FAYETTEVILLE, Ark. – A local power failure in Ohio ten years ago caused a series of cascading power failures that resulted in a massive blackout that affected 50 million people and caused billions of dollars in damage and lost revenue.

Such blackouts could be prevented in the future, thanks to a new piece of equipment developed by engineering researchers at the University of Arkansas. The device regulates or limits the amount of excess current that moves through the power grid when a surge occurs.

“We didn’t invent the fault current limiter,” said Alan Mantooth, Distinguished Professor and executive director of the National Center for Reliable Electric Power Transmission, based at the university. “But we have developed the first one using a silicon-carbide semiconductor device and technology, which we have developed over the past five years. The significance of this material cannot be overestimated. It is much more durable and responds so much faster than materials currently used in systems on the U.S. power grid.”

A fault current, also known as a surge, occurs when too much current flows through the electrical power grid in an uncontrolled manner. A fault current is typically caused by an accident or unintended event, such as lightning or contact between

power lines and trees. These events cause short-circuits, which result in a rapid increase in the electricity drawn from power sources within the grid.

When these sources do not have extra power to give, cascading or rolling blackouts can occur. This is what happened in Ohio, much of the northeast United States and parts of Canada in 2003.

A fault current limiter can be thought of as a giant surge protector. When excess current travels through a power line, the limiter absorbs it and then sends only what is necessary farther down the line, Mantooth said. The system thus ensures uninterrupted service when the fault is intermittent. Most consumers would not even detect a problem. Furthermore, if the fault is more permanent and will require repair to power lines, Mantooth said, the device then opens much like a normal circuit breaker, which would thus prevent further damage due to excess current.

Proper coordination and device placement will prevent cascading outages, he said.

“This device really can mean the difference between 25,000 customers or 5 million customers being affected,” Mantooth said.

The U of A researchers worked with silicon-carbide, a semiconducting material that is stronger and faster than conventional materials used in the power grid. High-speed switching devices within the limiter rapidly insert energy-absorbing impedance into the circuit or use advanced control techniques to limit the fault current, Mantooth said.

Silicon-carbide has other benefits as well. Its properties allow for extremely high voltage, and it is a good thermal conductor, which means that it can operate at high temperatures without requiring extra equipment to remove heat. Overall, use of the material will reduce the mass and volume of equipment needed on a power grid.

Mantooth envisions the device working in concert with circuit breakers on individual buildings, especially critical facilities such as hospitals. It could also serve neighborhoods, where one limiter could regulate current and thus preserve power for many houses. Depending on the size of the building or neighborhood, devices would vary in terms of amperage and voltage.

Mantooth said the U of A’s system, and fault current limiters in general, are examples of devices that will make and serve a “smart” grid, meaning they will play an integral role in the U.S. Department of Energy’s vision for a more efficient and more reliable power grid.

The National Center for Reliable Electric Power Transmission is funded as part of the federal government's focus on research and development on smart grid and renewable technologies. The center is one of only a few university-based research centers chosen by the Energy Department to investigate electronic systems to make the nation's power grid more reliable and efficient.

The Energy Department has funded the center since 2005 because of the university's research expertise in advanced power electronics and long-term investigation of silicon-carbide.

Mantooth is holder of the Twenty-First Century Chair in Mixed-Signal Integrated Circuit Design and Computer-Aided Design in the College of Engineering.

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University of Arkansas Arkansas Newswire

Geologist Receives National Science Foundation Early Career Award

Dumond uses research in Canada to study intracontinental systems

Thursday, May 09, 2013

Gregory Dumond, University of Arkansas

FAYETTEVILLE, Ark. – Gregory Dumond, an assistant professor of geosciences at the University of Arkansas, has received a $226,543 Faculty Early Career Development Program award from the National Science Foundation to further his research of major intracontinental strike-slip faults in Earth's lower crust.

Dumond is analyzing the Canadian Shield, an area in northern Saskatchewan, Canada, that was formed by local strains and major intracontinental faults deep inside the planet. He hopes the work will answer questions about the formation of Tibet, a major plateau in Asia.

"We will study a field area in Canada that has crust and faults that were once very deep, as much as 50 kilometers, but are now exposed at the surface," Dumond said. "This grant gives us an opportunity to study how these important faults work at depth. I am hoping to understand how the crust under Tibet works by using the field area in Canada as an analogy for the deep crust beneath it."

The grant will support Dumond's research over the next five years.

Dumond focuses on the relationship between continental collisions and deformations along Earth's crust due to strike-slip faults, which occur where pieces of the crust slide past each other. These faults are important features for

understanding how mountains and plateaus form. However, there is little research about what faults look like and how they work in the deeper parts of the crust.

The project will shed light on intensely debated topics of geosciences, such as continental collision, deformation along Earth's crust and intracontinental strike-slip faults. Understanding deformation in the lower crust is critical for theories about whether constraint is equally distributed or confined to local areas across fault systems.

The grant directly benefits the university by enriching its newly established doctoral program in geosciences in the J. William Fulbright College of Arts and Sciences, Dumond said. Training and education will be provided for at least one doctoral student and several undergraduate students who will be integrally involved in research and outreach efforts.

These efforts will focus on education for teachers and students who live near the New Madrid seismic zone, an unexposed intracontinental fault that is the most seismically active region east of the Rocky Mountains.

Additionally, two professional development summer institutes will provide inquiry-based modules for teachers. When implemented and assessed, the teaching units will strengthen earth sciences curricula in Arkansas middle schools. In this effort, the researchers will collaborate with Lynne Hehr, the director of the University of Arkansas' Center for Math and Science Education.

Dumond received a bachelor's degree in geological sciences from University of Texas at El Paso, a master's from Texas Tech University and a doctorate from the University of Massachusetts-Amherst. Following a two-year National Science Foundation postdoctoral fellowship at the Massachusetts Institute of Technology, Dumond joined the University of Arkansas in August 2010 as a tenure-track assistant professor in the geology division of geosciences.

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