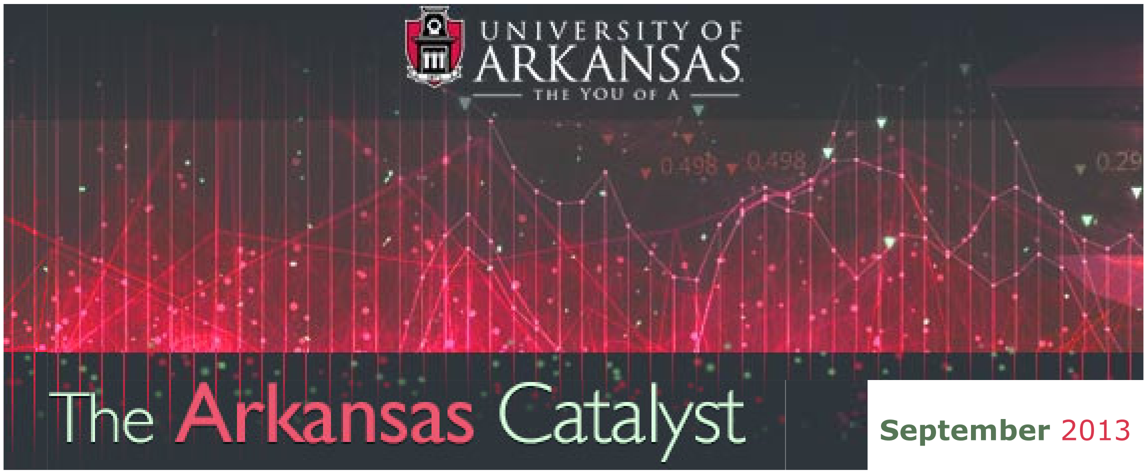
9-2013

Arkansas Catalyst, September 2013

University of Arkansas, Fayetteville



September 2013

University Awards Grants Through Arkansas Biosciences Institute

Arkansas Biosciences Institute funding helps improve University of Arkansas research facilities and supports faculty individually and with collaborators both on campus and at other institutions.

The University of Arkansas, with funding from the Arkansas Biosciences Institute, has awarded grants for 38 science and technology research projects for fiscal year 2014.

The institute is a partnership of scientists at five research institutions across Arkansas, including the state's flagship university in Fayetteville, with a focus on supporting research that improves human health.

The fiscal 2014 grants at the U of A totaled $1,467,195, said Roger Koeppe II, a Distinguished Professor of chemistry and biochemistry who represents the flagship on the institute's scientific coordinating committee.

"The Arkansas Biosciences Institute is important for promoting broadly based university research in areas such as biomedicine and biotechnology," Koeppe said. "A review panel evaluates the initiatives based on their impact on the scientific community and potential for eventual publication."

Institute-supported investigators explore many different body and cellular processes in their search for answers to challenging basic science- and health-related questions.
Koeppe said the institute chooses projects that are both innovative and may need preliminary results in order to compete for research funding on a national level, such as the National Institutes of Health or the National Science Foundation.

"These proposals primarily come from newer faculty who are just starting their labs but some can come from mid-career and senior faculty," he said. "An established faculty member who has had a good research career may want to start investigating in a new area and we recognize that."

There are two other categories the committee considers when it makes the grant: shared equipment and bridge funding.

Learn More

New Study Sheds Light on Tornado Behavior

Panneer Selvam

The first field investigations of the effect of terrain elevation changes on tornado path, vortex, strength and damage have yielded valuable information that could help prevent the loss of human life and damage to property in future tornadoes.

Engineering researchers at the University of Arkansas analyzed Google Earth images of the massive 2011 Tuscaloosa, Ala., and Joplin, Mo., tornadoes and found similarities between the two in behavior and interaction with the terrain. The findings likely apply to all tornadoes.

"We wanted to understand the impact of terrain on damage magnitude and tornado path," said Panneer Selvam, professor of civil engineering. "Information about this interaction is critical. It influences decisions about where and how to build, what kind of structure should work at a given site."

The researchers' analysis led to three major observations about the nature and behavior of tornadoes as they interact with terrain. First, tornadoes cause greater damage when they travel uphill and less damage as they move downhill. Second, whenever possible, tornadoes tend to climb toward higher elevations rather than going downhill. And third, when a region is surrounded by hills, tornadoes skip or hop over valleys beneath and between

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Scientists Awarded Telescope Time at Kitt Peak National Observatory

Faculty at University of Arkansas Co-Author New Edition of Arkansas: A Narrative History

HELPFUL LINKS

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GRANT AWARD WINNERS

The following is a sampling of grants awarded to faculty in July and August, with the these hills, and damage is noticed only on the top of the hills.

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Physicist Disentangles 'Schrodinger's Cat' Debate


Art Hobson

University of Arkansas physicist Art Hobson has offered a solution, within the framework of standard quantum physics, to the long-running debate about the nature of quantum measurement.

In an article published August 8 by Physical Review A, a journal of the American Physical Society, Hobson argues that the phenomenon known as "nonlocality" is key to understanding the measurement problem illustrated by "Schrodinger's cat."

In 1935, Nobel Laureate Erwin Schrodinger used the example of a cat in a closed box to illustrate the central paradox of quantum physics: microscopic particles such as electrons, photons or atoms can exist in two quantum states at once. These states are known as "superpositions."

Hobson cites direct experimental evidence supporting his analysis, from experiments performed in 1990 involving nonlocal observation of entangled pairs of photons.

"The strange thing is that the action happens instantly, with no time for light or an electromagnetic signal or radio signal to communicate between the two," Hobson said. "It is a single object that is behaving as a single object but it is in two different places. It doesn't matter what the distance is between them."

Hobson is professor emeritus of physics in the J. William Fulbright College of Arts and Sciences.

Learn More

principal investigator, the award amount and the sponsor. An asterisk (*) indicates the continuation of a previous award.

- Burt Bluhm, National Science Foundation, $778,000
- Roger Koeppe, $684,485, National Science Foundation
- Christian Tipsmark, $614,500, National Science Foundation
- Nan Zheng, $550,000, National Science Foundation
- Micah Hale, $367,345, Arkansas Highway and Transportation Department
- Fred Limp, $300,378, National Park Service
- Jim Correll, $289,982, University of Exeter
- Thad Scott, $273,546, Poteau Valley Improvement Authority
- Jackson Cothren, $249,986, National Science Foundation
- David Stahle, $219,650, National Science Foundation

U of A Becomes Member Institution of UIDP

The University of Arkansas has been accepted as a member institution of the University-Industry Demonstration Partnership.

Convened by the National Academies, the Washington, D.C.-based partnership was launched in 2006 by the Government-University-Industry Research Roundtable to provide a forum for academic and corporate representatives with diverse interests and responsibilities to find better ways to work together.

"Becoming a member of this national organization allows the University of Arkansas to strengthen existing research collaborations and partnerships and be in a better position to develop new relationships," said Jim Rankin, vice provost for research and economic development at the University of Arkansas. "The University-Industry Demonstration Partnership is a project-oriented organization where members identify issues and opportunities impacting university-industry relations and develop new approaches to working together."

Member benefits include preferred attendance at the partnership's meetings and workshops, exclusive participation in its projects and initiatives and access to critical information shared through the member listserv.

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University of Arkansas
Arkansas Newswire

University Awards Grants Through Arkansas Biosciences Institute

Projects across campus focus on improvement of human health

Wednesday, August 28, 2013


Roger Koeppe II, University of Arkansas

FAYETTEVILLE, Ark. — The University of Arkansas, with funding from the Arkansas Biosciences Institute, has awarded grants for 38 science and technology research projects for fiscal year 2014.

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Koeppe said the institute chooses projects that are both innovative and may need preliminary results in order to compete for research funding on a national level, such as the National Institutes of Health or the National Science Foundation.

“These proposals primarily come from newer faculty who are just starting their labs but some can come from mid-career and senior faculty,” he said. “An established faculty member who has had a good research career may want to start investigating in a new area and we recognize that.”

There are two other categories the committee considers when it makes the grant: shared equipment and bridge funding, according to Koeppe.

Multiple researchers may request funding for a large piece of equipment that they will share, he said.

“The Arkansas Biosciences Institute may be able to help buy equipment that could be hard for an individual lab to purchase,” he said. “This can be across disciplines.”

Bridge funding is intended to keep a research project going if funding from other areas has lapsed.

“This will be when someone has had major grant support but maybe there’s a lapse in funding for a year or two,” he said. “In some instances, ABI funds may be able to provide help to keep them competitive on the national level.”

Ralph Henry, Distinguished Professor of biological sciences at the U of A, has used Arkansas Biosciences Institute funding to improve his research facility and support his work individually and with collaborators both on campus and at other institutions, including the University of Arkansas for Medical Sciences. In the latest round of funding, Henry received a grant to support his long-running investigation of protein purification instruments.

“These instruments, called FPLCs, are critical to the research we do for the U.S. Department of Energy to understand how photosynthetic membrane proteins are targeted and assembled to function in light capture,” Henry said. “We use the FPLCs to support protein-based biomedical studies being conducted by researchers in the University of Arkansas’ Center for Protein Structure and Function, which has been funded by the National Institutes of Health since 2001. The same FPLCs we utilize have also been critical for the NSF-funded collaboration my group has with Professor Bob Beitle in the College of Engineering.

“So I would estimate that the ABI funds, which were used to maintain the FPLCs, resulted very conservatively in a return on investment, just in federal grants alone, of greater than 40 to 1 in terms of federal dollars for each dollar spent by ABI,” said Henry, the W.M. Keck Professor in the J. William Fulbright College of Arts and Sciences.

“If you consider dollars pumped into the economy through the hiring of researchers from the federal grant dollars, the impact of ABI is quite broad in the community and the state,” he said.

The vision for the Arkansas Biosciences Institute emerged during a statewide planning process for use of the state’s share of the 1998 nationwide tobacco settlement. Health care leaders across the state spoke out in favor of dedicating a portion of the tobacco settlement funds to innovative research that could help reduce or prevent smoking-related illnesses.

Arkansas voters endorsed the proposed Tobacco Settlement Proceeds Act of 2000, and the Arkansas Legislature enacted the provisions of that proposal as Acts 1569 through 1580 of 2001.

Part of that legislation established the Arkansas Biosciences Institute as a consortium of five research institutions: the University of Arkansas at Fayetteville, the University of Arkansas System’s statewide Division of Agriculture, the University of Arkansas for Medical Sciences, Arkansas State University and Arkansas Children’s Hospital.

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University of Arkansas Arkansas Newswire

New Study Shows Tornadoes Tend Toward Higher Elevations and Cause Greater Damage Moving Uphill

Research examined terrain damage of Joplin and Tuscaloosa tornadoes

Tuesday, August 27, 2013

The most severe damage caused by the EF5 tornado that struck Joplin, Mo., on May 22, 2011, occurred on flat terrain or when the tornado was moving uphill.

FAYETTEVILLE, Ark. – The first field investigations of the effect of terrain elevation changes on tornado path, vortex, strength and damage have yielded valuable information that could help prevent the loss of human life and damage to property in future tornadoes.

Engineering researchers at the University of Arkansas analyzed Google Earth images of the massive 2011 Tuscaloosa, Ala., and Joplin, Mo., tornadoes and found similarities between the two in behavior and interaction with the terrain. The findings likely apply to all tornadoes.

“We wanted to understand the impact of terrain on damage magnitude and tornado path,” said Panneer Selvam, professor of civil engineering. “Information about this interaction is critical. It influences decisions about where and how to build, what kind of structure should work at a given site.”

The researchers’ analysis led to three major observations about the nature and behavior of tornadoes as they interact with terrain:

- Tornadoes cause greater damage when they travel uphill and less damage as they move downhill.
- Whenever possible, tornadoes tend to climb toward higher elevations rather than going downhill.

- When a region is surrounded by hills, tornadoes skip or hop over valleys beneath and between these hills, and damage is noticed only on the top of the hills.

For years Selvam has studied the effect of high winds on structures and developed detailed computer models of tornadoes. He and civil engineering graduate student Nawfal Ahmed used tornado path coordinates from the National Oceanic and Atmospheric Administration and imposed this data on overlaid Google Earth images. They studied the tornadoes' damage in depth by comparing historical images to aerial photographs taken after the events. Google Earth photographed Tuscaloosa one day after the tornado there. For the Joplin tornado, an aerial photograph was taken on June 7, 16 days after the twister.

In terms of magnitude of damage, the data clearly showed that tornadoes cause greater damage going uphill and huge damage on high ground or ridges. Damage decreased as the tornadoes moved beyond the crest of a hill and going downhill. While it seems logical, this data contradicted a finding from a previous study in which Selvam and a different student found that a hill can act as a protection wall for buildings.

The researchers also found that when approaching a geographic intersection, tornadoes climb toward ridges rather than go downhill, which is counterintuitive when one thinks about wind or water seeking the path of least resistance. With both the Joplin and Tuscaloosa tornadoes, there were several locations where the paths changed direction. At each of these locations, or intersections, the tornadoes consistently sought higher ground.

Finally, Selvam and Ahmed discovered that when a region is surrounded by hills, tornadoes tend to maintain a consistent trajectory rather than follow topographical contours. jumping over valleys to hit hilltops and ridges. With both tornadoes, Selvam said, it was clear that all highland areas suffered the most damage.

Occurring less than a month apart, the Tuscaloosa (April 27) and Joplin (May 22) tornadoes are two of the most deadly and expensive natural disasters in recent U.S. history. Tuscaloosa was an EF4, multiple-vortex tornado that destroyed parts of Tuscaloosa and Birmingham, Ala. The tornado killed 64 people and caused roughly $2.2 billion in property damage, which, at the time, made it the costliest single tornado in U.S. history. Only a month later, the Joplin tornado, an EF5 with multiple vortices, which damaged or destroyed roughly a third of the city, killed 158 people, injured 1,150 others and caused $2.8 billion in damage.

The researchers presented their findings at the 12tth Americas Conference on Wind Engineering.

Selvam is holder of the James T. Womble Professorship in Computational Mechanics and Nanotechnology Modeling. He directs the university's Computational Mechanics Laboratory.

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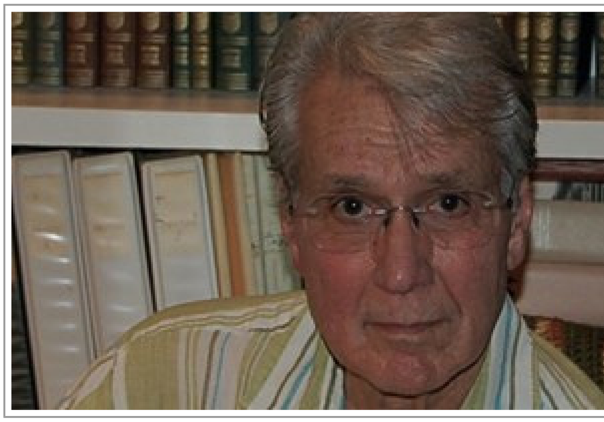
University of Arkansas Arkansas Newswire

Physicist Disentangles 'Schrodinger's Cat' Debate

Hobson's analysis contributes to foundations of quantum physics

Monday, August 26, 2013

FAYETTEVILLE, Ark. – University of Arkansas physicist Art Hobson has offered a solution, within the framework of standard quantum physics, to the long-running debate about the nature of quantum measurement.



Art Hobson, professor emeritus, physics, University of Arkansas

In an article published August 8 by *Physical Review A*, a journal of the American Physical Society, Hobson argues that the phenomenon known as "nonlocality" is key to understanding the measurement problem illustrated by "Schrodinger's cat."

In 1935, Nobel Laureate Erwin Schrodinger used the example of a cat in a closed box to illustrate the central paradox of quantum physics: microscopic particles such as electrons, photons or atoms can exist in two quantum states at once. These states are known as "superpositions."

"A measurement in quantum physics means using some sort of large-scale macroscopic device, such as a Geiger counter, to learn something about the quantum state of a microscopic system, such as an atom or a single photon," Hobson said. "Quantum theory seems to imply that if you connect the microscopic system to a large-scale measuring device that distinguishes between the two distinct states of the microscopic system, then the Geiger counter will be also 'entangled' into a superposition of existing in two simultaneous states. However, this is something that we never observe and is not acceptable."

Using Schrodinger's illustration, Hobson said the cat plays the role of the Geiger counter that is connected to a radioactive nucleus in order to determine the decayed or undecayed state of the nucleus. A "live cat" would be a macroscopic signal of an undecayed nucleus and a "dead cat" would be the macroscopic signal of a decayed nucleus. Quantum theory seems to say that the cat should therefore be entangled into a superposition of being both dead and alive, he said.

Instead, Hobson writes in his article that the cat's quantum state is "entangled" with the atom's state, implying that there is an important "nonlocal relation," or instantaneous action-at-a-distance, between the two. According to nonlocality, if any two entangled objects are sent in opposite directions and the state of one of them is altered, the second instantly alters its state in response no matter how far apart the two may be. Hobson cites direct experimental evidence supporting his analysis, from experiments performed in 1990 involving nonlocal observation of entangled pairs of photons.

"The strange thing is that the action happens instantly, with no time for light or an electromagnetic signal or radio signal to communicate between the two," Hobson said. "It is a single object that is behaving as a single object but it is in two different places. It doesn't matter what the distance is between them.

That phenomenon must be taken into account to resolve the measurement problem, he said. That means with Schrodinger's cat, the cat is no longer predicted to be both dead and alive. It is instead dead if the nucleus decays, and alive if the nucleus does not decay, just as one would expect.

According to Hobson, since 1978, three previous published analyses have suggested similar solutions to the measurement problem, but the earlier solutions were little noticed at the time and the debate continued, "leading to confusion and even to pseudoscientific claims about the implications of quantum physics," he said.

"It's important to sort out the foundations of quantum physics," Hobson said. "This theory is more than a century old now, and these ideas have been out there but they haven't been noticed or taken seriously enough. It is my hope that this resolution of the measurement problem will now be accepted by the quantum foundations community."

Hobson is professor emeritus of physics in the J. William Fulbright College of Arts and Sciences.

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