ARKANSAS epscor arkansas ASSETs

Fall / Winter · 2008

From the Director:

Transition is the key word for Arkansas. Historically, Arkansans have relied on a strong rural, agricultural economy and an industrial sector tied to small manufacturing and recruited branch plants. Over the past several years, the state has experienced a transition with the recognition of two key points: 1) high-tech and knowledge-based industries – including precision agriculture and advanced manufacturing – must be encouraged as traditional low-cost manufacturing migrates to places with lower costs, and 2) science and technology must play a key role in linking agricultural to the higher-value products of the future. This climate for change permeates the industrial, educational and policy-making sectors of the state. To support these efforts, Arkansas leaders realize the value and need for investing in science, engineering, and technology at the industry-university interface, within the university domain, and in the educational pipeline.

A second transition has been a unified multi-institutional approach from our research community to support the economic and policy changes that are part of the state's S&T plan. This has resulted in a shift of our Arkansas EPSCoR management to the Arkansas Science & Technology Authority, an instrumentality of the state, and to a team management approach that includes representation of the major participating campuses. While change always creates "growing pains" as new administrative management systems are organized, this transition has also broadened the opportunities for the campuses and allowed more direct access to partners and stakeholders within state government, as well as the private sector.

Our RII award has established the Arkansas ASSET Initiative (Advancing and Supporting Science, Engineering and Technology). It is designed to strengthen two research themes developing in Arkansas with potential for regional and national significance and with major economic development potential. The concept and structure of the Arkansas ASSET Initiative emerged based on the state's S&T strategies and a multi-step year-long process that involved Arkansas EPSCoR Governing Committee, as well as scientists and engineers from across Arkansas. This first edition of Arkansas ASSETs, our Newsletter and e-Newsletter, highlights the successes of the first year of the Arkansas ASSET Initiative. It is also a mark of the success that transition can produce. We thank the support of the campus communications teams, the EPSCoR researchers, and the Arkansas Science & Technology Authority staff who have helped to make the Arkansas ASSET Initiative and ASSETs a success.

ABI Faculty Attends World In Vitro Congress

Seven members of the Arkansas Biosciences Institute faculty at Arkansas State University attended the World Congress on In Vitro Biology, which was held on June 14-18 in Tucson, AZ.

Faculty members made presentations at the international congress, which is held every four years and focuses on issues pertinent to plant and animal research. Additionally, the congress gave participants the opportunity to make worldwide research connections, and it provided a unique learning experience on cell culture and biotechnology.

ASU participants included Dr. Greg C. Phillips, dean of the colleges of Agriculture, Engineering, and Sciences and Mathematics; Dr. Pam Weathers, senior professor, metabolic engineering; Dr. Brett Savary , associate professor, agriculture; Dr. Argelia Lorence, assistant professor, chemistry; Dr. Fabricio Medina-Bolivar, assistant professor, biology; Dr. Chunzhao Liu, assistant professor, bioengineering; and Dr. Ganapathy Sivakumar, assistant professor , bioengineering.

Upcoming Events

-NSF EPSCoR Workshop: Water Dynamics on November 9 – 12, 2008 at the Sheraton Hotel and Conference Center in Burlington, Vermont

-Call for White Papers on 2009 RII themes (due December 1, 2008 Guidelines at http://www.asta.ar.gov/epscor.html)

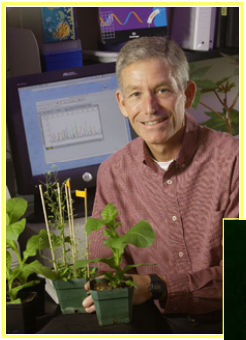
-Arkansas STEM Coalition Meeting November 10, 11:00 AM -1:00 PM

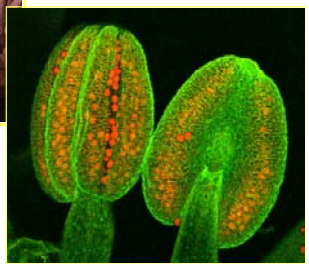
-STUART Training Workshop: November 18-19 for STUART awarded teachers

Recent Events

P3 Symposium

The Arkansas ASSET Initiative Center for Plant-Powered Production (P3) of the Arkansas ASSET Initiative, 2007 – 2010, conducted a three-day training symposium at the Winthrop Rockefeller Institute on Petit Jean Mountain August 20-23. The training symposium brought together faculty, post-docs, and graduate students from the campuses of Arkansas State University, the University of Arkansas at Little Rock, and the University of Arkansas, Fayetteville. The symposium focused on demonstration and hands-on experimentation of key areas of the P3 Center. Sessions included transient expression systems in tobacco; Arabidopsis as an experimental tool including: transformation, genomic resources and database access and manipulation; photosynthesis and light reactions in situ; and microarrays. Guest speakers included Elison Blancaflor, the Samuel Roberts Noble Foundation, and Dr. Joe Chappell, University of Kentucky. Key talks on grantsmanship were given for faculty and post-docs alike for developing ideas for the next rounds of grant funding opportunities, and a session on career development was given focusing on post-docs and graduate students. The main focus of this symposium was to provide enhanced hands-on training for both faculty and students, and networking for the P3 Center to enhance collaboration between the campuses and to further develop the P3 center for future funding.

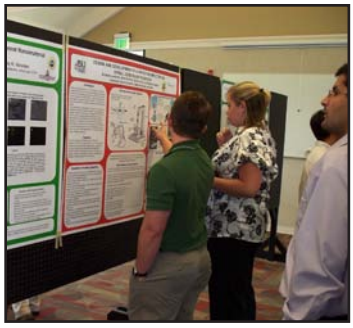


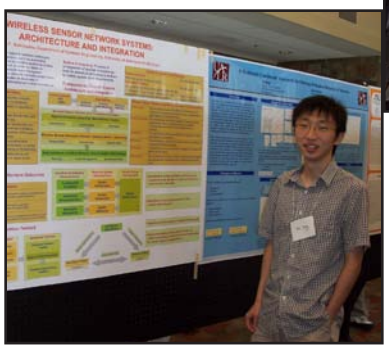


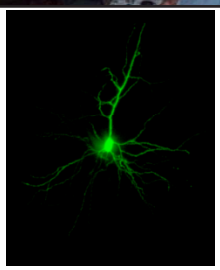
The P3 Center develops collaborative cross-disciplinary projects that directly address key issues in bioproduction through innovative research. Working with the latest advancements in research and technology, the P3 Center showcases Arkansas' recent investments in research at the interface of agriculture, medicine, and the environment. The P3 Center is focused on linking research competiveness with outreach and entrepreneurship to ensure knowledge-based economic development.

WiNS Symposium

The Wireless Sensors and Systems (WiNS) Center conducted a one-day Symposium at the Winthrop Rockefeller Institute on Petit Jean Mountain. The symposium focused on newly developed technologies and applications of the nano-bio-info-technologies-based sensors and systems in engineering and medicine. Along with the research on sensors using nanostructures, sensor networking technology enables the researchers to imagine a future where billions of people regularly access applications in global network as their daily routine. The technologies based on nanosensors and nanoelectronics devices with wireless communication capabilities will generate a significant impact in a broad range of applications in human healthcare, national security and environmental monitoring. Organic (plastic) electronics provide low-cost environmental-friendly devices and material technologies that are built on flexible and conformal substrates.







The symposium brought together researchers working in nanosensors and wireless integrated systems to discuss the latest results, explore new analytical, fabrication and instrumentation techniques, and set the agenda to meet future goals of the Nanosensor System Center research. The main goal of the symposium was to provide a forum to interact and discuss the research goals and present the recent findings in the poster session. The plenary session provided fundamental understandings on various nano-, bio-, and info-technology developments and their system level integration methodologies.

Arkansans Invited to Science Meeting

Thirteen economic "influencers" and college students from Arkansas were among those invited to a convocation in Washington, D.C., sponsored by the National Academies, an organization addressing the nation's critical needs in science, engineering and medicine.

The convocation focused on the nation's challenges in STEM education and its impact on the economic future of the U.S. The attendees who represented Arkansas at this event received travel support from the National Academies because of their involvement with the Arkansas Science, Technology, Engineering and Math Coalition and the ASSET Initiative.

Among the Arkansans in attendance: Greg Nabholz of Nabholz Construction; Mike Gealt, Dean of the College of Science & Mathematics at the University of Arkansas at Little Rock; Jerry Adams, executive director of the Arkansas Research Alliance; James Hendren, software developer and entrepreneur; Suzanne Mitchell, instructor at Arkansas State University; and Gail McClure, vice president of the Arkansas Science & Technology Authority.

Also invited were Maureen C. Dolan, Earl Benjamin III and Ellis T. Benjamin, instructors at Arkansas State University; students Alison Page and Tatum Branaman from the University of Central Arkansas and Michael Wolverton and Daniel Rucker from the University of Arkansas at Little Rock.

University of Arkansas Awarded 70k to Expand Journals and E-Access for EPSCoR Eligible Libraries

Judy Ganson, Interim Director of University of Arkansas Special Collections, received a $70,000 ASSET Initiative library grant with a proposal titled "Extending the e-Journal Resources for NSF EPSCoR Grant Program."

Five years ago a group of libraries from EPSCoR jurisdictions formed a group which named itself ESIG (EPSCoR Science Information Group). ESIG has been successful in negotiating agreements for discounted full-text journal collections with publishers such as Blackwell, Springer, Taylor and Francis, and Wiley Interscience.This award will be used for expanding access to full-text journals and electronic access for EPSCoR-eligible libraries in the state of Arkansas. This funding now allows libraries to support faculty where research takes place – in laboratories and offices. For example, the Wiley Interscience agreement allows electronic access to more than 750 Wiley journals. Additionally, these funds provide an opportunity to work with vendors to provide access to other important resources such as Biological Abstracts or SciFinder Scholar.

In the past, some libraries in Arkansas have been able to take advantage of agreements for full-text journals through ESIG, but others have found additional fees for the electronic access to be unaffordable. The funds now provide opportunities for many of the 24 eligible Arkansas institutions to provide expanded access to these resources.

Education Outreach

Using Math to Investigate the World

Math isn't every student's favorite subject, but when students are shown how math can be used beyond the classroom, they are exposed to a world of new possibilities.

This is what the professors at the University of Central Arkansas taught when 29 local high school students from private, public and homeschools participated in the first Math and Science Investigator program.

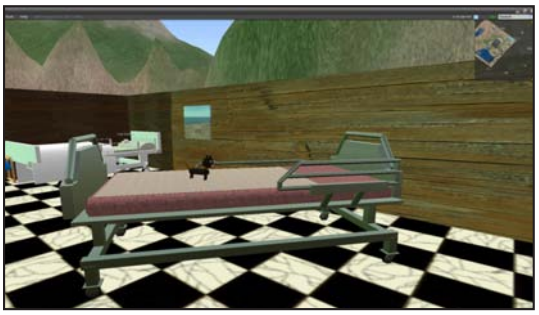
The students were taught five different lessons over the week-long program, from studying how math is used in musical acoustics to studying the relationship between wave speed and water depth to studying the use of math in modern medicine.

The students also took part in fun activities during lunch breaks, including touring a model of a giant whale. Although most of the students paid a $75 fee for the program, some students received financial assistance based on teachers' recommendations. The rest of the program was developed using a $10,000 grant from the Arkansas Science & Technology Authority and a $2,400 seed grant from the UCA Foundation.

Combining Technologies to Heal Patients, Virtually

University of Arkansas researchers seeking new ways to make healthcare more efficient and cost-effective have built a new kind of hospital: one that uses location aware systems, sensors, smart devices, radio-frequency identification and virtual reality. Anyone can visit this hospital on "University of Arkansas" island in Second Life, a free online 3D virtual world.

About 40 university students and six high school students from the EAST Initiative worked with professors Craig Thompson and Fran Hagstrom to create the virtual hospital and supply chain in Second Life. The students have visited local hospitals to understand the needs that exist. They have created a building with patient rooms, intensive care, a diagnostics suite, a pharmacy and supply rooms. In Second Life, professors and students can create things that they believe will exist soon in the real world, and then interact with those items to see how they work.



"Students in my artificial intelligence class developed smart pill bottles that only the owner can open and that know their pill count, smart shelves that know when to re-order, restocking robots, wheelchairs that follow way points and virtual RFID readers and tags," said Thompson. The students also created something that most avatars, or virtual beings within Second Life, lack – internal organs. Now the virtual doctors can perform virtual organ transplant operations.

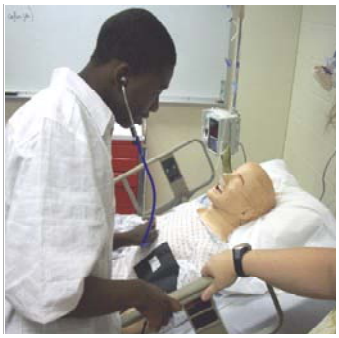
"We feel there is huge potential here – well beyond health care or the groups we have touched so far," stated Adam Barnes, a staff member on the project. "The project is really about the future world we will all live in -- where every object is a network object and humans can communicate with things as well as they do with each other."

"This program cuts across the boundaries of departments and colleges, with participants and ideas from the colleges of engineering, business, education and arts and sciences," said Malcolm Williamson, who works with the project. Partners in the project include the Center for Innovation in Healthcare Logistics, the RFID Research Center, the Center for Advanced Spatial Technologies, the Arkansas Science & Technology Authority and the EAST Initiative.

Please visit http://vw.ddns.uark.edu for more information on the project.

Students Conduct Research with UALR Mentors

High school students from 11 schools across Arkansas presented research projects in high-level math and science disciplines, the results of their participation in the University of Arkansas at Little Rock High School Research Program.



The program pairs high school students with a UALR scientist for one-on-one mentoring in a focused research environment. The mentoring guides the high academic achieving students in selecting the high school courses needed to pursue future careers in science, technology, engineering, and mathematics.

Providing informal peer mentoring by engaging students in faculty research projects allows high school students to establish early contact with college students and professors in specific areas of their interest.

The three-week residential experience comes at no cost to the participants. This program was directed by ASSET Initiative researcher, Dr. Srini Ramaswamy, UALR Computer Sciences.

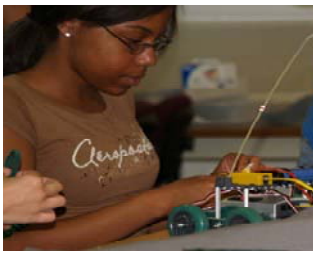
Future Engineers Experience Summer Program

UALR's systems Engineering Department hosted 17 high school students at a two-week summer camp. The program, headed by ASSET Iniative researcher, Dr. Seshadri Mohan, offered students some insight into several branches of engineering study.

The 2008 Summer Engineering Scholars Program is funded by the Arkansas Science & Technology Authority and the Winthrop Rockefeller Foundation. The residential program included hands-on experiences in mechanical engineering, computer and electrical applications, robotics, and telecommunications.

Besides introducing the students to an experimental approach to stimulating engineering education, the program included counseling and advising sessions to help students find financial aid resources that are needed to support their educations.

Building robots was just one example of the projects these students worked on. Other activities included two lectures by practicing engineers from Southwest Power Pool and Alltel Wireless, as well as a visit to Molex, a local plant that manufactures cable connectors and other electrical connectors.



ASU CSI Camp: Solving the mystery of "Who Dunnit?"

Arriving at 6:02pm Monday, June 16th, the CSI Team finds two bodies lying at center field of the football stadium. It's a double homicide…… And so begins the fourth annual CSI Summer Camp for high school students at Arkansas State University in Jonesboro!

High school students from around the country come to ASU for this 5 day camp, live in the dorms, and immerse themselves in learning the tools needed to solve the mock crime. This intensive, realistic, hands-on science-based camp challenges campers to learn and use the technology and database tools of forensics and criminal investigation as well as the reality and importance of proper evidence collection and custody procedures. Exercises include collecting evidence, securing a crime scene, conducting interviews and using computer forensics.

This CSI Summer Camp was originally designed in part as a recruitment tool to build the new Forensic Science undergraduate interdisciplinary program at ASU. Not only has this camp succeeded in attracting young investigators to forensic science but it has also served as an effective recruitment tool for the university, drawing students from as far away as Arizona, Texas, Michigan and Rhode Island.

Research

Micromeritics ASAS 2020

As a part of High Density Electronic Center (HiDEC) at University of Arkansas, Nanomaterials and nanotubes Research Laboratory (NnRL) is dedicated to research on synthesis, characterization and versatile applications of nanomaterials including carbon, oxides, metallic and organic materials.

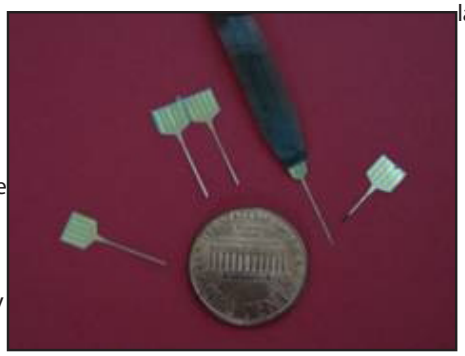
The laboratory's capabilities include chemical vapor deposition, sol-gel process, hydrothermal synthesis, electrochemical reactions, thermal annealing, regular chemical and polymerization reactions, critical drying, and a number of material characterizations. For NSF-EPSCoR projects, an accelerated surface area and porosimetry system has been ordered (Micromeritics ASAP 2020). By using this fully automated equipment, surface area and porosity measurements of synthesized nanomaterials can be conducted. This information will provide a guide for nanomaterials optimization in bioapplications.

At NnRL, research staff and students have synthesized carbon nanotubes and magnetic nanotubes. In addition to characterization of nanotubes, research has been focused on their potential biological applications. The long term goals are to understand the underlying basic

physio-chemical principles involved in the interaction between various nanotubes and cells/biomolecules at the nanoscale level, unveil the critical parameters which dictate their biocompatibilities/toxicities, and explore nanotube-related biological and biomedical applications. For instance, in collaboration with Professor Srivatsan's research group from Arkansas State University, the effects of nanotubes on neuronal growth and neurite extension have been investigated. Preliminary experiments have shown some promising results, which provide useful information for further research. It is aniticipated that this project will help discover effective nanotube-related treatments for neurodegenerate disorders via both in vitro and in vivo experiments.

Novel Neural Prosthetic Devices Combining Titanium and Nanowires

Extensive research in nano/micro-fabrication has led the development of innovative biosensing and medical devices. Researchers, H. Yoon, D. Deshpande and V. K. Varadan, from the University of Arkansas, Fayetteville, who are part of the WiNS Center, have developed a titanium neural probe with nanoelectrodes for use as a neural prosthetic. The metallic needle probe displays superior mechanical strength as compared to similar silicon and polymer structures.



Due to their superior properties and biocompatibility, these needle probes offer the potential to dramatically improve the function and reliability of neural prosthetic devices. Probably the most exciting thing about this research is that hetero-structured, free-standing nanowires are integrated on the needle probes. These nanowires could provide a highly functional interface for enhanced sensitivity and stability. Typically, anodic oxide thin films are generally used for neural electrode applications, due to their large charge storage capacity, high current injection limit and biocompatibility and chemical inertness. The newly developed probes with vertically aligned nanowire bundles and iridium oxide coating have demonstrated a charge storage capacity that is almost three times higher than the values obtained on the same size of iridium oxide coated electrodes.

Needle probes are most commonly used in neural prosthesis to assist in large improvements in the quality of life for patients with severe impairments. Current clinical applications of neural prosthetics include deep brain stimulation for Parkinson's disease and Tourette syndrome, restoration of urinary bladder function, and control of limb function in paralyzed individuals. The new probes will be integrated with a wireless communication module which is currently under development by Dr. Varadan's group at the University of Arkansas. This wireless module based on Zigbee and Wi-Fi protocol will provide wireless networking between multisite neural electrodes and a portable transceiver station, and will serve to free its users from the constraints of a wired connection.

Development of Flexible Organic (Plastic) Electronics and Sensors

Advances in smart sensors, miniaturization and related technologies are prerequisites to the construction of a smart sensory system that can be used for applications ranging from health monitoring, electronic nose, to smart fabric. Low manufacturing cost, light weight, portability and flexibility are among the requirements for the smart sensory system in conjunction with wireless technology.
Organic semiconductor technology has recently been envisioned to meet these realum pentoxide, which operate at less than 5 volts. High k dielectrics play an important role in determining the device performance with respect to high field effect mobility, low threshold voltage, and/or low operation voltage.

The metal organic chemical vapor deposition (MOCVD) tool we have recently purchased from Korea enables the growth of very high quality high k dielectrics. It can provide an extremely efficient way to deposit various types of metal oxide materials such as tantalum pentoxide, zinc oxide and tin oxide. In order to make sure that the equipment operates in specifications as to process temperature, vacuum range and mechanical motion, we performed on-site inspection for the MOCVD in Korea and understood the modifications needed for our flexible sensor fabrication. Using this equipment, we are now developing smart clothing, bed sheets and vest with flexible sensors.

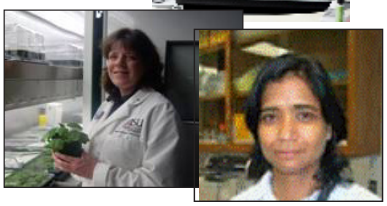
Arkansas EPSCoR P3 Seed Grants

One of the goals of the EPSCoR P3 Center is to foster cross-disciplinary, cross-institutional research as an instrument of creating a "critical mass" in research clusters in Arkansas among our geographically dispersed universities. A key mechanism in this process is the development of a Collaborative Seed Grant program. These competitively awarded Collaborative Seed Grants enable researchers within the Center to develop "preliminary data" and publications needed to prepare for nationally competitive proposals. The research is focused on understanding and overcoming the key biological and technical parameters that limit the ability of plant-based bioproduction to produce proteins and chemicals for applications in agriculture, food sciences, biofuels, and medical applications.

Six seed grants were awarded to the following researchers:

"Role of Ascorbate in Mitigating ER and Cellular Stress Associated with Transient and Stable Plant-Based Protein Production" – Dr. Argelia Lorence, ASU; Dr. Maureen Dolan, ASU; Dr. Vibha Srivastava

Just like vitamin C and other antioxidants are important components for a healthy diet in humans, our studies are looking at the effect of vitamin C and other antioxidants to make "healthier" plants. The goal of this project is to engineer plants to make higher amounts of vitamin C and other antioxidants; these plants will become better "factories" for producing high-value plant-made pharmaceuticals (i.e. vaccines, and cytokines) in the future.



"Intersection of Ascorbate Regulation, Jasmonate-Signaling, and Defense against Herbivory in Plants" – Dr. Argelia Lorence, ASU; Dr. Fiona Goggin, UAF

This project is an investigation into how plants with enhanced levels of vitamin C respond to the attack of insects that feed on leaves (caterpillars), sucking insects (aphids) and worms that feed on roots (nematodes). The project will also incorporate the modification of defense compounds that plants make naturally (jasmonates). With this objective in motion, we can modulate vitamin C levels in plants and thus enhance their ability to tolerate pests.

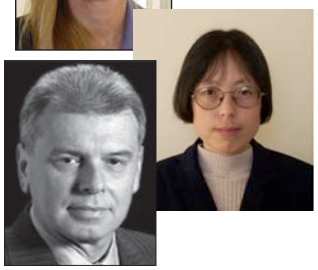
"Regulation, Production & Purification of Bioactive Stilbenoids from Hairy Root Cultures of Peanut" – Dr. Fabricio Medina-Bolivar, ASU; Dr. Maureen Dolan, ASU; Dr. Julie Carrier, UAF

The focus of this project is to study how certain plants produce a particular group of chemical compounds called "stilbenoids". To do this, researchers are using plant roots that can be grown in the laboratory and stimulated to produce these unique compounds. These compounds have many potential applications in human health such as for the treatment of different cancers and prevention neurodegenerative diseases such as Parkinson's disease.

"Role of Oxylipins in Plant Defenses against Aphids" – Dr. Robyn Hannigan, ASU; Dr. Fiona Goggin, UAF

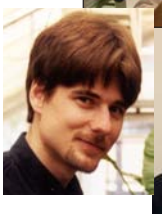
This project examines the biochemical response of plants to infestation by pests such as aphids. Using a unique set of chemicals that are produced by the plants under attack, we will establish the process by which the plants make these defense chemicals. By knowing how they establish these chemicals, we can identify plants that demonstrate a natural resistance, and we can also isolate genes that cause the resistance. That will then allow for the opportunity to assist in the development of plants that are naturally resistant to pests.

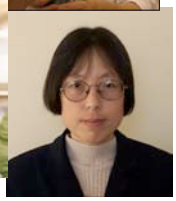
"Efficient algorithms for protein structure prediction and applications in RTB binding occupancy determination" – Dr. Xiuzhen Huang, ASU; Dr. Carole Cramer, ASU; Dr. Steve Jennings, UALR



This project will develop efficient computational approaches for protein structure prediction and validate the implemented approaches on a model protein, RTB. RTB, the lectin subunit of ricin, is being developed as a carrier for vaccine proteins within the P3 Center protein bioproduction cluster.

"Metabolomic and Genomics Empowered Platform for Phytochemical and Gene Network Discovery in Medicago trancatula" – Dr. Hong Li Wang, UALR; Dr. Xiuzhen Huang, ASU; Dr. Stephen Grace, UALR





This project is to develop an effective platform, using the metabolomics and functional genomic analysis experimental system of Medicago truncatula. Using this platform, we will (1) discover novel phytochemicals in the seed coats of Medicago truncatula, which are important in medicine and human nutrition, (2) identify their biosynthesis pathways and related gene networks, and (3) identify the genes and gene network that are involved in compartmentation and storage of identified important phytochemicals.

2008 Arkansas NSF EPSCoR Annual Conference

In an effort to strengthen research and education in science and engineering throughout the state of Arkansas, Arkansas NSF EPSCoR held their annual meeting in collaboration with multiple organizations in a special joint conference of research and academia October 5-7, 2008.

The conference was held over three days in conjunction with the Arkansas Association of Public Universities (AAPU). AAPU along with the Arkansas Deans Associations had a variety of breakout sessions on issues of mutual interest. A special legislative panel of Arkansas state senators and representatives discussed issues of relevance to Arkansas' higher education community. In addition, Arkansas NSF EPSCoR hosted research presentations along with the other major research organizations of Arkansas. Some of the features of the conference included, the Arkansas NASA EPSCoR Research, the Arkansas Biosciences Institute Fall Research Symposium, and the Arkansas Science & Technology Authority's Networking and Collaboration event, and graduate and undergraduate poster sessions.

Monday Events

Leadership of Arkansas EPSCoR Management Team (Drs. Gail McClure, John Hehr, Carole Cramer and Vijay Varadan) presented an overview of the Arkansas Asset Initiative Program, discussing the history of EPSCoR support, program research themes and educational outreach in Arkansas. The Arkansas ASSET Initiative was established by the NSF EPSCoR Research Infrastructure Improvement Award (RII award). Dr. Vijay Varadan provided an overview of the Wireless Nanosensors and Systems (WiNS) research and Dr. Carole Cramer discussed the Plant-Powered Production (P3) Center both established by the ASSET Initiative. Afternoon presentations focused on specific success of the two focal areas presented by research leaders from the three participating campuses participating in each of the two centers. On behalf of the WiNS Center, Dr. Vijay Varadan presented on Nanosensor Devices, Dr. Shesadri Mohan presented on Computing and Systems Engineering, and Dr. Malathi Srivatsan presented on Nanoneurobiology. Additionally, the P3 Seed Grant recipients, Drs. Fiona Goggin, Hong Li Wang, Fabricio Medina-Bolivar, Maureen Dolan, and Xiuzhen Huang, presented introductions on their newly awarded seed grant projects.

Keynote Speakers

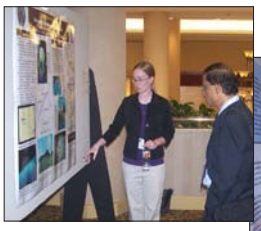
Keynote speakers included Arkansas Governor Mike Beebe and Director of NSF's Office of Integrative Activities Dr. W. Lance Haworth. Governor Beebe gave a well-received speech stressing a number of key issues regarding the current condition of higher education in the state of Arkansas.

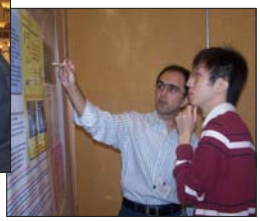
Dr. Haworth informed attendees that there are numerous resources and support available at NSF for both education and research in Arkansas. As an EPSCoR state, Arkansas has improved by increasing its share of NSF funding, but like all other EPSCoR states, Arkansas has yet to reach the final goal of graduating from EPSCoR funding. In an effort to graduate from EPSCoR, Dr. Haworth advised researchers, educators, and policymakers in the state to continue to stimulate collaborations both statewide and regionally. Furthermore, Dr. Haworth added that the Arkansas EPSCoR program should be willing to experiment and will benefit by broadening participation in science and engineering both geographically and institutionally, including two and four year institutions.

Tuesday: Networking Opportunities

In preparation for developing multi-university concepts to be submitted for the 2009 RII cycle, researchers from across the state participated in a unique networking opportunity. Fifty-three researchers presented 7 minute slide programs on their research in an effort to find collaborators from a variety of institutions statewide. Approximately 150 researchers from across Arkansas attended these presentations.

Additionally, the Arkansas Biosciences Institute held its Fall Research Symposium concurrently with the Arkansas Science & Technology Authority networking meeting for Arkansas researchers. Participants of both meetings were able to collaborate with one another to expand current foci and plan future research efforts in Arkansas.





Undergraduate and graduate students from institutions across Arkansas presented their research during the poster sessions.

McNair Scholars

Undergraduate McNair Scholars Kevin Hicks, Nicholas Jackson, Tenia Marshall, Michael Ugbade, and Lisa Wells of Henderson State University (shown at the right with Dr. McClure) attended the annual meeting, allowing them to meet researchers from across the state. This interaction allowed the undergraduate scholars an opportunity to better assess research opportunities in anticipation of graduate studies in Arkansas universities. The Ronald E. McNair Scholars Program provides educational opportunities and outreach programs designed to motivate and support students from disadvantaged backgrounds.