



INVESTING IN ALABAMA'S RESEARCH
INFRASTRUCTURE

**ALABAMA NSF EPSCOR
2006 ANNUAL REPORT**

Alabama EPSCoR NSF Award # 0447675

Executive Summary

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JANUARY 2007

**Alabama NSF EPSCoR
Research Infrastructure Improvement Program (RII)
Executive Summary**

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A. Major Highlights

The Alabama NSF EPSCoR RII investment is designed around four Centers of Excellence. Each Center is led by a Director and comprised of principal investigators, graduate students and technicians. The Centers sub-contract with other Alabama research institutions. Each Center also collaborates with business and industry in and outside the state.

Center Program Highlights

- The four research focus areas in the RII program are: Nanostructured Materials, Cellular Signal Transduction, Optical Sensors and Spectroscopies, and Structural Biology.
 - **Alabama Center for Nanostructured Materials:** U.S. President George W. Bush visited Tuskegee University's Center for Advanced Materials (T-CAM) on April 19, 2006. He discussed the opportunities that ACNM were providing for Ph.D. candidates in nanotechnology.
 - **Center for Environmental Cellular Signal Transduction:** The CECST mission is being addressed through a newly established inter-disciplinary, inter-institutional research effort involving a multi-organismal 'systems' approach in which life scientists in the CECST are working in and at the nexuses of disciplines including developmental biology, physiology, and evolution.
 - **Center for Optical Sensors and Spectroscopies:** The COSS researchers have identified hazardous contaminants of concern and representative compounds to study based on the National Homeland Security Water Sentinel program.
 - **Extended Alabama Structural Biology Consortium:** There is a proposed agreement with the Hudson-Alpha Institute for Biotechnology (HAIB) for the EASBC to provide the structural biology support for the institute. This will potentially lead to self-sustainability with HAIB. The success of EASBC produced two spin-off companies and a third is seeking \$12 million in capitalization.

Overview of Alabama EPSCoR Research Funding and Faculty

- The Alabama NSF RII EPSCoR program experienced an overall increase in the amount of external non-EPSCoR funding awarded from \$17 M in 2005 to \$35 M in 2006. Private donor contributions were a significant element of this increase.

Outreach and Diversity Programs

- Five programs structured Alabama EPSCoR's 2006 outreach and diversity programs. These programs include the 1) Louis Stokes Alliance for Minority Participation, 2) Teaching Enhancement Award, 3) Alabama Science in Motion, 4) E-Map, and 5) Agri-Trek. These programs address K-12 students and teachers through graduate students and Ph.D. candidates.

Alabama EPSCoR Administration

- **Alabama EPSCoR State Office Funding Organization:** Alabama Commission on Higher Education
- **Alabama EPSCoR Steering Committee** (see Appendix 1): Chair: Dr. Keith Harrison, Vice President of Research, University of South Alabama; Vice-Chair: Dr. Elizabeth French, Alabama Commission on Higher Education
- **Alabama EPSCoR Executive Director:** Dr. Keith McDowell, Vice President of Research and Vice Provost, The University of Alabama
- **Program Administrator:** Ms. Sheri D. Powell, The University of Alabama

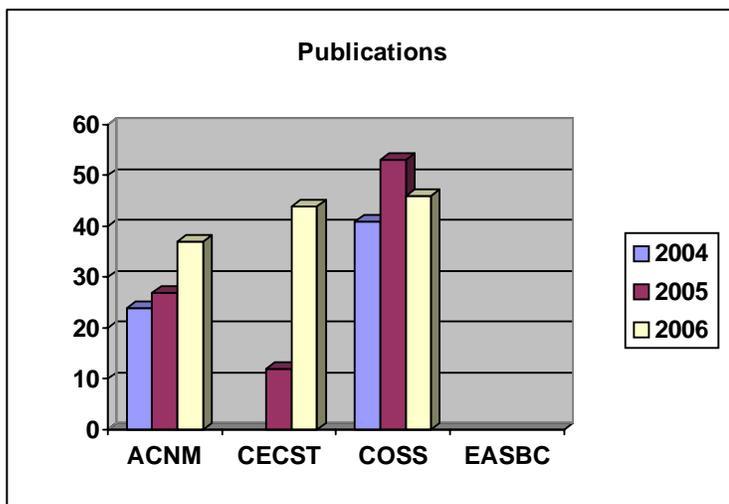
B. Alabama EPSCoR NSF RII Research and Development Focus Areas

The Alabama EPSCoR NSF RII program continues to display significant progress. The RII award helps Alabama EPSCoR achieve its mission to stimulate and support the growth of intercampus, interdisciplinary, multi-investigator research Centers of Excellence founded on existing and emerging strengths in Alabama's seven research institutions. These strengths are leveraged to build sustainable centers capable of competing for federal funding while serving the needs of technology-led economic development and workforce development in the State of Alabama. The program continues to hire outstanding faculty, graduate students and technicians to develop the collaborative research infrastructure of the RII program. Alabama EPSCoR is promoting the interaction and intercampus research and education programs that define the finest research and outreach qualities of the RII program.

■NSF RII Centers of Excellence

Four Centers of Excellence were funded under the NSF EPSCoR RII program scheduled to run from May 2005 through April 2008. This competitive phase provides an opportunity to implement a unique multifaceted plan focused on biotechnology and nanotechnology.

Alabama's strategy for focus of the RII investment revolves around a center model. The current RII identifies and supports four Centers, each with a core identified faculty group and stated focus. Each Center spans multiple universities in the State, effectively connecting their research and outreach endeavors. Center investment is often sustained across multiple RII awards based on the performance and milestones sought by each activity indicating a disciplined strategic approach. – NSF EPSCoR Reverse Site Visit Review Panel (October 2006)



EASBC data was not available by the due date.

establishing a baseline for reporting this data. Illustrated throughout this section are metrics determined by NSF to be significant indicators of strong research and self-sustainability. These indicators include publications, presentations, number of principal investigators, student participation, and number of grants awarded. The graphs establish a baseline beginning at 2004, prior to the RII award. This approach was developed to demonstrate how the RII program has impacted Alabama research and development.

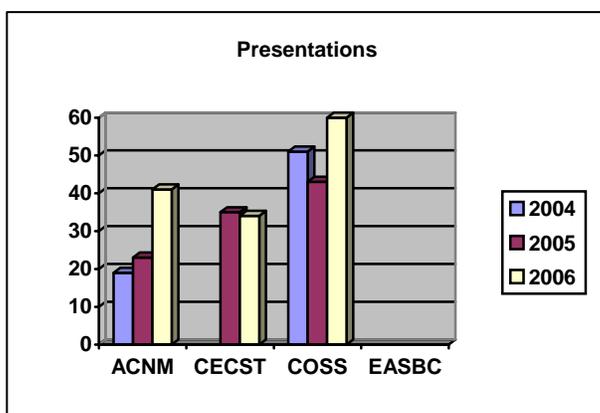
■Baseline Data

The current Alabama NSF EPSCoR RII cycle began its first year on May 1, 2005 and ends on April 30, 2008. In this report, we addressed recommendations from the Reverse Site Visit panel summary held in October 2006 at NSF Headquarters (see Appendix 2 for panel comments and state office response). These recommendations primarily relate to metrics and

▪**Alabama Center for Nanostructured Materials**

The Alabama Center for Nanostructured Materials (ACNM) is led by Dr. Mahesh Hosur at Tuskegee University. Collaborating institutions also include Alabama A&M University in Normal, Auburn University, the University of Alabama in Huntsville, and the University of South Alabama in Mobile. The ACNM mission is to synthesize and produce bulk nanocrystalline materials and develop new materials with enhanced thermal, physical and mechanical properties.

The research findings of ACNM, once implemented, will have far-reaching effects on society. For example, the nanostructured composite materials in structural parts will lead to a new generation of automobile, aircraft, spacecraft, locomotives and sporting goods. Further, the nanotechnology work being conducted by the center will lead to new types of biosensors, drug delivery systems, heat exchangers, etc.



ACNM principal investigators have discovered that nanotechnology research has radically altered the concept of constructing an engineering curriculum that primes students for the new nanotechnology age. The nature of the material is so broad that conventional bachelor-level curricula do not adequately address student needs. Engineers, knowledgeable in nanotechnology, are graduating in reasonable numbers from North American universities. A survey

EASBC data was not available by the due date.

conducted by ACNM of the top-ranked 60 universities illustrate that a number of these institutions conduct very good nanotechnology education at the doctoral and master's levels. However, the survey indicates that the *undergraduate* curriculum needs a fundamental modal shift to specific areas of concentration in order for the student to get a better start in business or industry. Only one of the 60 leading institutions had a 'bottom-up' approach to the issue, in that they addressed some nanotech issues at the freshman level. ACNM has formulated ideas on how to address this issue and plan to present an educational paper later in 2007.

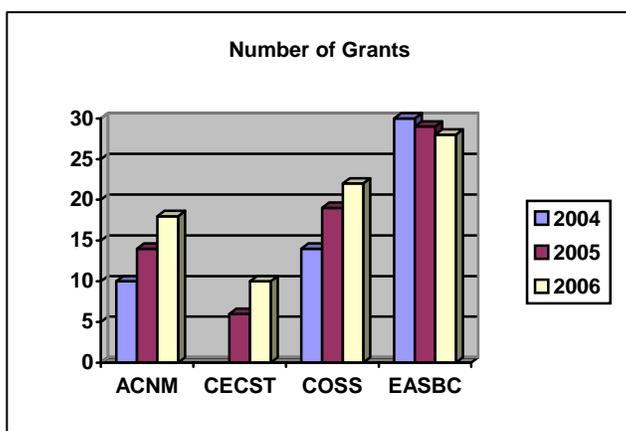
The ACNM nanotechnology and laser classes were taught at UAB, but UA students also took the class via video teleconference. Plans are underway to offer the nanotechnology classes (based at UAB) to students based at UA and Huntsville (UA and AAMU) in the future. Similar plans are underway for the laser classes taught at UAB.

The ACNM received three major funding awards from NSF over the past 1½ years (since the program was funded by RII). ACNM also received funding from DoD (Air Force, Army, Navy) and DOE ranging from ~ \$75K-450K/year. The program is working with private industry through SBIR grants. Research at Alabama A&M University, the major ACNM partner, is quite diverse in its funding. AAMU's research funding comes from various areas of the government including: U.S. Army, SDC, NASA-Marshall Space Flight Center, Department of Energy, and the National Science Foundation. The corporate sector

contributes as well, for example: Nichols Research Corporation, Wiley Labs, United Applied Technology, Rantek, and the United Technology Research Center. In the future, ACNM will strive to work with other University partners within the state and other faculty members within the University to broaden nanotechnology research in nano-electronics and nano-biotechnology.

▪**Center for Environmental Cellular Signal Transduction**

Dr. Frank Bartol directs the Center for Environmental Cellular Signal Transduction (CECST) at Auburn University. Collaborating research institutions include Alabama A&M University, Tuskegee University, and the University of Alabama at Birmingham. The mission of CECST is to develop a more complete picture of how biomolecular networks contribute to cellular and organismal resilience in the face of micro- and/or macro-environmental challenges.



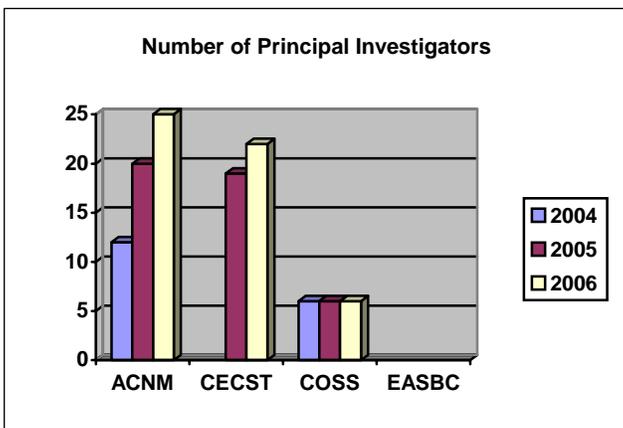
The CECST announced a newly formed international research partnership with Anhalt University of Applied Sciences and the University of Leipzig in the Federal Republic of Germany. Through support from the German Federation of Industrial Research Associations, the group will focus on the identification of the effects of a naturally occurring environmental estrogen on the reproductive development and health in pigs. A natural compound, zearalone, is produced by molds that grow on animal

feed grains. When consumed, zearalone mimics the effects of the hormone estrogen that can result in the disruption of normal processes including reproduction and fetal development. Pigs were chosen for the study as they are extremely sensitive to this environmental estrogen. This compound not only has the potential to cause negative economic impacts for animal agriculture but it could potentially harm humans, if exposed. The research team will look closely at gene expression patterns affected by zearalone in the developing female reproductive tract that could impact fertility and reproductive health later in life.

The AU-CMB/CECST project is contributing to society in ways that extend beyond the bounds of science and engineering through its educational and outreach components. This is particularly evident where programs are aimed at pre-college students and the public. Participation of high school students, their teachers, and (informally) their parents has raised the consciousness of these individuals and, by extension, their colleagues and friends to the value and impact of science in our lives. Ultimately, the goal of the CECST educational and outreach programs is to facilitate the development of a more technologically competent workforce in the state of Alabama, thus influencing the economic development of the state in a positive direction. Additionally, invited presentations by CECST faculty to speak to public groups on topics such as the importance of bioscience and the ethics of biotechnology is likely to affect public perceptions of both science and scientists in constructive ways.

▪**Center for Optical Sensors and Spectroscopies**

The University of Alabama at Birmingham houses the Center for Optical Sensors and Spectroscopies (COSS) directed by Dr. Christopher Lawson. Collaborators include The University of Alabama and the University of Alabama in Huntsville. The mission of the COSS is to promote optical sensing and spectroscopy research on environmental, biomedical, and national security issues through collaborative use of resources and expertise among the member universities, government and industrial laboratories, and improve sensor techniques using recently developed revolutionary laser and spectroscopic technologies.



EASBC data was not available by the due date.

COSS is developing a community of undergraduates, graduates, and faculty who work together in a common area which includes the laboratories for the undergraduate optics courses and the senior thesis courses as well as the more advanced laser laboratory where the doctoral level research is performed. The more advanced undergraduates participate in the graduate research. This provides essential experience for these undergraduates and prepares them to

take over operation of the advanced lasers in later years. The graduate laboratories are visited by undergraduates in the laser systems course. Undergraduate senior thesis students often choose topics that relate to the graduate research work. A professor is present in the research and teaching laboratory area virtually all day every day to provide assistance and advice to students as needed. During the summer, visiting students observe COSS laser system demonstrations. COSS has numerous posters and copies of published papers posted in the hallway that frequently attract attention from visitors. COSS especially emphasizes the role that lasers can play in space and in mitigation of threats to human civilization.

To improve UAB's infrastructure capabilities, COSS is continuing to pursue the purchase of a MicroRaman-Atomic Force-Near Field Microscopy System. This system is based on a unique combination of several novel developments in microscopy and spectroscopy and provides completely new capabilities for chemical imaging with a spatial resolution of several nanometers. AFM/TERS/NSOM images can be recorded simultaneously providing information about surface topology and chemical composition that no other technique is capable of providing. COSS representatives have negotiated a 35% discount for the Raman/AFM/NSOM system with the manufacturer and the purchase order is in the preparation stage. In addition to enhancing research capabilities, the acquisition of micro-Raman AFM/NSOM system would increase the number of research projects and training available to the graduate and undergraduate students at UAB.

▪**Extended Alabama Structural Biology Consortium**

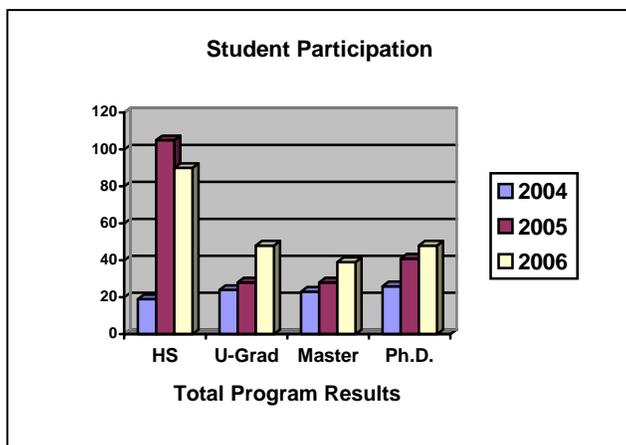
Dr. Edward Meehan is the Center Director for the Extended Alabama Structural Biology Consortium (EASBC) at the University of Alabama in Huntsville. Alabama research institutions collaborating with EASBC include the University of Alabama at Birmingham and the University of South Alabama.

Dr. Pamela Twigg, an EASBC principal investigator, developed and presented a Directed Study in Structural Biology for eight students (4 male and 4 female) for the National Youth Science Camp, July 2006. The National Youth Science Camp, is a month long honors camp designed for graduating high school seniors. Attendance is limited to two students per state. The Directed Study program encompassed three 75-minute hands-on sessions over a three-day period with the goal of exposing students to practical experiences in the area of structural biology and included an introduction to the primary methods for macromolecular structural determination.

Experiments were designed to offer students experience in protein crystallization using a variety of techniques including a formal presentation on the scientific basis for the methods used in protein structure determination (x-ray diffraction and NMR spectroscopy) and student-guided discussion. In addition to the Directed Study, Dr. Twigg presented an afternoon seminar in Science Olympiad style that included a challenge in Forensics designed for a competition the previous year. Dr. Twigg interacted with almost all the 100 student attendees over the course of her tenure at the camp. Dr. Twigg found the informal discussions regarding career goals and advanced degrees in science with the attendees very rewarding.

The Extended Alabama Structural Biological Consortium presented evidence of improved research competitiveness with the proposed agreement to provide the structural biology support for the Hudson-Alpha Institute for Biotechnology. The activities of this center show solid linkage to industrial partners and state economic development objectives and investments. The Consortium is also competitive enough to obtain near sustainability without Alabama EPSCoR funding. – NSF EPSCoR Reverse Site Visit Review Panel (October 2006)

Both UAH and USA sponsor Summer REU programs. UAH also participates in the AMP program and the Bridge to the Doctorate program. Dr. Larry DeLucas makes extensive



public presentations as a former astronaut. UAH works closely with local high school chemistry programs and the local junior college, providing tours, seminars, and workshops.

Structural biology is an important focus for the growth of the biotechnology industry in the State of Alabama. Nearly \$7 million in private donor contributions established UAH's Laboratory for Structural Biology, purchased UAH shares of SER-CAT, and established

EASBC data was not available by the due date.

UAH's NMR Laboratory. SER-CAT was initially formed in 1997 to provide third generation x-ray capabilities to macro-molecular crystallographers and structural biologists in the southeastern region of this country.

EASBC seeks to maintain sustainable collaboration with the Hudson-Alpha Institute of Biotechnology by continuing to provide structural biology support for the Institution. The success of EASBC also produced two spin-off companies and a third is seeking \$12M capitalization.

▪Collaborations

Results of 'discovery' research pursued by CECST scientists working in 'Systems Biology' is likely to have broad cross-disciplinary implications and catalyze interdisciplinary research and innovation. For example, biochemical and/or molecular markers of exposure to specific environmental conditions or bioactive agents could be used as targets for further discovery research in structural biology through the CECST-EASBC interface while, simultaneously providing baseline information needed to develop sensing platforms with field applications in environmental engineering through a CECST-COSS interface.

Each quarter, Alabama EPSCoR hosts a RII Grant Center Directors Meeting. Center Directors provide an update on the progress of their projects, sharing the processes, procedures, and various results of their research. This in turn leads to discussions of how one center's results may assist another. During the January 11, 2007 meeting, the CECST Center Director, Dr. Frank Bartol, approached Dr. Sergey Mirov, COSS Co-PI, regarding a future collaboration to field test the presence of an environmental chemical important to CECST research. CECST is studying natural steroid hormones such as zearalone, which is produced by molds that grow on animal feed grains. This natural compound mimics estrogen when consumed and can lead to the disruption of normal hormone-sensitive processes such as development and reproduction. CECST is interested in conducting a field test with the COSS developed optical sensing technology. This test, depending on the results, could be used to quantify risk to environmental exposures for animals. CECST will generate a list of compounds to "sense" and arrange a meeting with COSS researchers.

The current RII identifies and supports four Centers, each with a core identified faculty group and stated focus. Each Center spans multiple universities in the State, effectively connecting their research and outreach endeavors. – NSF EPSCoR Reverse Site Visit Review Panel (October 2006)

Also during the meeting, Dr. Ed Meehan, EASBC Center Director, mentioned two possible collaborations with ACNM regarding the molecular dynamic simulations of nanostructured materials and using a magnetic field for the dispersion of nanoparticles. EASBC is using a similar method for synthesizing proteins but wanted to discuss this approach with Dr. Mahesh Hosur, Director of ACNM. Dr. Hosur will be traveling to Huntsville the last week in January 2007 to attend the STTR/SBIR Conference at AAMU, which is sponsored in part by Alabama EPSCoR, and will meet with Dr. Meehan during this time.

C. Alabama EPSCoR NSF RII Research Highlights

Detailed information is located in Project Activities and Findings Section in FastLane

Alabama Center Nanostructured Materials

- Research work conducted at Tuskegee University focused on developing nanophased composite materials. Modified epoxy systems and foam systems were combined to make nanophased carbon/epoxy composites and foam-core sandwich composites. At each phase: fiber, foam and

resin were modified by variety of nanoparticles which included nanoclay, metallic nanoparticles and their oxides, vapor grown carbon nanofibers, multiwalled carbon nanotubes, etc. In addition, nanophased nylon filaments were extruded in-house. All these materials, in general, showed significant improvements in their thermal, thermomechanical, mechanical (both static and dynamic) properties at very low-loading percentage of nanoparticles. Thermal properties included the study of glass transition temperature and decomposition temperature.

- Researchers at AAMU studied the thermoelectric properties of nano-layered nanoparticles (Quantum well quantum dots). In this work, they synthesized materials with low thermal conductivity, high electrical conductivity and high Seebeck coefficient taking advantage of interaction of regimented quantum dots. First, they synthesized nano-layers of various known systems, and then converted nano-layered systems to nano-layered Nanoparticles system (Nano-Layered Quantum Dots) using energetic ions. In another task, they studied the mechanical, electrical and thermal properties of high temperature polymeric glassy carbon (GPC) composites. AAMU is well known for production of elevated temperature GPC wares, i.e. crucibles, heat exchangers, and percutaneous devices. In the third task they are designing a prototype E x B system for 1 to 2 nanometer particle separation. Traditionally, the nano powders are bought from vendors. Impurities, cleanliness and size uniformity of nano-powders/Nanoparticles have an important role in new materials which are composed of regimented quantum dot super lattices. This task will allow ACNM researchers to prototype a nano-particle velocity selector to use on powders furnished by vendors to produce more uniform size Nanoparticles.
- The UAH team focused on nano structure induced surface plasmon resonance (SPR) between dielectric and metal interfaces and their applications. These nano structures could be naturally formed random structures or specially designed periodic structures. Therefore, there are two closely related research thrusts in this project. In first thrust, researchers study the surface plasmon resonance phenomena for ultra thin nano-particle metallic films (usually less than 10nm) with the means of real time spectroscopic ellipsometry (RTSE) measurement. In the second thrust, the SPR is utilized on thin metallic film to design a SPR enhanced grating coupler to vertically couple light from fiber to SOI based Silicon nano-wire/nano-waveguides. Additionally, the research is published in refereed international journals and conference proceedings. Research work is also disseminated through presentations at international conferences.

Center for Environmental Cellular Signal Transduction

- Investigations focused on prokaryotic (bacterial) model systems have begun to provide important new insights into the effects of the host microenvironment on bacterial metabolism and development. For example, studies of a *P. aeruginosa*, a pathogenic microbe, indicate that the host microenvironment affects both the genetic and phenotypic 'evolution' of this bacterium. Novel observations suggest a potential dependency of *P. aeruginosa* on enzymes required for fatty acid metabolism that could only be provided by the host. Thus, studies suggest a new pathogenic mechanism involving specific microenvironmental interactions between bacterium and mammalian host which could be exploited to regulate the stability, and infectivity of this bacterial pathogen. The mammalian enzymes affecting critical bacterial metabolic events are anticipated to be important therapeutic targets.
- Work in the CECST has also shed new light on evolutionary, ecobiological, developmental and physiological mechanisms affected by macroenvironmental conditions. In the past year, studies, also involving marine invertebrates, provided novel perspectives on molecular phylogeny and gene flow. Genetic data, generated with CECST support from organisms collected at intervals

across the Antarctic circumcontinental current, indicates that gene flow can occur across a greater temperature gradient than has been previously thought. These important data have been interpreted to suggest that the diversity of marine Antarctic fauna is greatly underestimated.

- Interactions between CECST laboratories are contributing to the development of new approaches to the design, analysis and interpretation of microarray data. A new collaboration takes advantage of the *Vitis* (grape) genome in microarray-based functional genomics studies. Efforts are aimed at understanding the genetic basis of speciation, which has been a fundamental goal of biology ever since Darwin. Working with biostatisticians in the Section on Statistical Genetics, a CECST satellite laboratory, microarray technology is being exploited to identify mechanisms that contribute to the reproductive isolation of species and subsequent patterns of evolutionary diversification. To date, work has been aimed at both array design and refinement of new bioinformatic techniques applicable to such investigations. Techniques being developed for this project using the *Vitis* model will be applicable to other eukaryotic and prokaryotic systems.

Center for Optical Sensors and Spectroscopies

- COSS developed a new approach of ultrabroadband lasing in the middle-infrared spectral range under direct electrical excitation. The first ever room temperature electroluminescence in the Mid-IR spectral range was achieved in bulk n-type Cr:Al:ZnSe.
- A novel method of TM doped II-VI Nano dots fabrication based on laser ablation in liquid environment was demonstrated. This technique has considerable advantage over chemical synthesis of doped II-VI Nano dots due to possibility of doping nanocrystals with a variety of TM ions using laser ablation of thermo-diffusion doped polycrystalline II-VI targets. For the first time TM doped II-VI Nano dots demonstrated strong mid-IR luminescence. It opens a new pathway for future optically and electrically pumped mid-IR lasers based on TM doped quantum confined structures.
- Cr:ZnSe thin films were grown by molecular-beam epitaxy (MBE) with the long-term goal of demonstrating a new route for the development of transitional-metal-doped semiconductor lasers. Photoluminescence (PL) and PL lifetime measurements of doped thin films and bulk crystals indicate that Cr is incorporated in the optically active Cr²⁺ state.
- COSS developed a fabrication process of optical material based on hot-pressed Cr:ZnSe ceramic with an optical quality sufficient for the first demonstration of gain-switched and continues-wave lasing. The presented results demonstrate the first proof of the feasibility of the mid-IR laser systems based on hot-pressed ceramic. Further technological advances in raising the pump absorption and decreasing the passive loss of hot-pressed ceramic are needed for achieving large impact factor of hot-pressed ceramic on synthesis of large-scale mid-IR laser media.
- COSS has developed a new class of materials for sensor protection, transition metal complexes of phosphine-substituted oligothiophenes whose nonlinear absorption properties can be tuned by the appropriate choice of transition metal and oligothiophene. These materials have demonstrated promising optical limiting in the blue spectral region, and we have begun testing these materials and developing complexes with improved solubilities for higher concentration materials with improved nonlinear absorption characteristics.
- A new approach for fabrication of gold and silver nanoparticles by means of laser ablation has been developed. Surface enhanced Raman measurements enabled by these nanoparticles

provided detection of Endosulfan I concentrations as low as 0.01 µg/L, which is comparable with detection safety limit routinely used in environmental monitoring.

Extended Alabama Structural Biology Consortium

- EASBC has determined the structure of a human protein that is a target for treating RNA viral infections. A patent has been filed for this structure, which provides the basis for ongoing structure-guided drug design.
- >100 proteins expressed
- 27 purified and in crystallization trials
- 12 proteins with crystals and diffraction patterns
- 5 crystals with complete synchrotron data sets collected

D. Self-Sustainability Highlights

E.

The following describes plans to ensure positive outcomes of the projects to be sustained beyond the duration of the grant (see more details in Appendix 5).

Alabama Center for Nanostructured Materials

- Nanotechnology is a growth area in Alabama universities with several existing centers and numerous faculty researchers at UA, AU, UAH, UAB, USA, TU, and AAMU. To strategically address nanotechnology issues in the context of barriers to competitiveness and based on identified strengths in the state, Alabama EPSCoR has formed the Alabama Center for Nanostructured Materials with Tuskegee University as the lead institution. With the support of and through the administrative structure of Alabama EPSCoR and connections to ARA and other state agencies, ACNM forms the nucleus for an extended nanotechnology research cluster.

Center for Environmental Cellular Signal Transduction

- One of the cornerstones of sustainability for the CECST is the fact that it has grown out of the AU CMB Peaks of Excellence Program. The AU CMB Peak is an interdisciplinary program, encompassing four colleges (Science and Mathematics, Agriculture, Veterinary Medicine, and Human Sciences), that is permanently funded by a line-item in the University's budget. This program provides a firm base upon which further funding can be built. The AU CMB provides laboratory space for the core molecular facility, salaries for its director and assistant director, and annual funding for service contracts on all core instrumentation. This means that all state-of-the-art instrumentation acquired under the CECST award will be professionally maintained, supervised, and easily accessible to all CECST-affiliated researchers. Because the foundation infrastructure is already in place, the CECST can be sustained beyond the period of the EPSCoR award without having to obtain any commitments from Auburn University. It also means that a critical mass of faculty has already been identified and brought together – this group, which has been augmented by the CECST award (see new hires below), will become self-sustaining through existing and new research collaborations under the CECST umbrella.

Center for Optical Sensors and Spectroscopies

- Funding from NSF/EPSCoR under the present Research Infrastructure Improvement (RII) grant is vital for helping the COSS to become nationally competitive. However, in order to

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augment the funds received from the RII grant, and to sustain the COSS after the period of performance of the RII grant has lapsed, COSS personnel have been very active at submitting a number of proposals to other agencies, and a number of these proposals have already been awarded.

Extended Alabama Structural Biology Consortium

The Extended Alabama Structural Biological Consortium presented evidence of improved research competitiveness with the proposed agreement to provide the structural biology support for the Hudson-Alpha Institute for Biotechnology. The activities of this center show solid linkage to industrial partners and state economic development objectives and investments. The Consortium is also competitive enough to obtain near sustainability without Alabama EPSCoR funding. – NSF EPSCoR Reverse Site Visit Review Panel (October 2006)

E. Overview of Alabama NSF EPSCoR Budget Oversight & Research Funding

▪Budget Oversight

An extensive budget oversight program was designed by the Alabama EPSCoR to provide monthly data on Center and sub-awardee invoicing between institutions. This mainly consists of a staff member of the state office calling Center offices and contracts and grants personnel each month to verify if paperwork has been processed and is correct, and invoices have been mailed to the proper institution and recorded. Some 50-60 people must be contacted during the course of this process.

2006 NSF EPSCoR RII REPORTING PERIOD

Sponsored Center	*Year 1	**Year 2	Year 3	Total
ACNM(TU)	\$500,000	\$600,000	\$700,000	\$1,800,000
CECST(AU)	\$500,000	\$500,000	\$500,000	\$1,500,000
COSS(UAB)	\$500,000	\$500,000	\$500,000	\$1,500,000
EASBC(UAH)	\$500,000	\$400,000	\$300,000	\$1,200,000
Total	\$2,000,000	\$2,000,000	\$2,000,000	\$6,000,000

Fiscal YR Award Period: *5-1-05/4-30-06, **5-1-06/4-30-07

▪Research Funding

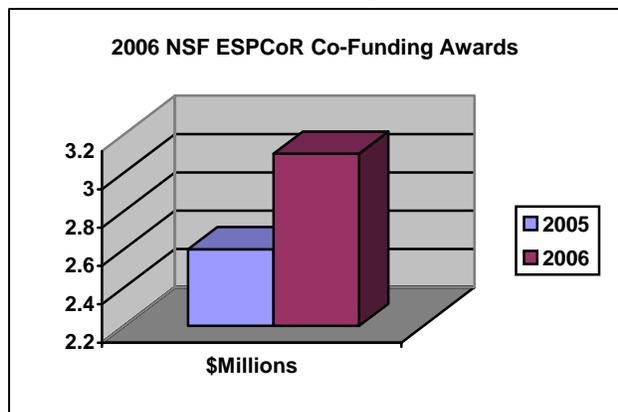
The ultimate goal of the Alabama EPSCoR program remains to increase the amount of research and development funding in the state. With limited resources, the research institutions must focus their efforts on improving the conditions for state researchers to perform their tasks. Three funding areas are monitored that enhance the state’s research infrastructure and capabilities. These programs include the: 1) NSF EPSCoR Research Infrastructure Improvement (RII) Award, 2) NSF EPSCoR Co-Funding Mechanism, and 3) non-NSF EPSCoR funding.

▪NSF EPSCoR RII Award

The mission of the Alabama NSF EPSCoR RII program is to stimulate and support the growth of intercampus, interdisciplinary, multi-investigator research Centers of Excellence founded on existing and emerging strengths in Alabama universities. Those strengths are leveraged to build sustainable

centers capable of competing for federal funding while serving the needs of technology-led economic development and workforce development in the state. This is critically evident in the newly created Graduate Research Scholars Program funded by the State of Alabama (see Section F).

■NSF EPSCoR Co-Funding Mechanism



NSF EPSCoR Co-funding provides joint support for certain meritorious proposals submitted for ongoing research, educational and special emphasis competitions by researchers in EPSCoR jurisdictions. If a project is found worthy during the review process, and not funded through the programs to which they were submitted, a co-funding mechanism may be requested to support the project.

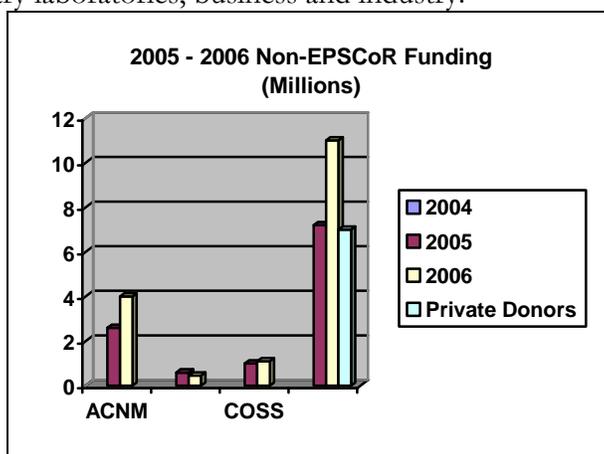
In these cases the Program Officer decides whether to recommend a proposal for funding

and the proposal undergoes a review process to determine if it will be eligible for co-funding support. Co-funding support is dependent on the quality of proposals submitted from EPSCoR jurisdictions and the availability of the EPSCoR budget funds for co-funding. The following is the breakdown by Institution for 2006.

Auburn	1,296,235
UA – Birmingham	61,774
Alabama A&M	82,500
South Alabama	395,300
UA – Tuscaloosa	580,000
Tuskegee	512,500
3 Corporations	<u>148,625</u>
	\$ 3,076,934

■Non-NSF EPSCoR Funding

Non-EPSCoR funding continues to develop as the Centers showed significant strength from 2005, particularly so in the EASBC program with private donor contributions totaling \$7 million for research infrastructure and development. The awards came from other state research institutions, federal, private and military laboratories, business and industry.



F. Outreach and Diversity

▪**LSAMP:** Fifteen undergraduate students participated in the EPSCoR/LSAMP Summer Research Conference in July 2006. The Louis Stokes Alliance for Minority Participation (LSAMP) program is designed to develop strategies to strengthen the participation and increase the number of minority students completing baccalaureates in science, technology, engineering and mathematics (STEM) fields. These students gave presentations on topics including: mathematical modeling for disaster planning, properties of materials, immune responses, insect salivary

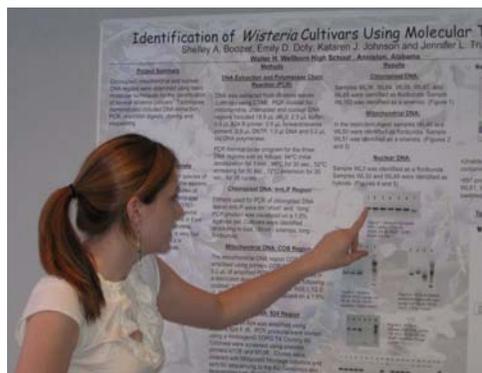


proteins, stresses in plants, parallel processing, nanoparticles for imaging and detection of cancer, toxicity, structure of Lycopene, suspension design for a racecar, and robotics. Ms. Sheri Powell, Alabama EPSCoR Program Administrator and Julio Lopez-Ferrao, NSF EPSCoR Program Director, attended the conference. The students were from Auburn University, Tuskegee University, The University of Alabama at Birmingham, and the University of Alabama in Huntsville.

▪**TEA:** The Teaching Enhancement Award (TEA) program was designed to provide exposure to bioscience and related technology for pre-college teachers and their students. Seven high school teachers and their students, representing five high schools (both public and private), completed the program. The student-teacher pairs were chosen based upon formal applications from a competitive pool.



Van Nguyen (left; student) and Cindy Shaw (right; teacher), from Auburn High School, prepare to organize their next bin microbiology experiment.



Shelly Boozer, a student from Wellborn High School, gets right to the point as she explains how nuclear DNA can be used to identify plant cultivars.

The Teaching Enhancement Award (TEA) program was designed specifically to provide exposure to bioscience and related technology for pre-college teachers and their students. Seven (7) high school teachers and their students, representing five high schools (both public and private) from Alabama, completed the TEA program on July 28, 2006. The student-teacher pairs were chosen based upon formal applications from a competitive pool.

Students spent three weeks in residence on the AU campus working in AU-CMB/CECST-affiliated laboratories under the direction of faculty mentors. They were joined by their teachers during week three. While in residence, TEA students and teachers

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were required to attend "lunch time lectures" in specific disciplines including: microbiology (general, pathological, environmental); nutrition and metabolism; and virology and epidemiology (using the 'bird flu' model as a basis for discussions).

Exit questionnaires revealed that all students and teachers - "would encourage students and teachers at my high school to participate in the TEA program next year". A final public presentation of all projects, made by TEA student-teacher pairs, was held at the Auburn University Alumni Center. This activity was attended by parents, as well as by several high school administrators representing non-scientists and the public.

▪**Alabama Science in Motion:** The State of Alabama has funded a state-wide high school science initiative in Biology, Chemistry, and Physics which is centered on a network of traveling vans. The *Alabama Science in Motion (ASIM)* program provides high school students with laboratory experiences with modern instrumentation and offers their teachers professional development opportunities through workshops and mentoring links with university faculty.



COSS is currently providing an enabling role in undergraduate and graduate education via the "Alabama Science in Motion" project where a van filled with science experiments visits local high schools. A COSS related experiment on the portable Raman system for identification of toxic organic pollutants has been designed for the Alabama Science in Motion Program. This program is being coordinating through UAB and UA.

▪**E-MAP:** Training opportunities were provided by COSS mentors via the Engineering - Math Advancement Program (E-MAP) at UA, which is designed for entering freshman students who do not possess the necessary skills to directly enter engineering disciplines and therefore require remedial math classes. Data collected by UA's College of Engineering revealed a two-fold problem impacting student performance related to math skills and motivation. Roughly half of the entering freshman engineering students required at least one semester of pre-calculus to be considered engineering curriculum ready. This has serious repercussions on the student's progress by delaying the start of core engineering classes by up to a full year. The E-MAP program, jointly funded by the National Science Foundation and the University of Alabama, College of Engineering, is a summer residence class for undergraduates with the goals of increasing student retention and graduation rates and increasing the number of engineering and science graduates employed in the state of Alabama. The E-MAP math classes are designed around pre-calculus, algebra and trigonometry skills. By offering these math classes and living laboratories before the freshmen start in the fall term, they will be better prepared to excel in engineering and science programs.

E-MAP recruiting activities are targeting rural, historically low per capita income communities, and reserves 33-40 percent of enrollment space for underrepresented groups. Outreach support for the COSS/E-MAP project was provided in 2006 through the Environmental Institute at UA (UAEI) and the West Alabama Chamber of Commerce's Environmental Task Force (ETF). Staff from the UAEI and ETF worked with COSS/E-MAP staff to design the sampling event at Lake Tuscaloosa in a manner demonstrating environmental water quality issues in Tuscaloosa County. Data collected

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by the students will be used by the EFT as part of their work to ensure clean water for the area. The project allowed students to take part in a real world project providing a beneficial service to society. After the event, EFT members spoke with a subset of the E-MAP students interested in pursuing environmental careers about their sampling event and methods for ensuring water quality.

▪**Agri-Trek:** The Agri-Trek Summer 2006 Program was held at Tuskegee University from June 13-23, 2006. Eight African-American high school students, eight males and two females, were mentored by one M.S. and three Ph.D. students. The high school students participated in introductory seminars on Materials Science Engineering, visited labs to learn about nanoparticles, made filaments and fibers, and worked with materials used for bullet proof vests.

In addition, the students were introduced to Microsoft Excel, Word and Power Point and were given information about entrance exams, financial assistance, advice on how to prepare for college, and job opportunities.



Agri-Trek Summer 2006 Participants and Mentors



Agri-Trek Participants Eric Roussel and Andrew Bryant display their bridge making skills.

The students then participated in a project where they were divided into teams and asked to build a bridge. The bridge had to meet size specifications and be made using Popsicle sticks, wood glue and cutting tools. The students were asked to develop an abstract, list their resources, explain the basis of their design and then test the bridge for load bearing capacity.

The bridges were ranked according to their efficiency. In a poster presentation, the students presented their research, explained the failure patterns and factors that affected the strength of their bridge, and how their design could be improved.

G. Graduate Research Scholars Program

The mission of the Alabama EPSCoR is to foster the growth of research capacity and capability in the State of Alabama in order to make the institutions of higher education more competitive for federal funding. A significant element in building both research capacity and capability is people and more specifically, graduate students.

In 2006, the Alabama State Legislature through the Alabama Commission on Higher Education and Alabama EPSCoR funded a Graduate Research Scholars Program (GRSP). Each year twenty (20) exceptional graduate students will be funded at \$25,000 each for a total of \$500,000. The graduate students will be selected competitively by the Center Directors from the four (4) NSF EPSCoR Research Infrastructure Improvement (RII) Centers of Excellence (Center).

Renewals will be granted each year subject to satisfactory progress in a given year and available funding. The goal of the Alabama EPSCoR GRSP is to invest in Alabama universities that will expand research output and attract quality graduate students. The objective of the program is to provide a highly trained workforce to fuel the growth of high technology companies in Alabama.

In the first year of the program (October 2006), other very positive elements are evolving as well. All seven research institutions are involved in GRSP. The NSF EPSCoR Center of Excellence Directors are utilizing other limited funding sources to supplement the GRSP funding, allowing more students to participate in the program. Rather than having the maximum 20 students the GRSP initially funded, 25 students are participating. Of the 25, 14 are women, six of whom are African American, and one young man is a descendent from the North Alabama Cherokee Tribe.

Six students received a fellowship or scholarship totaling \$109,000 from other sources in addition to their support by the GRSP. In the past and most recently during the National EPSCoR Conference in October 2006, the director of NSF EPSCoR stated during his presentation that state funding provided to manage the Alabama EPSCoR office allowed more critical research dollars to reach their full potential.

These students are very motivated as indicated by their educational goals. Presently, eight of the 25 students are working toward their M.S. degree or equivalency. The remaining 17 are working on their Ph.D. What is interesting; however, are the student's long-term educational goals. Twenty-three of the 25 students plan to earn their Ph.D. All of these students are lead by dedicated, exceptional faculty advisors.

Upon formally announcing the location of the Hudson-Alpha Institute for Biotechnology and the creation of a 120-acre biotechnology site to be named the Cummings Research Park Biotech Campus in Huntsville, Governor Riley stated that, "we actively and aggressively need to position Alabama to become a worldwide leader in biotech research." The GRSP is already demonstrating its capacity to develop the research and scientific workforce infrastructure that will support this effort. The concentrated area of employment desired by the majority of the GRSP students is in biotechnology.

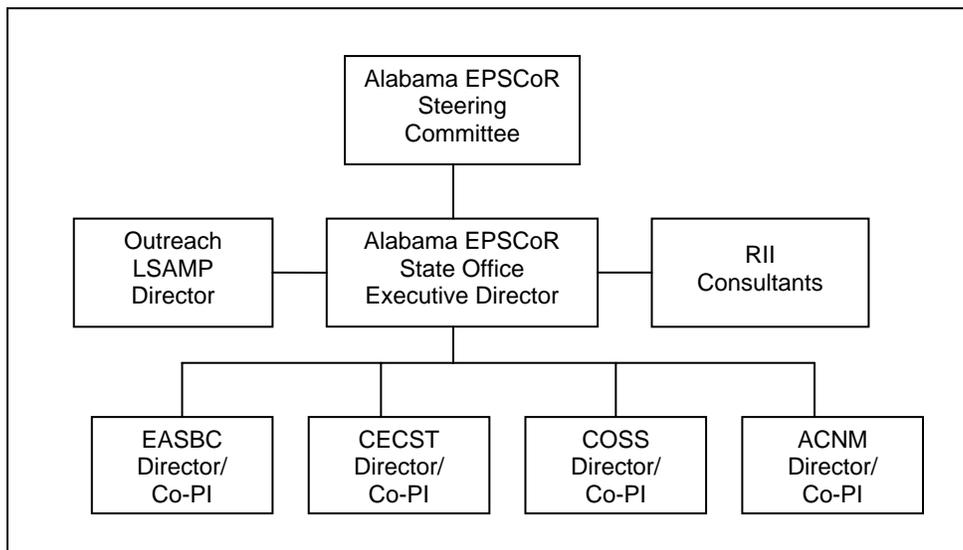
In the next NSF EPSCoR Research Infrastructure Improvement proposal, the goal of Alabama EPSCoR is to create a new statewide nano-biotechnology alliance incorporating existing nano-biotechnology laboratories and centers and fund the growth of a statewide nano-biotechnology program. The GRSP is well-designed to educate and train these students and will play an integral role in developing Alabama's future workforce.

H. Alabama EPSCoR Administration and Management

Alabama EPSCoR is administered by a supervising State Steering Committee, chaired by Dr. Keith Harrison and co-chaired by Dr. Elizabeth French, a State Executive Director, Dr. Keith McDowell, and independent Program Directors (Appendix 3) to operate each of the statewide federal agency programs. The Alabama Commission on Higher Education (ACHE) funds the Alabama EPSCoR State Office through a line-item in the Governor's budget. In 2006, ACHE secured an additional \$500,000 through Senator Steve French (also on the Steering Committee) to fund a Graduate

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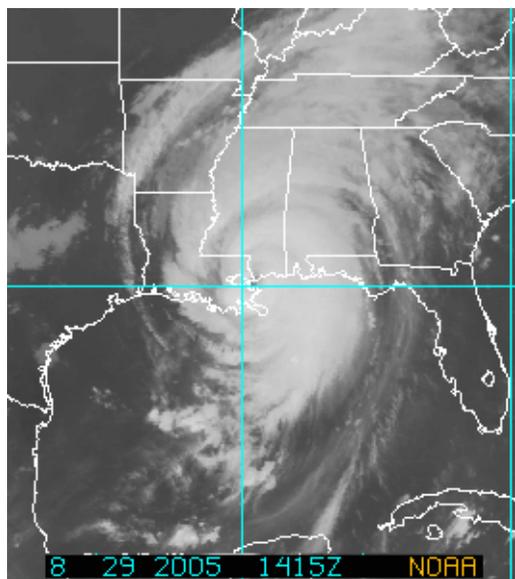
Research Scholars Program (see G. GRSP). Other state agencies involved in the Alabama EPSCoR program include the Alabama Development Office and the Economic Development Partnership of Alabama.



Seven research institutions are represented by Alabama EPSCoR. Two of these institutions are Historical Black Colleges and Universities (*HBCU):

- *Alabama A&M University
- Auburn University
- *Tuskegee University
- The University of Alabama
- University of Alabama at Birmingham
- University of Alabama in Huntsville
- University of South Alabama

NSF EPSCoR Katrina Study



NSF EPSCoR awarded the Alabama EPSCoR program a grant to coordinate development of a Hurricane Katrina recovery plan for educational research initiatives damaged within Alabama, Mississippi and Louisiana. The \$200,000 grant enabled EPSCoR to develop plans which address both short-term needs, such as additional clean-up of damaged research laboratories, and assistance with lost or damaged research data, as well as long-term needs, such as reconstruction of laboratories and other research infrastructure.

A few of the hardest hit research facilities in the state are the Dauphin Island Sea Lab and its research stations along the Gulf. Twenty-one of the state’s universities and four-year colleges are member institutions of the lab, which is the state’s marine education and research center.

University of South Alabama researchers developed an inundation map of the storm surge to understand the extent of the flooding and are installing observation sites to collect future data to

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understand the complex processes that occur when a hurricane makes landfall. Data will be made available to the National Weather Service forecasting offices and used to create a numerical weather model specifically for hurricane education and research.

South Alabama K-12 educational facilities including Mobile County School system, Bishop State Community College, University of South Alabama, Dauphin Island Sea Lab, and the Gulf Coast Research Laboratory in Ocean Springs, Mississippi were accessed for wind and flood damage. These facilities and the surrounding communities were affected by damage to structural, transportation, communication and civil infrastructures including the destruction of labs, buildings, piers, vehicles, boats, roads, waterways, power grids, telephone, and water/sewer systems.

NOAA scientists characterize Hurricane Katrina as one of the costliest and deadliest storms to hit the United States. Hundreds of thousands of people were displaced including an excess of 400,000 K-12 students and 73,000 college students. Studies are being conducted to document the impact on the educational experience including how a rapid influx of students changed the educational environment; the long and short-term consequences for students and their families, and coping mechanisms for similar events in the future.

Presentation to Alabama Commission on Higher Education

The Alabama Commission on Higher Education (ACHE) is the state funding agency for the state office of the Alabama EPSCoR program. ACHE, a statewide 12-member lay board appointed by the Governor, Lieutenant Governor, and Speaker of the House and confirmed by the Senate, is the state agency responsible for the overall statewide planning and coordination of higher education in Alabama, the administration of various student aid programs, and the performance of designated regulatory functions.

Annually, the Alabama EPSCoR Executive Director provides a report to the ACHE Board of Commissioners regarding the calendar year activities of the state office. This report discusses expenditures of state dollars to operate the Alabama EPSCoR office, an overview of statewide EPSCoR agency activities for NSF, DOE, EPA, NASA, and USDA, and projections for the next calendar year. A synopsis (see Appendix 4) of the Alabama EPSCoR report is prepared for the Steering Committee to discuss prior to the publicly scheduled meeting. A formal presentation by the Alabama EPSCoR Executive Director and a detailed hardcopy report is provided to the Steering Committee at the time of this meeting.

2006 Alabama EPSCoR Annual Meeting/NSF Day Workshop

The Alabama EPSCoR Annual Meeting and the NSF Day Workshop were held jointly in March 2006 at Tuskegee University Kellogg Conference Center. Both meetings attracted more than 130 researchers and staff from across Alabama.

NSF EPSCoR RII Center Directors addressed their research and accomplishments. Graduate students from each Center were also invited to discuss their role in research efforts and how the NSF EPSCoR program helped advance them to this stage in their academic career.

NSF Program Directorates provided overviews in Biological Sciences, Computer and Information Science and Engineering, Education and Human Resources, Engineering, Mathematical and Physical Sciences and Social, Behavioral and Economic Sciences.

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In fiscal year 2005, NSF made 9,784 awards out of 41,751 proposal submissions. It is estimated that by 2007 there will be nearly 180,000 senior researchers, other professionals and students involved in NSF research across the country.

Reporting

- 2005 Annual NSF RII Report
- 2005 Annual Report to the Alabama Commission on Higher Education
- NSF RII Interim Report
- Center Director's Quarterly Report
- External Site Review Report

National Conference Participation

Dr. Elizabeth French and Dr. Keith McDowell were invited by the National EPSCoR Conference planners in Lexington, Kentucky to represent Alabama EPSCoR.

Dr. French discussed "The Alabama Experience" - how the state has been successful in overcoming geographic disadvantages and institutional self-interests by emphasizing research clusters that cross campus and departmental boundaries.

Dr. McDowell was asked to moderate the panel, "Culture of Innovative Strategies." He commented that "global competitiveness is essential for our country and commercialization of university intellectual property is a major component." Dr. McDowell further stated that "the EPSCoR program should serve as a key experimental program to test-bed new approaches to commercialization, especially given that EPSCoR jurisdictions must be competitive if the United States is going to be competitive."



Tuskegee University Materials Science and Engineering Ph.D. student, Ms. Merlin Theodore (second from left), was invited to participate in the Annual National EPSCoR Conference poster session in Lexington, Kentucky, November 7-10, 2006. Ms. Merlin, originally from the Virgin Islands, hopes to complete her Ph.D. in December 2007. Her poster was entitled "Characterization of Epon 862 Reinforced with Functionalized MCNT".

Congratulating Ms. Merlin for her efforts are (left to right): Dr. Keith McDowell, Alabama EPSCoR Executive Director, Dr. Mahesh Hosur, Ms. Merlin's Faculty Advisory and Director for the Alabama Center for Nanostructured Materials, Dr. Elizabeth French, Alabama EPSCoR Vice-Chair and Director for the Alabama Commission of Higher Education, Mr. Julio Lopez-Ferrao, NSF EPSCoR Program Manager.

EPSCoR State Office External Site Review

Alabama EPSCoR staff Sheri Powell, Program Administrator and Charlotte Nix, Program Coordinator were accompanied by External Reviewer, Dr. Ed Moscovitch to conduct an External

Site Review at each of the four Centers of Excellence the last week in August 2006. The purpose of the visit was to assess the progress toward meeting each Center's goals and see first hand some of the exciting research going on in Alabama. An external review is part of the project's Program Monitoring and Assessment Plan described in the proposal. Dr. Moscovitch's report is posted on the Alabama EPSCoR website.

I. Conclusion

The Alabama EPSCoR program seeks to continue its success with the RII program with the next funding cycle. The Reverse Site Visit Panel was extremely impressed with the prospects of the EASBC program graduating at the end of this funding period. This Center was previously funded for three years through an RII and carried forward in the current RII for another three years. This provided strong evidence to backup data from principal investigators over the years that have suggested that it takes five to six years to build a self-sustaining center of excellence.

On November 13, 2006 the Alabama EPSCoR Steering Committee held its quarterly meeting through a telephone conference call. One of the discussion items was to finalize a plan for the next NSF EPSCoR RII proposal. After discussing the thematic input from potential principal investigators and reviewing information gathered from numerous meetings including a Reverse Site Visit at NSF, the Annual National EPSCoR Conference for 2006, and a nano-biotechnology planning meeting in Birmingham as well as considering the departure of the NSF EPSCoR Director, the Alabama EPSCoR Steering Committee approved the following recommendations for the next Alabama NSF EPSCoR RII proposal:

- Continue to fund three of the current Centers of Excellence but graduate these centers during the middle of the next RII funding cycle if it is a five or six year award as expected.
- Review the thematic one-page research documents to incorporate those into the current three centers and add new thrust in nano-biotechnology.
- Ask the current Center Directors to expand their search for other state researchers for broader participation for cross-cutting statewide collaboration.
- Create a new statewide nano-biotechnology alliance incorporating existing nano-biotechnology laboratories and centers and fund the growth of a statewide nano-biotechnology program.

As a result of the decision by the Alabama EPSCoR Steering Committee, Alabama EPSCoR will not conduct a statewide competition to determine the structure of the next NSF RII proposal, but will work through Vice-Presidents for Research to prepare a proposal consistent with the recommendations of the Alabama EPSCoR Steering Committee.

APPENDICES

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(VACANT)

Alabama Department of Economics and Community
Affairs

Alabama EPSCoR's Response to Panel Summary NSF EPSCoR Reverse Site Visit for Alabama October 24, 2006

Appropriateness of Investments to Increase Research Capacity:

- Alabama's strategy for focus of the RII investment revolves around a center model. The current RII identifies and supports four Centers, each with a core identified faculty group and stated focus. Each Center spans multiple universities in the State, effectively connecting their research and outreach endeavors. Center investment is often sustained across multiple RII awards based on the performance and milestones sought by each activity indicating a disciplined strategic approach.
- The report provided during the reverse site visit indicates that the Center investment strategy is working. Three prior centers have been shown to have graduated and one of the four centers in the current RII is at or near this point in its maturity. Panel members aware of Alabama's past efforts indicated the State had come a long way in EPSCoR.
- All but one Center had an appropriately focused research scope. The Center for Environmental and Cellular Signal Transduction needs to articulate its mission more succinctly and focus its activity. The CECST scope appeared far too diffuse to effectively define and focus resources to achieve measurable success traceable to specific investments.

RESPONSE:

The scientific mission of CECST is to develop a more complete picture of how biomolecular networks contribute to cellular and organismal resilience in the face of micro- and/or macro-environmental challenges.

The CECST mission is being addressed through a newly established interdisciplinary, inter-institutional research effort involving a multi-organismal 'systems' approach in which life scientists in the CECST are working in and at the nexuses of disciplines including developmental biology, physiology, and evolution. Within this concept, the CECST provides both the physical and organizational infrastructure that serves as an umbrella under which a diversity of life science researchers are united. One of the underlying and foundational goals of the EPSCoR program is to enhance the competitiveness of researchers (especially young investigators). The CECST achieves this goal by uniting a diverse group of scientists, with a wide array of expertise, under a common research theme. The CECST serves as the environment in which researchers come together, identify complementary ideas and experimental approaches, and initiate collaborations. This has already occurred to a significant degree in the first year of the program.

Research of this kind was recently identified as an important new interdisciplinary convergence in science, the conceptual *focus* of which was defined clearly by Dr. Warren Burggren, a member of the CECST external advisory group, as "comparative developmental physiology" or CDP. The term "comparative", which is central to understanding both the fundamental concepts of adaptation and its

evolution, necessarily includes the study of a variety of organisms along the spectrum of physiological and molecular responses. Adaptive responses, by nature, are varied and complex. Thus, while the scope of CECST research may appear diffuse as a result of the diversity of organisms studied, the central concept is highly focused on identification of fundamental cellular and molecular mechanisms of stress resistance and adaptation. It is important to study a variety of model systems if only to differentiate between mechanisms common to the majority of living systems versus those which are unique and species-specific.

In a seminal publication, Burggren and Warburton (See: Annual Reviews of Physiology 2005. 67:203-223) noted that:

“[Comparative developmental physiology] occupies a clear crossroads linking evolutionary biology, physiology, and developmental biology. Not surprisingly, the experimental approaches and methodologies employed by comparative developmental physiologists encompass most of contemporary biology” (Burggren and Warburton, 2005, P. 211; emphasis added).

Research in the CECST is focused on questions that are not only central to CDP, but to the missions of several organizations under the NSF Directorate for Biological Sciences, including, but not limited to, Environmental Biology (DBI), Ecological and Evolutionary Physiology (EEP), Emerging Frontiers (EF), Integrative Organismal Biology (IOB), and Molecular and Cellular Biosciences (MCB).

Investments in the CECST are being used to develop core analytical technologies and expertise, much of which was unavailable on a statewide basis prior to establishment of the CECST. The requirement for these new tools and talents is not only shared by ‘contemporary biologists’ working in CDP-related fields, but is absolutely necessary if CECST scientists are to compete for research funds. Moreover, these investments insure that Alabama, through the CECST, can provide 21st century educational and technical training experiences to their students at all levels. This, in turn, allows us to address a secondary, but central element of our mission, which is to contribute to the development of a modern scientific workforce that is ready and able to contribute to the ‘innovation ecosystem’ now evolving in Alabama.

Evidence of Improved Research Competitiveness:

- Each of the four centers supported under the current RII demonstrated to different extents metrics indicating their movement towards sustainable competitiveness. This being said, uniformity in choice and presentation of center metrics relative to baselines would be very useful in comparing relative success and degree of maturity of the efforts.

RESPONSE:

The Executive Director and Center Directors agree and discussed this point immediately following the RSV. A model similar to that presented by the COSS may be useful in future reporting exercises. This model was complimented by the RSV panel as a baseline with *presented evidence of improved competitiveness with increases in publications, grants, industrial agreements, and patents from 2004 to 2006. Presentation of a baseline year is a useful method of evaluating progress.* COSS explained that it was beneficial to have the 2004 data to establish a baseline of the pre-RII award data.

Dr. Sherry Farwell, former NSF EPSCoR Director, presented a metrics outline at the Program Director's/Program Administrator's meeting in Lexington, Kentucky in November 2006. Alabama EPSCoR will devise its baseline metrics around this outline and the COSS baseline and incorporate the plan into its strategic plan that includes assessment. Dr. Farwell's metrics outline is below:

	Quantitative Metrics	Qualitative Metrics/Narratives
1. Research production	Publications Patents/Intellectual Property	Major research success stories Participation in panels, boards, etc.
2. Research portfolio quality	Competitive awards from NSF & other agencies Federal Centers (competitive)	Sustainable research clusters Unique research areas
3. Human resource development	Research faculty & staff Students & post-docs K-12 outreach/teachers Underrepresented groups	Pipeline development for STEM Workforce Integration of research, education and innovation
4. Research investments and materials	Projects with multiple institutions Collaborative efforts that produced centers proposals	Communication networks/Clusters of interacting researchers Linkages between research and innovation
5. Research collaboration and networking	Funding allocated by state Funding allocated by university Teaching release time	Activities of state EPSCoR Committee State S&T plan IHE research climate

The majority of these metrics were addressed by all Centers; however, it was not as obvious as in some presentations. Alabama EPSCoR will develop a comprehensive model for all Centers to follow; however, the CECST agrees that "articulation" of such measures should be based on metrics appropriate to the center in question. For example, a "discovery-based" center such as the CECST has a very different mission from an engineering-based center. It is imperative that reviewers take in consideration these differences.

- The panel viewed the collaborations inside and outside the state that were detailed by each center as a significant strength.
- The Center for Environmental and Cellular Signal Transduction has a good record of proposals submitted with seven to NSF, four to NIH, one to AiF (German company), and one to NOAA. It is not clear how many of these were funded nor whether institutions other than Auburn, which is the lead for this Center, were involved.

RESPONSE:

Funding success was documented in the CECST program by indicating dollar amounts in the presentation (slide 26). Again, (as indicated in metrics discussion above), a single reporting standard for all centers would help to avoid confusion. Alabama EPSCoR will work to achieve a standard assessment program based on common metrics. At the time of the RSV, CECST had one major inter-institutional proposal pending that involved both AU and AAMU (Dr. Soliman). Inter-institutional proposals are anticipated to increase with time as investigators interact.

- The Center for Nanostructured Materials received three major awards from the NSF, which is evidence of national competitiveness. The Center should continue this progress and include other sources of funding to diversify its portfolio.

RESPONSE:

The ACNM received three major funding awards from NSF over the past 1½ years (since the program was funded by RII). ACNM also received funding from DoD (Air Force, Army, Navy) and DOE ranging from ~ \$75K-450K/year. The program is working with private industry through SBIR grants. Research at Alabama A&M University, the major ACNM partner, is quite diverse in its funding. AAMU's research funding comes from various areas of the government including: U.S. Army, SDC, NASA-Marshall Space Flight Center, Department of Energy, and the National Science Foundation. The corporate sector contributes as well, for example: Nichols Research Corporation, Wiley Labs, United Applied Technology, Rantek, and the United Technology Research Center. In the future, ACNM will strive to work with other University partners within the state and other faculty members within the University to broaden nanotechnology research in nano-electronics and nano-biotechnology.

- The Center for Optical Sensors and Spectroscopies presented evidence of improved competitiveness with increases in publications, grants, industrial agreements, and patents from 2004 to 2006. Presentation of a baseline year is a useful method of evaluating progress.
- The Extended Alabama Structural Biological Consortium presented evidence of improved research competitiveness with the proposed agreement to provide the structural biology support for the Hudson-Alpha Institute for Biotechnology. The activities of this center show solid linkage to industrial partners and state economic development objectives and investments. The Consortium is also competitive enough to obtain near sustainability without Alabama EPSCoR funding.

COMMENTS:

The Hudson-Alpha Institute for Biotechnology (HAIB) pursues the objective of developing and using biotechnology to personalize medicine, while creating economic growth and inspiring Alabama's youth to pursue careers in science. In addition, space is allocated for high school- and college-level outreach and training programs. The HAIB will foster cooperation between its scientific

research staff and biotechnology companies to shorten the time between the development in the lab of new and promising technologies and their availability for application.

EASBC seeks to maintain sustainable collaboration with the HAIB by continuing to provide structural biology support for the Institution. The success of EASBC also produced two spin-off companies and a third is seeking \$12M capitalization.

Effective linkages among Research, Education and Innovation:

- Each center presented education and outreach efforts that were integrated within their research, coupling student participants to the activities of the center and its faculty members.
- Intellectual property was valued and its development promoted by each Center activity. A path for IP cultivation and use was indicated for each center's innovations. Effective use of this path was demonstrated to varying extents by each Center.
- TU does not have a technology transfer office and it was not clear that other institutions in the state with established offices were providing this service to TU. The degree to which effective tech transfer services are available statewide to support innovation offers significant opportunity for improvement. Specifically, the more experienced institutions/centers should play a role in developing TU's technology transfer effort.

RESPONSE:

Tuskegee University, under the Office of Sponsored Programs, does have a technical transfer unit that looks into Intellectual Property issues. Contact information follows:

Ms. Felicia E. Moss-Grant
Assistant Director, Grantsmanship and Compliance
Division of Research and Sponsored Programs
103 Chappie James Center
Tuskegee University, Tuskegee, AL 36088
Ph: 334-727-8985
Fax: 334-724-4224
E-mail: fmgrant@tuskegee.edu

Alabama EPSCoR continues to work as the enabling agent with all EPSCoR universities and appropriate government agencies to unite and develop a statewide technology transfer operation. Significant progress has been made.

- The centers should better emphasize their enabling role in undergraduate and graduate education. This activity should be traceable to state and regional needs in workforce development as articulated in the state's science and technology plan.

RESPONSE:

The State of Alabama does not have a defined science and technology plan. Rather, Alabama EPSCoR along with all in-state private and public research institutions, recognize that with new discoveries in science and technology and the rapidly developing nano- and bio-technology industry in Alabama, workforce development goes hand-in-hand with STEM education. The Alabama Math, Science, and Technology Initiative (AMSTI), is the Alabama Department of Education's initiative to improve math and science teaching statewide. A Blue-Ribbon committee comprised of K-12 educators, higher education representatives, and business leaders designed this program. AMSTI has a proven track record for helping students develop the math and science skills and knowledge necessary for success in the workforce and postsecondary studies. The initiative provides equity and adequacy for all students in Alabama, regardless of their location or background.

Alabama EPSCoR and The University of Alabama under the auspices of the Economic Development Partnership for Alabama have engaged New Economy Strategies, a Washington D.C. based company, to analyze the State of Alabama and prepare a comprehensive plan for high technology economic and workforce development. Alabama EPSCoR through support of its RII Centers of Excellence will be a major component of the plan.

Alabama EPSCoR, its academic leaders and researchers, along with state government and business in the science and technology community, are in a unique position to influence the economic future of the state. Steps taken now to enhance the state's infrastructure for research and technology, and training needs of its workforce, will have profound implications for the state's competitive position for decades to come. The Alabama State Legislature took the first step in addressing this issue by creating the Graduate Research Scholars Program. This competitive program placed five exceptional graduate students in each of the four NSF EPSCoR RII Centers. Center Directors have been creative as well in using other sources of funding to add additional students to this program. While this program is only in its first year, the long-term investment into the state's research infrastructure will have a tremendous impact for Alabama's economic and workforce development.

COSS is currently providing an enabling role in undergraduate and graduate education via the "Alabama Science in Motion" project where a van filled with science experiments visits local high schools. The Engineering Math Advancement Program (E-MAP) is designed to improve the math skills of incoming engineering students at the University of Alabama in Tuscaloosa. In the E-MAP program, local high school teachers are used to provide a review of the methods used for presenting data collected as part of student math instruction.

Twenty graduate and ten undergraduate students have participated in the ACNM research activities. Some of the undergraduate students are motivated to take up graduate education while Ph.D. students have shown strong interest in academic careers. Most of the undergraduate and Ph.D. students involved in the program are African-American with the majority being female. Thus, the Center is fulfilling

much needed workforce diversity requirements at the state and regional level. Further, the summer high school student/teacher research programs help attract high school students interested in science/engineering education. The program encourages them to continue careers in these fields. These efforts will help build the technical workforce for the state and region in the near future.

CECST programs which include the 'Teaching Enhancement Awards' (TEA) for high school teachers and students, Undergraduate Summer Research Scholarships (USRS) for rising college juniors and seniors, and Graduate Research Assistantships (GRA) for graduate students at CECST-affiliated institutions, were developed and are aimed at addressing these workforce needs.

- The linkage between the research in the four focus areas and education is not as strong as they could be. All involve graduate students in research, which is a necessary ingredient of graduate education but there was little evidence of research results feeding into the class room. One exception was the Alabama Center for Nanostructured Materials at Tuskegee University, which has one course in nanomaterials at TU and another in nanocomposites at the University of South Alabama (USA). The Center for Optical Sensors and Spectroscopies also has graduate courses in laser physics, laser spectroscopy, and nanomaterials. Presumably all these courses are offered at the University of Alabama at Birmingham. The course in nanomaterials at UAB perhaps can benefit from the activities in the ACNM. This would also provide some of the missing interactions among the four centers. The other two centers did not apparently have courses. Bringing research results into currently existing courses or new courses is an efficient method to accomplish broader impacts and to build research infrastructure.

RESPONSE:

The nanotechnology and laser classes were taught at UAB, but UA students also took the class via video teleconference. Environmental classes were offered at UA. Plans are underway to offer the nanotechnology classes (based at UAB) to students based at UA and Huntsville (UA and AAMU) in the future. Similar plans are underway for the laser classes taught at UAB.

Courses related to the disciplines represented by CECST investigators working at the nexus of developmental biology, physiology and evolution, are offered through institutions affiliated with the CECST. Indeed, established and recently recruited CECST faculty offer a range of courses that are immediately relevant to the mission of this center. Examples of new courses include: Molecular Systematics, Molecular Ecology and Comparative Genomics. All of these courses are interdisciplinary in nature, bridging traditional biological disciplines with modern, state-of-the-art molecular concepts and approaches.

The issue of cross-fertilization of research and education as well as multi-campus, statewide courses is important to the Alabama EPSCoR Steering Committee and the Alabama Commission on Higher Education. Both of these entities will review progress on this metric in the future with respect to the RII Centers.

Performance of Broadening Participations Strategy:

- Goal 5 of the state's plan to engage diversity and outreach was well articulated. RII efforts are effectively interfaced with LSAMP and the Center research activities and state commitment is demonstrated by the Graduate Research Scholars Program. Involvement of TU as an HBCU seems well integrated in planning and execution.
- The broadening participation plan however suffers from the lack of a solid evaluation plan. While current numbers are given of students in the program, this snapshot of data does not give the baseline numbers that the program seeks to impact and the target number for increased participation.

RESPONSE:

As discussed in a response above, Alabama EPSCoR is working to establish a standard evaluation program founded on baseline data with respect to defined metrics. This exercise is being carried out as part of the overall NSF EPSCoR effort to develop a full-scale evaluation program. In some measure, Alabama EPSCoR has taken a significant first-step by creating a strategic plan for its RII awards. This plan requires that a Center of Excellence supported by RII funding develop a center strategic plan geared to achieve diversity and a broadening of participation as well as sustainability and graduation from RII funding. Alabama EPSCoR recognized the need to standardize and better articulate the metrics used to demonstrate these goals.

ACNM has supported ten Ph.D. and fifteen undergraduate students. By the end of three years, this number will double. It has also supported eight summer high school students in 2006. Eight high school students were supported in the summer of 2007. In addition, there is a plan to support two high school teachers from Tuskegee in a research experience for a structured teachers program. This program will expose the high school teachers to a new field of nanotechnology which they in turn will take back to their classroom. Further, there is a plan to have a nanotechnology day in the spring or summer of 2007. Local high school students and teachers will be invited to participate. This will further increase the participation of minority students.

Suitability of Evaluation Plan and Evidence of Implementation:

- While there was clear evidence of performance, this performance could not be gauged effectively relative to a baseline of activity metrics prior to investment, expected rates of change for these metrics, and targeted performance goals whereby a decision could be made to graduate a center effort. Better articulation of measures appropriate to a given center activity and their relationship to chosen strategies and recognition of success is needed.

RESPONSE:

As described above, Alabama EPSCoR will enhance its strategic plan to include a baseline evaluation and assessment plan.

Contribution of Activities to Project's Sustainability:

- Attention should be given to the research and education opportunities that exist at the intersection of the activities of the four centers. Such opportunities were only mentioned briefly by a few of the presenters but represent a significant opportunity for the long-term sustainability of the center efforts. For example, significant opportunity exists in nano-bio related topics that can leverage the expertise across all four centers.

RESPONSE:

Alabama EPSCoR recognizes the opportunities for synergism among the centers. The quarterly meeting of the Center Directors, the quarterly newsletter, and the annual state EPSCoR meeting are intended to serve as vehicles to bring about collaboration. Currently, the Alabama EPSCoR state office, in conjunction with all Vice Presidents for Research, is working to develop a statewide nano-bio alliance using the Centers of Excellence as the core.

The CECST agrees that significant opportunities exist for collaborative research and education opportunities between the centers. Obvious potential exists for such interactions between the CECST and both the COSS and EASBC. These have been articulated before. However, opportunities for interactions between CECST and the ACNM should not be overlooked. Increasingly, nanoparticles are being used in imaging (ex. 'Quantum Dots'), and bio-nanotechnologies are being developed to facilitate the targeted delivery of molecular vectors to facilitate the design and engineering of both gain- and loss-of-function biological models in both plant and animal systems.

- Development and implementation of incentives for center interaction should be considered. New initiatives and metrics should encourage successful research interaction between centers and measure the range of its outcomes.

RESPONSE:

The mission of the Alabama EPSCoR program is to foster the growth of research capacity and capability in the State of Alabama in order to make the institutions of higher education more competitive for federal funding. A significant element in building both research capacity and capability is people and more specifically, graduate students. In 2006, the State of Alabama through the Alabama Commission on Higher Education and Alabama EPSCoR funded a Graduate Research Scholars Program (GRSP). Twenty exceptional graduate students were funded at \$25,000 each for a total of \$500,000. The graduate students were selected competitively by the Center Directors from the four NSF EPSCoR RII Centers of Excellence. Once this program is firmly established, we anticipate the possibilities of graduate students interchanging ideas, concepts, environments, and research development information between each of the Centers. At the annual state meeting, Alabama EPSCoR will provide a forum for the GRSP participants and Directors to meet and form a discussion group between Centers. This discussion should result in a collaborative agreement between Centers leading to new initiatives and potential research collaborations.

Most importantly, however, Alabama EPSCoR has a unique perspective regarding incentives that clearly motivate Centers with RII funds to seek self-sustainability. Rather, we established four Centers of Excellence, each recognized for their exceptional research and potential for workforce and economic development in the state. The NSF EPSCoR RII grant funds awarded, based on this model, are spread thinner than if concentrated in one area. Alabama EPSCoR believes this approach provides each Center a natural incentive toward collaboration and self-sustainability. The incentive of having “less” emphasizes collaborations and creates an environment where the investigators internalize the importance of seeking additional funding to continue their work. Equipment purchases are often planned as a unit to be shared among institutions to utilize funds available. This in turn encourages the sharing of ideas, promotes seeking of additional funding and, the realization of self-sustainability. In simple terms, Alabama EPSCoR uses RII funding to leverage and promote growth of centers of excellence to sustainability rather than provide core funding.

Effectiveness of Communication and Dissemination Strategies:

- The site visit presentation and the supporting materials were well organized and provided a compelling picture of the cohesiveness of the state’s EPSCoR efforts and its integration with state S&T planning.
- The outcomes and the potential of current and planned interactions between centers needs to be communicated more effectively.

RESPONSE:

Alabama EPSCoR will review our current usage of quarterly center director meetings, the quarterly EPSCoR newsletter, and the annual statewide EPSCoR meeting, as well as quarterly meetings of the Alabama EPSCoR Steering Committee, to search for new avenues to evaluate our EPSCoR program and to communicate our plans and achievement to all constituencies.

- The state EPSCoR effort appears to have good communication channels open to state-level media outlets.
- Outreach activities are well disseminated at the national, state and local levels encouraging adoption of best practices and awareness of opportunities for student participation and faculty engagement.

Alabama EPSCoR Program Directors		
Dr. Keith McDowell	EPA EPSCoR	keith.mcdowell@ua.edu 205-348-4566
Dr. John C. Gregory	NASA EPSCoR, Director	jcgregory@matschi.uah.edu 256-890-6028
Dr. Gary C. April	DOE EPSCoR, Associate Director	gcapril@eng.ua.edu 205-348-6450
Dr. McArthur Floyd	USDA EPSCoR, Co- Director	mcarthur.floyd@aamu.edu 256-372-5781
Dr. Charles Prince	USDA EPSCoR, Co- Director	princecw@uab.edu 205.934.5218
Dr. Daryush Ila	*DEPSCoR, Director	ila@cim.aamu.edu 256-851-5866

*Alabama is currently not eligible to participate in DEPSCoR

DISCUSSION ITEM:**Annual Report: Alabama Experimental Program to Stimulate Competitive Research (EPSCoR)****Staff Presenter:**

Dr. Elizabeth French
Director of Institutional Effectiveness and Planning

Staff Recommendation:

For discussion only.

Research is a substantial industry in Alabama and the Alabama EPSCoR program is dedicated to the development of scientific and engineering capabilities through a collaborative effort among the State's research universities. The focus of activities is designed to attract and retain distinguished scientists and researchers for Alabama, to foster economic development through investment resulting in cutting-edge technologies, and to stimulate competitiveness in medicine, biotechnology, engineering, mathematics and other applied sciences.

Notable achievements in 2006 included: 1) the receipt of \$7.7 million in EPSCoR funding, a one percent increase from 2005; 2) establishing the Graduate Research Scholars Program (GRSP) by Senator Steve French and ACHE; 3) a successful reverse site review in Washington, D.C. where the former NSF EPSCoR Director called Alabama EPSCoR a model program for other EPSCoR states to emulate; 4) the inclusion of one of Alabama's NSF Centers of Excellence in the operational plans of the \$130 million Hudson-Alpha Biotechnology Institute in Huntsville; 5) a tour of the Center for Advanced Materials (funded by the NSF EPSCoR RII program at Tuskegee University) by President George W. Bush; and, 6) President Bush's speech, in Birmingham at an alternative fuels location, highlighting the Alabama DOE EPSCoR Implementation Grant proposal submitted just three days earlier indicating, if funded, it would be a major step toward decreasing the United States dependence on foreign oil.

Alabama EPSCoR Research Awards**• Graduate Research Scholars Program**

The mission of the Alabama EPSCoR is to foster the growth of research capacity and capability in the State of Alabama in order to make the institutions of higher education more competitive for federal funding. A

significant element in building both research capacity and capability is people and more specifically, graduate students.

In 2006, the Alabama State Legislature (Senator Steve French) through the Alabama Commission on Higher Education and the Alabama EPSCoR funded a Graduate Research Scholars Program (GRSP). Each year twenty (20) exceptional graduate students will be funded at \$25,000 each for a total of \$500,000. The graduate students will be selected competitively by the Center Directors from the four NSF EPSCoR Research Infrastructure Improvement (RII) Centers of Excellence.

Renewals will be granted each year subject to satisfactory progress in a given year and available funding. The goal of the Alabama EPSCoR GRSP is to invest in Alabama universities to expand research output and attract quality graduate students. The objective of the program is to provide a highly trained workforce to fuel the growth of high technology companies in Alabama.

EPSCoR Research Awards

• NSF EPSCoR

The Alabama EPSCoR entered its second year (fiscal year: May 1, 2006 – April 30, 2007) of the NSF EPSCoR RII award. The overall award totaled \$6 million for a three year period (2005-2008), with an additional \$3 million in state matching funds. These funds were used to establish four research centers of excellence.

- Alabama Center for Nanotechnology Materials – Tuskegee University (collaborating institutions: AAMU, AU, UAH, USA)
- Center for Environmental Cellular Signal Transduction – Auburn University (collaborating institutions: AAMU, TU, UAB)
- Center of Optical Sensors and Spectroscopies – University of Alabama at Birmingham (collaborating institutions: UA, UAH)
- Extended Alabama Structural Biology Consortium - University of Alabama in Huntsville (collaborating institutions: USA, UAB)

• NSF EPSCoR Katrina Study

NSF EPSCoR also awarded a \$200,000 grant to the Alabama EPSCoR program, in conjunction with

Mississippi and Louisiana, to develop a recovery plan for educational research facilities damaged by Hurricane Katrina and establish priorities for reconstruction.

Alabama EPSCoR submitted the following reports:

- NSF EPSCoR Katrina Impact Assessment Study: Alabama Gulf Coast
- NSF EPSCoR Katrina Planning Grant: Final Report

• **NSF EPSCoR Co-Funding**

NSF EPSCoR Co-funding awards provide researchers and institutions another opportunity to obtain NSF support. Co-funding is not a program to which proposals can be submitted. Instead, it operates internally within NSF and does not involve any action on the part of the submitter. Co-funding provides joint support for certain meritorious proposals submitted to the EPSCoR Foundation's ongoing research, educational, and special emphasis competitions by researchers from the EPSCoR states. These are “fund-if-possible” proposals, which lie at or near the merit review cutoff process for funding a proposal.

In the past few years, Alabama EPSCoR has been very successful with these awards. In 2006, \$3 million in Co-funding awards were received by six of the seven research institutions. Three private research laboratories affiliated with Alabama’s research institutions were also awarded a total of \$150K to develop collaborative research. With declining federal research dollars across the board, Alabama continues to demonstrate national confidence in its research capabilities.

• **USDA EPSCoR**

The USDA EPSCoR program operates under the auspices of the Cooperative State Research Education and Extension Service. The funding division is the National Research Initiative (NRI) Competitive Grants Program.

In 2006, Alabama USDA EPSCoR was awarded \$1.5 million in research funding. A substantial increase of 24% from 2005. However, when one looks at the majority of Alabama’s USDA EPSCoR research, all have immediate and significant impacts on the health and safety of world producing food markets. For example: 1) aquaculture; the cultivation of the natural produce of water (such as fish or shellfish, algae and other aquatic organisms); 2) avian influenza; 3) food processing

and preservation; 4) salmonella in chickens; and 5) maintaining the economic viability of the small farm grower in the United States.

- **NASA EPSCoR**

The goal of NASA EPSCoR is to develop academic research activities that are long-term, self-sustaining, and nationally competitive for non-EPSCoR dollars. The Alabama NASA EPSCoR program is a full research program, competitively selected in a field of interest to both NASA and the State of Alabama. In 2006, Alabama NASA EPSCoR funded six research projects along with two students representing the Undergraduate Research Scholars Program (URSP). These projects and student support totaled \$232K.

- **DOE EPSCoR**

The current Fuel Cell energy research cluster is located at The University of Alabama and Alabama A&M University (HBCU). The program is in its final year of the six year Implementation Award. DOE EPSCoR has awarded the Fuel Cells group a total of \$2.4 with matching support from research institutions and the state. The grant will end June 30, 2007.

In September 2006, Alabama DOE EPSCoR submitted its state proposal for the next Implementation Grant cycle. If the proposal is funded, it is anticipated to begin July 2008. The proposal selected is titled, Elucidating the Fundamentals of Biofuel Systems: Feedstocks, Conversion, and Combustion.

- **DOE EPSCoR State Laboratory Partnership Program**

The DOE EPSCoR State Laboratory Partnership Program encourages collaborations between researchers at the seven research institutions and Federal Laboratory personnel. There are currently four active State Laboratory Partnership programs in the Alabama DOE EPSCoR program through 2008. The program cycle is three years. For 2006, the four Alabama researchers received ~ \$350K.

DOE EPSCoR announced the next funding round for the State Laboratory Partnership Program in December 2006. All research institutions and four year colleges were notified by email broadcast.

- **EPA EPSCoR**

The federal EPA EPSCoR program was not funded in 2006.

Background:

The Alabama EPSCoR is a family of competitive, merit-based programs supported by the State of Alabama and sponsored by the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the Department of Energy (DOE), the United States Department of Agriculture (USDA), and the Environmental Protection Agency (EPA). Alabama EPSCoR is currently only eligible to participate in these programs. Each program represents a federal-state-industrial partnership formed to enhance the science and engineering research, education and technology capabilities of Alabama.

The Steering Committee of the Alabama EPSCoR Program is responsible for fiscal and programmatic aspects of the operations. Members include representatives from the seven research institutions (Alabama A&M University, Auburn University, Tuskegee University, The University of Alabama, University of Alabama at Birmingham, University of Alabama in Huntsville, University of South Alabama), the Alabama Development Office, the Economic Development Partnership of Alabama, the Alabama Legislature, and the Executive Director of the Alabama Commission on Higher Education.

The Chair of the Steering Committee is Dr. B. Keith Harrison, Associate Vice President of Academic Affairs and Interim Dean of the Graduate School at the University of South Alabama. Dr. Keith McDowell, Vice-President for Research and Vice Provost at The University of Alabama serves as the Executive Director of the Alabama EPSCoR and is responsible for overall program supervision and coordination of all EPSCoR activities within the state. In addition to the Executive Director, the Steering Committee appoints Project Directors for each of the federal programs. They are responsible for the administration of activities of their respective components in collaboration with the Executive Director.

The fiscal agent for the state EPSCoR appropriation is the Alabama Commission on Higher Education.

Supporting Documentation:

Annual Report to the Alabama Commission on Higher Education. To be distributed. Additional information on activities is available at <http://alepscor.ua.edu>

Alabama RII Grant Plans/Progress toward self-sustainability										
Proposal Status during grant period of 5-1-05 to 4-30-08										
AL Center-Inst.	PI	Sub. Inst.	Co-PI	Agency/Funding Source	Title of Proposal	Status	Proposal Submission Mo/Yr	Period of Performance	Financial Support Requested	Financial Support if awarded
ACNM-AAMU				NASA-Marshall Space Flight Center	High Strength Composite Materials	Awarded				\$778,981 (funded to USA)
ACNM-TU				Cornell University	A Research and Education Partnership in Nanomaterials	Awarded		8/1/06 to 7/31/11		\$2,100,000 (\$2.1 M TU share)
ACNM-TU				Clarkson Aerospace, Inc.	Characterization of Nanocomposites and Composite Laminates, Air Force/HBCU/MI Program	Awarded		8/1/05 to 7/31/07	\$225,000	\$225,000
ACNM-TU					Enhancement of Research Infrastructure in the Materials Science and Engineering Program	Awarded		9/1/06 to 8/31/08	\$1,000,000	\$1,000,000
ACNM-TU				Miss. State University	Modeling High-rate Material Responses for Impact Applications	Awarded		11/1/05 to 10/31/06	\$100,000	\$100,000
ACNM-TU				Ondax, Inc.	SBIR Phase I: Advanced Composites Research to Reduce Costs	Awarded		6/15/06	\$105,000	\$105,000
ACNM-TU				Ondax, Inc.	STTR Phase I: Nanocluster characterization in Volume Holographic Glass gratings	Awarded		6/25/06 to 5/31/07	\$105,000	\$105,000
ACNM				DOE/Mississippi State University	Fabrication and Characterization of Nanophased Structure Composite	Awarded				\$100,000

ACNM				US Army Office, Army National Automotive Center, Mississippi State University	High Strain Rate Experimental Tests for Lightweight Alloy	Awarded					\$50,000
ACNM				U.S.Army Corps of Engineers Engineer Research and Development Center	Prediction of Degradation of FRP Composites in Army Facilities	Awarded					\$69,119
ACNM- TU				NSF (pre-proposal submitted to NSF with Mississippi State University as prime)	PIRE: Multiscale Material Modeling of Time-Dependent Behaviors of Nanofiber- Reinforced Constituent Materials	Submitted					
ACNM- TU				NSF (pre-proposal submitted to NSF with Florida State University as prime)	PIRE: United States- United Kingdom Cooperative Research and Education: Interfaces of Nanostructured Materials	Submitted					
ACNM- TU					MRI: Acquisition of a Material Testing System for Research and Educational Training in Static and Dynamic Characterization of Advanced Structural Nanocomposites	Submitted				\$394,550	
ACNM- TU				AFRL	Nanostructured Carbon-Carbon Composites for Aerospace Structural and Thermal Application	Submitted				\$200,000	
ACNM				Missile Defense Agency	Synthesis of Iron Sulphide (FeS ₂) Nanoparticles by Sonochemical and Microwave Processing for Advanced Thermal Battery Technology	Submitted				\$300,000	

ACNM				Missile Defense Agency	Development of Nanomaterial Reinforced Metal Matrix Composites for Improved Mechanical and Structural Properties in Materials for Aerospace Applications	Submitted			\$300,000	
ACNM				USDA/Mississippi State University	Inorganic Nanoparticle Impregnation in Natural Fiber/Thermoplastic Composites	Submitted			\$47,996	
ACNM				NSF-NEES/University of California, Irvine	Smart Structures with Magnetorheological Nanocomposite Dampers for Seismic Protection	Submitted			\$75,000	
ACNM				with Mississippi State and Florida Atlantic					\$18.35 M	\$2.05 M (TU Share)
ACNM				NSF	STTR Phase I: Innovative Foams For Automotive Applications				\$144,853	
ACNM				NSF	Synthesis, Manufacturing and Characterization of Structural Nanocomposites (supplemental grant to NSF-CREST)				\$100,000	
ACNM				NSF	Processing and Development of Nanophased Functionally Graded Materials and Structures				\$348,144	
ACNM				NSF	MRI: Acquisition of Materials Testing System For Research and Educational Training in Structural Nanocomposites				\$397,311	
CECST	Hill, G, Bartol FF, Edwards SV			AU-BioGrant Program	Variation in the Host Transcriptome in Response to Pathogen Infection in a Wild Bird	Funded		4/2006 - 5/2007	\$30,000	

CECST	J Kauffold (Co-PI; Universitat Leipzig, VMF,; Leipzig, FRG)		FF Bartol (Co-PI; Auburn University; USA).	Arbeitsgemeinschaf t industrieller Forschungsvereinig -ungen "Otto von Guericke" (AiF; www.aif.de).	Einfluss einer perinatalen Zearalenon-Exposition auf die Entwicklung der Fortpflanzungsorgane beim weiblichen Schwein ('Effects of Perinatal Zearalenone Exposure on Genital Tract Development in Female Pigs').			9/06 to 9/09	\$263,829	
CECST	EM Whitley (PI),		DF Wolfe, MA Edmonson and FF Bartol (Co- PIs)	AU College of Veterinary Medicine Animal Health and Disease Research Program	Cutaneous responses of cattle to horn fly feeding			10/1/06 to 9/20/08	\$30,000	
CECST	James L. Sartin		Frank F. Bartol	PHS/NIH	Maternal obesity and fetal programming of appetite regulatory pathways.	Pending			\$1,229,981	
CECST	Johannes Kaufford (Universitat Leipzig, FRG)		Frank F. Bartol (Auburn Univ.)	Federation of Industrial Research Associations "Otto von Guericke"	Effects of perinatal zearalenone exposure on genital tract development in the neonatal pig	Pending		2006	\$261,768	
CECST	Huettle, Robin (lead PI) AU		K. Halanych (AU)	NSF – Biosurveys and inventories	Collaborative Research: Molecular and Morphology Bioinventory of Marine Nematodes of the Gulf of Mexico Deep Sea	In Review		2006	\$639,154	
CECST	Goertzen, L. (AU)			Auburn University Biogrant Program	The genetic basis of speciation in grapevines	Pending		10/1/2007	\$39,954	
CECST	Goertzen, L. (AU)			Auburn University AAES Foundation	Investigation of agronomically significant traits in native grapevines	Funded		10/1/2006	\$57,323	
CECST	Locy, R.		Goertzen, L. (AU)	NSF-GEPR	Identifying Heat Stress induced Small RNA Regulatory Networks in cotton	Submitted		10/1/2006		

CECST	Goertzen, L. (AU)			NSF-IGERT	Biorefining - A Technology Concept for Sustainable Production of Fuels and Chemicals	Submitted		8/1/2006		
CECST	Goertzen, L. (AU)		Boyd, R. (AU)	US Fish and Wildlife Service	Conservation Genetics of Endangered Alabama Leather Flowers <i>Clematis socialis</i> and <i>C. morefieldii</i>	Submitted		7/1/2006	\$11,872	
CECST	Mast, A.		Goertzen, L. (AU)	NSF-BRC	Deep South e-Flora Plant Specimen Imaging Project	Submitted		7/1/2006	\$658,954	
CECST	Goertzen, L. (AU)			NSF-BRI	Systematics of Native North American Grapevines (<i>Vitis</i>)	Submitted		7/1/2006	\$289,505	
CECST	Boyd, R. (AU)		Goertzen, L. (AU)	US Fish and Wildlife Service	Conservation of the Federally Endangered Alabam Leather Flower: <i>Clematis socialis</i>	Funded		6/1/2006	\$3,918	
CECST	Goertzen, L, Lockaby, G. (AU)		Zipperer, W.	USDA-CSREES	Land Use and Invasive Wisteria: the role of the urban-rural interface in species invasion	Not Funded		2006	\$385,123	
CECST	Goertzen, L (AU)		Kamas, J.	USDA-CRIS ARS (NGRL)	Plant exploration in the United States to collect grape germplasm for crop improvement	Funded		1/1/2006	\$9,103	
CECST	M. R. Liles (academic lead PI) (AU), R. M. Goodman (company PI)			NIH Phase II STTR program at NIAID	Discovery of Anti-Bioweapon Agents in BAC Libraries	In Review		2006	\$1,027,257	
CECST	M. K. Lee AU (lead)		M.R. Liles, L. Wolf AU (Co-PI)	United States Geological Survey	Geochemistry, Microbiology, and Bioremediation of metals-contaminated water in the Black Warrior Coal Basin	Not Funded		2006	\$70,001	

CECST	M. Liles (AU PI)		M.K. Lee AU, J. Saunders AU (Co-PIs)	Strategic Environmental Research and Development Program	Assessment of remediation of arsenic-contaminated groundwater using a community genomics approach targeting sulfate reducing bacteria	In Review		2006	\$649,485	
CECST	R. Locy		Scott Santos, Jian-Kang Zhu, J. Gould, Khairy Soliman, Narendra Singh, Thomas Girke, Keerti Rathore	NSF – Plant Genome	TRPGR: Functional Genomics of miRNAs and siRNAs in Cotton	Pending			\$3,120,000	
CECST	Scott Santos		N. Chadwick, K.M. Halanych, A. Moss Title	NOAA - NURP	Effect of overfishing on population dynamics and genetic diversity: A case study with the rose-tipped anemone, Condylactis gigantea	Pending			\$62,535	
CECST	Scott Santos		Sharon Roberts	NSF - DEB.	Evolution of Mycoplasma Host Range	Pending			\$487,845	
CECST	Scott Santos		T.C. LaJeunesse (FIU)	NSF-BIO OCE.	Collaborative Research: The Evolution and Diversification of Coral Endosymbionts	Pending			\$540,958	
CECST	Scott Santos		H. Toro, V. van Santen	NIH	Evolution of Coronaviruses in the Immunodeficient Host	Pending			\$1,327,500	
CECST	Suh, Sang- Jin.			NSF	Partnership on developing value-added products from glycerol as biodiesel byproduct	Denied	2006			
CECST	Suh, Sang- Jin.			NSF	Characterizing the role of RpoS in anaerobic physiology of Pseudomonas aeruginosa	Denied	2006			

CECST	Moss, A.G		supplement for undergraduate student, James C. Taylor	NSF - REU NSF - Microbial Observatories (Microbial Interactions and Processes)	Analysis of the coastal assemblage of the coastal ctenophore, <i>Mnemiopsis leidyi</i>	funded	2005		\$6,000	
CECST	Moss, A.G		supplement for undergraduate student, James Gillespie	NSF - REU NSF - Microbial Observatories (Microbial Interactions and Processes)	Analysis of the coastal assemblage of the coastal ctenophore, <i>Mnemiopsis leidyi</i>	funded	2006		\$6,000	
CECST			Wower, J.	AU Biogrants Program	Intelligent drug release via reversible modulation of RNA cross-linked hydrogels		10/18/2006		50,000.00	
COSS	B. Sony		S.B.Mirov	NSF	Engineering Research Center for Nanotechnology Enabled BioSensors	Denied			\$750,000	\$750,000
COSS	L. DeLucas		S.B.Mirov	NIH	Specialized Center for Membrane Protein Structural Studies	Denied		7/2005 - 6/2008	\$250,000	\$250,000
COSS	R. Camata		S.B.Mirov	NSF	Acquisition of pulsed laser deposition system for research and education in doped II-VI semiconductor heterostructures	Denied			\$225,000	\$225,000
COSS	R. Fork			NASA Institute for Advanced Concepts	Efficient Conversion of Sunlight in Space to Coherent Light	Denied			\$240,000	
COSS	S.B. Mirov			NIH/SBIR/Light Age, Inc	"A Multi-Color Laser for Clinical Opto-Acoustic Imaging"	Denied		9/2005 - 3/2006	\$30,000	
COSS	S.B. Mirov			NSF	"Multiphonon relaxation of mid IR optical transitions of rare - earth ions in solid state matrices with dissimilar anions"	Denied		5/2006 - 4/2009	\$83,255	

COSS	S.B. Mirov			NIH/SBIR/Light Age, Inc.,	"Generation of tunable mid-IR (4-10 mm) with output energy in excess of 10 mJ at 6.45 mm from a ZnGeP2 (ZGP) optical parametric oscillator pumped by Raman shifted Nd:YAG laser radiation	Denied			\$193,015	
COSS	S.B. Mirov			NIH	Nano-enabled image-guided photo-thermal therapy for brain tumors	Denied		9/2005 - 8/2007	\$497,954	
COSS	S.B. Mirov		L.DeLucas, P.O'Reily	NIH/NBIB Quantum Project	Optical nose: Detection of biomarkers for the early diagnosis of lung cancer"	Denied		9/2006 - 8/2009	\$2,704,042	
COSS	S.B. Mirov			IPG Photonics Corporation	"Er-fiber laser cw-pumped, passively Q-switched Er:YAG laser"	Awarded		05/15/06 to 05/14/07	\$79,692	\$79,692
COSS	L. DeLucas		S.B.Mirov	DARPA	"Sensing biological pathogenes through the wall"	Pending		9/2006 - 3/2007	\$500,000	
COSS	M.Everts		S.B.Mirov	NIH	Adenoviral Vector Mediated Targeting of Metal Nanoparticles to Tumors"	Denied		9/2006 - 8/2009	\$400,000	
COSS			Pitt	US EPA	An Expansion of the National Stormwater Quality Database using Existing MS4 Data to Assist Phase 2 Communities.	Not selected for full proposal			\$150,517	
COSS					Compact portable source of optical pulses having energies > 100 microjoules and durations less than 100 fs.	Pending				
COSS	Pitt			EPA's Office of Wastewater Management	Developing Local Stormwater Indicator Monitoring Programs to Demonstrate Environmental Results, with the Center for Watershed Protection	Awarded		2006	\$175,040	
COSS	Pitt			Auckland Regional Council. With Landcare Research.	Development of Innovative Stormwater Treatment Practices.	Pending		5/16/2005 - 5/15/2006		

COSS	S.B.Mirov			NSF/Bioengineering and Environmental Systems	Development of middle infrared optical nose”	Awarded		09/01/05-08/30/08	\$494,807	\$390,000
COSS	S.B.Mirov		R.Camata, A. Stanishevsk y	NSF/Electrical and Communication Systems	En route to broadly tunable middle-infrared optically and electrically pumpable Cr2+ and Fe2+ doped II-VI semiconductor lasers”	Awarded		03/01/05-02/28/08	\$392,214	\$210,000
COSS	Boykin		Pitt, Ward, Findlay	WateReUse Foundation.	Evaluating Wetland Systems for Treated Wastewater Performance to Meeting Competing Effluent Quality Goals.	Not Funded		5/16/2005 - 5/15/2007	\$200000/year for 2 years	
COSS				NIH	Framework Program for Global Health	Pending				
COSS					Multi-Functional Optical Power Limiters	Awarded	July 2006		\$700,000	\$700,000
COSS				Argonne National Laboratories	nanophotonics to facilitate the removal of waste enat from laser gain media.	Pending				
COSS		Penn State – Harrisburg.	Pitt co-PI with S. Clark	Preproposal to EPA Region 3	Stormwater Pollution from “Environmentally-Friendly” Roofing Installed in an Urban Environment	Not Funded		May 16, 2005 - May 15, 2006	\$213,853	
COSS					STTR award for white light filament generation in a compact laser system	Pending				
COSS	Pitt		Johnson, Durrans, Williamson, Boykin, Ward, Findlay, Barrett, Higgenbotham, Churchill, Gibson, Fridley, Olsen, Addy, Bryan, Donahoe, Kavanuagh,	EPA – STREAMS.	Sustainable Water Resources and Community Health in Economically Deprived Communities	Not Funded		five years	up to \$50M	

			Daly, Rogers							
COSS	Higgenbotham	UA Institute for Rural Health Research	Pitt	NIH	Sustainable Water Resources Center for Environmental Sciences (letter of intent).	Pending		May 16, 2005 - May 15, 2006	\$2.6M	
COSS	S.B.Mirov			IPG Photonics Corporation	Tm fiber laser cw-pumped, repetitively Q-switched Ho:YAG or YLF laser	Awarded		07/01/04-12/31/05	\$93,352	\$93,352
COSS	Pitt	UAH	Durrans, Johnson, Williamson, Boykin, Ward, Findlay, with EarthTech.	DOD – SERDP. Irrigation State Study. NOAA/UAH. Durrans	Watershed Management Modeling at Critical Source Areas on Military Installations	Not Funded		May 16, 2005 - May 15, 2006		
COSS	S.B.Mirov	Push Technologies		NASA/STTR	Portable Ultra Sensitive Health Detector - PUSH Detector	Denied		2007-2008	\$100,000	
COSS	S.B.Mirov		A.Stanishevsky	NSF	Materials World Network: Composite nanoparticles with controlled optical features based on gold nanorods coated with RE and TM ions doped dielectric nanoshells	Pending		2007-2010	\$413,756	
COSS	S.B.Mirov		C.Lawson, Y.Vohra	NSF	PIRE: U.S.-Russia Partnership: new generation of bulk and nano-enabled middle-infrared laser materials	Pending		2007-2012	\$2,500,000	

COSS	S.B.Mirov			Reliant Technologies	Fiber (Er)-bulk (Cr:ZnSe) mid-IR hybrid laser tunable over 2.3-2.8 μm spectral range with up to 1.5W output power	Awarded		01/01/07-05/30/07	\$87,680	\$87,680
COSS	S.B.Mirov			Biolase	Passively Q-switched Cr:Er:YSGG laser for dental applications	Pending		04/01/07-12/30/07	\$88,138	
COSS	S.B.Mirov		C. Lawson	UAB, Research Enhancement Fund	Acquisition of MicroRaman-Atomic Force-Near Field Microscopy System	Pending		02/15/07-12/30/07	\$100,000	
COSS-UA	R. Pitt			<i>NIH Global Health Education</i> , National Institutes of Health, with UAB lead	Initial proposal to start international instruction			May 16, 2005 - May 15, 2006	\$10,000	
COSS-UA	Durrans	UAH	Pitt, Boykin	NOAA/UAH	Irrigation State Study	Not Funded this year, but will informally participate		May 16, 2005 - May 15, 2007	\$166,000	
COSS-UA	Pitt			Landcare Research, New Zealand	Haywards Fellow	Accepted		2005		
COSS-UA	Pitt		Boykin	UA OSP	Environmental Institute Strategic Planning	Pending		May 16, 2005 - May 15, 2006		

COSS- UA	Pitt		Johnson, Durrans, Williamson, Ward, Findlay, Gibson, Fridley, Barrett, Higgenbotham, Churchill, Olsen, Addy, Bryan, Donahoe, Kavanaugh, Daly, Rogers	College of Engineering, UA	<i>Alton Scott: Sustainable Water Resources for Community Health</i>	Not Funded		May 16, 2005 - May 15, 2006	\$150,000/ year for 2 yrs	
EASBC -UAB	DeLucas			MedaRex	Co-complex (ab/antigen) 3-D Structure Determination	Awarded		2006-2007	\$50,330	\$50,330
EASBC -UAB	DeLucas			Schering AG	Expression, Purification and Structure Determination of GPCRs	Awarded		2006-2007	\$1,039,000	\$1,039,000
EASBC -UAB	DeLucas			NIH/Coley Pharm	Innate Immune Receptors and Adjuvant Discovery	Awarded		2006-2007	\$144,281	\$144,281
EASBC -UAB	DeLucas			Merck, Inc.	Protein Crystallization Anal and Protein Stability Studies	Awarded		2006-2007	\$12,000	\$12,000
EASBC -UAB	DeLucas			Dow Agrosiences	Structural Biology of Proteins Assoc with the Develop of Novel Insecticides	Awarded		2006-2007	\$518,907	\$518,907
EASBC -UAH	Ciszak			SUNY	Regulation of Mammalian Dihydrolipoamide Dehydrogenase	Awarded	2003	2003-2004	\$30,624	\$30,624
EASBC -UAH	Ciszak	UAH/BAE		BAE/Commercial	C/BAE Systems/Fluid Flow Control in Protein Crystallization Using Strong Magnetic Fields	Awarded	2006		\$15,744	\$15,744

EASBC -UAH	Ciszak	MSFC		NASA/MSFC	MSFC/Crystal Structure of Pyruvate Dehydrogenase Complex Facilitated by Microgravity	Awarded	2003	2003-2005	\$305,500	\$305,500
EASBC -UAH	Ciszak			NSF	Representing TPP Enzymes to Multiple Users	Denied	2005	2005	\$213,367	\$0
EASBC -UAH	Ciszak			NSF	Structure Derived Catalytic action of TPP enzymes	Denied	2005	2005-2008	\$498,659	\$0
EASBC -UAH	Meehan	UAB/USA		A/UA	A/UA/ABSC/EPSCoR	Awarded	2001	2001-2005	\$2,228,615	\$2,228,615
EASBC -UAH	Meehan	MSFC		NASA/MSFC	CMDS/MSFC/Biom mineralization	Awarded	2001	2001-2005	\$186,500	\$186,500
EASBC -UAH	Meehan	MSFC		NASA/MSFC	IPA CISZAK	Awarded	2003	2003-2005	\$242,816	\$242,816
EASBC -UAH	Meehan	UAB		A/UAB	NIH/Structural Genomics-Yr 5	Awarded	2004	2004-2005	\$141,178	\$141,178
EASBC -UAH	Meehan	UAB/USA		A/UAB/USA	NSF/EPSCoR 2004/2004 Ala Rsch Infrastruc Improv Prog	Awarded	2004	2005-2008	\$1,200,000	\$1,200,000
EASBC -UAH	Meehan			Commercial/HAIB	Operon Bioinformatics	Awarded	2005	2006-2007	\$564,790	\$564,790
EASBC -UAH	Meehan			Commercial/HAIB	Operon/Synthesis of Libraries of Organic Compounds	Awarded	2005	2006-2007	\$128,426	\$128,426
EASBC -UAH	Meehan	UGA/UAB		A/UAB	U GA/UAB/SECSG-HT Crystallography Core	Awarded	2005	2005-2006	\$239,441	\$239,441
EASBC -UAH	Ng				Protein Crystallization studies using dilatometry		2004			
EASBC -UAH	Ng				UAH IGERT	Denied	2005		\$5,000,000	\$0

EASBC -UAH	Shriver			Commercial	Expression Genetics/NMR Usage	Awarded	2005	2005-2007	\$8,000	\$8,000
EASBC -UAH	Shriver			F/DHHS/NIH	F/DHHS/NIH/Energetics of Protein-DNA Binding and Bending	Awarded	2006	2006-2007	\$2,944,144	\$383,725
EASBC -UAH	Vogler				Tapestry	Awarded	2005	2005-2006	\$4,000	\$4,000
EASBC -UAH	Vogler				Tapestry	Awarded	2005	2005-2006	\$2,500	\$2,500
EASBC -USA	Wierzbicki			NSF	Alabama Epscor ASBC Grant II	Awarded		2005-2008	\$175,000	\$175,000
EASBC -USA	Wierzbicki			DOE	Investigation of Molecular Mechanisms of Preferential Binding	Awarded		2005-2006	\$42,000	\$42,000
EASBC -USA	Wierzbicki			NSF	REU Site on Structure and Function of Proteins	Awarded		2004-2007	\$332,794	\$332,794