



CREST

CENTERS FOR RESEARCH EXCELLENCE IN SCIENCE AND TECHNOLOGY

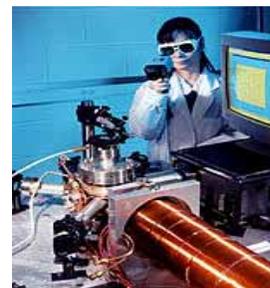
NATIONAL SCIENCE FOUNDATION
DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIVISION OF HUMAN RESOURCE DEVELOPMENT



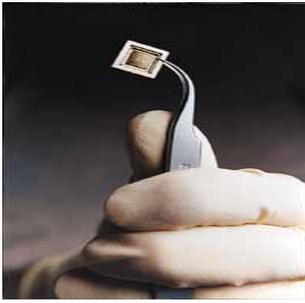
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Front Cover–Agriculture Science, Danise Coon, 2003; Nuclear Magnetic Resonance Magnet, National High Magnetic Field Laboratory, 2002; Classroom Follow Up, Barry Myers, 2002; Blue Swirl Fractal, Frances Griffin 1997; Solar Acoustic Wave, John W. Harvey, National Solar Observatory, 1985. **3**–Atom Trap, Argonne National Laboratory, 2001. **4**–EPSCoR Computer Chip, University of Alabama, 1999. **5**–First Magnetic Resonance Scanner, FONAR Corporation, 1977. **6**–Sergey Yarmolenko, North Carolina A&T State University, 2005. **7**–Michael Busby, Tennessee State University, 2005. **8**–Center for Mesoscopic Modeling and Simulation, 2005. **9**–Elvira Cuevas and Joel Ruiz, University of Puerto Rico, Rio Piedras, 2005. **10**–RESSACA, 2005. **11**–James Mitchell, Howard University, 2005. **14**–Florida International University, 2005. **15**–Carl E. Bonner, Jr., Norfolk State University, 2005. **16**–(top) Tuskegee University, 2005 (bottom) Engineering Biological Bodies, Georgia Tech/Emory Center, 2002. **17**–CEA-CREST, 2005. **18**–Jackson State University, 2005. **19**–New Mexico State University, 2005. **20**–Warren Collins, Fisk University, 2005. **21**–Alabama A&M University, 2005. **22**–Biogeochemical education, Susan Pfiffner, 2003. **23**–Silicon Nanocrystal, Lucas Wagner, Quantum Simulations Laboratory, North Carolina State University, 2002.

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Overview

Established nearly two decades ago, the Centers for Research Excellence in Science and Technology (CREST) program provides a substantial source of Federal support for research at minority-serving institutions across the United States. By facilitating research projects in science, technology, engineering and mathematics (STEM) disciplines with multi-year, multi-million dollar cooperative agreements, the main goal of CREST and its awardees is to build the research competitiveness of minority-serving institutions while increasing the recruitment and retention of individuals from diverse backgrounds in STEM study and STEM-based careers.

To date, more than 20 long-term, large-scale projects have received CREST funds. The variety and scope of these CREST projects encompass nearly every traditional STEM discipline and seek to advance human knowledge by defining innovative new areas of study. Each CREST project strives to build upon the state of the art in its particular research areas, while at the same time bringing these advancements to the next generation of STEM practitioners and the general public. A particular emphasis is placed upon increasing the recruitment and retention of historically underserved populations in quality STEM study and productive, fulfilling STEM careers. To this end, CREST sites are expected to complement their research efforts with innovative new education programs and to forge lasting, mutually beneficial links to other learning institutions, regional industries and national laboratories. In this way, each Center becomes a vital, contributing part of the local community that will continue to benefit the national interest long after Federal support has ended. The cutting-edge practices and human capital involved in CREST projects also make these projects an attractive means for recruiting new intellectual talent and garnering international recognition for U.S. scientific research.

To bring the principles of CREST to a more focused group of eligible schools, the program has begun support for the initiative, Historically Black Colleges and Universities-Research Infrastructure for Science and Engineering (HBCU-RISE). Although CREST began making provisional HBCU-RISE awards in FY 2002, the first full HBCU-RISE competition was not held until FY 2003. After 3 proposal competitions to date, 11 institutions have received HBCU-RISE funds.

The list of CREST awards is as diverse and engaging as the communities these projects have served and continue to support. This publication summarizes the CREST projects supported since FY 1987 and describes the current cohort of awardees. As a nation, we have much to learn from them, collectively and individually.

Note: Awards tabulated and detailed on pages 6 to 22 are listed chronologically by award number. Further information on CREST awards can be found at: <http://www.nsf.gov/awardsearch/> by using the award number(s) indicated. For updates on current CREST activities and deadlines, visit the program Web page at: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=6668.

Program History



The CREST program represents a substantial portion of the National Science Foundation's investment in research at minority-serving institutions.

Established more than 18 years ago, CREST has the goal of strengthening the national research competitiveness of minority-serving institutions as well as increasing the number of underrepresented minorities awarded master's and Ph.D. degrees in STEM fields. Funded at levels of between \$8.7 million and \$10 million annually, the CREST program represents a substantial portion of the National Science Foundation's investment in research at minority-serving institutions.

Center awards, issued via a cooperative agreement with the awarded institution, are typically funded for up to \$1 million per year for up to 5 years. Centers that successfully complete one cycle of CREST funding are eligible to compete for a second cycle of funding. A number of past CREST awardees have qualified for a renewal and have graduated from the program after 10 years of CREST support, the maximum currently allowed. CREST's ability to make awards is contingent upon the NSF budget and program's annual funding appropriations. Consequently, only 8 competitions for CREST awards have been held since the program's inception. Two CREST awards were made in Fiscal Year (FY) 1987, four in FY 1988, two in FY 1991, four in FY 1997, and four in FY 1998. The FY 2002 CREST competition resulted in the renewal of two Centers and the award of three new Centers, the FY 2003 competition resulted in four renewals and two new Center awards, and the FY 2004 competition resulted in three new Center awards. During this interval, nine Centers completed one cycle of CREST funding, with eight of these eventually completing two cycles (10 years) of program support. In FY 2002, CREST additionally began supporting Historically Black Colleges and Universities - Research Infrastructure for Science & Engineering (HBCU-RISE) with the intent of increasing the production of minority Ph.D.s. in science, mathematics and engineering.

CREST responds to both the PEOPLE Goal ("A diverse, competitive and globally engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens") and the IDEAS Goal ("Discovery across the frontier of science and engineering, connected to learning, innovation and service to society") of the NSF Strategic Plan (2003-2008). In 2003 alone, CREST Centers involved 41 researchers, 93 faculty and more than 360 student participants. In this same year, CREST awardees also tallied more than 150 proposals, 130 awards, 446 presentations and 445 publications.

Note: CREST and HBCU-RISE are institutional awards. CREST applicants must be minority-serving institutions. HBCU-RISE applicants must be accredited Historically Black Colleges or Universities in the United States or its territories. Interested applicants should consult the U.S. Department of Education's Office of Civil Rights (online at: <http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>) to confirm their institution's eligibility for CREST or HBCU-RISE.



Center for Advanced Materials and Smart Structures

NSF Award: 0205803

Institution: North Carolina Agricultural & Technical State University. IRC Building, Room 242, Greensboro, NC 27411

Contact: Jagannathan Sankar, Department of Mechanical Engineering. Phone: (336) 256-1151; fax: (336) 256-1153; e-mail: sankar@ncat.edu

Internet: <http://camss.ncat.edu>

North Carolina A&T State University's Center for Advanced Materials and Smart Structures (CAMSS) conducts research in the three areas: nanoengineered and surface-engineered coatings and materials; nanocomposites and other innovative composites; and electronic and smart materials and structures. Structural ceramics have unique properties that can be used to

great advantage in advanced high-temperature applications. Innovative ceramic composites are also being developed for use in high-temperature applications, wear-resistant materials, and novel sensor and smart-structure applications. Nanoscale science and technology is expected to revolutionize next-generation technology ranging from structural materials to smart structures and from microelectronics to medicine. CAMSS seeks to continue the promotion of advanced materials engineering as a unifying research and education discipline, including the development of new curricula and the recruitment of talented undergraduate and graduate students from ethnic and economic groups historically underrepresented in science and technology. By its very design, the Center has been driving adjustments in the rewards and recognition for collaborative research and teaching. Center participants have now published more than 65 peer-reviewed articles, delivered 73 international conference presentations and registered two patents. The Center is a state and national educational and research resource in the field of advanced materials and their composites, developing research programs with a focus on student participation and learning.

Nanoscale science and technology is expected to revolutionize next-generation technology ranging from structural materials to smart structures and from microelectronics to medicine.

Selected Publications

Kumar, D, SJ Pennycook, J Narayan, H Wang and A Tiwari. 2003. Role of Silver addition in the synthesis of high critical current density MgB_2 bulk superconductors, *Superconductor Science and Technology*, Volume 16(4).

Neralla, S, D Kumar, S Yarmolenko and J Sankar. 2004. Mechanical properties of nanocomposite metal-ceramic thin films. *Composites, Part B: Engineering*, Volume 35(2).

Xu, Z, J Sankar and S Yarmolenko. 2004. Yttria-stabilized zirconia coatings produced using combustion chemical vapor deposition. *Surface and Coatings Technology*, 177-178, 52-59.





Center for Systems Science Research

NSF Award: 0206028

Institution: Tennessee State University, 3500 John Merritt Boulevard, Nashville, TN 37209

Contact: Lee Hyun Keel, Center of Excellence Information Systems. Phone: (615) 963-7025; fax: (615) 963-7027; e-mail: keel@gauss.tsuniv.edu

Internet: <http://explorers.tsuniv.edu/cssr/>

During its first 4 years, CSSR published 171 articles, of which 139 were in refereed journals or included in conference proceedings.

Tennessee State University has established the Center for Systems Science Research (CSSR), which consists of components from Mathematics, Physics/Astronomy, and Electrical/Mechanical Engineering. The CSSR has two primary goals: 1) the establishment of a permanent research base at Tennessee State University that

produces new knowledge and quality, peer-reviewed research; and 2) the enhancement of participation and substantial involvement of minority students and faculty in STEM research areas. During its first 4 years, CSSR published 171 articles, 139 of which were in refereed journals or included in conference proceedings. Over the same period, the Center has supported an average of 35 undergraduate and 7 graduate African-American students per year. Support for both graduates and undergraduates has averaged over \$200,000 per year for various combinations of tuition, fees, room and board, and stipends. Students present their work at the TSU university-wide research symposium and at the NSF/NASA/TSU student research symposium. Students have also been co-authors with CREST researchers on journal articles and conference papers. In the Fall 2001 semester, the university began enrolling students in the newly established Ph.D. program in Computer Information Systems Engineering, which is housed in the College of Engineering, Technology and Computer Science.

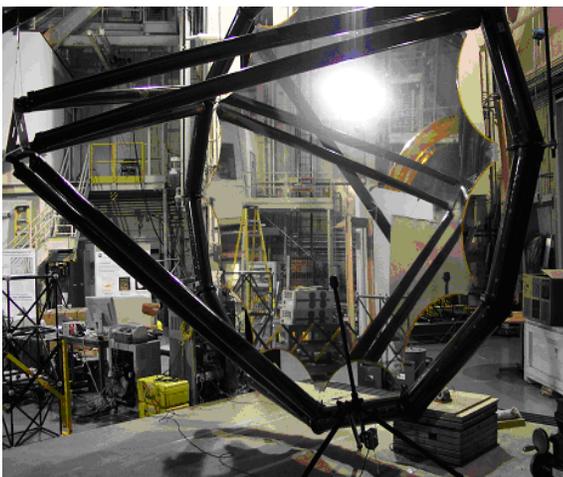
Selected Publications

Adetona, O. 2004. Robust adaptive control of nonaffine nonlinear plants with small input signal changes. *IEEE Transactions on Neural Networks*, Volume 15.

Paulson, DB, SH Saar, WD Cochran and GW Henry. 2004. Searching for Planets in the Hyades III: The Quest for Short-Period Planets. *Astrophysical Journal*, Volume 127.

Sathanathan, S and LH Keel. 2004. Convergence and stability of stochastic hereditary iterative processes. *Dynamics of Continuous, Discrete and Impulsive Systems*, Volume 11.

Tao, Y and R Moreno. 2004. A 3-D Micro network piping convective heat sink with NPCM suspension fluid. *Journal of Heat Transfer*, Volume 126.



NSF Award: 0206162

Institution: CUNY City College. Convent Avenue at 140th Street, New York, NY 10031

Contact: Charles B Watkins, Professor of Mechanical Engineering. Phone (212) 650-5439; fax: (212) 650-8013; e-mail: watkins@ccny.cuny.edu

Internet: <http://www.ccny.cuny.edu/cmms/>

City College and Hunter College at the City University of New York (CUNY) have teamed with CUNY diversity partners such as Lehman College and the CUNY Alliances for Graduate Education and the Professoriate (AGEP) and Louis Stokes Alliance for Minority Participation (LSAMP) projects. The Center for Mesoscopic Modeling and Simulation (CMMS) focuses on physicochemical modeling, simulation and analysis at the mesoscale level of several distinct - but physically related - condensed matter and materials systems.

Classical mechanics cannot completely describe complex macroscopic systems. At the other end of the size spectrum, atomistic quantum interaction theory is intractable for complex molecules and ensembles.

Classical mechanics cannot completely describe complex macroscopic systems. At the other end of the size spectrum, atomistic quantum interaction theory is intractable for complex molecules and ensembles. Hence, mesoscopic mathematical models must be devised as the tools for understanding macroscopic and microscopic behavior. Many of these models involve similar features, such as combinations of semi-empirical and exact formulations and inclusion of quantum effects, which provide common areas of

modeling research for the CMMS's research areas. This commonality also provides a framework for CMMS educational activities for graduate students, including formal computational science courses, seminars, internships and training in parallel and distributed processing systems administration. By design, CMMS also includes a multi-faceted diversity outreach, recruitment and retention plan based on proven-good practices in diversity partnerships.

Selected Publications

Akins, D, G Haiquan, W Xu and X Zhang. 2003. Spectroscopy and dynamics of DCM encapsulated in MCM-41 and Y Zeolite mesoporous materials. *Journal of Molecular Structure*, Volume 689.

Andreopoulos, Y. 2003. A new laser vorticity probe, LAVOR: its development and validation in a turbulent boundary layer. *Experiment in Fluids*, Volume 34.

Hammonds, J. 2003. The effect of laser light propagation through a self-induced inhomogeneous process gas on temperature-dependent laser-assisted chemical etching. *International Journal of Heat and Mass Transfer*, Volume 46.

Xanthos, S and Y Andreopoulos. 2003. Boundary layer separation induced by successive favorable and adverse pressure gradients. *Journal of Visualization*, Volume 17.

Center for Tropical Applied Ecology and Conservation at the University of Puerto Rico



NSF Award: 0206200

Institution: University of Puerto Rico, Rio Piedras. PO Box 21489, San Juan, PR 00931

Contact: Elvira Cuevas, Department of Biology. Phone: (787) 764-0000 ext. 14713; fax: (787) 773-1722; e-mail: ecuevas@uprrp.edu

Internet: <http://crest-catec.hpcf.upr.edu>

The Center is designed to create a research environment where multidisciplinary groups work together to solve the complex environmental problems facing the tropics, with particular emphasis in the Caribbean.

the Caribbean. The Center promotes research programs in the particular areas of: Molecular Ecology, Evolution and Genetics; Species Population Management; Landscape Ecology; and Ecosystem Processes. The administration of the University of Puerto Rico has also demonstrated their commitment to the continuation of the Center by returning nearly 19 percent of indirect costs on all grants submitted through the Center. The ultimate goal of the Center is to train a new generation of scientists with a strong education and research experience in applied ecology and conservation, and to better integrate university research activities with societal needs.

The CREST Center for Applied Ecology and Conservation at the University of Puerto Rico, Rio Piedras, focuses on four levels of biological organization: individuals and their genes, populations, ecosystems and landscapes. The Center is designed to create a research environment where multidisciplinary groups work together to solve the complex environmental problems facing the tropics, with particular emphasis in

Selected Publications

Bayman, P, EJ Gonzales, JJ Fumero and R Tremblay. 2003. Are fungi really necessary? How fungicides affect growth and survival of the orchid, *Lepanthes rupestris*, in the field. *Journal of Ecology*, Volume 90.

Melendez-Ackerman, E, C Calisto-Perez, M Morales-Vargas and J Fumero-Caban. 2003. Post-hurricane recovery of a herbaceous understory plant in a tropical rain forest in Puerto Rico. *Journal of Tropical Ecology*. Volume 19.

Santiago-Valentin, E and S Aragon. 2003. Phylogenetics of the Antillean Goetzeoideae (Solanaceae) and their relationships within the Solanaceae based on chloroplast and ITS DNA sequence data. *Systematic Botany*, Volume 28: 452-460.

Soucy, S, T Giray and D Roubik. 2003. Solitary and group nesting in the orchid bee, *Euglossa hyacinthine*. *Insects Sociaux*, Volume 50.





Research on the Environmental Sustainability of Semi-Arid Coastal Areas (RESSACA)

NSF Award: 0206259

Institution: Texas Engineering Experiment Station. 332 Wisenbaker Engineering Research Center, College Station, TX 77843

Contact: Dr. Kuruvilla John. Frank H. Dotterweich College of Engineering. Phone: (361) 593-2290; fax: (361) 593-2069; e-mail: k-john@tamuk.edu

Internet: <http://crest.tamuk.edu/>

Texas A&M University, Kingsville (TAMUK) is the lead institution for the Research on Environmental Sustainability of Semi-Arid Coastal Areas (RESSACA) project. RESSACA is an interdisciplinary research center that supports partnerships with education, research, government and private entities to conduct and disseminate research findings. The Center's three principal research areas are: Environmental Systems Modeling (ESM), Environmental Informatics (EI), and Living Laboratories for Academics and Research (LLAR). The LLAR, in particular, provides multi-scale integrated academic and research field facilities for environmental assessment in semi-arid coastal zones within South Texas. The data generated are utilized in ESM and EI applications and is transferred into educational domains from kindergarten through graduate school and to the general public. RESSACA also provides a forum for minority student enrollment in graduate-level disciplines pertaining to environmental engineering, the integration of research and education, and the translation of environmental research to public policy and economic development. Partner institutions include: Texas A&M University, Corpus Christi; Texas A&M International University, Laredo; The University of Texas, El Paso; The University of Texas, Pan American; and The University of Texas, Brownsville.

RESSACA provides a forum for minority student enrollment in graduate-level disciplines pertaining to environmental engineering, the integration of research and education, and the translation of environmental research to public policy and economic development.

Selected Publications

Chang, N-B. 2003. Compatibility analysis of material and energy recovery in a regional solid waste management system (Year 1). *Journal of the Air and Waste Management Association*, Volume 53.

Clapp, L. 2004. Evaluation of polyethylene hollow-fiber membranes for hydrogen delivery to support reductive dechlorination in a soil column (Years 1 & 2). *Water Research*, Volume 37.

Jones, K and A Martinez. 2004. Kinetic evaluation of H₂S and NH₃ biofiltration for two media used for wastewater life station emissions (Year 2). *Journal of the Air and Waste Management Association*, Volume 54.

RESSACA partnerships with other NSF-funded projects include the Science and Technology Center for Sustainable Semi-Arid Hydrology and Riparian Areas at the University of Arizona, the Center for Environmental Analysis of the California State University, Los Angeles, and the San Diego Supercomputer Center. The project's research and partnerships will enable TAMUK to achieve national competitiveness in sustainability research and become a top producer of Hispanic students earning doctoral degrees in environmental engineering.



Center for Nanomaterials Characterization Science and Processing Technology

NSF Award: 0317607

Institution: Howard University. 2400 Sixth Street, NW, Washington, DC 20059

Contact: James W. Mitchell, Professor of Materials Science. Phone (202) 806-9086; fax: (202) 806-5367;

e-mail: jwm@msrce.howard.edu

Internet: <http://www.hucrest.eng.howard.edu>

The Howard University CREST is conducting collaborative characterization science research that should significantly impact the forefront of nanomaterials synthesis and technology development.

Howard University established the CREST Center for Nanomaterials Characterization Science and Processing Technology (NCSPT) in 2003. Characterization scientists provide the intellectual foundation for verification of directed synthesis and development of methods for fabricating new nanomaterials with clearly definable chemical identities and technologically useful properties. Additionally, characterization research clarifies the

unexpected chemical transformations that nanomaterials undergo as these substances get exposed by processing to generate nanostructured devices.

Collaborative investigations of surface science and morphology of nanomaterials are done in conjunction with the National Institute of Standards and Technology (NIST). Meanwhile, at Howard, a group of core faculty focuses on the chemical characterization research of nanomaterials. Taken together, the Howard University CREST is conducting collaborative characterization science research that should significantly impact the forefront of nanomaterials synthesis and technology development. Broader impacts of the center activities include advancing discovery and understanding while developing tools for exposing minority undergraduates and graduates to the fundamental aspects of materials chemistry.



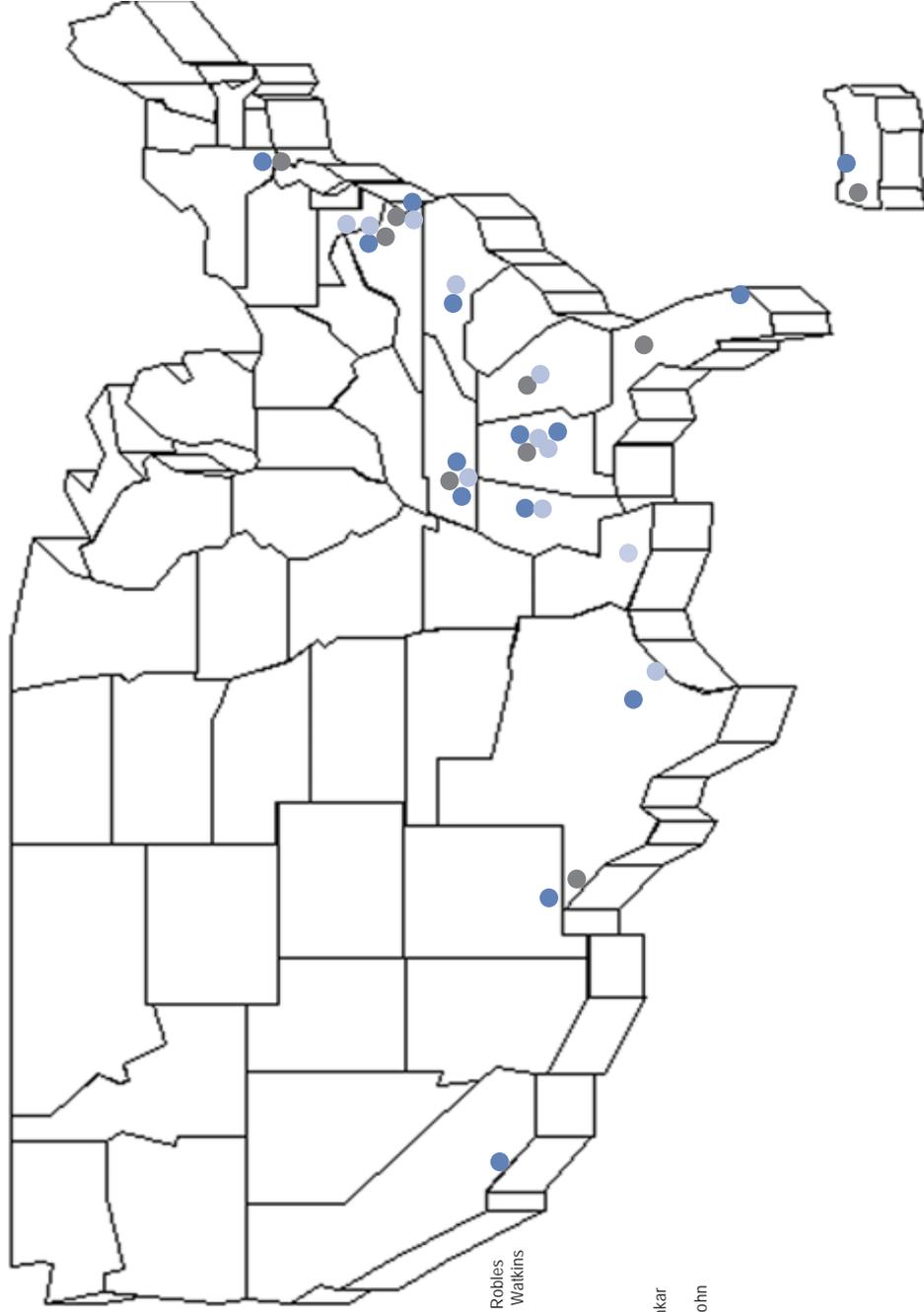
Selected Publications

Baruah, T, RR Zope, SL Stevenson and MR Pederson. 2004. Electronic structure, vibrational stability, and predicted infrared-Raman spectra of the As clusters. *Journal of Chemical Physics*, Volume 121.

Bates, C, Jr. and I Bankman. In press. Conversion efficiencies and carrier lifetimes in PtSi/p-Si composites. *Journal of Applied Physics*, Volume TBA.

Harris, G and L Salamanca-Riba. 2003. Systematic study of effects of growth conditions on the size and shape of GaN single crystals grown by a direct reaction of Ga with ammonia. *Journal of Applied Physics*, Volume 94.

Map of CREST Centers and HBCU-RISE Awards



Past CREST Centers

Two Funding Cycles

- Alabama A&M University (AL) - Williams
- City University of New York (NY) - Akins
- Clark Atlanta University (GA) - Msezane
- Hampton University (VA) - Buck
- Howard University (DC) - Spencer
- Meharry Medical College (TN) - Hill
- University of Puerto Rico (PR) - Caban
- University of Texas, El Paso (TX) - Bronson

One Funding Cycle

- Joint Award - Florida A&M University/Florida International University (FL) - Harmon

Current CREST Centers

- Alabama A&M University (AL) - Fraser
- California State University, Los Angeles (CA) - Robles
- City University of New York City College (NY) - Watkins
- Fisk University (TN) - Collins
- Florida International University (FL) - Deng
- Howard University (DC) - Mitchell
- Jackson State University (MS) - Leszczynski
- New Mexico State University (NM) - Ranjan
- Norfolk State University (VA) - Bonner
- North Carolina A&T State University (NC) - Sankar
- Tennessee State University (TN) - Keel
- Texas Engineering Experiment Station (TX) - John
- Tuskegee University (AL) - Jeelani
- University of Puerto Rico (PR) - Cuevas

Current HBCU-RISE Awardees

- Alabama A&M University (AL) - Lal
- Clark Atlanta University (GA) - Allabadi
- Hampton University (VA) - Hommerich
- Howard University (DC) - Mitchell
- Jackson State University (MS) - Leszczynski
- Morgan State University (MD) - Kennedy
- North Carolina A&T State University (NC) - Song
- Southern University, Baton Rouge (LA) - Owens
- Tennessee State University (TN) - Rogers
- Texas Southern University (TX) - Wilson
- Tuskegee University (AL) - Jeelani

Table 1: Graduated and Current CREST Awards

Graduated Center Awards	
Materials Science Research Center of Excellence Howard University - 8714767 & 9255378	Michael Spencer
Meharry Medical College Research Center of Excellence in Membrane Biology Meharry Medical College - 8714805 & 9255157	George Hill
Puerto Rico Center of Excellence in Tropical and Caribbean Research University of Puerto Rico - 8802961 & 9353549	Reinaldo Caban
Center for Analysis of Structures and Interfaces (CASI) City University of New York - 8802964 & 9353488	Daniel Akins
Center of Excellence in Nonlinear Optics and Nonlinear Optical Materials Alabama A&M University - 8802971 & 9353548	Alton Williams
Materials Research Center of Excellence University of Texas, El Paso - 8802973 & 9353547	Arturo Bronson
Center for Theoretical Studies of Physical Systems Clark Atlanta University - 9154077 & 9632844	Alfred Msezane
Nuclear/High Energy Physics (NuHEP) Research Center of Excellence Hampton University - 9154080 & 9633750	Cynthia Keppel
Current Center Awards	
Center for Advanced Materials and Smart Structures North Carolina A&T State University - 9706680 & 0205803	Jagannathan Sankar
Center for Systems Science Research Tennessee State University - 9706268 & 0206028	Leehyun Keel
Center for Mesoscopic Modeling and Simulation City University of New York City College - 0206162	Charles Watkins
Center for Tropical Applied Ecology and Conservation at the University of Puerto Rico University of Puerto Rico, Rio Piedras - 0206200	Elvira Cuevas
Research on the Environmental Sustainability of Semi-Arid Coastal Areas (RESSACA) Texas Engineering Experiment Station - 0206259	Kuruvilla John
Center for Nanomaterials Characterization and Processing Technology Howard University - 0317607	James Mitchell
Center for Emerging Technologies for Advanced Information Processing and High-Confidence Systems Florida International University - 0317692	Yi Deng
Synthesis, Manufacturing and Characterization of Structural Nanocomposites Tuskegee University - 9706871 & 0317741	Shaik Jeelani
Center for Photonic Materials Research Norfolk State University - 9805059 & 0317722	Carl Bonner
Center for Environmental Analysis (CEA-CREST) California State University, Los Angeles - 9805529 & 0317772	Carlos Robles
Computational Center for Molecular Structure and Interactions Jackson State University - 9805465 & 0318519	Jerzy Leszczynski
Center for Research Excellence in Bioinformatics and Computational Biology New Mexico State University - 0420407	Desh Ranjan
Center for Excellence in Physics and Chemistry of Materials Fisk University - 00420516	Warren Collins
Center for Forest Ecosystems Assessment Alabama A&M University - 0420541	Rory Fraser



Center of Emerging Technologies for Advanced Information Processing and High-Confidence Systems

NSF Award: 0317692

Institution: Florida International University, Miami, FL 33199

Contact: Yi Deng, School of Computer Science. Phone: (305) 348-1229; (305) 348-3549; e-mail: deng@cs.fiu.edu

Internet: <http://www.crest.fiu.edu>

The Center of Emerging Technologies for Advanced Information Processing and High-Confidence Systems is managed jointly by the School of Computer Science and the Department of Electrical and Computer Engineering at Florida International University (FIU). The Center's mission is to become a leading center of education and research in advanced information processing and high-confidence systems through integration of emerging technologies with real-world applications and significant societal impact. The Center also serves as a resource for the education of students underrepresented in STEM and is a gateway to research and education opportunities in Latin and South America.

The FIU CREST serves as a resource for the education of students underrepresented in STEM and is a gateway to research and education opportunities in Latin and South America.

The FIU Center will become a driving force to enhance minority-student recruitment, retention, training, research and career preparation. In particular, it will help to increase the production of minority students at the Ph.D. level. The project's research areas cross the traditional boundaries of computer science and engineering, information processing, assistive technologies and neuroscience with an integrative approach to advance design, analysis and development of safety-critical, real-time information processing systems.

With over 34,000 students, of whom more than 68 percent are Hispanic or African American, FIU is one of the largest minority-serving research universities. The FIU CREST will significantly enhance the infrastructure and competitiveness of the university's research and education programs in computer science and engineering. In addition to the educational component, the Center pursues four major research subprojects: 1) Specifying, analyzing, and implementing the construct of high-confidence reactive software systems; 2) multidimensional-multimodal data modeling and query research; 3) the development of real-time assistive technology for visual impairments, blindness, and motor disabilities through the integration of software and hardware designs; and 4) advanced information processing with neuroscience applications that focuses on signal and imaging techniques with significant real-world applications. The latter research area aims to meet the needs for new developments in bio-signal processing and neuro-rehabilitation as the functional mapping of the brain and the causality of key brain dysfunctions are elicited.

Center for Photonic Materials Research



NSF Award: 0317722

Institution: Norfolk State University, 700 Park Avenue, Norfolk, VA 23504

Contact: Carl E. Bonner, Jr., Center for Materials Research. Phone: (757) 823-2097; fax: (757) 823-9054;
e-mail: cebonner@nsu.edu

Internet: <http://vigyan.nsu.edu/~cmr/>

The CPMR project has dramatically improved the research competitiveness of the physical sciences faculty and helped in building NSU's national recognition in the niche area of photonic materials.

Norfolk State University (NSU) is the home of the Center for Photonic Materials Research (CPMR), which was first funded by CREST in 1998. The CPMR project has dramatically improved the research competitiveness of the physical sciences faculty and helped in building NSU's national recognition in the niche area of photonic materials. During 4 years of CREST support, more than 100 research publications and presentation

have been produced by CPMR faculty and students, including 26 publications in peer-reviewed journals. Thirty-four graduate and 43 undergraduate students have been supported by and involved in CPMR projects. The prime educational goal of the Center is to increase the number of underrepresented minority students skilled in the field of photonics and nanotechnology and to prepare them for positions of leadership in the emerging areas of science and technology. The project will initiate a Ph.D. program in Materials Science and Engineering that builds upon the strength of the existing master's program in Materials Science and will develop master's programs in Optical Engineering and Electronics Engineering at NSU.

The Center will complement and strengthen the ongoing research and educational projects at NSU in the key area of photonics, spintronics and nanomaterials by enhancing the research potential of existing faculty, providing capital equipment, student-support resources and adding tenure track and research faculty. These improvements will enable the university to sustain its advanced materials research and engineering activities beyond the duration of the CREST award.

Selected Publications

Ibrahim, W, CE Bonner, Jr., H El-Sayed Ali and M Shinn. 2004. Femtosecond damage threshold of multi-layer metal films. *International Journal of Heat Transfer*, Volume 47.

Noginova, N, and V Atasarkin. 2004. NMR and spin relaxation in $\text{LaGa}_{1-x}\text{Mn}_x\text{O}_3$: Evidence for thermally activated internal dynamics. *Physics Review B*, Volume 69.

Noginov, M, M Bahoura, G Zhu and I Fowlkes. 2004. GaAs random laser. *Laser Physics Letters*, Volume 1.

Sun, S. 2004. Improving opto-electronic efficiency via bridged donor and acceptor block copolymers. *Poly Materials Science and Engineering*, Volume 90.



Synthesis, Manufacturing and Characterization of Structural Nanocomposites

NSF Award: 0317741

Institution: Tuskegee University, Tuskegee Institute, AL 36088

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The Tuskegee University Center for Innovative Manufacturing of Advanced Materials has been successful in stimulating and producing cutting-edge materials research in the study of nanoparticle-polymer interactions. Over the past 5 years of CREST support, extensive scientific, technical, and educational advances have been made in each of the research areas of the project. Sixty refereed publications in journals and conference proceedings have resulted from the research performed with CREST support. Tuskegee's Ph.D. program in Materials Science and Engineering was launched within a year of establishing the CREST Center and currently enrolls 12 students. A majority of students in the program are African Americans and one-third of these are female. Twenty-one master's students and 25 undergraduate students have completed their research under the CREST program and have graduated from the university. The Tuskegee CREST has also assembled a diverse team of researchers to study the entire spectrum of technology related to the synthesis, fabrication and characterization of structural nanocomposites. The project also involves collaborative research and education activities with Auburn University, Purdue University, the University of Illinois at Urbana-Champaign, and the University of South Alabama. In addition, scientists at Boeing, Raytheon, TRW, the Air Force Research Laboratory, NASA's Marshall Space Flight Center and the University of Wisconsin will also participate in the project.

Tuskegee's Ph.D. program in Materials Science and Engineering was launched within a year of establishing the CREST Center and currently enrolls 12 students.

Selected Publications

Kanny, K. 2004. Static and dynamic characterization of polymer foams under shear loads. *Journal of Composite Materials*, Volume 38.

Mahfuz, H. 2004. Fabrication, synthesis and mechanical characterization of nanoparticles infused polyurethane foams. *Composites-Part A*, Volume 35.

Thomas, T. 2004. Dynamic compression of sandwich composites at sub-ambient temperatures. *Journal of Composite Materials*, Volume 38.



Center for Environmental Analysis (CEA-CREST)



NSF Award: 0317772

Institution: California State University. 5151 State University Drive, Los Angeles, CA 90032

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The CEA-CREST team formulated a spatially explicit model of marine predator-prey dynamics, providing an alternative to verbal hypotheses that prevailed as general theory for more than three decades.

The Center for Environmental Analysis (CEA), based at California State University, Los Angeles, is conducting multidisciplinary environmental research in a partnership with major national research centers, including the University of California at Santa Barbara and several other schools in the region. To open more educational opportunities for the diverse pool of CEA-CREST student fellows, the Center is revising an existing interdisciplinary

master's degree program and establishing a joint doctoral degree with the University of California.

Over the first 4 years of the project, CEA-CREST faculty's refereed publications increased 153 percent, from 17 to 43; presentation of abstracts increased 138 percent, from 16 to 38; and total grant dollars (not including the CREST award) increased 33 percent, from \$2.07 million to \$2.73 million. The current pool of CEA-CREST fellowship recipients consists of 5 undergraduates and 13 graduates, most of whom are underrepresented minorities. Fourteen CEA-CREST fellows graduated in the program's first 4 years, with 11 of these entering Ph.D. programs. CEA-CREST presents a vision of a fully integrated science community in which minority faculty and students lead significant intellectual enterprises. The vision inspires the efforts of other minority-serving institutions and encourages the allegiance of majority research universities in the causes of educational and environmental justice.

CEA-CREST researchers are poised to establish an impressive series of discoveries in Environmental Science under the unifying theme of Spatially Structured Dynamics. As only one example, the CEA-CREST team formulated a spatially explicit model of marine predator-prey dynamics, providing an alternative to verbal hypotheses that prevailed as general theory for more than three decades.

Selected Publications

Hibbs, B and C Eastoe. 2003. Binational study of the surface and groundwater resources of the El Paso/Juarez international corridor. *Water Resources Update*, Volume 125.

Hibbs, B and C Eastoe. 2003. Hydrogeological and isotopic study of the Hueco Bolson aquifer, El Paso/Juarez Mexico area. *Hydrological Science and Technology*, Volume 19.

Stow, D and J Gamon. 2004. Remote sensing of vegetation and land-cover change in Arctic Tundra ecosystems. *Remote Sensing of Environment*, Volume 89.



Computational Center for Molecular Structure and Interactions

NSF Award: 0318519

Institution: Jackson State University. 1400 J.R. Lynch Street, Jackson, MS 39217

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Internet: <http://ccaix.jsums.edu/~sst/crest.htm>

The Computational Center for Molecular Structure and Interactions (CCMSI) at Jackson State University (JSU) has been recognized for its innovative leadership in computational chemistry at the national and international levels through peer-reviewed journals, conferences and prestigious awards. CCMSI research develops efficient computational methodologies and their application to the study of structures and the properties of molecules.

CCMSI has been recognized for its innovative leadership in computational chemistry at the national and international levels through peer-reviewed journals, conferences and prestigious awards.

CCMSI faculty conduct collaborative research on the structures and properties of molecules ranging from nanoscale systems to large biomolecules. Over the past 4 years, the Department of Chemistry at Jackson State University has become the most research-active department in Mississippi. The Center has published 50 to 60 papers per year in leading peer-reviewed journals in addition to giving 50 to 90 presentations at national and international conferences. Many of these efforts were co-authored by undergraduate and graduate students.

Selected Publications

Cain, D, DM Pawar and EA Noe. 2004. Conformational studies of trans-cycloheptene, trans-cycloheptene oxide and trans-bicyclo [5.1.0] octane by ab initio calculations. *Theochem*, Volume 674.

Deng, T and M Huang. 2004. Capillary electrophoretic separation and theoretical study of inclusion complexes of sulfobutyl ether α -cyclodextrin with estrogens. *International Journal of Quantum Chemistry*, Volume 100.

Gorb, L, Y Podolyan, P Dziekonski, WA Sokalski and J Leszczynski. 2004. Double-proton transfer in adenine-thymine and guanine-cytosine base pairs. A Post-Hartree-Fock ab initio study. *Journal of the American Chemical Society*, Volume 126.

Xiao, C, J Blundell, F Hagelberg and WA Lester, Jr. 2004. silicon clusters doped with an yttrium metal atom. *International Journal of Quantum Chemistry*, Volume 96.

International recognition for the Center is evidenced by the recruitment in 2001 of Nobel Prize Laureate Dr. Herbert Hauptman to the Center's Advisory Board, as well as the 2000 appointment of Dr. Jerzy Leszczynski as the Editor-in-Chief for the *International Journal of Molecular Sciences*, his 2001 White House Millennium Award for Excellence in Research at HBCUs, and his election in 2002 to the European Academy of Sciences. Currently, Center faculty support 11 graduate students. Two more students defended their Ph.D. thesis in 2003 and the program expects to graduate three to five students per year, positioning JSU among the nation's largest producers of African-American Ph.D.s in chemistry.

Center for Research Excellence in Bioinformatics and Computational Biology



NSF Award: 0420407

Institution: New Mexico State University. Las Cruces, NM 88003

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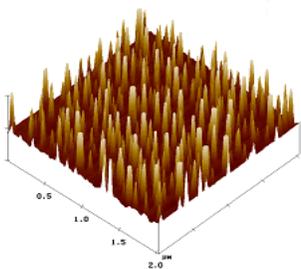
NMSU is among the first minority-serving institutions with a research center for Bioinformatics and has the first BCB program in New Mexico.

The Center for Bioinformatics and Computational Biology (BCB) at New Mexico State University (NMSU) is dedicated to the discovery of information technology to facilitate the understanding of biological processes. The Center will combine the complementary expertise of a team of researchers from Computer Science, Biology,

Chemistry, and Agriculture to advance the state of the art in BCB. It will also serve a diverse student population with a large proportion of Native Americans and Hispanics. The Center will build on the existing infrastructure to enhance minority participation in science and technology and extend its impact by providing access to academic excellence in BCB. NMSU programs such as Native American Pathways, the National Institutes of Health Bridge in Biomedical Sciences, the NMSU National Institute of General Medical Sciences' Minority Access to Research Careers program, and the NSF-funded NM-AMP, NM-ADVANCE and NM-AGEP programs have also committed their support to the development of the BCB Center at New Mexico State University.

The Center will seamlessly integrate cutting-edge research in BCB with the creation of educational opportunities for a diverse body of students and researchers. The educational effort will provide new research-oriented courses and training, and will culminate with the development of a master's degree in BCB as well as outreach efforts targeting local high schools and community colleges. The Center will also support specific research projects and activities aimed at developing a general infrastructure for research and education in BCB.

NMSU is committed to provide access to existing research and educational resources that will help the Center to fulfill its mission. The Center will greatly boost the BCB research and educational activities at NMSU, acting as a catalyst for the creation of a comprehensive BCB program. It will provide educational and training opportunities for students from high school to graduate school and from diverse backgrounds, increasing the access to careers in BCB by underserved populations. The proposed research also has the potential to impact disciplines such as medicine and agriculture, expanding the broader societal benefits of the Center's work. NMSU is one of the few minority, Hispanic-serving, research-extensive institutions with comprehensive science, technology and engineering programs. With this CREST award, NMSU will also be among the first minority-serving institutions with a research center for Bioinformatics and will have the first BCB program in New Mexico.



Center for Excellence in Physics and Chemistry of Materials at Fisk University

NSF Award: 0420516

Institution: Fisk University, 1000 Seventeenth Avenue North, Nashville, TN 37208

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The Center for Excellence in Physics and Chemistry of Materials (CPCoM) at Fisk University will establish a program that integrates high-quality science education with state-of-the-art research and develop it over the course of CREST support into an internationally recognized research center. Education of undergraduates and graduates will be a vital component of the Center. Fisk University and its partners are

committed to increasing the number of scientists from historically underrepresented populations in order to provide a diverse group of graduate practitioners in this discipline. Student research experiences at CPCoM will include laboratory experimentation and modeling the areas of: preparation of amorphous materials; crystal growth of optical materials; preparation of nanophase materials; thin-film deposition; surface characterization; linear and non-linear optics; laser spectroscopy; and the fabrication and implementation of materials in sensors, devices and subsystems.

Undergraduate students supported by the Center will be encouraged to participate in summer research experiences at Fisk, national laboratories, industry facilities and other universities, including participation in summer semesters at doctorate-granting institutions. The project will extend its outreach activities to high schools in Nashville and to HBCUs in Tennessee and neighboring states. Agreements made with Vanderbilt University and Carnegie Mellon University will provide Fisk program graduates with opportunities beyond the master's degree as Fisk builds the academic foundation and intellectual climate to develop a quality Ph.D. program of its own.

Fisk University and its partners are committed to increasing the number of scientists from historically under-represented populations in order to provide a diverse group of graduate practitioners in this discipline.





Center for Forest Ecosystems Assessment

Award: 0420541

Institution: Alabama A&M University. 135 Agricultural Research Center, Normal, AL 35762

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The intellectual benefits of CFEA will be shared with the greater community of scholars, students and practitioners of natural resource science and policy.

With its FY 2004 CREST award, Alabama A&M University (AAMU) will establish a Center for Forest Ecosystems Assessment (CFEA) with the goals of strengthening multi-disciplinary research for the improved understanding of forest ecosystems, and increasing the number of trained professionals, especially African Americans, engaged in the research, teaching and

management of renewable natural resources. CFEA activities and objectives also include an enhanced research base, enhanced graduate student training, curricula and faculty development, and the development of research facilities and resources. Five multi-disciplinary research sub-projects are planned to enhance the understanding of upland hardwood forest ecosystem responses to disturbances. Ecological relationships will be examined at different temporal and geographical scales.

CFEA faculty and their students, diverse in their disciplinary backgrounds, will undertake several integrative studies. They will contribute to the knowledge of forest ecosystems by in-depth analysis of additive and confounding effects of anthropogenic and natural interventions in the forest. The study of biogeochemical cycling will characterize the impact of fire on microbes on soils and focus on the contributions that nitrogen-cycling microbial communities make to the succession of herbaceous and woody plants. The intellectual benefits of CFEA will be shared with the greater community of scholars, students and practitioners of natural resource science and policy. It is hoped that the approaches utilized in CFEA will aid future CREST proposals and grantees, especially smaller minority-serving institutions, to develop programs and capacities in research and training.

Undergraduate, graduate and post-doctoral students will be at the core of each research team. They will be supported by a network of technical staff, faculty and external experts, including adjunct faculty, advisors and collaborators. Center research and related information will be made available through the CFEA Web site, the annual CFEA conference, and outreach to communities, high schools, community colleges and other HBCUs with an interest in the monitoring of renewable natural resources. Faculty-development strategies will encourage production of refereed journal articles, new or revised graduate courses, and student recruitment and matriculation. Collaboration with external partners and solicitation of extramural support will also be encouraged.

HBCU-RISE



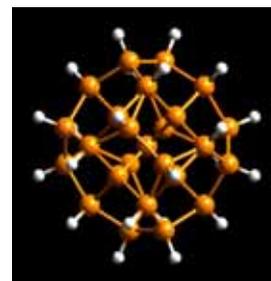
Historically Black Colleges and Universities - Research Infrastructure for Science and Engineering (HBCU-RISE), formerly known as HBCU Doctoral Capacity Building, was incorporated into the CREST portfolio of projects for FY 2004 and beyond. HBCU-RISE supports the development of research capability at HBCUs that offer doctoral degrees in STEM disciplines. Activities include, but are not limited to: faculty and technical support, faculty professional development, acquisition and/or upgrading of research equipment, and collaborative research efforts with partner universities and national laboratories. In many ways, HBCU-RISE awardees represent the next generation of minority-serving institutions that will have a strong capacity for world-class research and the production of quality STEM graduates.

Although CREST began making provisional HBCU-RISE awards in FY 2002, the first full HBCU-RISE competition was not held until FY 2003. To date, 11 institutions have received HBCU-RISE funds. These awards are summarized in Table 2 below. For more information on a particular award, visit NSF's online Abstracts at: <http://www.nsf.gov/awardsearch/> and search by the project award number.

Table 2: HBCU-RISE Awardees, FY 2002 - 2004

Doctoral Research Capacity Building for Sensor Science Technology Alabama A&M University - 0236425	Ravindra Lal
Infrastructure Building to Develop a Center for Biological and Chemical Sensor Research Morgan State University - 0236753	Alvin Kennedy
Building Research Capacity and Increasing Doctoral Successes for Underrepresented Minority Students Tennessee State University - 0236793	Decatur Rogers
Infrastructure Support for Doctoral Research in Optics & Photonics Hampton University - 0400041	Uwe Hommerich
Chemical and Biological Assessment of Endocrine Disruptors in Waterways of Southeast Texas Texas Southern University - 0401587	Bobby Wilson
Research and Education in Advanced Computing (REACOM) Clark Atlanta University - 0401679	Shahrouz Aliabadi
Computational Biology Howard University - 0401697	Louis Shapiro
Studies of Structural Nanocomposites Using Transmission Electron Microscopy Tuskegee University - 0401724	Shaik Jeelani
Synthesis, Characterization, and Computational Study of Potential Antibiotic/Antitumor Spiroisoxazolines Jackson State University - 0401730	Jerzy Leszczynski
Biologically-Inspired Adaptive and Reconfigurable Systems: Modeling, Synthesis, and Simulation North Carolina A&T State University - 0450203	Yong D. Song
Enhancement of Doctoral Research Capacity in Environmental Toxicology Southern University, Baton Rouge - 0450375	John Owens

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