# Louisiana Board of Regents
# Commendation

**to**

# National Science Foundation 2009
# CAREER Awardees

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**Board of Regents**
**State of Louisiana**
**September 2009**

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## Introduction

At this, its September 24, 2009 meeting, the Board of Regents is recognizing and honoring the 11 Louisiana university faculty members awarded a 2009 National Science Foundation CAREER Award.

According to NSF, "This premier program emphasizes the importance the Foundation places on the early development of academic careers dedicated to stimulating the discovery process in which the excitement of research is enhanced by inspired teaching and enthusiastic learning. Effective integration of research and education at all levels generates a synergy in which the process of discovery stimulates learning and assures that the finding and methods of research are quickly and effectively communicated in a broader context and to a larger audience. The CAREER program embodies NSF's commitment to encourage faculty to practice, and academic institutions to value, integration of research and education."

The recipients are:

Dr. Michelle Claville, Assistant Professor of Chemistry, Southern University and A & M College

Dr. Tabbetha Dobbins, Assistant Professor of Physics, Grambling State University & Louisiana Tech University

Dr. James P. Donahue, Assistant Professor of Chemistry, Tulane University

Dr. Jayne Garno, Assistant Professor of Chemistry, Louisiana State University and A & M College

Dr. WT Godbey, Assistant Professor of Chemical and Biomolecular Engineering, Tulane University

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Dr. Scott Grayson, Assistant Professor of Chemistry, Tulane University

Dr. Tevfik Kosar, Assistant Professor of Computer Science, Louisiana State University and A & M College

Dr. Long Que, Assistant Professor of Electrical Engineering, Louisiana Tech University

Dr. Jiandi Zhang, Professor of Physics and Astronomy, Louisiana State University and A & M College

Dr. Danella Zhao, Assistant Professor of the Center for Advanced Computer Studies (CASC), University of Louisiana at Lafayette

**Michelle Fletcher Claville, Assistant Professor of Chemistry, Southern University and A&M College**. Dr. Claville attended the University of Florida and received a B.A. in English in 1990, B.S. in Chemistry in 1993 and Ph.D. in Organic Chemistry in 1998.

Her research interests are fundamental physical organic chemistry/reaction mechanism, generation and fate of distonic radicals (i.e. specialized charged radicals) derived from amino acids and peptides, and effect of singlet oxygen on furan-containing compounds.

She was motivated to become a scientist in high school where she discovered a natural interest in chemistry that was further stimulated by certain chemistry teachers. She chose chemistry as a major upon beginning college/university. After completing a successful National Science Foundation (NSF)-sponsored summer Research Experience for Undergraduates (REU) program, she then determined to go to graduate school and earn a PhD. While in graduate school, Dr. Claville had the great fortune of meeting and learning from great chemistry mentors such as William Dolbier, Jr., Merle Battiste, Conrad Burkholder, William Jones, William Weltner and Vanecia Young. Additionally, she benefited from the friendship and interaction with numerous chemists in the National Organization for Black Chemists and Chemical Engineers (NOBCChE).

**Intellectual Merit:** Extensive research has been performed on the generation and effects of conventional radicals in various media. For example, it is widely accepted that radicals cause aging and certain diseases. Research has shown that when certain amino acids are exposed to high energy irradiation (e.g. x-ray and gamma ray), they will form a specialized type of radicals called distonic radicals. These charged radical species have been shown to be more reactive than their conventional counterparts. The research concentrates on using chemical methods to generate distonic radicals in methionine-containing peptides and comparing these results with those obtained from gamma irradiation of the same species.

**Broader Impact:** Findings from this project will benefit scientific education, government and industry. In addition to providing extensive training for undergraduates, this project will provide valuable information to industry and government regarding the potential hazards that pertain to purification of foods using irradiative methods.

**Tabbetha A. Dobbins, Assistant Professor of Physics with a joint appointment to Grambling State University and Louisiana Tech University.** After receiving a B.S. degree from Lincoln University (PA), M.S. degree from the University of Pennsylvania, and doctorate from Penn State University, Dr. Dobbins was awarded the prestigious National Research Council Post-Doctoral Fellowship to do research at the National Institute of Standards and Technology.

Dr. Dobbins came to Louisiana for the opportunity to mentor students in both graduate and undergraduate research projects and to promote the student's ability to perform scientific research. Another reason was the state supported synchrotron radiation facility located in Baton Rouge, the Center for Advanced Microstructures and Devices. Her research area involves synchrotron X-ray use.

Science runs in Dr. Dobbin's blood. Her mom is a homemaker who did not attend college. Early on, she recalled her mom saying that if she had her life to do over again, she would become a scientist who studied the stars and planets (an astrophysicist). Her dad, who also did not attend college, had a hand for fixing things and understanding how they work. As he would help her older sister with her science homework (i.e. building a lighted circuit), Dr. Dobbins would be watching close at hand, fascinated. Those early exposures to science were inspirational. Although she did not know it at the time, it would lead to a career in science which would permit her to work on some of the most challenging problems facing society today, such as the need for alternative energy, global warming, etc.

It was when she arrived at Lincoln University and entered the Lincoln Advanced Science and Engineering Recruitment (LASER) Program led by Dr. Willie Williams that the decision to pursue physics as a major was made. This program provided wonderful opportunities to visit the Air and Space museum at the Smithsonian Institute and to visit NASA at Greenbelt, Maryland. The program was an outreach project which gave her an understanding of the importance of including outreach in her own career plans which is why Dr. Dobbins works diligently to engage Grambling State and Louisiana Tech Universities in high school outreach programs. One focus of this collaboration is introducing students to instrumentation and to the excitement of materials research in an NSF funded project titled 'Nanoscale Measurement and Analysis' Workshop. Her research programs also attract and recruit students to graduate science programs in energy-related topics funded by the Department of Energy.

**Intellectual merit:** The objective of this proposal is to understand the influence of catalytic additives in enhancing atomic mobility and desorption rates in metal hydrides (specifically, NaAlH4 and LiBH4). The adaptation of sintering models to a new class of materials will be investigated, while incorporating x-ray and neutron scattering studies to understand local lattice changes in these hydrides during desorption. Prior experimental investigations to understand the role of catalysts have been limited to single-experiments such as x-ray absorption spectroscopy, nuclear magnetic resonance, or direct imaging to understand the local structure around the catalysts. Alternatively, the proposed project approaches this problem by applying an entire paradigm. In order to build concepts in understanding the role of the transition metals in hydrides, ideas are taken from a well-developed field of study (i.e., ceramic sintering and densification) wherein it is understood how dopants effect diffusion and

mass transport. Studies will investigate the effect of transition metal catalytic additives on atomic mobility at various stages of the $H_2$ desorption process. Synchrotron x-ray scattering data aid in understanding the relative roles of mass transport and $H_2$ desorption on microstructure remediation. Concentration and type of point defects formed as a result of catalytic additions will be determined using positron annihilation studies. As well, in situ synchrotron x-ray diffraction, neutron diffuse scattering studies with atomic pair distribution function analysis, and x-ray absorption spectroscopy will enable examination of local lattice strains, lattice amorphization and catalyst local structure upon hydrogen desorption and uptake.

**Broader impact:** Dr. Dobbins has a history of mentoring student researchers in synchrotron x-ray studies, many from underrepresented groups, through her joint faculty position between Grambling State University, a historically Black university, and Louisiana Tech University. This program will support both undergraduate and graduate students. Educational activities include new courses on synchrotron x-ray studies and alternative energy and a high school outreach program. Other impacts include the high school program called Project ENERGY (Exploring New Energy-alternatives Relevant to Generation Y).

The high school portion that Dr. Dobbins is developing through the CAREER grant will have a broader impact by addressing two things which have been strong motivators in her own scientific career: (1) a fascination with state-of-the-art equipment/instrumentation (another validation that science was the career for her was her first time using the electron microscopes) and (2) the ability to work on problems which are relevant to society. The CAREER proposal features two high school projects. One will give high school students exposure to scientific instrumentation in a research laboratory (for use in their science fair projects) and the other gives students a forum to discuss and work on alternative energy (a very popular technical topic) in a classroom design challenge. Dr. Dobbins believes that these projects will be fun for the high school participants, their teachers, and for the team of students from Grambling State University and Louisiana Tech University who will help with the project implementation.

**James P. Donahue, Assistant Professor of Chemistry, Tulane University**. He received his Bachelor of Science degree in Chemistry from Massachusetts Institute of Technology (MIT) in 1991. He went on to attend Harvard University where he obtained his M.A. in Inorganic Chemistry in 1996 and Ph.D. in Bioinorganic Chemistry in 1999. Dr. Donahue spent 1999-2004 conducting his postdoctoral study at Texas A&M University.

His research interests include the recycling of $CO_2$ by its electrocatalytic reduction to CO, the synthesis and study of small molecule analogues of the active site of metalloenyme active sites, and the synthesis of complex metallodithiolene molecules with "nonclassical" electronic structures.

My motivation to be a scientist, more specifically a chemist, was that it allows me maximal freedom to use my creative ability to help solve important problems that challenge our society. One of these problems is the development of *renewable* energy resources and chemical materials.

In addition, chemists routinely make new things. For me personally, few things equal the excitement of seeing a newly synthesized crystalline compound, made by my own hands, which has never before been beheld by human eyes.

**Intellectual Merit:** The intellectual merit to my research is that it aims to develop the use of carbon dioxide, a waste product of combustion, as a starting material both for chemical fuel, such as methanol, and for a variety of feedstock chemicals that underpin our chemical industry, such as ethylene. The challenge is to efficiently and selectively reduce carbon dioxide to carbon monoxide, a process that is uphill energetically. This energy must be supplied from a renewable source, such as solar or wind electricity. A metal catalyst must be employed to selectively induce the right reaction of $CO_2$ with the minimal energy input. My research focuses on the use of tungsten compounds that do react with $CO_2$ to form CO. Current efforts are focused on the technical challenges of regenerating the reactive tungsten species so that the system can be truly catalytic.

**Broader Impact:** The broader impact of my research is first and foremost that it aims to address a significant future need for carbon-based chemicals that will be unable to be met with fossil fuels alone. Further, we seek to engage students from other institutions in the New Orleans area in the actual laboratory research. This effort, coupled with an outreach program of chemical demonstrations in a nearby school, aims to foster interest in chemistry at a grassroots level so that future needs in science will have persons educated and motivated to meet the challenges.

**Jayne Garno, Assistant Professor of Chemistry, Louisiana State University and A & M College**. My career has followed a non-traditional path to academics. I worked as a technician and as an instrumental/analytical chemist for 18 years while continuously electing courses as a part-time student. Throughout my career in medical, environmental and industrial laboratories, I have always been intrigued by the operation and principles of lab instruments used for chemical analysis. My ambition was to invent new methodologies in chemical analysis. I was motivated to pursue graduate studies because of the impending automotive plant closures in my home town of Saginaw, Michigan. I became a full-time graduate student after retiring from General Motors in 1998. In my new career, I have been able to reinvent myself as a teacher and scholar, and I use all of my experience from practical lab training for research activities. I have no regrets about my new career.

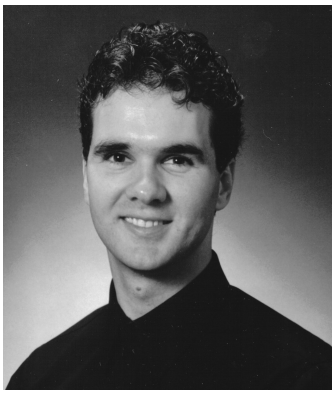
Graduate and undergraduate students under my direction (including two African-American students) participate in a range of interdisciplinary efforts which emphasize nanoscale measurements with scanning probe microscopes. A considerable challenge is posed for developing effective, reproducible methods for measurements in nanosize systems, for scaling devices to nanometer length scales, and for systematically evaluating the effects of molecular structure on nanoscale properties. My research program merges scanning probe microscopy characterizations with nanoscale lithography and is ideally suited for graduate and undergraduate participation in a range of interdisciplinary research projects.

Considering the escalating requirements placed on academic professors to produce well-trained chemistry graduates, I recognize that it is important to maintain a high standard and level of scholastic achievement. However, as a new member of the chemistry faculty, I hope to make learning chemistry less painful and rather a subject of challenge and interest. "We hated our college chemistry classes!" This bitter experience with chemistry is far too common among college students and is a problem we need to address. Students often come to chemistry classrooms with pessimistic expectations and a preconception of difficulty. My teaching approach includes a zealous research basis, since I have found that students will share my enthusiasm for scientific discovery. Classroom activities for *learning by teaching* help to offset the negative perception of chemistry by giving students an opportunity to trade roles with the professor and experience what it is like in front of a classroom.

**Intellectual merit:** As a new investigator in chemistry at Louisiana State University, my research program is directed towards applying and developing surface measurements with scanning probe microscopes at the frontier of nanoscience. The magnetic measurements described in my career proposal will have broad impact for characterizations of magnetic nanomaterials and understanding size-scaling effects of nanomagnetism. The new magnetic imaging method expands the capabilities for magnetic measurements with scanning probe instruments to ultra small size scales, at the level of individual proteins and nanoparticles. Promising directions for my research program will be to advance beyond the field of chemistry for detection of magnetic nanoparticles used in bioimaging and nanomedicine at levels beyond single cell and single molecule imaging. The goal of my research and educational program is to train students in the interdisciplinary areas of nanoscience, materials science, analytical and surface chemistry, while developing and improving their skills for

careers in academics, government R&D laboratories or industry. Students gain intensive training in instrumentation, data analysis, troubleshooting, scholarly writing and presentation skills.

**Broader Impact:** The proposed research merges nanoscale characterizations with lithography, and is ideally suited for graduate and undergraduate participation in a range of interdisciplinary research projects. My research group will promote and continue participation in K-12 outreach efforts in Louisiana schools, host guest researchers from other universities and organize instrument workshops for the public. I have initiated new curriculum developments to bring the concepts of surface science and molecular imaging into undergraduate and graduate-level courses at LSU. With a geographic location in the South, outreach programs can make tremendous impact. In Louisiana, nearly 25% of the state's population is functionally illiterate and only two-thirds graduate from high school. Thus it is essential that programs on the cutting-edge of science be visible within the state. By reaching out to the young we have the opportunity to influence future career choices.



**WT Godbey, Paul and Donna Flower Assistant Professor of Chemical and Biomolecular Engineering, Tulane University**. Dr. Godbey received his Bachelor of Science degree in mathematics from Southern Methodist University in 1988, and his Ph.D. in Bioscience and Bioengineering from Rice University as a National Science Foundation graduate fellow in 2000. He went on to become a Postdoctoral Fellow in Anthony Atala's Laboratory for Tissue Engineering and Cellular Therapeutics at Children's Hospital/ Harvard Medical School in Boston, MA.

Dr. Godbey's research interests focus on gene therapy, from the design and development of novel gene delivery vehicles to the application of gene therapy for cell and tissue engineering, and for cancer treatment.

Dr. Godbey's motivation to become a scientist stem from his desire to help as many people as he can in his limited lifetime. He sees that, through research, one has the potential to help millions of people at one time, and that coordinated efforts with other scientists can help mankind unlock the secrets of the universe.

**Intellectual Merit:** The concept of expression-targeted gene therapy was an incremental advance for transitional cell carcinoma gene therapy, for which the principal investigator has been a leader (patent 20050187177, pending). This transformative concept will be investigated further with the goal of creating a method for cancer screening as well as a potential treatment for transitional cell carcinomas. In a third application of the technology, cells will be engineered to utilize novel signaling cascades. Ancillary benefits of this cellular engineering objective will be the elucidation of basic biologic principles.

**Broader Impact:** The model mentioned above will lead to gene delivery procedures for which the levels of transgene expression can be controlled. This control will offer a level of variability that will be managed by physiological circumstances within the body. This integration of engineering and life science would advance fundamental knowledge and have a significant impact upon the biomedicine industry.

Additional broader impacts will be realized through outreach activities. The applicant's regular involvement with the Louis Stokes Louisiana Alliance for Minority Participation (LS-LAMP) has produced manuscripts for publication with the participants listed as co-authors, which will certainly strengthen their abilities to get into graduate or professional school. Minority participation in the proposed experiments will also increase the number of minority students entering science and engineering disciplines as the applicant's contagious enthusiasm sparks an interest to continue working in the field after the summer experience has ended. The proposed activities will also enhance the infrastructure for research and education as networks and partnerships are bolstered through the applicant's continued visits to give scientific demonstrations to K-12 schools having predominantly minority populations. A new undergraduate-level course will amplify these endeavors by training freshmen and sophomores to give the demonstrations themselves, thereby increasing the number of schools visited in the community.

**Edward Golob, Assistant Professor of Psychology, Tulane University**. Dr. Golob earned a B.A. degree from Capital University, a Ph.D. from Dartmouth College, and was a Postdoctoral Fellow at the University of California, Irvine.

His research interests are in the area of cognitive neuroscience. Topics include the auditory system, spatial cognition, attention and memory, normal aging and Alzheimer's disease.

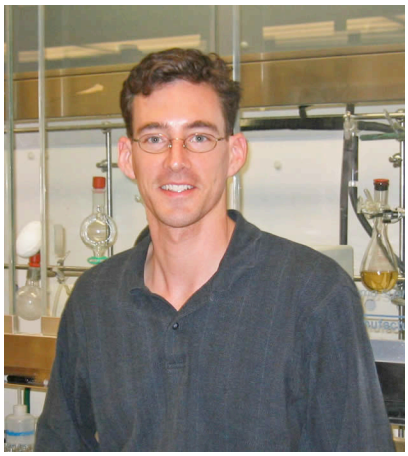
The challenge and satisfaction of discovery, and the privilege of working with students were the major motivating factors in his decision to become a scientist.

**Intellectual Merit and Broader Impact:**

The ability to use spatial information is crucial to survival because space is such a basic feature of the world. The auditory system is particularly important for spatial cognition because our ears can detect sounds coming from any direction. Knowing where things are in space seems effortless but is actually the product of delicate interactions between representations of spatial information and their application by other cognitive systems.

The objective of my grant project is to better understand how auditory spatial information is used by higher-level cognitive processes in the brain. The experiments focus on the interface between representing sound location and two cognitive functions that prioritize subregions of space: spatial attention and motor responses. In a series of studies human subjects will perform various auditory spatial tasks. During performance, sensors will monitor electrical brain activity, and brief magnetic pulses will be applied to influence brain activity.

Besides answering basic science questions the results may also help to improve rehabilitation techniques for patients with brain damage. The education plan is collaboration between Tulane and Xavier Universities, and will offer research opportunities to undergraduates that will culminate in a Masters degree.



**Scott Grayson, Assistant Professor of Chemistry, Tulane University**. Dr. Grayson received a B.S. in Chemistry and Mathematics and a B.A. in History from Tulane University in 1996. He earned his Ph.D. in Chemistry from University of California at Berkeley in 2002 and spent 2002-2005 conducting his postdoctoral in Chemistry at the University of Texas in Austin.

From an early age, it was apparent to me that a fundamental understanding in science was the foundation of all technologies, and a large part of how humans can successfully meet the new challenges that face every generation. Through a series of exceptional teachers, starting with my parents, the underlying logic and simplicity of the laws of nature were revealed to me during my education, and I was inspired to both push the limits of our scientific understanding and share the beauty of this knowledge with future generations of students.

**Intellectual Merit and Broader Impact:**

In particular, I have devoted myself to understanding the basic tools with which chemists can assembly polymer architectures on the nanoscale. By honing these skills, nanometer scale molecules can be prepared to address a variety of materials and medical challenges. My research group trains both graduate students and undergraduates in the technical aspects of constructing diverse nanoscale architectures, as well as methods of testing these materials to address a range of potential applications.

The two major focuses of our research group are the construction of well defined macromolecular components, and their controlled assembly into larger more complex structures. By building nanometer-scale molecular devices in a step-wise fashion, a range of technological challenges can be addressed, including the controlled targeting of drugs within the body specifically to the target tissues, in order to reduce common problems with side effects; the efficient, biologically friendly remediation of contaminants from the environment; and the compatibilization and stabilization of electronically active nanomaterials in bulk to yield improved improved materials for advanced technologies. As an extension of these scientific pursuits within the local community, an outreach program has been designed in which Tulane undergraduates present pertinent examples of this scientific methodology to local New Orleans public high schools.

**Tevfik Kosar, Assistant Professor in Computer Science, LSU Center for Computation & Technology (CCT)**. He holds a B.S. degree in Computer Engineering from Bogazici University, Istanbul, Turkey and an M.S. degree in Computer Science from Rensselaer Polytechnic Institute, Troy, NY. Dr. Kosar received his Ph.D. degree in Computer Science from University of Wisconsin-Madison, where he worked in the Condor project for six years.

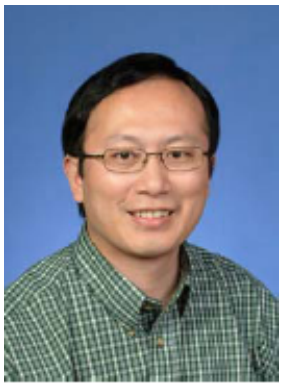
He is the primary designer and developer of the Stork distributed data scheduling system which has been adopted by many national and international institutions. Dr. Kosar spent three summers at IBM T.J. Watson Research Center doing research on several state-of-the-art topics, such as on-demand computing, storage area networks, and web capacity planning. He has published four book chapters and more than fifty journal and conference papers. Dr. Kosar has served on the technical program committee of leading conferences and workshops, on NSF and DOE panel reviews, and on top journal and conference peer reviews.

Dr. Kosar's research interests include: distributed systems, grid and collaborative computing with emphasis on data intensive distributed computing, resource allocation and management, fault tolerance, coordination of computation and I/O, distributed data scheduling and management, use of distributed systems to solve problems in biology, astronomy, high energy physics, and coastal and environmental sciences.

**Intellectual Merit:** This project responds to the urgent need of scientists across a broad range of disciplines who have large-scale data generation, analysis, sharing and collaboration requirements. It aims to enable scientists to focus on their primary research problem, assured that the underlying middleware will manage the low-level data handling issues. Dr. Kosar proposes a new distributed computing paradigm called **'data-aware distributed computing'** with its theory, research, implementation, education, and dissemination components all together. He will develop a diverse set of algorithms, models, and tools for mitigating the data bottleneck in distributed computing systems, and to support a broad range of data-intensive as well as dynamic data-driven applications. As part of this plan, Dr. Kosar will perform research and development on three main components: i) a data-aware scheduler which will provide capabilities such as planning, scheduling, resource reservation, job execution, and error recovery for data movement tasks; ii) integration of these capabilities to the other layers in distributed computing such as workflow planning, resource brokering, and storage management; and iii) further optimization of data movement tasks via dynamically tuning of underlying protocol transfer parameters.

**Broader Impact:** The broader impact is the integration of research to literally all levels of education which will include science projects, seminars and summer camps on data-intensive computing with K-12 students (where 99% is minority); curriculum development, mentoring, and international student/intern exchange programs for undergraduate and graduate students; and summer internships and workshops specifically for HBCU community including faculty members. Dr. Kosar has leading roles in state-wide cyberinfrastructure projects such as PetaShare and CyberTools, and also ongoing collaborations with regional and national grid initiatives such as SURAGrid, TeraGrid and Open Science Grid. Building on existing strengths and closely working with these communities, Dr. Kosar will make the services

developed within this proposal available to researchers across the nation, as well as participate in their outreach and education programs to increase awareness and availability throughout the broader education and research community. He also plans to increase the impact of this work via two international technical workshop series and an edited book in this area. The developed tools will be available to public via open-source distribution. This integrated career plan will impact all traditionally compute intensive disciplines from science and engineering, as well as new emerging computational areas in the arts, humanities, business and education which need to deal with increasingly large amounts of data.



**Long Que, Assistant Professor of Electrical Engineering, Louisiana Tech University**. Dr. Que received his Bachelor of Science degree in Physics from Peking University, China, in 1990; his Ph.D. in MEMS/Nanotechnology from University of Wisconsin-Madison in 2000; and his Postdoctoral in BioMEMS/Nanotechnology from the University of Michigan at Ann Arbor from 2002-2004.

His research interests include micro/nanotechnologies for biomedical engineering, life science and environment energy harvesting applications.

Using technology innovations to make our life better if possible is what motivated him to become a scientist.

**Intellectual merit:** The goal is to develop an inexpensive micro/nanotechnology platform to facilitate the detection of diseases at their early stages and help significantly reduce the time and cost for the discovery of new drugs. In addition, this research has a broad range of applications in pathogen detection, environmental monitoring and homeland security.

**Broader impact:** The educational goal of this project is to effectively integrate research into educational activities, and the training of both undergraduate and graduate students in interdisciplinary studies for next-generation engineers.

**Jiandi Zhang, Professor of Physics and Astronomy, Louisiana State University**. Dr. Zhang received B.S. and M.S. degrees in Physics from the Nanjing University of Science and Technology in 1982 and the Chinese Academy of Science in 1986, respectively. He was a member of the Shanghai Jiao Tong University faculty from 1986-1989. He received his Ph.D. in physics from Syracuse University in 1994 and spent three years as a Postdoctoral Fellow at Oak Ridge National laboratory/the University of Tennessee.

Dr. Zhang's main research interest is in exploring novel properties of complex materials like transition-metal compounds by the effects of broken symmetry, reduced dimensionality and spatial confinement, and by controlling lattice strain and chemical composition. The research includes growing artificially structured configurations of complex materials with atomic scale precision and in-situ comprehensive characterization on lattice structure, chemical composition, electronic and magnetic properties.

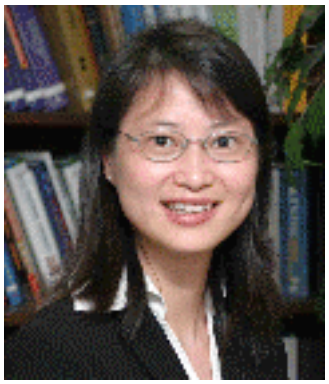
Dr. Zhang's major research expertise includes the growth of thin films of crystalline materials with molecular beam epitaxy (MBE) and laser MBE technique, and a variety of both surface and bulk characterization techniques such as scanning tunneling microscopy, electron/photon, as well as neutron scattering.

The main motivation for his becoming a scientist is his curiosity of the way of nature. One grand challenge in condensed matter physics and materials science is to understand the remarkable properties emerging from complex correlations of atomic and electronic constituents, and to control these properties for technological applications. The complexity in many novel materials is directly responsible for their tenability and consequently their practical functionality. Creating surfaces, interfaces, ultra-thin films, and artificial superstructures add the additional twist of "man-made" dimensions, approaching the quantum phenomena of correlated electrons with broken symmetry and reduced dimensionality.

**Intellectual merit:** Dr. Zhang's funded CAREER project contains an integrated approach to research and educational outreach in the area of materials physics. The discovery, understanding, and design of novel phases at the surfaces/interfaces of transitional-metal oxides (TMOs) are the objective of the research activities. The major physics issues to be addressed are the nature of surface metal-insulator transition and the essence of nanophase separation in reduced dimensionality. Exploring the electron-electron correlation driven Mott-insulator transition affected by electron-phonon interaction and nanophase inhomogeneity is the main focus. The research approach is to use a unique combination of characterization techniques to investigate both local and global structural and electronic properties and dynamical response (including phonons and low-energy excitations) of well-defined surfaces of single crystals or epitaxial thin films. The major educational component of this project is aimed at addressing modern materials science education at the pre-college and college levels to aggressively encourage and promote the study of physics (or physical science in general). Activities include: enrichment activities and research experiences involving undergraduates, and the development of an interdisciplinary advanced materials science curriculum. The goal of this proposal is: 1) to increase enrollment in

materials physics or materials science; 2) to educate a new breed of materials scientists as the future workforce for technology-driven society; 3) to explore new physical phenomena at surfaces/interfaces of TMO materials; and 4) to exploit materials tailoring for desired functionalities for future technological applications.

**Broader impact:** The main objective of this CAREER project is to lead a better understanding of the complexity of the relationship between structure and properties in transition metal compounds and to the development of novel devices, the devices made of these correlated electron compounds beyond simple materials like silicon. The combination in research activities with state-of-the-art materials fabrication and characterization allows the involvement of students at all levels, thus promoting the study of materials physics and training new breed of materials scientists as the future workforce for technological-driven society. Equally important is the educational outreach to the community, involving both teachers and students in research experience, experimental demonstrations, and internship opportunities.



**Dr. Danella Zhao, Assistant Professor with the Center for Advanced Computer Studies (CACS), University of Louisiana at Lafayette**. Dr. Zhao earned her B.E. degree from Zhejiang University, one of the top three universities in China. She received a M.S and Ph.D. in Computer Science and Engineering, University at Buffalo, SUNY in 2001 and 2004 respectively.

Her research interests are nanoelectronics embedded computing with special emphasis on system-on-chip (SoC) design and test, high-performance intra-chip interconnect and communication, nanoscale application and system architecture, and electronic design automation.

Before entering graduate school, Dr. Zhao did not have a clear thought of a career in science. In the first year of master study, she led a three-member student design team supervised by Dr. Ram Sridhar to join the National Copper Design Contest which was sponsored by the Semiconductor Research Corp. (SRC), Novellus Systems Inc., the UMC Group and SpeedFam-IPEC. 44 teams from a total of 34 universities submitted design proposals for the "SRC Copper IC Design Challenge." Although the design did not win the prize, the design contest experience stimulated her interest in IC chip design, and she decided to pursue further study in the area. During her three-year Ph.D. study, she received more encouragement from her advisor, Dr. Shambhu Upadhyaya. She decided to pursue a career as a university professor in order to have an opportunity to continue to experiment on new ideas and be a lifelong learner along with her students.

**Intellectual Merit:** Future multi-processor chips will likely be in the form of nanoscale many-core system-on-chip (MCSoC) devices which consist of hundreds or even thousands of processor cores. A scalable, cost-efficient, flexible and reusable on-chip communication infrastructure will become an enabling technology for this MCSoC paradigm. While conducting research in the embedded computing area, Dr. Zhao will lead a research team to pioneer research in wireless network-on-chip, a new on-chip communication infrastructure, aimed at replacing electronic wires with chip-based wireless radios for increasing accessibility, improving bandwidth utilization, and eliminating delay and crosstalk noise in conventional wired interconnects. Transmitting data wirelessly across chip would inherently remove the loss associated with the metal lines and achieve near speed-of-light communication. In other words, Dr. Zhao and her research team will work to develop a method to make small computer chips even smaller. Shorter distances for information to travel equates to fewer losses and near speed-of-light communication. The end result will be a scalable, cost-efficient, flexible, and reusable chip infrastructure that will allow small devices to have more complex functions with fewer errors.

**Broader Impact:** The success of this research can lead to breakthroughs in on-chip communication and transform the way of the next generation gigascale multi-processor system-on-chip development. Integrated with such a high-performance on-chip communication infrastructure as wireless network-on-chip, it is possible to build gigascale MCSOC chips to meet the increasing compute and memory intensive demands of the latest PC games and high performance computing applications, such as graphics, multimedia, image processing, physical simulation and medical and financial analytics.

# PRIOR RECIPIENTS OF NSF CAREER AWARDS

| | |
|---|---|
| **2008 Awards** | |
| Ashbaugh, Henry | Tulane University |
| Baldridge, Scott | Louisiana State University and A & M College |
| Monroe, William | Louisiana State University and A & M College |
| **2007 Awards** | |
| Mao, Zhiqiang | Tulane University |
| Mbarika, Victor | Southern University and A & M College |
| Park, Sunggook | Louisiana State University and A & M College |
| **2006 Awards** | |
| Chen, Qin | Louisiana State University and A & M College |
| Cook, Robert | Louisiana State University and A & M College |
| Kaplan, Lev | Tulane University |
| Nesterov, Evgueni | Louisiana State University and A & M College |
| Venkatesh, T. | Tulane University |
| **2005 Awards** | |
| Chen, Bin | Louisiana State University and A & M College |
| de Queiroz, Marcio | Louisiana State University and A & M College |
| Fang, Jiye | University of New Orleans |
| Gaarde, Mette | Louisiana State University and A & M College |
| Mainardi, Daniela | Louisiana Tech University |
| Perkins, Dmitri | University of Louisiana at Lafayette |
| Walker, Edwin | Southern University and A & M College |
| Young, David | Louisiana State University and A & M College |
| **2004 Awards** | |
| Frandsen, Jannette | Louisiana State University and A & M College |
| Gilman, Samuel | Louisiana State University and A & M College |
| Karki, Bijaya | Louisiana State University and A & M College |
| Lee, Matthew | Louisiana State University and A & M College |
| Lu, Yunfeng | Tulane University |
| Schmidt, Gudrun | Louisiana State University and A & M College |
| Wu, Hongyi | University of Louisiana at Lafayette |
| **2003 Award** | |
| Chan, Julia | Louisiana State University and A & M College |
| **2002 Awards** | |
| Colombo, Paul | Tulane University |
| Schluchter, Wendy | University of New Orleans |
| Spivak, David | Louisiana State University and A & M College |
| **2001 Awards** | |
| Cortez, Ricardo | Tulane University |
| Finelli, Christopher | Louisiana Universities Marine Consortium |
| Lee, Jeong-Bong | Louisiana State University and A & M College |

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|---|---|
| Livesay, Glen | Tulane University |
| Thayumanavan, Sankaran | Tulane University |

**2000 Awards**

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|---|---|
| Blanchard, Gerard | Southeastern Louisiana University |
| Dee, Kay C | Tulane University |
| Podlaha, Elizabeth | Louisiana State University and A & M College |
| Rovnyak, Steven | Louisiana Tech University |
| Schulte, Marvin | The University of Louisiana at Monroe |
| Wong, Harris | Louisiana State University and A & M College |

**1999 Awards**

| | |
|---|---|
| Rosenzweig, Zeev | University of New Orleans |
| Thomas, Britt | Louisiana State University and A & M College |

**1998 Awards**

| | |
|---|---|
| Li, X. Rong | University of New Orleans |
| Schafer, Kenneth | Louisiana State University and A & M College |
| Schwartz, Daniel | Tulane University |

**1997 Awards**

| | |
|---|---|
| Diebold, Ulrike | Tulane University |
| DiTusa, John | Louisiana State University and A & M College |
| Nakano, Aiichiro | Louisiana State University and A & M College |

**1996 Awards**

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|---|---|
| Hurley, David | Tulane University |
| Lacks, Daniel | Tulane University |
| White, Mary | Southeastern Louisiana University |

**1995 Awards**

| | |
|---|---|
| Henson, Michael | Louisiana State University and A & M College |
| Murphy, Michael | Louisiana State University and A & M College |