Department of Energy Awards Ceremony

Office of Science
and
Office of Defense Programs

Early Career Scientist and Engineer Awards

James Forrestal Building
Room 1E-245
1000 Independence Avenue, SW
Washington, D.C. 20585
June 13, 2005

The Secretary of Energy
Washington, DC 20585

In Recognition and Appreciation

The Department of Energy today is proud to salute nine exemplary investigators from the Department's National Laboratories and collaborating universities. Each of these investigators is the recipient of one of the special annual awards the Department's Office of Science and Office of Defense Programs sponsor: the Early Career Scientist and Engineer Awards.

Along with the Office of Science and the National Nuclear Security Administration's Office of Defense Programs, I want to take this opportunity to recognize the extraordinary scientific and technical achievements represented by the awardees' contributions. These Departmental awards reflect our belief that the representatives of the new generation of scientists and engineers honored by these awards are meeting demanding scientific and technical challenges with superior leadership, knowledge and insight.

The awards demonstrate the Department's enduring interest in creative scientific and technical talent. Each honoree has made a distinctive contribution both as an independent investigator and as a team member. Individually and collectively, they continue to be sources of invaluable technical direction and expertise in support of the Department's research and development and national security missions.

It is absolutely crucial to these Departmental missions that we continue to invest in and to nurture the development of the technical leaders of the future. It is equally important that the Department, on occasions such as this, recognizes its critical need for active and sustained partnerships with the Nation's scientific and technical communities.

I am pleased to offer my heartiest congratulations to this group of outstanding investigators on the occasion of their receipt of these Departmental awards.

Samuel Wright Bodman

2004 AWARDEES

DR. JOHN ARRINGTON
Argonne National Laboratory

DR. WILLIAM J. ASHMANSKAS
Fermi National Accelerator Laboratory

DR. HONG QIN
Princeton Plasma Physics Laboratory

DR. ROBERT B. ROSS
Argonne National Laboratory

DR. PAUL VASKA
Brookhaven National Laboratory

DR. ZHANGBU XU
Brookhaven National Laboratory

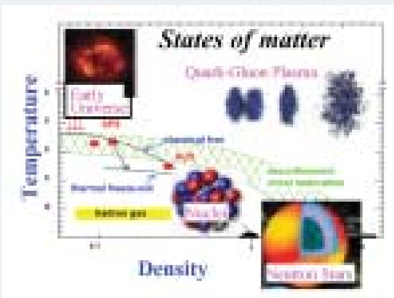
DR. WEI CAI
Stanford University

DR. WILLIAM P. KING
Georgia Institute of Technology

DR. YUNFENG LU
Tulane University

DR. JOHN ARRINGTON
ARGONNE NATIONAL LABORATORY

Dr. John Arrington is a Physicist in the Medium Energy Physics group at Argonne National Laboratory. He is involved in electron scattering measurements designed to probe the quark sub-structure of nucleons and nuclei at a variety of scales. His main focus involves precise measurements of nucleon structure and medium modifications of nucleons in nuclei.



Dr. Arrington has participated in experiments at SLAC, DESY, MIT-Bates, and Jefferson Lab. He was actively involved in the setup and commissioning of Hall C at Jefferson Lab. He recently completed a series of measurements of inclusive electron scattering from nuclei to study the nuclear distributions of quarks and nucleons, with particular emphasis on the short range structure of nuclei. The short range structure is particularly sensitive to any modification of the structure of protons and neutrons when bound inside of a nucleus.

His most recent work relates to understanding two-photon exchange contributions to electron scattering. These effects can explain the recent and surprising new measurements of proton structure and are important for next generation of high-precision measurements of nucleon structure. This program involves a series of measurements he is leading at Jefferson Lab as well as a comparison of positron and electron scattering at Novosibirsk.

"For his innovative research into the quark distributions of nuclei with exceptionally high quark momentum fractions, which has provided a compelling new look into the short-range structure of nuclei, and for his efforts to show science to the public through his work and support of undergraduate research and at Argonne National Laboratory's Open House Day."

Dr. William J. Ashmanskas

Fermi National Accelerator Laboratory

Dr. William Ashmanskas is a scientist at Fermilab, which is home to the Tevatron -- an energy-frontier particle accelerator in which protons and antiprotons collide to produce under laboratory conditions the elementary particles that are the building blocks of the universe. Two experiments, CDF and D0, with world-wide teams of nearly 1000 researchers, study the particles produced by the Tevatron.

He has worked with CDF since his college years. As a postdoc, he worked on the Silicon Vertex Trigger (SVT) project, which provides 50 micron impact-parameter measurements with 15 microsecond latency. SVT allowed CDF to record bottom and charm decays based on lifetime, enabling each of the first three Run 2 Tevatron physics publications. He led two SVT circuit board designs, several software efforts, and SVT's commissioning and initial operation. While working with the SVT team, he learned a wealth of digital electronics techniques from the engineers at the University of Chicago.

He moved to Fermilab to apply the electronics he learned as a postdoc to accelerator instrumentation problems. Continued evolution in the tools used to observe and to control particle beams will contribute to further progress in the performance and reliability of Fermilab's accelerators. He is currently working primarily on Fermilab's Antiproton Source -- whose performance in the next few years will be a key factor in the scientific reach of the Tevatron physics program.

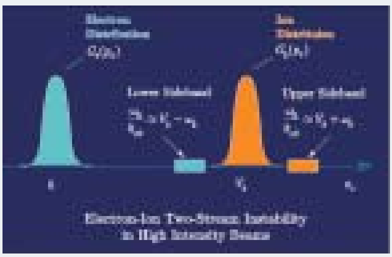
"For applying to Fermilab accelerator instrumentation and controls problems the state-of-the-art digital electronics techniques that he and others have successfully applied in recent years in the trigger systems of the CDF experiment, and for his efforts to involve university physics students in accelerator instrumentation projects at Fermilab."

Office of Science

Dr. Hong Qin

Princeton Plasma Physics Laboratory

Dr. Hong Qin is a theoretical physicist at Princeton Plasma Physics Laboratory, a collaborative national center for plasma and fusion science, with the mission of developing the scientific understanding and the key innovations which will lead to an attractive fusion energy source. The focus of his research includes the nonlinear beam dynamics for heavy ion inertial fusion drivers and the gyrokinetic theory for magnetic fusion plasmas.



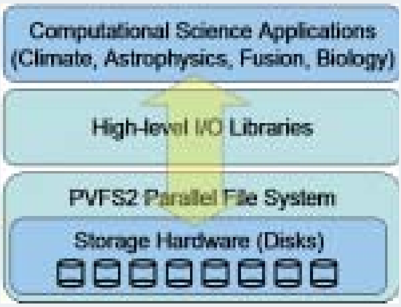
Dr. Qin played a key role in the following research areas: analytical studies of collective nonlinear dynamics and instabilities; three-dimensional nonlinear perturbative simulation studies of two-stream interactions and collective instabilities in intense charged particle beams; concept development for the Paul Trap Simulator Experiment (PTSX); development of innovative approaches for pulse shaping and drift compression of heavy ion beams; and development and application of advanced gyrokinetic models to magnetically confined plasmas, including high-frequency electromagnetic effects.

Dr. Qin has published 50 refereed research papers, and co-authored a major graduate-level treatise (with Prof. Ronald C. Davidson) entitled *Physics of Intense Charged Particle Beams in High Energy Accelerators.* Through the education programs at the Princeton University and the U.S. Particle Accelerator School, Dr. Qin has mentored graduate and undergraduate students in plasma physics and accelerator physics.

"For his seminal contributions to the numerical and analytical studies of collective effects in high intensity charged particle beams, and his innovative development of gyrokinetic theory including high-frequency electromagnetic effects in magnetically-confined plasmas, and for his work with students in the lab's graduate and undergraduate educational programs."

Dr. Robert B. Ross
Argonne National Laboratory

Dr. Robert Ross is a computer scientist in the Mathematics and Computer Science Division at Argonne National Laboratory. He has made significant contributions to the area of parallel data access for high-performance computing. Dr. Ross's research integrates novel algorithms, traditional storage techniques, and concepts from message-passing systems to create storage solutions tailored for computational science applications.



Dr. Ross and his colleagues at Argonne and Clemson University have implemented an open source, highly scalable parallel file system, called PVFS2, that is used in production systems worldwide and as a starting point for further research in parallel I/O. With others at Argonne, Dr. Ross has helped developed high-level I/O interfaces that have already substantially improved the performance of astrophysics applications. His recent research on buffering schemes promises to benefit scientists not only in performing remote I/O access, but also in managing cluster file systems. Together these tools form a comprehensive parallel data access solution designed to improve both the performance and usability of data storage on the world's top supercomputers.

An important component of Dr. Ross's work is educating the community about parallel data access. He has mentored students from four universities and served on the committees of two Ph.D. students. He also routinely organizes tutorials on message passing and parallel data storage at conferences both in the United States and internationally.

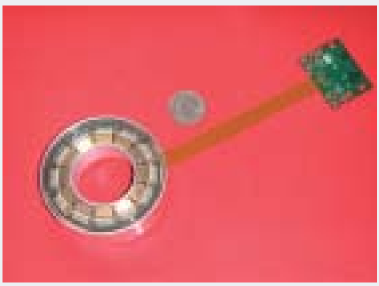
"For his pioneering in the design of parallel file systems and high-performance interfaces for managing large datasets. His innovative work is helping users worldwide to overcome the input/output bottleneck that has hampered performance on commercial parallel computers, and for his work with students in Argonne's Summer Student Program and students at Northwestern, Pennsylvania State, and Clemson Universities."

Office of Science

Dr. Paul Vaska

Brookhaven National Laboratory

Dr. Paul Vaska holds the rank of Associate Scientist in the Medical Department at Brookhaven National Laboratory. He is a physicist working in the Center for Translational Neuroimaging, with a research focus on the physics and instrumentation of Positron Emission Tomography (PET) imaging. PET is a complex but powerful medical imaging method that is unique in its ability to derive quantitative biochemical information throughout the human body in a non-invasive way.



Dr. Vaska has made a number of important contributions to PET relating to improved spatial resolution, enhancing quantitative image processing, and novel applications of the technique. One area that has benefited from his work is neuroscience that utilizes small-animal PET imaging. The rat brain is an important model to help understand human neurobiology, but imaging animals requires anesthesia for immobilization, and this can unintentionally disturb the brain receptors under study. In collaboration with distinguished scientists in the Brookhaven departments of Chemistry, Physics, and Instrumentation, Dr. Vaska has played a pivotal role in the development of a new miniaturized PET scanner which the rat can wear while conscious, eliminating the confounding effects of anesthesia and enabling new types of studies that correlate behavior and neurochemistry. Compared to commercial systems, the sheer reduction in scanner size while maintaining high imaging performance is impressive: from 100's of pounds and several feet across to about 200 g and 7 centimeters diameter.

Dr. Vaska has pioneered practical, high-resolution gamma-ray detection strategies using novel scintillator and photosensor geometries as well as solid-state designs, some of which are finding application to national security problems as well. Dr. Vaska has also been a dedicated mentor to several students, from the high school through postdoctoral levels.

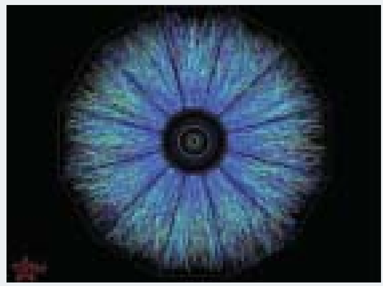
"For his leadership and scientific innovation in the field of medical imaging physics, particularly for the development of novel instrumentation and techniques to improve the capabilities of positron emission tomography in medicine, and for providing research opportunities and being a responsible scientific mentor to students at the high school, undergraduate, graduate, and postdoctoral levels."

OFFICE OF SCIENCE

Dr. Zhangbu Xu

Brookhaven National Laboratory

Dr. Zhangbu Xu is a physicist at Brookhaven National Laboratory, home of the Relativistic Heavy Ion Collider (RHIC). Dr. Xu is a member of the STAR collaboration (the Solenoidal Tracker at RHIC). The collaboration uses a variety of detectors to study the complex systems formed in ultra-relativistic heavy ion collisions, with the goal of creating and studying a new state of matter called the Quark Gluon Plasma (QGP) that existed in the early universe.



Dr. Xu has made essential contributions to the observation of resonance production at RHIC. Measurements of the yields and line shapes of these short-lived particles indicate a possible modification of their properties and production mechanism due to the presence of strongly interacting matter. Along these lines, he has led the effort to extend STAR's future capability in the detection of low mass electron pairs, using conceptually advanced techniques involving a combination of TPC ionization energy loss and state-of-the-art MRPC Time-of-Flight measurements.

Dr. Xu has contributed significantly to the first direct reconstruction of charmed hadrons at RHIC, and the measurement of their associated electron spectra in d+Au and p+p collisions. He also plays a leading role in the scientific and technical development in STAR of stable particle identification at high transverse momentum.

Dr. Xu has actively supervised several postdoctoral researchers, graduate students and summer undergraduates from the USA, China and India, and has regularly guided RHIC tours for the general public. Dr. Xu has co-convened a STAR physics working group studying the chemical and thermal properties of the dense matter formed at RHIC and a cross-collaboration working group on electromagnetic probes in the upcoming upgrades to RHIC.

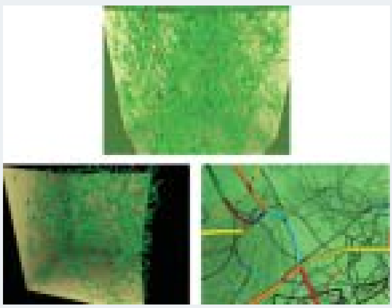
"For his pioneering scientific research and technical developments in the study of resonances, open charm and particle identified Cronin effect in relativistic heavy ion collisions, and for his gracious professionalism in mentoring graduate students from developing countries and for leading tours for high school students and the general public of the Relativistic Heavy Ion Collider, Brookhaven National Laboratory's world-class accelerator for nuclear physics."

Dr. Wei Cai

Stanford University

Office of Defense Programs

Dr. Wei Cai is an Assistant Professor of Mechanical Engineering at Stanford University. He was nominated by Lawrence Livermore National Laboratory, a Department of Energy National Nuclear Security Administration (NNSA) Defense Programs Laboratory, for his partnership in developing the Parallel Dislocation Simulator (ParaDiS), which simulates the dynamics of many dislocation lines in a crystal under deformation at the micrometer scale.



Professor Cai has been able to show for the first time how macroscopic phenomena such as material strength and hardening, as well as crystal deformation and the propagation of dislocations, are related to fundamental physics at the atomistic level. All of this has been integrated into the ParaDis. In addition to his research, this work has been made possible by the very recent evolution of massively parallel computing and the immense computing capabilities being developed under the NNSA/DP Advanced Simulation and Computing (ASC) Program.

Another major topic in computational materials in which Professor Cai has been making important advances is in developing ways to deal with familiar but difficult multiscale problems, especially problems with widely disparate time scales. He has been working on conditional sampling methods to reduce the costs of the processes occurring at the shortest, usually atomic, levels so that the overall system simulation can proceed at the longer time scales on which macroscopic phenomena are observed. This general problem is common to many disciplines in addition to materials science, and it is the type of extremely difficult computational science problem in which Professor Cai excels.

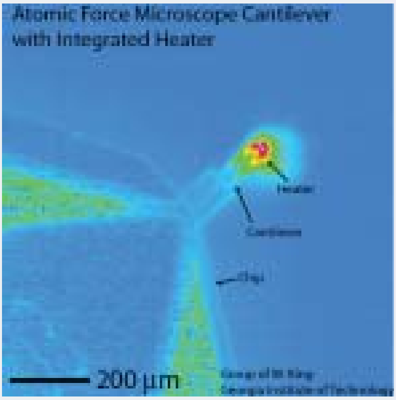
Professor Cai's research has focused on predicting materials strength under ambient and extreme conditions through theory and simulations of defect microstructures across electronic, atomic, mesoscopic and continuum scales. He is interested in identifying atomic mechanisms in defect mobility in crystalline solids and modeling the collective evolution of defects by massively parallel simulations. He is also developing new methods to simulate long time-scale atomistic processes, and electronic structure of nano-structures under magnetic fields.

"For the development of a computational theory of dislocation dynamics, which has been able to unify dislocation physics and crystal plasticity into a new computational discipline, for developing ways to deal with challenging multiscale problems, especially those with widely disparate time scales, and for the development of innovative tools to aid in teaching beginning students about atomistic simulations."

DR. WILLIAM P. KING

GEORGIA INSTITUTE OF TECHNOLOGY

Dr. William P. King is Assistant Professor in the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. He was nominated by Sandia National Laboratories, a Department of Energy National Nuclear Security Administration (NNSA) Defense Programs Laboratory, for his work on heat transfer and thermomechanical processing at micrometer and nanometer scales. Professor King's work contributes to the NNSA mission to reduce global danger from weapons of mass destruction. His research is critical to developments in nonproliferation, stockpile surety, and homeland defense.



Professor King's contributions also have had a significant impact on the commercialization of nanotechnology. While working at IBM Research Laboratory in Zurich, Switzerland, he was part of the "Millipede" data storage project. This project may be the world's first and one of the most important industrially sponsored nanotechnology projects. During Professor King's year and a half with IBM Research, the Zurich group invented key technology for Thermomechanical Data Storage - an advanced MEMS-based data storage technique that uses heat transfer to write, read, and erase nano-mechanical data bits. This data storage technology remains under development as a potential commercial product.

Professor King's work at Georgia Tech involves transport physics at small scales; building MEMS tools for nanoscale thermal processing; M/NEMS design and manufacture in advanced materials, including novel manufacturing of soft materials for MEMS; and micro/biofluidics. In addition, Professor King is highly regarded for his excellent teaching of graduate and undergraduate students.

Professor King has been recognized in other ways. He is a recipient of a National Science Foundation CAREER Award for his proposal to develop heated atomic force microscope cantilevers for nanoscale thermal processing. Professor King was recently an invited participant at the National Academy of Sciences Keck Futures Initiative on *Nanostructures in Biology*, 2004. He collaborates with industry and has been named to the scientific advisory boards of Nanochip, Inc. and Nanoink, Inc., two U.S. companies applying nanotechnology to commercial products. He also is an inventor and has six provisional patents.

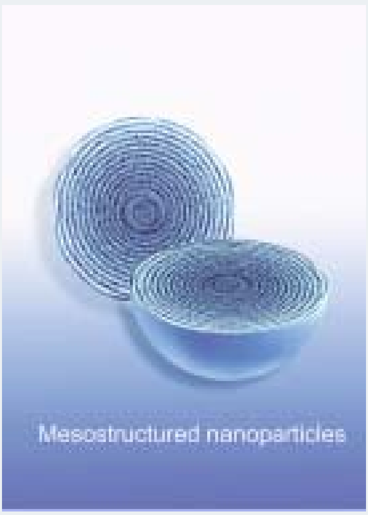
"For work in heat transfer and thermomechanical properties of materials at the nanometer scale, which is critical to developments in nonproliferation, stockpile surety, and homeland defense, for collaborations with industry towards the commercialization of nanotechnology, and for excellent teaching of graduate and undergraduate students."

Dr. Yunfeng Lu

Tulane University

Office of Defense Programs

Dr. Yunfeng Lu is a Professor of Chemical and Biomolecular Engineering at Tulane University. He was nominated by Sandia National Laboratories, a Department of Energy National Nuclear Security Administration (NNSA) Defense Programs Laboratory, for his pioneering work in the synthesis of novel porous and composite nanoscale materials and their application to sensing and detection in support of NNSA's national security mission, and for excellence in teaching and mentoring graduate students. His work has contributed to the development of high sensitivity chemical sensing systems, high-efficiency energy conversion, and many other relevant areas.



Professor Lu has distinguished himself as a leader in the synthesis and processing of porous and composite nanostructures for applications in chemical and biological sensing; smart, environmentally sensitive surfaces; and protective/barrier coatings. He developed evaporation-induced self-assembly as a means to create thin films with precisely controlled pore sizes and surface chemistries. His films have proven crucial to the performance at Sandia's μChemLab™ and could be extended to develop ultra-sensitive detectors to monitor the health of stockpiled nuclear weapons.

Professor Lu has received other recognition for his work. He was a 2004 recipient of the National Science Foundation's CAREER award. His contributions to the defense mission have been recognized by a 2003 Office of Naval Research (ONR) Young Investigator Award and research grants with ONR and the Defense Advanced Research Projects Agency. He shows a great combination of creativity, rigor, and engineering insight in his research. He has received eight research awards including the 2000 American Chemical Society's Victor K. LaMer Award for Graduate Research in Colloid and Surface Chemistry, the 1998 Materials Research Society Graduate Student (Gold) Award, and the 1998 DOE Basic Energy Sciences Award.

"For pioneering work in the synthesis of novel porous and composite nanoscale materials and their application to sensing and detection in support of the country's national security mission, and for excellence in teaching and mentoring graduate students."

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