Department of Energy Awards Ceremony

Office of Science
and
Office of Defense Programs

Early Career Scientist and Engineer Awards

James Forrestal Building
1000 Independence Avenue, SW
Washington, D.C. 20585

December 19, 2008

The Secretary of Energy
Washington, D.C. 20585

In Recognition and Appreciation

The Department of Energy today is proud to salute eight 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.

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 W. Bodman

2007 AWARDEES

Mickey Chiu
Brookhaven National Laboratory

Hooman Davoudiasl
Brookhaven National Laboratory

Bert Debusschere
Sandia National Laboratories

Jennifer S. Martinez
Los Alamos National Laboratory

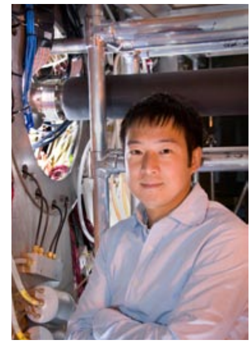
Wei Pan
Sandia National Laboratories

Robin Santra
Argonne National Laboratory

Yugang Sun
Argonne National Laboratory

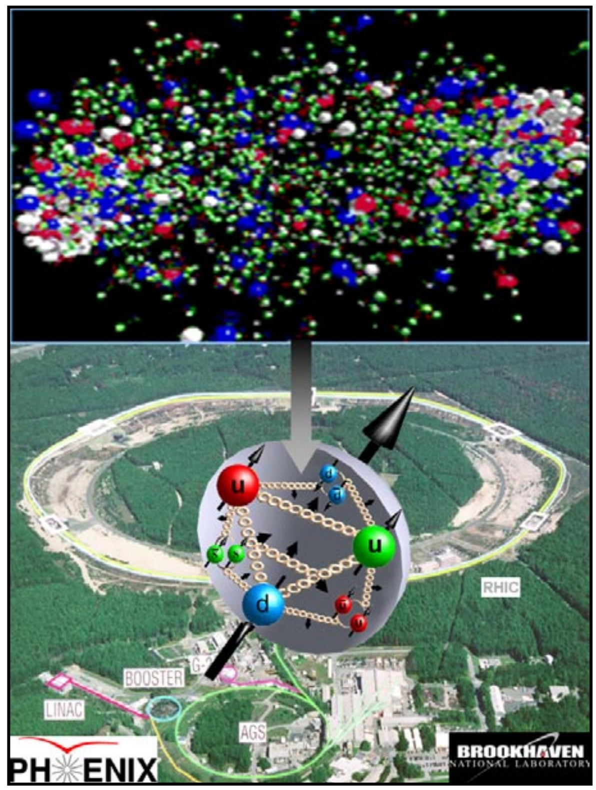
Jeanine Cook
New Mexico State University

Mickey G. Chiu
Brookhaven National Laboratory



For developing the use of neutral pions to identify hot, dense nuclear matter and to study transverse proton spin asymmetries; and for mentoring of graduate students in building advanced instrumentation.

Mickey Chiu earned a B.A. in Physics from Bowdoin College in 1996 and a Ph.D. from Columbia University in 2004. From 1998 to the present, he has been a member of the Pioneering High Energy Nuclear Interactions Experiment (PHENIX) Collaboration, composed of physicists from throughout the world who perform experiments at the PHENIX detector, one of four detectors at Brookhaven National Laboratory's premiere accelerator, the Relativistic Heavy Ion Collider (RHIC). He joined the University of Illinois at Urbana-Champaign for a two-year term as a postdoctoral research associate in 2004, and, in 2006, he came to Brookhaven Lab as an assistant scientist. He was promoted to associate scientist in 2008.



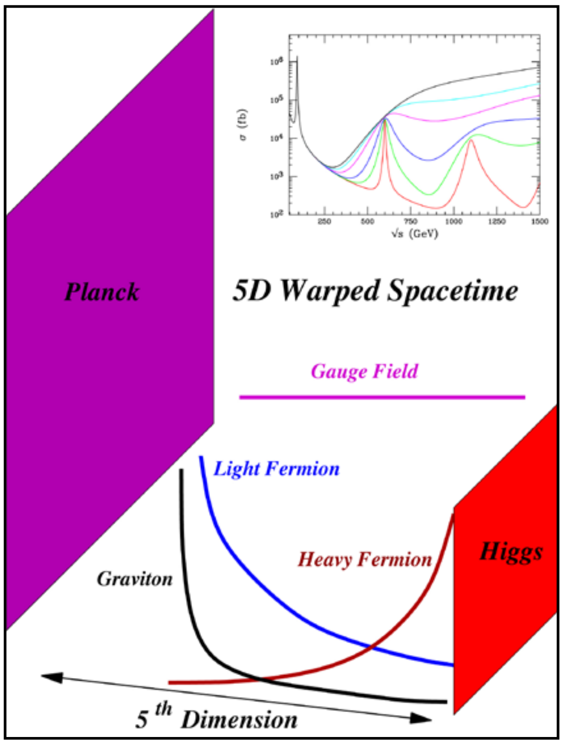
Mickey Chiu's research involves studying experimentally many different aspects of Quantum Chromodynamics (QCD) at RHIC. QCD is the theory of the strong interaction, which is responsible for binding together quarks and gluons into protons, and protons and neutrons into nuclei, as well as providing dynamically most of the mass of the visible world, and is therefore fundamental to our existence. With RHIC, one has a truly unique and flexible collider, where one can collide heavy nuclei to study QCD at the frontier of very high energy density, or one can collide polarized protons and peer at the quarks and gluons deep within protons and nuclei.

Dr. Chiu has led the development of a detector upgrade that has extended PHENIX's range so that more particles from these collisions are captured. While this upgrade enables many unique measurements in PHENIX, in particular it has allowed PHENIX to measure left-right asymmetries in particle production from transversely polarized proton collisions, measurements which might lead toward a richer understanding of the substructure in the proton. Dr. Chiu has also contributed greatly to the analysis of hard scattering events in heavy ion collisions, providing the first proof in PHENIX that one could measure the properties of jets using angular correlations between very energetic leading particles in the event. This line of research has led to quantitative extraction of key properties of the hot dense quark-gluon matter produced at RHIC, as well as numerous surprises, such as the possibility of a QCD mach cone and the observation of long range correlations between quarks and gluons that are much longer than seen in proton-proton collisions.

Hooman Davoudiasl
Brookhaven National Laboratory

For elucidating experimental signatures for testing the possible existence of extra space-time dimensions; and for providing guest lectures to graduate students as well as organizing international conferences.

Hooman Davoudiasl received his Ph.D. in physics from Caltech in 1998. He conducted postdoctoral research at Stanford Linear Accelerator Laboratory, the Institute for Advanced Study in Princeton, New Jersey, and the University of Wisconsin-Madison, where he was a P.A.M. Dirac Fellow in the Department of Physics. In 2006, he joined the High Energy Theory group at Brookhaven National Laboratory, where he is currently an associate physicist. His research has mostly involved investigations of theories beyond the Standard Model of particle physics and their observable consequences.

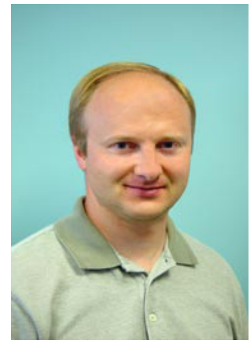


A main focus of Dr. Davoudiasl's work has been the exploration of 5-dimensional (5D) warped spacetime models that address the "hierarchy problem," namely the puzzling weakness of gravity compared to certain subatomic forces. A distinct prediction of these models is the emergence of a sequence of particles, associated with echoes of gravity in the fifth dimension. The collider signals of these particles, possibly accessible to experiments at the Large Hadron Collider (LHC) at CERN, were first studied in Dr. Davoudiasl's work. His early research also provided the first steps towards a warped 5D version of the Standard Model, in which masses of fermions (cousins of the electron) can be explained geometrically. His more recent work has emphasized the challenges involved in detecting the signals of new and more realistic 5D warped models at the LHC. One of his latest works is on truncated models of ``flavor'' with significantly enhanced collider signals. His numerous works on 5D warped scenarios have been published in major scientific journals and have gathered well over 1000 citations to date.

In the coming years, the LHC experiments will explore uncharted microscopic territories. It is hoped that these experiments will shed light on some of the mysteries that the Standard Model leaves unresolved and lead to a more fundamental understanding of Nature.

Dr. Davoudiasl has also worked on a variety of other subjects, such as the proposal of a novel space-based technique for detection of elusive hypothetical particles, known as "axions," that could emanate from the sun. He has also examined cosmological and astrophysical constraints on the recently-proposed "unparticle" scenario. He has been active in organization of scientific meetings that have brought leading physicists from the U.S. and other countries to Brookhaven National Laboratory, and has contributed to an enhanced level of interaction among physicists at Brookhaven and the Stony Brook University.

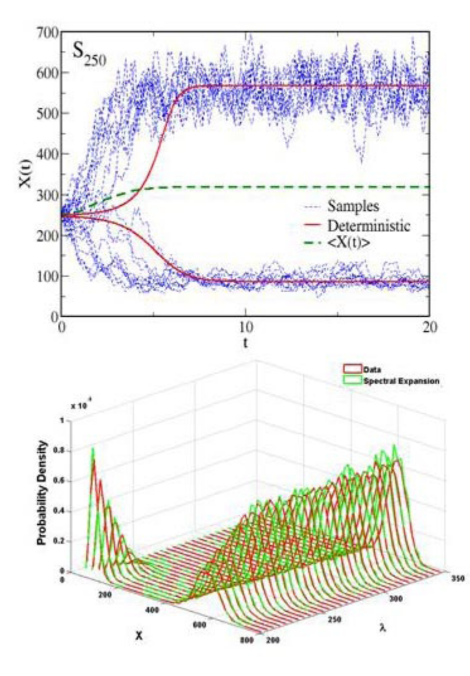
Bert Debusschere
Sandia National Laboratories



For introducing rigorous, mathematical methods capturing stochastic uncertainties in computational biology and providing a framework for simulation-based discovery; and for service to the Sandia Diversity Council and Foreign National Networking Group.

Bert Debusschere is a staff member in the Transportation Energy Center at Sandia National Laboratories, in Livermore, CA, where he currently develops computational methods for the study of chemical and biochemical reaction networks, with applications ranging from combustion to the human immune system. The goal is to gain a deeper understanding of the fundamentals of these reaction networks, to enable improvements in their energy efficiency and environmental footprint, or to facilitate novel biomedical approaches.

One of Dr. Debusschere's research projects focuses specifically on the analysis of stochastic reaction networks, which are prevalent in molecular level and biological systems, where the small numbers of molecules that participate in the reactions generate significant intrinsic noise in the system. Based on spectral representations of stochastic processes, Dr. Debusschere's research group has developed methods for sensitivity analysis, predictability studies, and reduced order modeling of stochastic reaction networks. These methods allow the analysis of these systems in terms of identifying their key properties, how they depend on the system parameters, and how reliably they can be predicted.



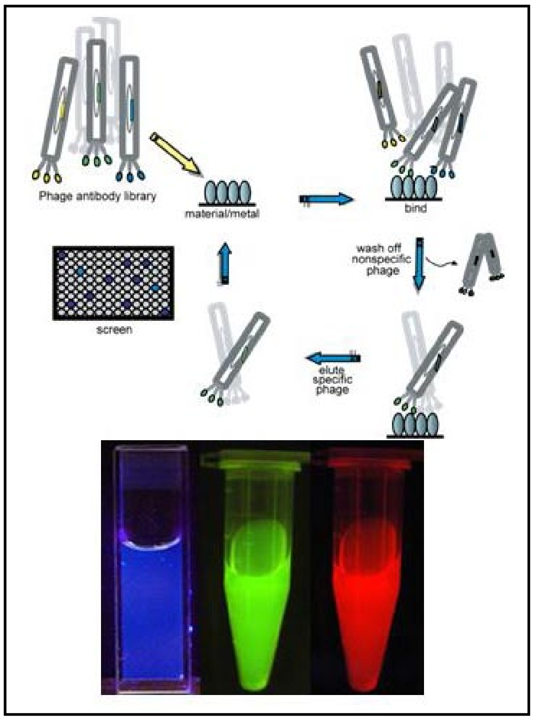
Schlögl model trajectories and the variation of its state with a parameter λ

After receiving his Bachelor's degree in Mechanical Engineering from the Katholieke Universiteit Leuven in Belgium in 1994, Dr. Debusschere obtained a scholarship from the Belgian American Educational Foundation to pursue his Master's degree at the University of Wisconsin, Madison, where he obtained both his M.S. and Ph.D. degrees in Mechanical Engineering. In 2001, he joined Sandia National Laboratories in Livermore, CA, first as a postdoctoral researcher and later as a senior member of technical staff. At Sandia, Dr. Debusschere developed a broad research program in the areas of spectral uncertainty quantification, multiscale simulation, stochastic processes, and Bayesian analysis. He has also been very active fostering diversity at Sandia in his roles on the Division Diversity Council and the Foreign National Networking Group. When not at work, he assists in a non-profit canine rescue organization that he and his wife founded.

Jennifer S. Martinez
Los Alamos National Laboratory

For the discovery and characterization of templated nanomaterials, biomolecular recognition strategies, and natural products of marine bacteria for robust biological sensing; and for exemplary career-development mentoring of women.

Jennifer Martinez is a staff scientist in the Center for Integrated Nanotechnologies at the Los Alamos National Laboratory. Her research aims at designing and characterizing the interface between inorganic and biological systems. One component of her research has focused on the isolation and structural characterization of iron(III)-binding peptide-amphiphiles. These exciting classes of siderophores are not only important in the competition for limited nutrients, but interesting materials whose assemblies change, and can be controlled, upon molecular recognition of iron(III). This past work provides an important background for her current work where she uses peptide amphiphiles to template, solubilize, and assemble nanomaterials using biomolecular recognition strategies, ultimately targeting the creation of functional nanoscale materials. Additionally, Dr. Martinez collaborates with colleagues to use phage display with biological and polyelectrolyte templating methods to create fluorescent metal nanoclusters and optically active nanomaterials.



Dr. Martinez received a B.S. in Chemistry from the University of Utah and a Ph.D. in Bioinorganic Chemistry from the University of California, Santa Barbara, where she was a Sea Grant Doctoral Trainee. She continued her studies as a Director's Postdoctoral Fellow at Los Alamos National Laboratory.

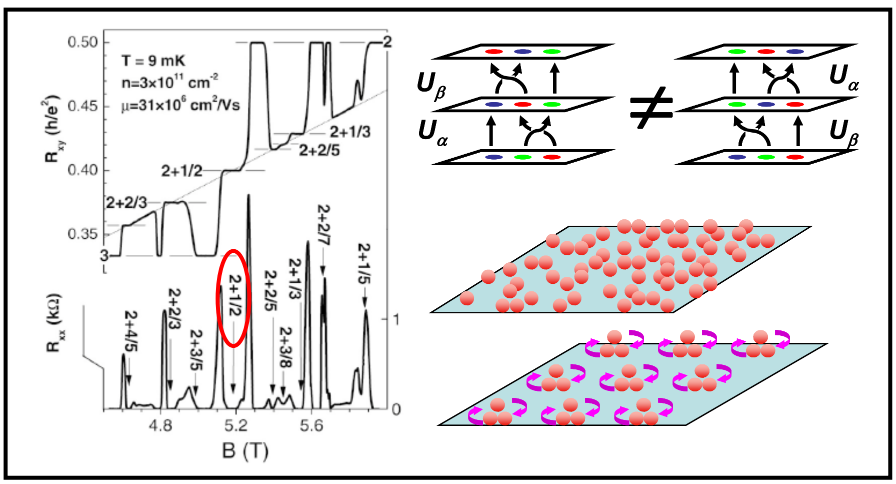
Dr. Martinez also has been active in biosensor development, with work ranging from discovery of recognition ligands by phage display to production of deployable sensors for medical diagnostics and the detection of biological threat agents and other pathogens. Her work has been published in high-profile journals such as *Science, Proceedings of the National Academy of Sciences, Journal of the American Chemical Society,* and *Langmuir*. Her services include the mentorship of postdoctoral scientists, an activity for which she recently received an award at Los Alamos National Laboratory. Dr. Martinez actively participates in DOE-sponsored programs at Los Alamos and also works with visiting scientists and collaborators at the Center for Integrated Nanotechnologies, one of the five DOE Nanoscale Science Research Centers.

Wei Pan
Sandia National Laboratories

For leadership in the field of experimental many-particle physics, especially non-Abelian states in ultra-clean two-dimensional systems; and for broad scientific community outreach activities and leadership.

Dr. Wei Pan, who received his Ph.D. from Princeton University, is a Principal Member of the Technical Staff in the Physical, Chemical, and Nano Sciences Center at Sandia National Laboratories. He leads Sandia's DOE/Basic Energy Sciences project on Quantum Electronic Phenomena and Structures, and is the principal investigator for Laboratory Directed Research and Development (LDRD) projects at Sandia on Bloch oscillations, silicon nanocrystals, and other topics.

Dr. Pan is a leader in the field of experimental many-particle physics in lower dimensions, where he has made many important contributions. His research has involved discoveries of many novel quantum Hall states in two-dimensional electron systems (2DES), including tilted magnetic field-induced quantum Hall striped states in ultra-high quality 2DES. In particular, he is credited with the first observation of the precisely quantized Hall plateau at the Landau level filling factor $\nu = 5/2$, which unequivocally established for the first time that this even-denominator state is a true fractional quantum Hall liquid. However, the 5/2 liquid is believed to be non-Abelian, meaning that when interchanging its quasiparticle excitations the *order* of exchange changes the nature of the many-body wavefunction. These particles thus form a new class of matter not previously observed. This result has impacted and stimulated a great number of recent developments in theoretical physics and in topological quantum computation, which is expected to be extraordinarily fault tolerant.

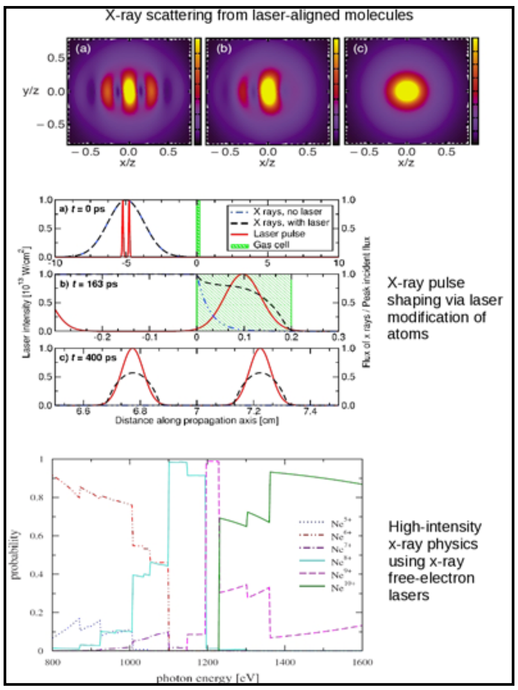


Dr. Pan has published more than 50 peer-reviewed articles, including 11 in *Physical Review Letters*. He has served on the User Proposal Review Committee for the Center for Integrated Nanotechnologies, one of five DOE Nanoscale Science Research Centers, and for the past three years as a member of the Users Advisory Committee and the Research Program Committee for the National High Magnetic Field Laboratory in Tallahassee, Florida. In 2005, he was on the Organizing and Program committees of the 16th International Conference on Electronic Properties of Two-Dimensional Systems (EP2DS-16) and was a guest editor of the proceedings in a special edition of *Physica E*. He regularly serves as a reviewer for *Physical Review Letters* and *Physical Review B*.

Robin Santra
Argonne National Laboratory

For contributions to the field of atomic, molecular, and optical science in the areas of high-order harmonic generation and strong-field absorption and ionization; and for scientific mentoring of students and the public.

Robin Santra is a theoretical physicist in the Chemical Sciences and Engineering Division at Argonne National Laboratory and an Associate Professor (part time) in the Department of Physics at the University of Chicago. His research interests focus on the ionization dynamics and inner-shell physics of atoms, molecules, and clusters; strong-field and electron-correlation effects in the x-ray regime; and applications of x-ray free-electron lasers. Dr. Santra's research supports DOE's basic science mission. His theoretical work complements the experimental program at Argonne's Advanced Photon Source, a DOE national user facility. In addition, it addresses important issues related to planned experimental research at fourth-generation x-ray sources, in particular the Linac Coherent Light Source (LCLS), which is currently under construction at the SLAC National Accelerator Laboratory.

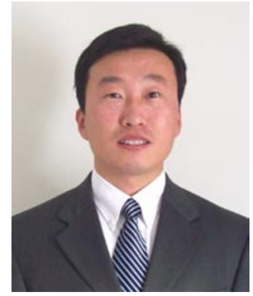


Dr. Santra has been investigating various strategies for controlling x-ray processes using intense lasers. In one approach, molecules in the gas phase are spatially aligned along the laser electric-field axis. The suppression of random molecular orientations can be exploited for both x-ray absorption and x-ray scattering. This may make it possible to perform x-ray imaging of molecules that cannot be crystallized. In another approach, the electronic states reached via x-ray absorption are modified. For instance, it becomes possible in this way to substantially suppress x-ray absorption in an otherwise strong x-ray absorber. This may be exploited to imprint the shape of one or more laser pulses onto an x-ray pulse. In a third scenario, the optical field is strong enough to ionize even chemically inert atoms. As an example, x-ray absorption studies of laser-ionized atoms made it possible to directly observe the spatial alignment of the orbital hole produced by the strong laser field. This work has interesting implications for attosecond science, aiming to control the dynamics of electrons in matter.

Another theoretical effort of Dr. Santra focuses on scientific applications of future x-ray free-electron lasers (FELs). The first of the x-ray FELs to come online is the LCLS. The high-intensity aspect of x-ray FELs will allow us to extend concepts of nonlinear optics and strong-field physics to the x-ray domain. For instance, Dr. Santra's calculations predict that the focused beam of LCLS will be intense enough to ionize, in a single x-ray pulse, all 10 electrons of a neon atom. In addition to the fundamental interest in understanding x-ray/matter interaction at high intensity, this topic is critical for planned single-shot single-biomolecule experiments, which seek to overcome the current limitations of protein crystallography.

Dr. Santra received his Ph.D. in theoretical chemical physics from the University of Heidelberg in 2001. As a postdoctoral researcher, he worked at JILA, which is jointly operated by the University of Colorado and the National Institute of Standards and Technology, and at the Institute for Theoretical Atomic, Molecular, and Optical Physics at the Harvard-Smithsonian Center for Astrophysics. Dr. Santra joined Argonne National Laboratory in 2005. In 2007, he was awarded by the International Union of Pure and Applied Physics the Young Scientist Prize in Atomic, Molecular and Optical Physics. Dr. Santra has published more than 60 peer-reviewed articles and has given 50 invited presentations.

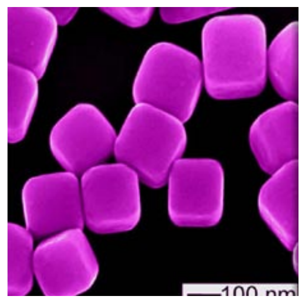
Yugang Sun
Argonne National Laboratory



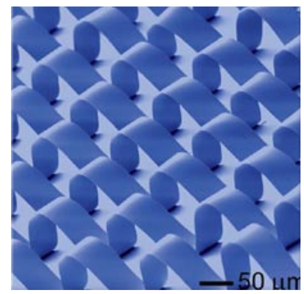
For developing ground-breaking techniques for chemical synthesis and nanofabrication of metal and semiconductor nanomaterials; and for educational activities for the community.

Yugang Sun is an assistant chemist in the Center for Nanoscale Materials at Argonne National Laboratory. His world-leading breakthroughs in the synthesis and characterization of new nanoscale structures and composites have changed the landscape for next-generation optics and electronics.

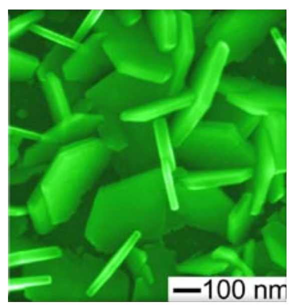
Dr. Sun's research interests focus on developing novel approaches for the synthesis of a wide range of nanostructures, including metal nanoparticles with well-controlled morphologies, single-crystal semiconductor nanostructures with mechanical flexibility, and metal/semiconductor nanocomposites with multiple functionalities. These nanomaterials offer unique optical, electrical, and mechanical properties, which make them uniquely suited for many applications including efficient solar energy conversion, energy storage, photocatalysis, wearable electronic textiles, sensing, and medical therapy. His interests also include development of novel devices that exploit the superb performance of the as-synthesized nanomaterials.



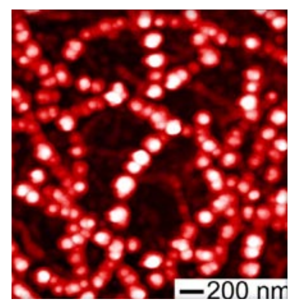
Silver Nanocubes



Flexible Silicon Nanoribbons



Ag Nanoplates on GaAs Wafer



Pd Particles on Carbon Tubes

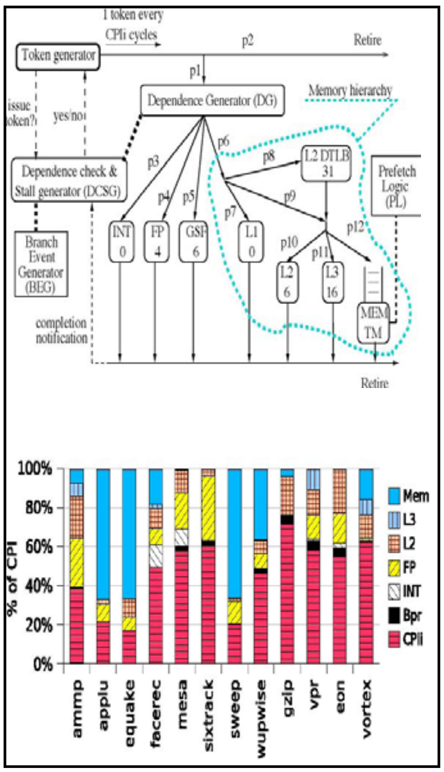
Dr. Sun received B.S. and Ph.D. degrees in chemistry from the University of Science and Technology of China in 1996 and 2001, respectively. Before joining Argonne in 2006, he was a post-doctoral research associate at the University of Washington and the University of Illinois at Urbana-Champaign, where his research led to more than 10 patents (most have been licensed). He has published more than 80 peer-reviewed articles in high-profile journals including *Science*, *Nature Nanotechnology*, *Nano Letters Advanced Materials*, and the *Journal of American Chemical Society*. The total number of citations to his work is more than 7,400, and he has 16 papers that have been cited individually more than 100 times. He has delivered more than 20 invited presentations at major international conferences and universities. Dr. Sun has also been active in scientific outreach and has played a leading role in building an active and robust user community at the Center for Nanoscale Materials.

Jeanine Cook
New Mexico State University

For high-impact research on performance modeling and prediction of future-generation computer architecture; and for dedication to educating and mentoring future-generation electrical and computer engineers.

Dr. Cook, who received her Ph.D. from New Mexico State University, is currently an associate professor in the Klipsch School of Electrical and Computer Engineering.

As a leader in research of microprocessor architecture, her primary work is in the modeling and simulation of next-generation microprocessors used in massively-parallel computer systems, to predict their performance for applications relevant to Stockpile Stewardship.



Her work will allow NNSA to make well-informed decisions on the procurement of supercomputers best suited for the Stockpile Stewardship needs in the future. This body of work will also guide the industry in directions for microprocessor research and development for scientific computing applications.

Dr. Cook also performs research in the areas of microarchitecture power optimization, workload characterization, and performance optimization of large-scale scientific applications, using both traditional methods and tools, and hardware accelerators.

In addition to conducting cutting-edge research, Dr. Cook is also a dedicated, engaging teacher. Since 2002, she has advised and graduated 18 M.S. and Ph.D students in Electrical and Computer Engineering at the New Mexico State University. In letters of support from her former students, she has been credited for fostering her students' interests in computer architecture, motivating them with her work ethic and innovative approach to solving problems, and exposing them to relevant applications at the National Laboratories in New Mexico.

The Presidential Early Career Award for Scientists and Engineers (PECASE)

In 1996, the National Science and Technology Council (NSTC) was commissioned to create an award to recognize and honor outstanding scientists and engineers at the outset of their independent research careers. The NSTC was established to coordinate the multiagency science and technology policy-making process, and to implement and integrate the President's science and technology policy agenda across the federal government.

The Presidential Early Career Award for Scientists and Engineers (PECASE) embodies the high priority placed by the government on maintaining the leadership position of the United States in science by producing outstanding scientists and engineers and nurturing their continued development. The Awards identify a cadre of outstanding scientists and engineers who will broadly advance science and the missions important to the participating agencies.

The PECASE Awards are intended to recognize some of the finest scientists and engineers who, while early in their research careers, show exceptional potential for leadership at the frontiers of scientific knowledge during the twenty-first century. The Awards foster innovative and far-reaching developments in science and technology, increase awareness of careers in science and engineering, give recognition to the scientific missions of participating agencies, enhance connections between fundamental research and national goals, and highlight the importance of science and technology for the nation's future.

The PECASE Award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers. The awards are conferred annually at the White House following recommendations from participating agencies. To be eligible for a PECASE Award, an individual must be a U.S. citizen, national, or permanent resident. Each Presidential award winner receives a citation, a plaque and funding from their agency for up to five years to advance his or her research. Individuals can receive only one PECASE award in their careers.

The agencies participating in the PECASE Awards program are:

Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Education
Department of Health and Human Services: National Institutes of Health
Department of Veterans Affairs
National Aeronautics and Space Administration
National Science Foundation

U.S. Department of Energy
Early Career Award
Past Recipients

	Office of Science Recipients	Office of Defense Programs Recipients
1996	Michael Smith John P. Hill Philip M. Jardine Christine Hartmann	Shenda M. Baker Richard A. Cairncross
1997	Andrew Brandt David J.Dean Lori A. Freitag David E. Newman John Shanklin	Bruno S. Bauer Thomas J. Matula
1998	Mari Lou Balmer James W. Lee Anthony Mezzacappa Gary P. Wiederrecht	Tonya L. Kuhl Roya Maboudian Christopher Palmer
1999	Kenneth M. Kemner John F. Mitchell Lynne E. Parker Xian Chen	Ken R. Czerwinski David M. Ford
2000	Richard B. Lehoucq Zhihongb Lin Zheng-Tian Lu Andrey Zheludev	Aaron L. Odom Jonas C. Peters
2001	Ian Anderson Vincent Cianciolo Mark Herrmann Jizhong Zhou	Kenneth A. Gall Paul Ricker Z. John Zhang
2002	Jeffrey C. Blackmon Edmond Chow Sergei Maslov Jonathan E. Menard Christine Orme	Carl Boehlert Krishnakumar Garikipati

	Office of Science Recipients	Office of Defense Programs Recipients
2003	Tamara G. Kolda Saskia Mioduszewski Margaret S. Torn Jian Shen	Catherine M. Snelson Donald P. Visco, Jr. Brian D. Wirth
2004	John Arrington William Ashmanskas Hong Qin Robert B Ross Paul Vaska Zhangbu Xu	Wei Cai William P. King Yunfeng Lu
2005	Daniel Bardayan Todd Munson Wynne Schiffer Yanwen Zhang	Christopher J. Roy Wendelin Wright Michael A. Zingale
2006	Kyle Cranmer Julia Laskin Ho Nyung Lee Len A. Pennacchio	Brian J. Kirby Jeffrey Kysar Shawn Newsam Carlos Pantano

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NNSA