


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

Wednesday, July 26, 2006



**The Secretary of Energy  
Washington, DC 20585**

### **In Recognition and Appreciation**

The Department of Energy today is proud to salute seven 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.

A handwritten signature in black ink that reads "Samuel W. Bodman".

*Samuel Wright Bodman*

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## **2005 AWARDEES**

**DR. DANIEL W. BARDAYAN**  
*OAK RIDGE NATIONAL LABORATORY*

**DR. TODD S. MUNSON**  
*ARGONNE NATIONAL LABORATORY*

**DR. WYNNE K. SCHIFFER**  
*BROOKHAVEN NATIONAL LABORATORY*

**DR. YANWEN ZHANG**  
*PACIFIC NORTHWEST NATIONAL LABORATORY*

**DR. CHRISTOPHER J. ROY**  
*AUBURN UNIVERSITY*

**DR. WENDELIN JANE WRIGHT**  
*STANFORD UNIVERSITY*

**DR. MICHAEL A. ZINGALE**  
*STATE UNIVERSITY OF NEW YORK*  
*AT STONY BROOK*

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# DR. DANIEL W. BARDAYAN

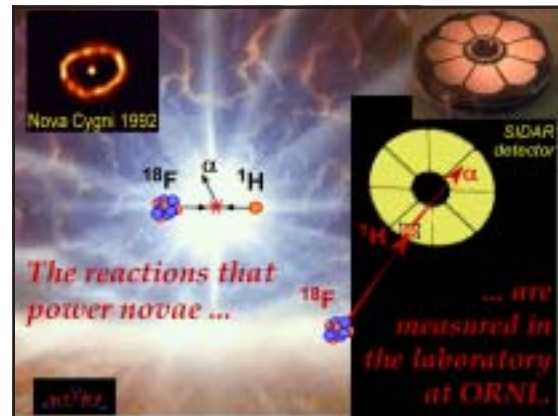
## OAK RIDGE NATIONAL LABORATORY

*For his innovative precision nuclear spectroscopy measurements at the ORNL Holifield Radioactive Ion Beam Facility (HRIBF) clarifying the production of elements and radioisotopes in exploding stars. Dr. Bardayan supported promising young scientists at HBCUs (ORNL Days of Science), high achievers (Tennessee Governor's School), first-generation students (ORNL-UT Science and Energy Expo), graduate students in exotic beam physics (RIA (Rare Isotope Accelerator) Summer School), and students throughout the southeastern US (HRIBF facility tours).*

Dr. Dan Bardayan is a physicist in the experimental nuclear astrophysics group at Oak Ridge National Laboratory (ORNL). ORNL is home to the Holifield Radioactive Ion Beam Facility (HRIBF), where Dr. Bardayan measures reactions of astrophysical interest using accelerated radioactive beams. Dr. Bardayan's primary focus has been on studying nuclear reactions that influence the production of gamma-ray emitting radioisotopes in exploding stars such as novae. The observation of gamma rays from these nuclei provides a window into the inner workings of the explosion.

Dr. Bardayan discovered an important quantum level in neon-18 that was thought to dominate the interaction rate of the unstable nucleus fluorine-17 with hydrogen in novae. Neon-18 had been studied for over 30 years using stable beam techniques, but the important level was not discovered until an exotic beam became available at the HRIBF. To make this discovery, Dr. Bardayan developed the Silicon Detector Array which has become the workhorse of the nuclear astrophysics group. This result changed predictions of isotope production in novae (e.g., oxygen-17) by factors as large as 10000 and resulted in the first publication reporting work with a reaccelerated radioactive beam in North America.

Dr. Bardayan's most recent work has focused on studying thermonuclear reactions that destroy the radioisotope fluorine-18 in novae. Dr. Bardayan made precision measurements of the properties of an important quantum level in neon-19 that resolved a serious discrepancy in the literature. This, combined with subsequent measurements, led to important constraints on the sensitivity required for billion-dollar orbiting telescopes.



# DR. TODD MUNSON

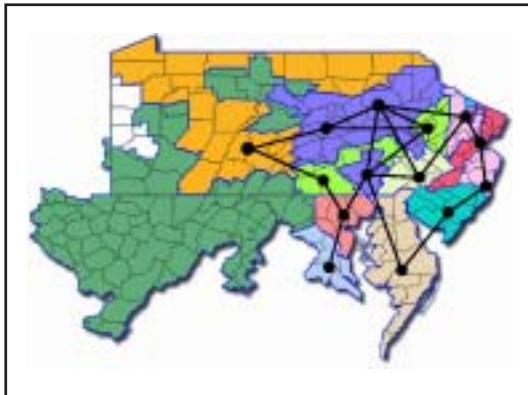
## ARGONNE NATIONAL LABORATORY



*Dr. Munson is a pioneer in the development of algorithms, software, and problems-solving environments for the solution of large-scale optimization problems. His major contributions range from the most widely used code for complementarity's problems, to the design and implantation of a novel interface for the seamless interaction of optimization modeling languages with remote solvers in a distributed network. Dr. Munson has worked with students in the DOE/NSF Faculty and Student Team (FaST) Program and in Argonne's Summer Student Program, and he served on the organizing committee for the University of Chicago-Argonne Institute on Computational Economics, gave tutorials on numerical optimization to the graduate student participants, and acted as a moderator and scientific judge for the Chicago Regional Middle School Science Bowl.*

Dr. Todd Munson is a computational scientist in the Mathematics and Computer Science Division at Argonne National Laboratory, where he has made significant contributions in the areas of large-scale continuous optimization and nonlinear complementarity problems. His main focus is the development

of robust, efficient numerical methods based on strong theoretical foundations for solving these problems.



Dr. Munson is a lead developer of PATH, the most widely used code for solving complementarity problems; NEOS, the Network Enabled Optimization System, a collaborative project between Argonne National Laboratory and Northwestern University that provides access to

optimization packages through a variety of Internet interfaces; and TAO, the Toolkit for Advanced Optimization, an open source collection of parallel algorithms for solving large-scale nonlinear optimization problems. He also provides numerical methods for Mesquite, the Mesh Quality Improvement Toolkit, which implements r-adaptivity techniques for mesh-based simulations. Dr. Munson and collaborators were awarded the Beale-Orchard-Hays prize from the Mathematical Programming Society in 2003 for their work on NEOS.

Dr. Munson has mentored graduate and undergraduate students through the DOE/NSF Faculty and Student Team Program and Argonne's Summer Student Program; has served on the organizing committee for the Argonne-University of Chicago Institute on Computational Economics and has given tutorials on numerical optimization to the workshop participants; and has acted as a moderator and scientific judge for the Chicago Regional Middle School Science Bowl.





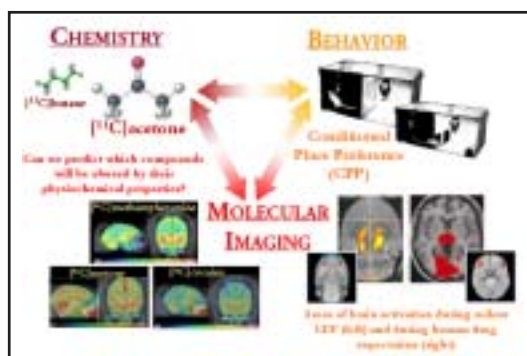
# DR. WYNNE K. SCHIFFER

## BROOKHAVEN NATIONAL LABORATORY

*For pioneering work in integrating neurobiology, chemistry, physics, and instrumentation which responds to an urgent need to translate multi-disciplinary discoveries and new knowledge into advances in human health. Her work focuses on educating the community about the important role of nuclear medicine in diagnosing and treating diseases such as mental illness and drug abuse. Dr. Schiffer has educated students, teachers, counselors, and administrators in over 30 local schools about brain imaging and drug abuse. She has presented to universities, rehabilitation groups (Alcoholic Anonymous, DARE (Drug Abuse Resistance Education), etc.), police departments, state governmental officials, hospitals and various community groups (places of worship, firehouses, recreational centers, etc.).*

Dr. Wynne Schiffer is a Neurobiologist in the Chemistry Department at Brookhaven National Laboratory (BNL). Together with physicists, chemists and engineers, Dr. Schiffer aids in the development and application of novel imaging technologies which can be used to provide insights into complex biological systems not attainable with current technologies. Her contributions to this new effort, both as an independent investigator and as a member of BNL's Translational Imaging Team, have led to several important discoveries.

Among these, Dr. Schiffer pioneered an effort to label nanoparticles with positron emitting isotopes, generating a new family of imaging probes for use with Positron Emission Tomography (PET). Dr. Schiffer leads a team of chemists, materials scientists, biologists and physicists in this ongoing multidisciplinary effort. Thus far, some exciting findings to come out of this project are that 2 nm nanoparticles go to different places in the body than 10 nm particles, just by virtue of their size. Further, different concentrations of 10 nm particles also show unique patterns of accumulation in living systems.



Dr. Schiffer has also used advanced molecular imaging techniques to show that a common model of drug seeking, conditioned place preference (CPP), produces an identical pattern of brain activation in animals as that observed in human addicts expecting a psychostimulant. These studies were the first to take advantage of a new imaging technology that permits brain scans of behaving animals, much like brain scans occur in behaving humans.

Dr. Schiffer's work reflects the breadth of the world-class research supported by the DOE. Dr. Schiffer maintains that all of these discoveries were made possible because of the DOE's commitment to advanced imaging technologies and the application of these technologies to understanding the molecular bases of biological and medical problems.

After receiving a B.A. in Psychology from The Colorado College in 1996, Dr. Schiffer went on to receive an M.S. and a Ph.D. in Neurobiology and Behavior from Stony Brook University in 2002 and 2004, respectively. She conducted post-doctoral research at the National Institute of Health and at BNL before joining the DOE research staff in 2005. Presently, she is an Assistant Scientist in BNL's Center for Translational Neuroimaging.

# DR. YANWEN ZHANG

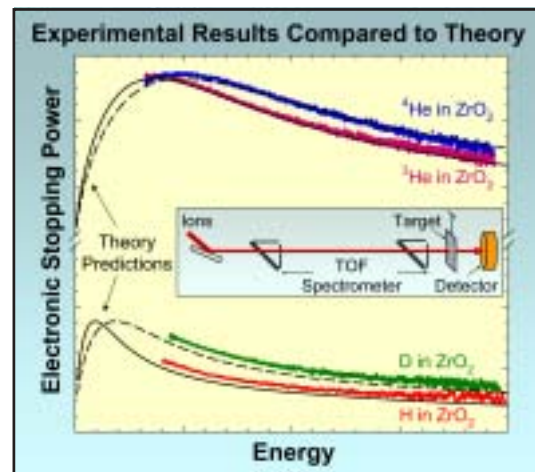
## PACIFIC NORTHWEST NATIONAL LABORATORY

*For internationally recognized, seminal contributions to the fields of ion-beam physics and ion-solid interactions in materials, especially development of a novel approach for measuring electronic stopping. Dr. Zhang has a personal commitment to mentoring students at the high school, undergraduate, graduate and postdoctoral levels, and she lectured within the Joint Institute with the University of Washington, provided Chinese translations to local middle schools, and judged local science fairs.*



Dr. Yanwen Zhang is a Senior Research Scientist at the Pacific Northwest National Laboratory. She is co-Principal Investigator (PI) for an Office of Science project on *Defects and Defect Processes in Ceramics*, PI for a project on *Response of Radiation Detection Materials to Ions*, and leads a capability development project on *Advanced Elastic Recoil Detection Analysis Instrument*.

Dr. Zhang's research covers a range of topics in materials science, and she has distinguished herself in the fields of ion-beam physics and ion-solid interactions, especially in the field of electronic stopping in solids. She developed a novel approach based on high-resolution time-of-flight spectrometry for accurately measuring electronic stopping over a wide range of energies and for validating theoretical predictions in ceramics. This fundamental work is directly relevant to DOE missions related to advanced nuclear power, nuclear nonproliferation, national security, nuclear waste and energy-efficient electronic devices. Dr. Zhang's work also addresses defects and irradiation effects in ceramics. Her work on silicon carbide provided critical new understanding and models of defect configurations, damage accumulation and recovery processes. In her work on complex oxides, Dr. Zhang demonstrated the role of oxygen vacancy mobility on the critical temperature for amorphization in pyrochlore ceramics, provided quantitative determination of irradiation damage accumulation behavior in rare-earth titanates and silicates, and determined the kinetics of electron-beam stimulated recrystallization processes in strontium titanate.



The broad range of Dr. Zhang's research has led to numerous national and international collaborations and has resulted in an extensive publication record. She is the author/co-author of more than 80 journal articles and many peer-reviewed conference papers. She is co-author on an invited book chapter and is currently serving as co-editor for a book on *Ion Beams in Nanoscience and Technology*. Dr. Zhang has given more than 30 presentations, including 8 invited seminars and presentations. She regularly serves as a reviewer for international journals.

Dr. Zhang also is involved in educational activities and community service. She routinely hosts visiting scientists at DOE's Environmental Molecular Sciences Laboratory ion-beam user facility, lectures on topics related to ion beam physics, mentors post doctoral fellows, graduate students, summer undergraduates and high school interns, serves on Ph.D. committees, assists local middle schools with Chinese translations, and serves as a judge for local Science Fairs.

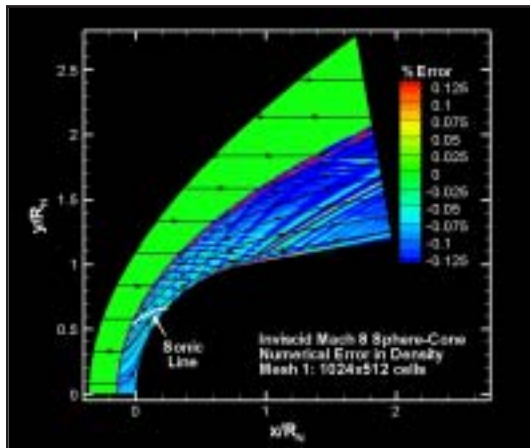


# DR. CHRISTOPHER J. ROY

## AUBURN UNIVERSITY

*For the development of verification and validation methodologies critical to improving accuracy and building confidence in computational science and engineering simulations, for the development of unsteady hybrid turbulence models and fluid dynamics simulations, and for providing high quality educational opportunities for the next generation of American scientists and engineers.*

Dr. Chris Roy received his Ph.D. in aerospace engineering from North Carolina State University in 1998 and is currently an Assistant Professor of Aerospace Engineering at Auburn University. Sandia National Laboratories nominated Professor Roy for his contributions in verification (mathematical accuracy) and validation (physical accuracy) of engineering computer simulations. He is a nationally recognized expert in the areas of verification and validation and his research in these areas has had a positive impact on ensuring the safety and reliability of the United States nuclear weapons stockpile.



Professor Roy's verification work is focused primarily in the area of estimating the grid-related numerical errors that exist in all engineering simulations. His validation work addresses the modeling and simulation of fluid turbulence, which impacts a wide range of aerospace systems. His work involving advanced turbulence modeling approaches for complex aerodynamic flows is relevant to flight systems that are of interest to the Office of Defense Programs, other national security programs, and the energy sector.

Professor Roy has also helped to strengthen U.S. leadership in science and technology through his leadership in engineering education and professional service. His commitment to educating the next generation of American scientists and engineers is evidenced through the multiple awards he has received in recognition of his teaching while at Auburn University. These awards include the Student Government Association Outstanding Faculty Award (April 2005), the Fred H. Pumphrey Teaching Award (March 2005), and the Outstanding Faculty Member Award in the Department of Aerospace Engineering (March 2005). Dr. Roy also is a co-instructor for the two-day professional short course Verification and Validation in Computational Simulation which has been taught numerous times through the American Institute of Aeronautics and Astronautics.



# DR. WENDELIN JANE WRIGHT

## STANFORD UNIVERSITY

*For research into the deformation and failure of metals and polymers under dynamic loading using high-speed and spatially-resolved infrared measurements of temperature, and for guidance and leadership to fellow researchers with an exceptional ability to communicate difficult technical concepts to colleagues and students.*



Dr. Wendelin Wright was nominated by Lawrence Livermore National Laboratory for her research into the dynamic deformation and failure of materials using high-speed and spatially-resolved infrared measurements of temperature. Her work is providing fundamental understanding of deformation and fracture in metals and polymers under dynamic loading which is directly relevant to the Stockpile Stewardship Program. Other DOE Office of Defense Programs applications include machining and safety aspects of explosives and other hazardous material, verification of existing material models, and contributions to the development of new material models.



Wendelin Wright completed her Ph.D. in Materials Science and Engineering at Stanford University in 2003. For her dissertation, “Shear Band Processes in Bulk Metallic Glasses,” Professor Wright investigated the mechanical behavior of amorphous metals to study atomic scale and microscopic deformation mechanisms. Her work provided early experimental evidence that localized heating is not the primary cause of flow localization in metallic glasses. Her specific interest in characterizing mechanical behavior led her to complete her Ph.D. with a minor in mechanical

engineering. Her other research interests focus on studying microscale deformation using nanoindentation techniques.

While in graduate school, Professor Wright held several fellowships, including a Stanford Graduate fellowship, a NSF Graduate Research fellowship, and for her final year of study, a fellowship from the American Association of University Women. As a graduate student, she was actively involved in teaching in the Materials Science department. In 2003, she was presented with the Walter J. Gores Award for excellence in teaching, Stanford University’s highest teaching honor. She completed a post-doctoral term at Lawrence Livermore National Laboratory and returned to Stanford University as an Acting Assistant Professor of Materials Science and Engineering in 2005. In September 2006, Professor Wright will assume an appointment as the Clare Booth Luce Assistant Professor of Mechanical Engineering at Santa Clara University.



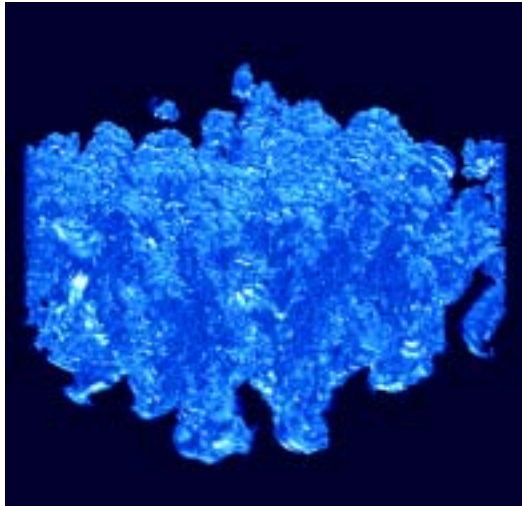
# DR. MICHAEL A. ZINGALE

## STATE UNIVERSITY OF NEW YORK AT STONY BROOK

*For advancing the detailed simulation of turbulent combustion and demonstrating parallel, multi-physics methods used in national security-related applications, for pioneering collaborations with fellow researchers, and for training students in computational astrophysics.*

Dr. Michael Zingale is an Assistant Professor in the Department of Physics and Astronomy at SUNY Stony Brook. He was nominated for this award by Lawrence Livermore National Laboratory for his key role as a developer of the 3-D astrophysical code FLASH, its application to neutron star X-ray bursts, and his subsequent pioneering of detailed 2- and 3-D hydrodynamics simulations that are illuminating how thermonuclear flames drive cosmologically important Type Ia Supernova explosions. His contributions to the FLASH project played an important role in the successful FLASH simulations of 3-D cellular detonations, winning the University of Chicago team a Gordon Bell prize in 2000. Professor Zingale's work contributes to NNSA/Defense Programs in many ways, including the

demonstration of new parallel multi-physics methods useful to NNSA lab code development and advancing the detailed simulation of turbulent combustion producing results of direct interest to NNSA programs.



Presently, he is working on developing new algorithms for the efficient simulation of Type Ia supernovae, in collaboration with scientists at Lawrence Berkeley Laboratory. In support of this work, he received an Outstanding Junior Investigator award from the DOE Office of Nuclear Physics. Professor Zingale is also interested in working with DOE scientists on validation of

simulation codes to laboratory experiments. This is an essential step in building confidence in simulation capability and a key part of DOE's Defense Programs mission.

In addition to his excellent work in computational astrophysics, Dr. Zingale has contributed to teaching and the popularization of astrophysical discoveries. For his work in these areas, he was awarded the Gregor Wentzel and Carl Sagan Prizes. In the classroom, he recently taught a graduate seminar on computational hydrodynamics. This type of education provides students with the tools needed to perform simulations of astrophysical phenomenon as well as introduces them to the techniques utilized in simulations of importance to the Office of Defense Programs.

# **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 Awards are 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 PECASE Award will be of five years duration. 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 Health and Human Services: National Institutes of Health

Department of Veterans Affairs

National Aeronautics and Space Administration

National Science Foundation



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