



Argonne's  
Ian Foster

# Research Highlights . . .



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## Best rookie year ever for a supernova search

In 2002, its first year, the [Nearby Supernova Factory](#) based at [Lawrence Berkeley National Laboratory](#) discovered 34 supernovae—"the best performance ever for a 'rookie' supernova search," says astronomer Greg Aldering of the Lab's Physics Division. Aldering credits the remarkable discovery rate to software developed by colleague Michael Wood-Vasey. Fifty billion bytes pour in nightly from the Jet Propulsion Laboratory's [Near Earth Asteroid Tracking](#) telescopes at Mount Palomar and Maui and are automatically processed at the [National Energy Research Scientific Computing Center \(NERSC\)](#) to extract supernova candidates. Understanding Type Ia supernovae better could help solve the mystery of dark energy.

[Paul Preuss, 510/486-6249,  
[paul\\_preuss@lbl.gov](mailto:paul_preuss@lbl.gov)]

## Tropopause effect linked to ozone depletion

Researchers at DOE's [Lawrence Livermore National Laboratory](#) have discovered another fingerprint of human effects on global climate. Recent research has shown that increases in the height of the tropopause over the past two decades are directly linked to ozone depletion and increased greenhouse gases. The tropopause is the transition zone between the lowest layer of the atmosphere—the turbulently-mixed troposphere—and the more stable stratosphere. The tropopause lies roughly 10 miles above the Earth's surface at the equator and five miles above the poles. To date, no scientist has examined whether observed changes in tropopause height are in accord with projections from climate model greenhouse warming experiments.

[Anne Stark, 925/422-9799,  
[stark8@llnl.gov](mailto:stark8@llnl.gov)]

## Keeping parallel computing in sync

Researchers at DOE's [Los Alamos National Laboratory](#), [Rensselaer Polytechnic Institute](#), Mississippi State University, and Florida State University have developed a method for enhancing parallel-computing techniques in large-scale networked computer simulations. Parallel computing divides tasks among many smaller computers in order to process the job faster than one large supercomputer. Synchronization problems develop when some computers process data at a faster pace than others. This results in a data traffic jam that slows down the entire simulation process. The solution lies in creating a communication network where individual computers randomly "check in" with each other to make sure they are all in sync.

[Todd Hanson, 505/665-2085,  
[tahanson@lanl.gov](mailto:tahanson@lanl.gov)]

## Life leads to methane in the ocean floor

Researchers from DOE's [Idaho National Engineering and Environmental Laboratory](#) discovered new life and new insight into the microscopic creators of the planet's largest frozen methane pools, trapped within the ocean floor. The team, led by microbiologist Rick Colwell, has identified a what may be a new species of methanogen and published a family tree of unique DNA sequences from hydrate microorganisms to show their relationships to many other microbes. Now, they're literally starving methane-producing microbes called methanogens, trying to develop realistic models of hydrate distribution and formation rate in seafloor sediments.

[Deborah Hill, 208/526-4723,  
[dahill@inel.gov](mailto:dahill@inel.gov)]

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## Sandia, University of New Haven offer national security degree program

Generally referred to already as a “campus,” DOE’s Sandia National Laboratories’ site at Livermore, Calif., actually became that in January with the beginning of classes in a program administered jointly with the University of New Haven. A class of 34 students began work in a course of academic instruction that will lead them to masters of science degrees in National Security and Public Safety, and could benefit the US in the international war on terrorism.

The courses—and the degrees—are offered by the university via a faculty drawn from Sandia’s technical staff and other sources. Classes are taught Monday, Tuesday, and Wednesday evenings and on-line. The program is open to US citizens holding baccalaureate degrees from accredited institutions.

“Our University feels quite privileged to be affiliated with one of our nation’s premiere laboratories, as it provides a unique opportunity to work with scientists who share our interest in national security,” said Dr. Thomas Johnson, dean and director of the university’s School of Public Safety & Professional Studies in New Haven. “Our graduate concentration in information protection and security, with research issues related to cyberterrorism and issues related to cyber-intelligence, will be enhanced by our ability to work with Sandia scientists, who are among the best in the world.”

He said the strategic collaboration between Sandia and UNH will enable a sharper focus on issues directly related to homeland security.

“The challenge of preparing the next generation of security experts and leaders cannot be accomplished by universities solely relying on traditional educational methods,” he said. “We believe the richness of our campus location within Sandia National Laboratories—as well as the structured format for teamwork between our faculty, Sandia scientists, and members of the corporate community—will provide an environment for exchange of ideas and the critical assessment of theories fundamental to the graduate study of national security and public safety.”

The program is aimed at current government workers who may already be involved in homeland security issues, government contractors or those who do business with the government, and “pre-service” college graduates who may be looking for guidance and learning opportunities that will lead them into national service.

“We anticipate mid-career professionals joining our program, thus enriching the academic environment by the wealth of their experience and insights,” Johnson said. “Our national security program aspires to produce graduates who will work within agencies comprising our intelligence community, as well as other national security and Department of Defense entities.”

The program, which requires 36 credit hours, is designed to provide students with an understanding of the fundamental principles of the legal charter, presidential executive orders, and the framework which guides the operation of national security agencies. Students will also analyze the role and function of the US agencies comprising the intelligence community, focusing largely on information protection and security.

Submitted by DOE’s Sandia National Laboratories

## ARGONNE SCIENTIST ACHIEVES ‘GLOBUS’ FAME

Ian Foster, associate director of the Mathematics and Computer Science Division at DOE’s Argonne National Laboratory and professor in computer science at the University of Chicago, has gone from mild-mannered computer geek to technology-media star—all because of something called “Globus.”



Ian Foster

The Globus Project is a research and software development project led by Foster and Carl Kesselman of the University of Southern California. The project’s goal is to deliver the research advances and open source software required to make grid computing successful in science, engineering, business and other collaborative situations. Grid computing is the high-speed networking equivalent to the electric power grid, providing computer power on demand, much the way a power grid provides electricity.

*R&D Magazine* recently named the Globus Toolkit, developed by the Globus Project, the “Most Promising New Technology” developed this year. The Sept. 16 Internet edition of *Newsweek* called Foster and Kesselman “two of the founding fathers of the grid,” while October’s *Red Herring* magazine referred to Foster as “the grid-father.” And *The New York Times* calls Globus “the de facto standard” in grid computing.

Foster’s Distributed Systems Laboratory, which he operates at both Argonne and the University of Chicago, employs 40 staff members and students. Among these projects are the Grid Physics Network and the international Virtual Data Grid Laboratory, both funded by the National Science Foundation, and the Earth System Grid and Particle Physics Data Grid projects, funded by DOE.

And the next step is international: The British Computer Society will present the 2002 Lovelace Medal to Foster and Kesselman next May in London. The Lovelace Medal is presented to individuals who have made contributions of major significance in the advancement of information systems, or that adds significantly to the understanding of the development of information systems.

Submitted by DOE’s Argonne National Laboratory