

PHYSICS COMMUNITY

Los Alamos's New Director Must Get Stockpile Stewardship in Gear, Grapple with Locals' Concerns

On 3 November, John Browne took the helm of the Department of Energy's Los Alamos National Laboratory. He succeeds Siegfried Hecker, who served as director for 12 years.

A nuclear physicist who earned his PhD from Duke University in 1969, Browne is a Los Alamos insider. He's been there for about 18 years, during which he's held various management positions in the lab's research and computational divisions. "He probably has as good or better an overview of the lab as anyone," says LANL physicist Tom Bowles. "And, in this day and age, [the job of director] requires someone with really good personal skills and a high degree of diplomacy. John has both." Indeed, these qualities are likely to prove useful both for overseeing nuclear weapons research and for improving relations with the local community—the main challenges Browne faces as director.

Safe and reliable weapons

Browne has inherited a lab in transition. The end of the cold war and the existence of the Comprehensive Test Ban Treaty (signed last year by President Clinton and awaiting ratification by the Senate and by about 40 other countries) have made LANL's chief job—to design and test nuclear weapons—obsolete (see PHYSICS TODAY, March, page 63). "The lab was in great turmoil for a few years," says a physicist who is a consultant to LANL. But since DOE adopted the Science-Based Stockpile Stewardship and Management Program in 1993, a new mission for the agency's weapons labs (Lawrence Livermore and Sandia National Laboratories, in addition to LANL) has been staked out: They are to monitor the existing nuclear arsenal and make sure that the weapons can perform as designed. It's a formidable task and, says LANL weapons physicist John Kammerdiener, "We haven't totally gotten into the new mode yet."

Stewardship, Browne says, "requires understanding the underlying physics [of nuclear weapons] from initiation to explosion." This deep un-

Depending on one's point of view, John Browne is seen either as bringing a good mix of experience and personality to his new job as Los Alamos's director, or as being too entrenched in the lab to make changes.

derstanding wasn't necessary before, because "we always had the ability to go to Nevada to test ideas," adds Browne. Says Jas Mercer-Smith, deputy director of nuclear weapons at LANL and a former weapons designer, "How do I predict at what age a [weapon] part needs to be changed? If I'm too conservative, you'll have to spend a whole lot of money. If I'm not conservative enough . . ." And the approach of testing the parts but not the integrated product has flopped in the past, he notes, pointing to last year's explosion of the European Space Agency's Ariane 5 in its maiden launch and to the Hubble Space Telescope's faulty mirror. Says Browne, "The fact that I'll have to sign a letter each year [to the secretaries of energy and de-

fense] certifying the safety and reliability of the stockpile is a pretty daunting proposition."

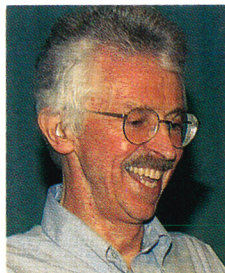
Technically, computer simulations form the heart of the stewardship program. The simulations use data from past nuclear tests and from experiments that use bomb components in nonexplosive regimes. For example, material properties of bomb components are studied at the

Los Alamos Neutron Science Center. (A few days after becoming director, Browne named Roger Pynn, an experimental physicist who has been at LANL for about 11 years, to take over his own job as head of that center.) The dynamics of material compression, which would produce fission in an actual nuclear bomb, are imaged with x rays, and a new facility to image them from two directions, the Dual-Axis Radiographic Hydrotest Facility,

or DARHT, is under construction at Los Alamos. And extremely high temperature and pressure experiments on small gas pellets of thermonuclear fuel will be done at the \$1.2 billion National Ignition Facility planned for Lawrence Livermore. Other stewardship-related facilities are planned, including a \$350 million upgrade for LANL's plutonium center.

Cost estimates for the stewardship program have been creeping up, with \$4.5 billion the current estimate for fiscal year 1999. The program has given a boost to LANL's defense spending, which, after a slump of nearly a decade, came to about \$685 million of the lab's approximately \$1.15 billion budget for FY 1997; the estimate for FY 1998 is \$766 million of a \$1.2 billion budget. More than half of LANL's nondefense spending goes to research in areas such as the Human Genome Project, high-performance computing and climate studies.

The stewardship approach to stockpile maintenance has met with controversy in scientific, defense and environmentalist circles. Opponents argue variously that the program will lead to development of new weapons, that it will exacerbate nuclear proliferation and undermine the test ban treaty, that it has the purpose of giving DOE a new lease on life and keeping physicists employed and that it is too costly. And, while some people oppose the program as a whole, others don't object to the scientific aims of the program *per se* but argue that the stewardship program is not a good way to maintain stockpile reliability. Without testing, "we will never have confidence in anything new that may be developed," says Washington University astrophysicist Jonathan Katz, who worked in laser fusion at Lawrence Livermore in the early 1970s, and has been a long-time consultant to that lab. Katz and others argue instead for manufacturing replicas of tested weapons. For about three weeks beginning in mid-October, Hugh Gusterson, a professor in MIT's Program on Science, Technology and Society, moderated an on-line debate



SIEGFRIED HECKER



JOHN BROWNE

on the stockpile stewardship program; anyone wanting to read or contribute to the debate can visit <http://stsfac.mit.edu/projects/sbss/>.

An unhappy community

Browne has also inherited sour relations between the lab and the local community. The problem is widely attributed to the layoffs two years ago of about 700 people, which then-director Hecker says were made to increase the ratio of technical to support staff. But the layoffs, which also prompted claims of discrimination against Hispanics and older workers, are not the only source of tensions. In addition, the lab is dogged by issues concerning environmental safety, environmental restoration and the economic impact of the lab on the local community, as well as treatment of lab employees—and different issues raise the hackles of different sectors of the community.

Spurred by the community's concerns, in September when DOE renewed the University of California's contract to run the weapons labs, the agency said it would review LANL's and UC's performance on community participation and on environmental health and safety issues, including waste management. The review (which applies only to LANL) will take place in 1999, two years into the five-year contract. "LANL is under a lot of heat [for its] interactions with the local population," acknowledges Browne.

Last year, for example, Concerned Citizens for Nuclear Safety, a Santa Fe-based nonprofit organization, won a suit against DOE for not adequately monitoring radioactive air emissions. And in the past few months, says the organization's Jay Coghlan, "it's been demonstrated that there is migration of radioactive contaminants during storm water runoff events." Long-time LANL employee Charles Montaña, who is a member of Northern New Mexico's Citizens' Advisory Board, a DOE-funded group that advises the agency on local environmental cleanup issues, complains that the lab is not forthcoming with "information concerning lab actions and associated risks, so we cannot truly judge." Awareness of lab safety problems has also been heightened by a string of four serious (non-nuclear) accidents within the last three years.

There has also been a growing sense that LANL, which is the largest employer in northern New Mexico, does not do as much for the local economy as it could, says Tom Garcia, who heads the lab's community economic development effort. "People recognized that the largest economic engine was not involved in the community," Garcia says, but the lab

is working hard to improve the situation. For example, in the last six months of FY 1997, "we shifted \$50 million in procurements to northern New Mexico."

Browne plans to focus on community relations. "I'm going to be visible and personally listen," he says. "We are going to have to show [the community] we are doing business in a way

that makes us good neighbors." But some would have preferred that the new director be an outsider. Says Montaña, "Browne's been a part of the decision making process. It's difficult to imagine him changing things."

As for Browne's predecessor, Hecker, who has been at LANL for about 26 years, he plans to stay on and spend about half his time studying the ma-

SNO Gets Set to Go

More than 2 km down a nickel mine near Sudbury, Ontario, the Sudbury Neutrino Observatory (SNO) is nearly set to start counting solar neutrinos. Shown here before the last of its 122 acrylic panels were glued into place, the 12 m diameter vessel was assembled underground. Next month, it will start to be filled with 1000 metric tons of heavy water. The rocks above the observatory will keep out cosmic rays, and light water will fill the barrel-shaped region around the vessel to block out background radiation.

It's the use of heavy water that distinguishes SNO from the world's other solar neutrino observatories, such as Super Kamiokande in Japan, which uses light water and went into operation in April 1996; see "Solar Neutrino Experiments: The Next Generation" in *PHYSICS TODAY*, July 1996, page 30. With heavy water, the flux of electron neutrinos and the total neutrino flux (electron, tau and muon neutrinos combined) can both be measured. So, "with one experiment, we will have a determination of whether neutrinos change flavors," says SNO director Art McDonald of Queen's University. If they do, it would explain the discrepancy between predicted and measured solar neutrino flux, and it would mean that neutrinos have mass. "This would be clear evidence for physics beyond the standard electroweak model and would also have significant implications in astrophysics," McDonald says.

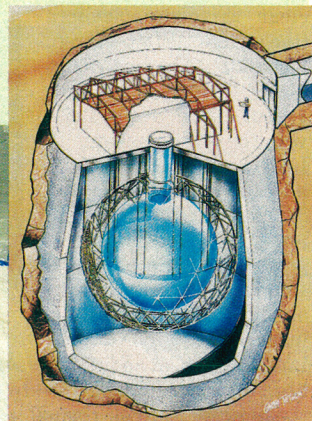
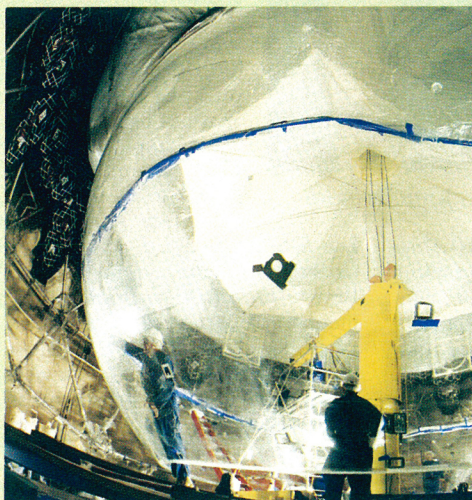
Arranged around the vessel in a geodesic array 18 m across are 10 000 photomultiplier tubes that will be used to detect Čerenkov radiation from electrons resulting from the electron neutrino reaction ($d + \nu_e \rightarrow p + p + e$). The total neutrino flux will be measured in two ways. In one, neutrons from the reaction ($d + \nu \rightarrow p + n + \nu$) will be absorbed and counted by helium-3 counters suspended in the heavy water. (These counters will be installed in the full vessel by a remote-controlled minisubmarine.) In the other, experimenters will spike the heavy water with about two metric tons of magnesium chloride salt and measure the Čerenkov radiation produced when a chlorine ion captures a neutron.

Calibration measurements will be made during the three months it takes to fill the vessel with heavy water, and data collection is expected to begin in May.

SNO is a collaboration of about 100 scientists from Canada, the US and the UK; all three countries contributed to the \$72 million (Canadian) construction costs. The heavy water, worth about \$300 million, is on loan from Atomic Energy of Canada Ltd's reactor business.

TONI FEDER

BOB CHAMBERS



GARTH TIEJEN

spend about half his time studying the material properties of plutonium. He will also serve as a senior adviser on lab-related issues to UC president Richard Atkinson, and he plans to continue working with Russian nuclear scientists to reduce the risks from Russian nuclear material. In fact, during the last days of his tenure as director, Hecker was in Siberia.

TONI FEDER

University of California Reviews Its Physics Programs

About 60 physicists from the University of California's eight physics and two astronomy departments, and from the three UC-run national labs, met this past spring in Berkeley to review the universities' physics programs at the behest of UC's vice chancellors.

One reason for these systemwide reviews—they've been conducted in history, anthropology, foreign languages and other fields, and more are planned—is to see how things are settling down after the faculty shrinkage that resulted from aggressive early retirement programs earlier this decade. Between 1991 and 1994, the total number of UC faculty "full-time equivalencies" shrank by 13%, according to Jim Litrownik, of UC's Office of the President. Physics lost 75 of 287 eligible professors, with UC Berkeley losing the most (about 21) and UC San Diego, UCLA and UC Riverside losing 10 to 12 each.

Among the topics discussed at the meeting were research equipment and facilities, computers and networking, the need for more start-up money for new faculty, undergraduate and graduate education and how to find the best balance between core physics subjects and subjects that cross boundaries into other fields—in short, a host of issues that concern physics departments across the country. The participants noted that UC could better exploit the intellectual and infrastructure resources at the three UC-run labs (Los Alamos, Lawrence Livermore and Lawrence Berkeley). And a decision was made to conduct a systemwide review of the graduate curriculum "to see what steps can be taken to make this curriculum more relevant to the needs of the students of today," according to UCLA's dean of physical sciences, Roberto Peccei, who organized the meeting.

An annual meeting of UC physics and astronomy chairs and their counterparts from the three labs was suggested as a forum to continue to discuss such issues and to seek ways to improve intercampus and campus-lab

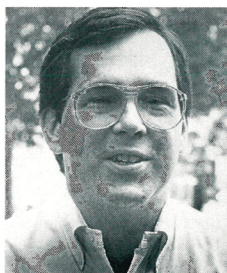
communication and collaboration. However, the meeting participants felt that improving the infrastructure, which had been the other major recommendation to come out of the spring meeting, went beyond physics, and so should be handled by the vice chancellors.

TONI FEDER

Rossnagel Is President-Elect of AVS for 1998

On 1 January, Stephen M. Rossnagel will take office as president-elect of the American Vacuum Society. He will assume the presidency in 1999, succeeding Jerry M. Woodall of Purdue University.

Currently a research staff member at IBM's Thomas J. Watson Research Center in Yorktown Heights, New York, Rossnagel earned his BS and MS degrees from Pennsylvania State University in 1975 and 1977, respectively. He then worked on plasma-surface interactions at Princeton University before



STEPHEN ROSSNAGEL

returning to graduate school at Colorado State University, where he received his PhD in physics in 1982. At IBM, his work centers on process technology for interconnect and pack-

aging applications, based mostly on magnetron sputtering. "Over the years, AVS has grown into a number of areas that diverge from the historical realm of vacuum technology," Rossnagel notes, such as biomaterials interfaces, nanostructures and flat-panel displays. "I think the challenge for AVS is to learn how to grow into these different but somehow connected areas while at the same time keeping the underlying core areas in mind," he says.

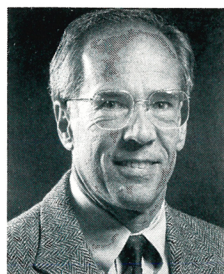
In other results of the AVS election, Joseph E. Greene of the University of Illinois at Urbana-Champaign and Sweden's Linköping University was reelected clerk, and N. Rey Whetten, AVS's technical director, was reelected treasurer. The new directors are Yip-Wah Chung of Northwestern University, Elizabeth A. Dobisz of the Naval Research Laboratory and Peter Sheldon of the National Renewable Energy Laboratory. James M. E. Harper of the T. J. Watson Research Center and

Anne L. Testoni of Digital Equipment Corp were elected trustees of AVS.

Ippen Will Lead OSA in 2000

Members of the Optical Society of America have elected Erich Ippen of MIT to be their vice president for 1998. The following year, he will become president-elect of OSA and in 2000, president. The society's president for 1998 is Gary Bjorklund.

Ippen, the Elihu Thomson Professor of Electrical Engineering and a professor of physics at MIT, is known for his work on developing ultrashort pulse optical sources and measurement



ERICH IPPEN

techniques, and applying them to studies of ultrafast processes in materials and devices. Before joining MIT in 1980, he was a member of the research staff at AT&T Bell Laboratories in Holmdel, New Jersey, for 12 years. He holds a 1968 PhD in electrical engineering from the University of California, Berkeley.

"As OSA adjusts, along with the rest of us, to changing economic conditions, new communication technologies and increasing globalization," Ippen says, "we need to make sure we preserve its friendly and unbureaucratic character and its high level of professionalism," so as to provide "the strongest foundation for meeting the challenges of the next century head on."

Newly elected to the OSA board of directors are Connie Chang-Hasnain of the University of California, Berkeley, Peter Moulton of Schwartz Electro-Optics and Eric Van Stryland of the University of Central Florida.

IBM Will Open Research Center in India

IBM plans to open a research center in New Delhi, India, next month. The Solutions Research Center will be the company's eighth research center worldwide and will focus on technology development in India and other Pacific Rim countries.

The center's initial projects, according to Paul Horn, IBM's senior vice president for research, will include cyclone and hurricane forecasting—an