

what we're testing."

"Since 9-11, we have done quite a bit of work in simulating the effects of a weapons-of-mass-destruction event in an American city so we can better understand those effects," says Younger. "Nuclear, chemical, and biological weapons are each frightening," he says, "but with chemical and biological there is at least some time to act." This research, he adds, has resulted in a set of playbooks, now used by government officials, that describe how the local, state, and federal governments should respond after an attack, how to deal with false alarms, when to evacuate, and who should be notified.

But it is another, less concrete set of simulations that intrigues Younger. "To understand the problem of terrorism . . . we've had the idea of trying to combine simulation with cultural studies," he says. Accordingly, the agency tries to predict how US actions will be interpreted by terrorists under certain conditions. "We have done some preliminary work there and it is actually quite promising," he says. The research attracts Younger because of his strong interest in history and philosophy. "We believe that detectors and weapons treat symptoms of terrorism, and we need to deal with the problem of terrorism. That's fundamentally a social-political problem, not a technological problem. But perhaps technology, through simulations, can improve our understanding of these personalities and help us to deal

with them." DTRA is not the only group working in this field, but the problem—how terrorists react—is so difficult that "it's worthwhile to have several different approaches," Younger says. He adds that one may find some answers through researching historical records, given that other societies in the past have dealt with terrorism. "I think we can do a better job at looking at what worked and what didn't."

The ongoing debate on whether to publish research that is sensitive but unclassified is "an exceptionally difficult problem," Younger says. "The solution . . . will have to involve government and the research community working together. Clearly, we wish to keep dangerous information out of the hands of terrorists or potential adversaries, but, on the other hand, the free flow of scientific information has proved vital in maintaining the economic vitality of this and many other countries. I do not believe we have yet achieved a balance."

Despite being in Washington for more than a year, Younger still thinks of Los Alamos as home. "I miss my friends and colleagues at Los Alamos," he says, "but I have the opportunity to work with a large number of fine people who are doing excellent work. We're doing an important mission for the country, and we have about the right resources to carry out that mission. I don't think any professional can ask for more than that."

Paul Guinnessy

Closer NNSA-Academic Links Needed to Boost Plasma Physics, NRC Says

The growing sophistication of instruments for observing matter under extreme high-energy-density (HED) conditions in both astrophysics research and laboratory plasmas has created an "opportune time" for scientists to "develop a fundamental understanding of the physics of high energy density plasmas." That is the bottom-line conclusion of a new report, *Frontiers in High Energy Density Physics*, by the National Research Council's committee on HED plasma physics.

Key to achieving significant advances in HED physics is recognizing the interconnectedness between laboratory research and astrophysical research, said Ronald Davidson, a Princeton University plasma physicist and chair of the committee that produced the report. Davidson pointed to a section of the report that says HED physics "spans a wide

range of physics areas, including plasma physics, laser and particle beam physics, materials science and condensed matter physics, nuclear physics, atomic and molecular physics, fluid dynamics and magnetohydrodynamics, and astrophysics." The intellectual challenge of HED physics "lies in the complexity and nonlinearity of the collective interaction process that connect all of these subfields of physics," the report says.

Because of the complexity of the science that is the subject of the report, Davidson and his committee colleagues open the document with a lengthy definition of HED physics. "Recent advances in extending the energy, power, and brightness of lasers, particle beams, and Z-pinch generators make it possible to create matter with extremely high energy density in the laboratory," the report

begins. "The collective interaction of this matter with itself, particle beams and radiation fields is a rich, expanding field of physics." The working definition of HED "refers to energy densities exceeding 10^{11} joules per cubic meter (J/m^3), or equivalently, pressures exceeding 1 megabar (Mbar)."

Because much of the federal funding of HED physics is related to nuclear weapons research and stockpile stewardship, the report makes several recommendations that focus on National Nuclear Security Administration research programs. The report's first recommendation calls on the NNSA to "continue to strengthen its support for external user experiments on its major high energy density facilities."

The three major HED facilities in the US are the OMEGA laser system at the University of Rochester in New York; the Z machine x-ray generator at Sandia National Laboratories in New Mexico; and the ATLAS pulsed-power facility at Los Alamos National Laboratory, also in New Mexico. The National Ignition Facility, when completed, will be the highest-power HED laboratory. NIF is being constructed at Lawrence Livermore National Laboratory as the key test facility for the NNSA's nuclear weapons stockpile stewardship program. (See PHYSICS TODAY, January 2001, page 21.)

The report also recommends that the NNSA expand its stewardship science academic alliances program, which funds about \$12 million in HED-related research projects at universities. "The NNSA doesn't have a history of funding university research," Davidson said. "The NNSA mainly supports research at the weapons laboratories. But they have initiated the academic alliances program and it is very much needed and appreciated. What has been done is an important first step, but only a first step."

The report also calls for a "significant effort" to be made by the federal government and the university community to expand the involvement of NSF, NASA, the US Department of Defense, and the nondefense directorates of the Department of Energy in funding HED physics. That recommendation, and one calling for more federal support at smaller, "university-scale" HED facilities, is intended in part to attract new students and researchers to the field.

In addition to recommending upgraded instruments at some HED facilities, the report calls for more support for an "iterative computational-experimental integration procedure" for HED physics research, and

stronger federal interagency cooperation so that federal funding isn't constrained by the weapons orientation of many of the NNSA's programs.

"We didn't tally up specifically the support that exists [for HED physics], but we were struck by the opportunity for agencies to work together to actually fund frontier science," Davidson said.

The report makes for challenging reading for nonscientists in Washington, DC, but Davidson is scheduling briefings with officials at the relevant federal offices, including the DOE's Office of Science and the Bush administration's Office of Science and Technology Policy.

Jim Dawson

Physics Education in the Netherlands Gets Good Marks, Advice

Dutch physics education is world-class, an external reviewing committee concluded last fall in a report on the Netherlands' nine university programs in physics, applied physics, and astronomy. For more than a decade, however, the country has seen falling physics enrollments, and many of the committee's recommendations are aimed at reversing that trend.

Among the recommendations are that each physics department focus on specific research areas, and that students be encouraged to move to the university that is strongest in their preferred subfield. "You cannot have nine MITs. So we strongly emphasized that not all universities can be first in everything, but that they can build niches," says Jan Sengers, the University of Maryland, College Park, physicist who chaired the committee, which looked at pre-PhD university education. Such reviews are undertaken every five years in the Nether-

lands, but the appointment of committee members from abroad is new. "The point was to make sure there was objectivity," says Sengers.

The recommendations dovetail with broader changes in the Netherlands' education system. In particular, last fall, most programs for the first degree were reshaped into the bachelor's-master's mold, making the country among the first in Europe to implement the Bologna Declaration (see *PHYSICS TODAY*, May 2001, page 21). Now, instead of studying for 5–6 years to obtain a degree roughly equivalent to a US master's, Dutch students will get a bachelor's after three years, and a master's two years later.

Physics enrollments in the Netherlands dropped by half from 1988 to 1999; by contrast, astronomy saw rising enrollments over the same period. And the number of women in physics is "embarrassingly low" compared with neighboring countries, says Karel Gaemers, a high-energy theorist at the University of Amsterdam. "This was the first time female faculty members were on the review committee of Dutch physics," adds Sengers. "It sends a clear message."

To attract students—both men and women—who otherwise might not choose physics, the committee said that universities should make the first year of study more flexible, and that students should have more time to sample subjects before settling on one. That is similar to the US system, "but in the Netherlands it's more difficult because the degree is only three years," says Sengers. Advertising the career possibilities available to physicists would also bolster enrollments, the committee said.

In addition, says Sengers, "we tried to stimulate [physics departments] to think about their mission in the overall community. We said, 'Even if you don't find many students, make yourself essential to the university and to

society.'" Also in the American vein, the committee told Dutch physics departments to cultivate relations with their alumni for fundraising and other purposes.

Says Gaemers, "We were very happy that an international committee says that physics in the Netherlands is on an international level. And we have to work very hard to attract a new category of student and to prepare them for more careers." As a first step in figuring out what actions to take in response to the recommendations, the Dutch association of physics chairs, which Gaemers heads, is holding a symposium this month.

In other Dutch university news, in mid-November students staged a protest against the government's proposed across-the-board cut of several percent in higher education spending.

Toni Feder

Sreenivasan Called to Head ICTP

This spring, Katepalli Sreenivasan will become the third director—and the first experimentalist—to head the Abdus Salam International Centre for Theoretical Physics in Trieste, Italy. Sreenivasan, a 55-year-old fluid physicist at the University of Maryland, College Park, will succeed Miguel Virasoro, who stepped down this past May because he had reached the mandatory retirement age of 62. Virasoro has returned to the University of Rome I ("La Sapienza"). Serving as ICTP interim director until Sreenivasan begins his five-year term is Erio Tosatti, a condensed matter theorist from the neighboring International School for Advanced Studies.

Founded in 1964 by Pakistani theoretical physicist and future Nobel laureate Abdus Salam, the ICTP aims to foster the growth of advanced studies and research in physics and mathematics in developing countries (see the article by Juan Roederer, *PHYSICS TODAY*, September 2001, page 31). That's what persuaded Sreenivasan to accept the directorship despite his recent move to Maryland after some 22 years at Yale University. "I couldn't say no, because of the commitment of the center to the developing world," says Sreenivasan,



Sreenivasan

Dutch universities face a shortfall of physics students and looming budget cuts. The Maagdenhuis, shown here, was built in 1787 and now serves as the main administrative building at the University of Amsterdam.



HENK THOMAS