Younger Speaks From the Frontline of Defense FREE

New weapons can be built in record time to defend against terrorism and weapons of mass destruction, says Stephen Younger, the military's top physicist.

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Physics Today **56** (2), 23–25 (2003);
https://doi.org/10.1063/1.1564337

No matter when it was done, Browne said, Lee's actions were the worst security violations he had ever seen.

In May 2000, as Browne was riding out the Lee storm, two computer hard drives belonging to a group of nuclear weapons scientists were discovered to be missing. The disks weren't just lost, they had disappeared from a vault during an evacuation caused by the raging Cerro Grande wildfire—a blaze, Browne notes, that was started by the National Park Service. The disks suddenly reappeared behind a copy machine at the lab about six weeks later. More congressional criticism was heaped on the lab for bad security.

Sails in a storm

"You can see the picture I'm painting," Browne said. "While we are trying to make all of these business improvements, the feeling really is like you put up the sail, and it gets ripped down. I don't want to make excuses. I mean, the job is the job is the job."

Browne said several times during the interview that the claims that more than $3 million worth of property was stolen or missing and that he was trying to cover up the problem, were wrong. "While some property has been reported stolen, the data do not support widespread theft or a 'culture of theft' as alleged."

With respect to the cover-up charges, Browne noted that LANL makes regular missing property reports to the DOE inspector general and the FBI. He said he was open about the procurement card problem and ordered an external review to resolve it. That review, conducted by former DOE Inspector General John Layton and former Department of Labor Inspector General Charles Masten, found that in addition to about $2800 in fraudulent charges, "there was, inside our computer system, $3.7 million worth of unreconciled costs from the banks," Browne said.

"When we looked more deeply, $2.7 of the $3.7 million actually was reconciled, it just had not been entered into the database yet." About a million in unreconciled costs remained, "so I put people to work to see what they could find that could not be reconciled. After a few weeks of pretty intensive work, we found that those numbers dropped down to what I would consider normal business flow in and out." The Layton report supported his numbers, he said, and "did not find widespread abuse of the purchase card system."

Part of the problem with the charges of abuse and theft, Browne said, is that "people are using numbers without understanding the numbers." But when he tried to explain to outside officials the details of what was going on with the procurement card auditing, he said, "everybody's eyes glazed over. It didn't have anything to do with the amount of money anymore. It had to do with the fact that they had lost confidence in our ability to manage. So that is what finally drove me to say, you know, it's time for somebody else to try and take the next step in improving performance here."

"There was a series of events," Browne concluded. "Whether they are of my making or not, it doesn't matter. It's kind of like the commander whose boat is run up on the shore by a junior officer. The commander still gets fired."

In the days after Browne resigned, the shakeups continued at Los Alamos. The two top managers of the lab's security system were reassigned to "nonmanagement positions." The head of Los Alamos's auditing office was also reassigned.

As the staff was being reshuffled, DOE was beginning an assessment of UC's ability to manage the lab. Abraham said he wasn't confident that the university should continue managing Los Alamos and asked for a full evaluation by 30 April. The lab contract could go to the University of Texas, which expressed interest in running the lab in 2001, or to the Battelle Corp, the Ohio company that runs Oak Ridge National Laboratory in Tennessee and is a partner with the State University of New York at Stony Brook in operating Brookhaven National Laboratory in New York.

Jim Dawson

Younger Speaks From the Frontline of Defense

New weapons can be built in record time to defend against terrorism and weapons of mass destruction, says Stephen Younger, the military's top physicist.

Ten days before the events of 11 September 2001, Stephen Younger arrived in Washington, DC, to replace Jay Davis as the director of the Defense Threat Reduction Agency. DTRA, at Fort Belvoir, Virginia, is part of the Department of Defense and serves as the US hub for developing strategies against weapons of mass destruction. "I wasn't surprised to be offered the job, because the administration was very kind in discussions of how I might be able to come to Washington," says Younger, who was previously the senior associate director in charge of the stockpile stewardship program at Los Alamos National Laboratory in New Mexico. "We talked about several types of positions, and, after some discussion, this was the one that seemed the best fit."


DTRA

Younger

The fit seems apt: In 2000, Younger published his widely disseminated unclassified paper, *Nuclear Weapons in the Twenty-First Century*, to stimulate long-term thinking about the strategic capability of the US nuclear stockpile in light of the end of the cold war. DTRA's mandate involves working with all branches of government concerned with weapons of mass destruction, and a range of activities from arms control to arms development. The agency carries out arms control both by monitoring international treaties and through a program that involves the cooperative destruction of weapons of mass destruction. Arms development consists mainly of developing weapons to destroy or neutralize hostile weapons of mass destruction before they can be used against the US and providing combat support to the US military.

"Our job is to make the world safer by reducing the threat of weapons of mass destruction," says Younger. "How can you do that most effectively? We look at the grades of threat, then we identify the best technologies and systems for reducing that threat by working with industry, academia, and the national laboratories." DTRA doesn't have a laboratory system of its own, so the agency has "no obligation to take care of our own researchers," Younger says. "Our job is to find the best product for our customers." Most of the weapons DTRA conceives take from one month to two years to design and build.

Younger, who has a PhD in theoretical physics from the University of Maryland, College Park, started his career in the 1970s at the National Bureau of Standards (now NIST). In 1982, he joined Lawrence Livermore National Laboratory, where he developed several underground nuclear bomb tests and led the nuclear-driven x-ray laser design group. He moved to Los Alamos in 1989. There, he helped develop the first programs in lab-to-lab cooperation with the nuclear weapons institutes in the Russian Federation, and in 1995 he founded the Center for International Security Affairs. He also testified in federal court three years ago on the potential security problems resulting from classified data mishandled by former Los Alamos scientist Wen Ho Lee.

Younger oversees a five-year-old agency that has about 2100 employees and a $2 billion budget. The organization is an amalgamation of several previous civilian and military agencies. "In a sense, we are like America itself in that we are a blend of several cultures," says Younger.

Challenges

During the past year, DTRA has concentrated on two basic challenges: how to find weapons of mass destruction and, once found, how to destroy them. These undertakings involve fundamental physics, Younger says. Physics puts limits on the sensitivity of radiation detectors, and that, in turn, influences how officials search for weapons-grade plutonium or uranium.

Younger points out that DTRA is actively developing enhanced conventional weapons for specialized combat roles, such as eliminating chemical and biological agents with the minimum amount of collateral damage. "This is a very difficult problem because there is incomplete information about the target, the organisms [biological agents] are very difficult to kill, and you have to achieve an extraordinary success rate in killing the organisms to ensure that a sufficient number doesn't survive that they could cause problems, either in the local countryside, or when our forces move through the area later on," he says. If it isn't possible to destroy a biological weapon, he adds, then "what you really want to do is deny the utility of that weapon to the adversary."

"We have several programs . . . to look at advanced methods for agent defeat, such as generating a high enough temperature for a long enough period to kill biological organisms," he says. "This appears to be a promising route, but lacking that ability, the best we may be able to do is immobilize the agent until ground forces have arrived."

According to Younger, a series of simple questions defines weapons research at DTRA: "Can you make it? Can it be built safely? Can it be built in a way that is operationally usable?" Although the questions may be simple, the new weapons are not, he says. "It used to be that a weapon consisted of a casing filled with high explosives, and there may or may not be a guidance system associated with it. Now we can look at the type of effect that we would like to provide for you—high temperature, low temperature, high pressure, low pressure, or a pressure pulse over a protracted time. Do you want a lot of fragmentation, or no fragmentation at all? Do you want a pressure pulse prior to a high-temperature pulse?"

When he knows what the weapon is supposed to do, says Younger, the questions turn to "What kind of fill, what kind of explosive, what kind of molecule would produce that effect? How do you make a lot of those molecules [and] what kind of bomb casing would you put those molecules into? What kind of fuse will enable those molecules to operate . . . and what kind of guidance package will put [the weapon] onto the target? In the past, questions like that could take a number of years to answer. I think we're moving into a time when it will take a number of weeks to answer."

The success of developing these new, tailored systems depends on carrying out computer simulations and mixing and matching existing technologies, adds Younger. He points to the thermobaric weapon designed to take out tunnels in Afghanistan as an example of a new DTRA weapon. "We did that in near-record time," he says. "We were able to take an existing molecule, decide what type of fuse we wanted, decide what type of guidance package [was needed], pull them off the shelf, put them together, and create a fundamentally different type of weapon."

Safeguarding the US

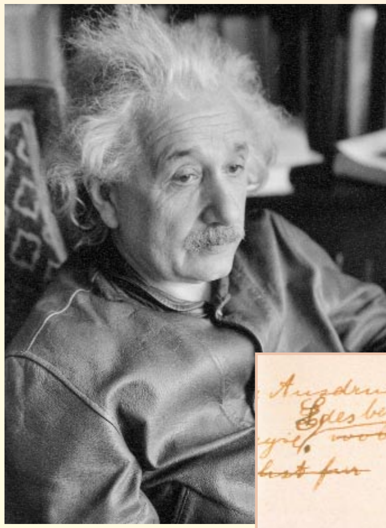
The terrorist attacks on US soil led DTRA to establish priority programs such as protecting military bases by developing a perimeter detection system for nuclear materials. "There are two aspects to that problem," says Younger. "One is the detector itself; the second is the integration of that detector into an operational defensive system. It's not enough to have a detector that works just in the laboratory. It has to work outside, in the rain, it has to be operable by a person with a limited education, it has to work when the batteries are weak, and when the electricity goes off. So it's not enough to have the detector; it has to work in the field, and that's

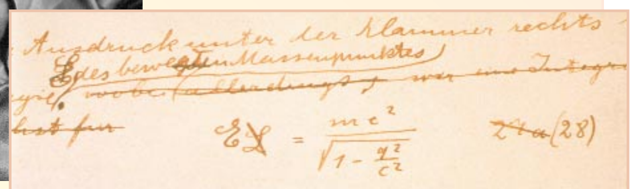
Einstein Exhibit In-Depth in New York

Astrophysicist Michael Shara, curator of the American Museum of Natural History's in-depth exhibition "Einstein," tried hard during a recent public discussion to explain how Albert Einstein was able to conceive of special relativity, general relativity, Brownian motion, and the photoelectric effect. "He was simply a brilliant man," Shara said, then quickly conceded that the adjective "brilliant" was a gross understatement. "He could see things nobody could see. He could look at the universe with fresh eyes."

The exhibit, which opened in November 2002 at the New York City museum and runs through 10 August 2003, is one of the most comprehensive Einstein programs ever put together. Pages from several of Einstein's original, handwritten manuscripts are on display, including parts of his profound 1905 paper on special relativity. The displays are regularly changed during the exhibit's run and many letters, both scientific and personal, are being presented. A letter from David Ben-Gurion, in which he offers Einstein the presidency of Israel, is part of the exhibit, as are letters from Einstein to his wives, children, and mistresses. The exhibition was organized by the museum, the Hebrew University of Jerusalem, and the Skirball Cultural Center in Los Angeles. More information is available at http://www. amnh.org/exhibitions/einstein.

Jim Dawson





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