

oped 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."

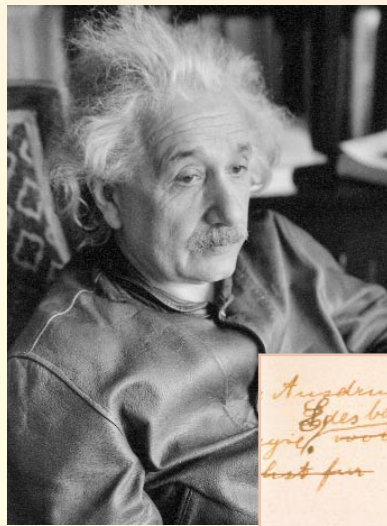
"We have several programs . . . to look at advanced methods for agent defeat, such as generating a high enough temperature for a long enough period to kill biological organisms," he says. "This appears to be a promising route, but lacking that ability, the best we may be able to do is immobilize the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

According to Younger, a series of simple questions defines weapons research at DTRA: "Can you make it?

Einstein Exhibit In-Depth in New York

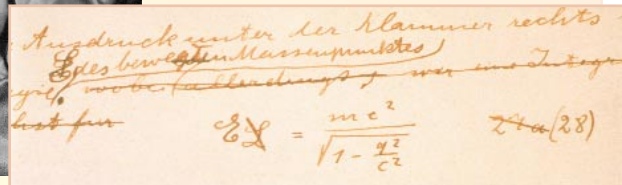
Astrophysicist Michael Shara, curator of the American Museum of Natural History's in-depth exhibition "Einstein," tried hard during a recent public discussion to explain how Albert Einstein was able to conceive of special relativity, general relativity, Brownian motion, and the photoelectric effect. "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



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 therobaric 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