National Science Foundation's Division of Astronomical Sciences.

When the WRC last dealt with spectrum allocations back in 1979, millimeter-wavelength astronomy was in its infancy. "At the time there was no way of emitting or detecting waves in that band," says Wooten, "so there was no commercial interest, and the WRC decided to ignore it. Now, as the technology is developing, people are also discovering military and commercial applications in that band."

For radio astronomers, advances in receiver technology and high-speed digital processing have turned millimeter wavelengths into a new frontier. A $550 million joint European–U.S. observatory, to be built in the high desert of northern Chile, is at the end of its design phase. The project, which will consist of an array of 64 12-meter radio telescopes, is scheduled for completion in 2010. Some plan to use it to search the interstellar medium for complex molecules, such as glycoaldehyde, the simplest possible sugar, recently observed among the stars. Wooten describes such chemicals as "on the road to life." Others will use the observatory to study galaxies billions of years older than the Milky Way that formed stars at a rate 10 to 100 times faster. "A lot of those galaxies are completely invisible at the visible wavelengths, because their photons have been redshifted all the way into millimeter wavelengths," says Wooten. "Now we know we'll be able to see them clearly and without interference." **–GARY TAUBES**

NUCLEAR SECURITY

Los Alamos Under Siege After Secrets Recovered

Smaller than a paperback spy novel, the secrets-packed computer hard drives that temporarily disappeared at the Los Alamos National Laboratory in New Mexico could spark big changes in science and security at the country's nuclear weapons laboratories.

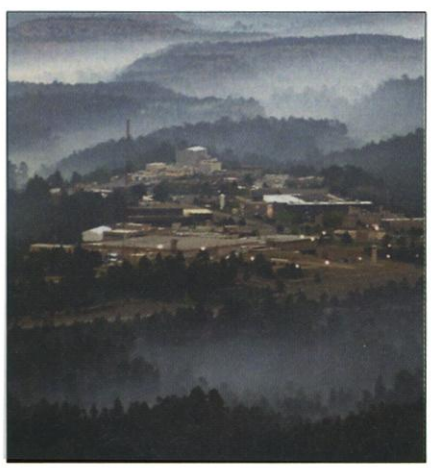
As *Science* went to press, investigators were trying to determine if the disks—missing from a vault since at least 7 May and discovered behind a nearby copying machine on 16 June—were pocketed by spies or just mislaid by employees. Their disappearance touched off a debate about how useful they might be to a rogue nation or terrorist group. Energy Secretary Bill Richardson says he believes the disks never left the premises and "espionage was not a factor." But he isn't waiting for a final report to slap new controls on the flow of sensitive lab information. He has already blamed the lab's contractor, the University of California (UC), for the lax security, raising the possibility that the Department of Energy (DOE) may try to sever the university's 57-year oversight of the lab. At the same time, some lawmakers are calling for Richardson's head.

The incident has refocused attention on lab security and revived debate about the fate of Los Alamos scientist Wen Ho Lee, arrested last December and awaiting trial for allegedly mishandling classified information. It has also broken the logjam blocking the confirmation of former CIA official General John Gordon as head of a new National Nuclear Security Administration to improve security and oversee all weapons work. These and other issues were expected to get a high-profile airing at congressional hearings this week, even as several task forces and the FBI investigate how a team that is supposed to help prevent nuclear terrorism lost track of its classified cookbook for finding and disarming weapons.

To date, DOE officials have been intentionally vague about the contents of the laptop computer hard drives, confirming only that they stored information that might help its Nuclear Emergency Security Team (NEST) find, identify, and disarm a homemade atom bomb or stolen warhead. Formed in 1975, NEST has responded to dozens of calls with a team of scientists and emergency personnel equipped with sensitive bomb-finding and -disarming equipment.

Those familiar with NEST have speculated that the hard drives contain information, ranging from bomb radiation signatures to wiring diagrams, that could be valuable to terrorists and aspiring nuclear powers. Even poorly detailed guides to the shape and construction of weapons components, says Greg Mello of the nonprofit Los Alamos Project in Santa Fe, "would be very valuable to a technically advanced but data-starved country like Pakistan. It would shave years off new weapons' development by helping them avoid dead-end research alleys."

A few commentators have proposed



Hot spot. The disappearance of sensitive computer disks during forest fires last month has sparked new criticisms of Los Alamos lab.

CREDITS: (LEFT TO RIGHT) J. SCHOELLKOPF/AP; INDEX STOCK PHOTOGRAPHY

ScienceScope

Trial Balloon Federal officials are about to test reaction to a hot-button question in the global warming debate: whether the Environmental Protection Agency (EPA) has the authority to regulate carbon dioxide (CO_2) emissions from new vehicles.

Within a few weeks, the agency expects to publish a *Federal Register* notice asking for comments on a petition filed last October by the International Center for Technology Assessment, a green-leaning think tank in Washington. The petition argues that EPA can and should regulate CO_2 under the Clean Air Act because it's a pollutant that's harmful to public health and welfare. Comments already submitted by industry groups, however, argue that the act doesn't apply to CO_2. Moreover, extra CO_2 "is not having harmful effects, and it can be and has been shown to be beneficial," argues Paul Kamenar of the conservative Washington Legal Foundation.

EPA insists that it has no immediate plans to actually regulate CO_2. And officials note that the agency has been asked to air the idea at the request of two warming skeptics in Congress: Representatives David McIntosh (R–IN) and Ken Calvert (R–CA). "The agency isn't taking any position on the merits of the petition," says David Doniger of EPA. "It's simply to get everybody's two cents."

Signing Up After years of dithering, the Indian government has joined global efforts to develop a vaccine against AIDS. Last week Indian and U.S. officials pledged to accelerate cooperative research aimed at developing a vaccine against the HIV subtype most common in the Indian region. India has traditionally been wary of foreign scientists seeking to conduct vaccine trials on its territory for fear that the trials would not benefit its population (*Science*, 20 November 1998, p. 1394), although about 3.5 million people are thought to be HIV positive.

The new accords were signed last week in Washington, D.C., by C. P. Thakur, the Indian Minister of Health and Family Welfare, and U.S. Health and Human Services Secretary Donna Shalala and cover maternal and child health as well as AIDS. A working group of Indo–U.S. scientists will propose specific projects to be carried out under the auspices of the Indian Council of Medical Research in New Delhi and the U.S. National Institutes of Health.

an even more frightening scenario: "The missing data also reveal how a stolen bomb might be set off," Gary Milhollin of the Wisconsin Project on Nuclear Arms Control wrote on 16 June in *The New York Times*. Such fears led Senate Energy Committee chair Frank Murkowski (R–AK) to press DOE officials to confirm or deny that assertion at a hearing last week. They declined, citing security concerns.

Some specialists, however, doubt that even savvy terrorists would be able to defeat the multiple fail-safe devices that prevent an unauthorized user or an accident from detonating a weapon manufactured by one of the major nuclear powers. Although little is known publicly about Russian and Chinese weapons, U.S. and European warheads are known to carry "electronic combination locks," called permissive action links (PALs), notes arms-control scholar Dan Caldwell of Pepperdine University in Malibu, California. PALs automatically disable a weapon if a user makes repeated guesses at the correct digital code, he says. Even a thief with the right code would still face formidable obstacles to detonating the weapon, as sensors must detect an exact sequence of pressure, acceleration, or temperature changes before triggering the conventional explosives that prime the nuclear reaction. In addition, the trigger mechanism is believed to be sealed in a tamper-proof barrier that disarms the weapon if it is pried apart or subjected to unusual electromagnetic bursts. For all these reasons, the idea that terrorists could use information on the NEST hard drives to arm a stolen weapon "doesn't seem to be the most plausible" scenario, says Mello.

Still, the disappearance of the disks has reignited a long-running debate in Congress over how to protect U.S. nuclear secrets. Richardson and several senators had long resisted appointing someone to lead the new nuclear security agency, saying that the organization undermines the secretary's authority and would hamper environmental cleanup and civilian science programs at the labs. That resistance evaporated just days after DOE revealed the loss of the hard drives, however, with the Senate voting 97–0 on 15 June to confirm Gordon.

More changes are on the way. In interviews after the disks were rediscovered, Richardson said he had already ordered the reintroduction of document tracking and other security measures abandoned in the early 1990s. He promised to penalize researchers involved in the disk episode, once identified, and he declared that officials at the University of California, which oversees both Los Alamos and California's Lawrence Livermore weapons lab, "have some explaining to do." The university is "very strong on science," he noted, but hasn't "done a good job" on security.

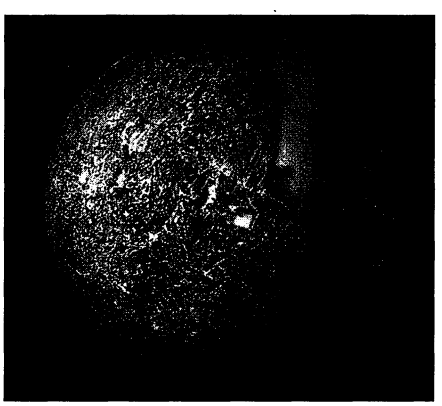
Six members of the House Commerce Committee, including Representative John Dingell (D–MI), want Richardson to dump UC. "It is time for [DOE] to take charge," they wrote in a 16 June letter. Other critics, such as Milhollin, would like to give weapons work back to the Pentagon, which controlled it during and immediately after World War II, saying that it "has a much better security record." UC's contract runs through 2002, however, and spokesperson Rick Malaspina says its "commitment to managing the labs remains strong."

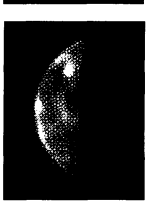
Meanwhile, many Los Alamos researchers are demoralized by the latest publicity and beg to be left alone. "Things were just getting back to normal after the fire," says one scientist. "Now we're right back in the flames." –DAVID MALAKOFF

PLANETARY SCIENCE

Imaging Spat Pits Amateur Against Pros

BOSTON—A long-running dispute over who should get credit for first reporting landmarks on Mercury's uncharted hemisphere burst into public view on 26 May, when a Boston University press release claimed honors for a BU team without mentioning the contributions of an erstwhile collaborator, amateur astronomer Ron Dantowitz. The row, which has left both sides bitter and unwilling to work with each other, "was the opposite of how a collaboration between amateurs and professionals should be," says one of the scientists involved.





Two different takes on a world. Full frontal Mercury imaged by Mariner 10 (*above*) and a slice of the planet's once-hidden hemisphere imaged by Dantowitz's team (*top right*) and Mendillo's group (*bottom*).

CREDITS: (TOP TO BOTTOM) ASTROGEOLOGY TEAM/U.S. GEOLOGICAL SURVEY; RONALD DANTOWITZ; BOSTON UNIVERSITY

Mercury is a major challenge to observe, because Earth-based telescopes must tease out the tiny planet's reflected light from the sun's glare. And Mercury orbits too close to the sun to be imaged by the Hubble Space Telescope, whose optics might be damaged by stray sunlight. Most of what we know about the scorched and pitted planet comes from images beamed back by Mariner 10, which in three flybys in 1974 and 1975 mapped half its surface. For the next quarter-century, the other half remained a mystery.

That was until Dantowitz, an education associate at the Boston Museum of Science, developed a technique called selective image reconstruction. It improves on the established "shift and add," in which short-exposure photos, snapped in rapid succession, are aligned and combined for an overall sharper picture. The technique helps remove much of the blurriness caused by Earth's turbulent atmosphere. Dantowitz's improvements are faster imaging—using 1/60th-of-a-second frames from a high-speed video camera—and an old-fashioned eyeballing of each frame to select the sharpest parts of the best images, snapped during minimal turbulence, before creating the composite image. Testing his approach with light gathered by a 12-inch (30-cm) telescope at the museum's Gilliland Observatory, Dantowitz a couple of years ago captured sharp views of the Russian space station Mir and the U.S. space shuttle. Later, at the 60-inch (152-cm) Mount Wilson Observatory in California, he obtained high-resolution images of Jupiter and Saturn and their satellites.

In 1998 Dantowitz, with Scott Teare of the University of Illinois, Urbana-Champaign, was planning to observe Mercury from Mount Wilson when he was contacted by BU astronomer Michael Mendillo, who studies the planet's rarefied sodium atmosphere and wanted to cooperate on a project along with BU colleagues Jeffrey Baumgardner and Jody Wilson. "I offered to send the video feed of the high-speed camera to their digital recorder," Dantowitz says. His group gathered data on the planet in late August 1998 and copied it, as promised, to a BU recording device.

Several months later, Dantowitz's team—including Teare and the museum's Marek Kozubal—finished its analysis, in which they described dark plains and at least one large, bright crater on Mercury's unmapped hemisphere. In June 1999, the trio submitted a paper to *The Astronomical Journal*.

The submission surprised the BU group, which learned about it through the Internet. They had been planning to list Dantowitz as a co-author on a paper featuring their own analyses. "We felt we had a collaboration," says Baumgardner, "but he submitted his pa-