official Terry Turchie was "wrong" to warn that the congressionally mandated merger of the intelligence and counterintelligence offices at DOE could hinder detection of espionage at LLNL and other weapons facilities. Turchie, who retired in 2007 as the counterintelligence chief at LLNL, wrote to committee chairman John Dingell (D-MI) in September, warning that "the vulnerability of DOE personnel and facilities to hostile intelligence activities has increased exponentially" because of the DOE reorganization. Turchie was not among the witnesses testifying at a 25 September hearing of the committee's oversight and investigations subcommittee, and the committee issued a statement afterward dismissing his concerns.

The merger reversed a 1999 congressional directive for the establishment of a separate counterintelligence function within DOE. That elevation came in the wake of allegations that China had stolen nuclear secrets from the labs.

Cyberattacks increasing

DOE officials also reported that malicious attempts to penetrate the computer networks at the labs and other DOE facilities are on the rise. Dingell charged that the labs "are virtually naked to concerted cyberattacks, especially by assault from persistent, well-funded, and dedicated assailants." Attacks numbered more than 400 million in each of three recent months, Borgia said. DOE inspector general Gregory Friedman said the frequency of attacks has jumped 45% over the past year. Hackers range from relatively harmless curiosity seekers to those originating from "nation-state and belief-based espionage," said Linda Wilbanks, the chief information officer for DOE's National Nuclear Security Administration. Asked whether some breaches in cybersecurity may have gone undetected, Borgia answered simply "yes" and left further elaboration to a closed hearing that followed the public session.

Lab directors reassured lawmakers that classified information isn't at risk in cyberattacks. That top-secret material is kept on secured internal networks that are "air gapped," or physically separated from, internet connections. A second, "yellow" network restricted to the labs and their collaborators does contain sensitive but unclassified data such as personnel records, business proprietary information, and information relating to naval reactors and other nuclear facilities. Though protected by firewalls, the yellow network is accessible from the internet to a number of foreign nationals who have security clearance and to others. That network presents "a valuable target for foreign governments, terrorists, and spies," warned Gene Aloise, director of natural resources and environment at the Government Accountability Office (GAO), who noted that 13 000 users at Los Alamos National Laboratory have access.

Friedman, who has authored numerous reviews urging DOE to upgrade its cybersecurity, said the ongoing concern "is one of the most perplexing issues I deal with." The department has failed to follow through on numerous cybersecurity measures it has initiated, he said.

Wilbanks and Bradley Peterson, DOE's chief of nuclear security, said cybersecurity upgrades are under way. More than half of the recommendations contained in a recent GAO report will be implemented by December, and the remainder will be in place by the end of 2009, they said in their joint testimony.

Mock terror attack

The hearing also covered concerns over the state of LLNL's physical security; committee members pointed out that the lab's protective force had failed to repel a mock terrorist assault last April. The DOE Office of Independent Oversight found the guards' performance lapses during the exercise "shocking and so serious" that they couldn't be discussed in an open hearing, Dingell said. Glenn Podonsky, DOE's chief health, safety, and security officer, said "key equipment malfunctions" and "some difficulty in implementing response actions" were to blame. Among other problems, the lab's security force was unable to deploy a key element of its defenses—an enormous truck-mounted Gatling-type machine gun capable of firing 4000 rounds per minute and with a kill range of more than a mile.

LLNL director George Miller said that health and safety considerations limited the guard force's options in response to the simulated terrorist attack. Officers, for example, were not allowed to use ladders to climb onto the roof of the "superblock," the highly secured warehouse in the lab complex where fissile materials are kept. They were also prohibited from using smoke and engaging in "realistic exercises" inside the facility. Guards performed far better during a mock terrorist attack held in August, and a DOE review of that drill said the lab now has "a robust protection strategy," according to Miller.

David Kramer

Bubble fusion scientist disciplined

After making headlines with claims of achieving nuclear fusion in a tabletop experiment, Rusi Taleyarkhan joined Purdue University's nuclear engineering department in 2004. His tenure there has been rocky. After a university investigation cited Taleyarkhan for two instances of research misconduct, the university imposed sanctions in August. Taleyarkhan will remain a member of the university's faculty and can serve on graduate committees, but he will no longer have a named professorship and will not be allowed to serve as a major professor for graduate students for at least three years.

The saga began in 2002, when Taleyarkhan was at Oak Ridge National Laboratory. He and his colleagues had subjected a flask of deuterated acetone to very intense, high-frequency sound waves, causing the formation of tiny bubbles that expanded and contracted in phase with the sound. Theorists had predicted that the compression-induced shock wave in a sufficiently spherical bubble could create high enough temperatures and pressures for deuterons to fuse. Taleyarkhan's team presented evidence that such fusion had indeed occurred. But their report, published in *Science*, met with considerable skepticism. (See PHYSICS TODAY, April 2002, page 16.)

Independent research groups have so far failed to confirm the results of Taleyarkhan's group, and controversy has dogged him. Some have criticized the experiments. Others have leveled charges of misconduct. Purdue convened two successive investigations in 2006 and 2007 to explore those allegations. Neither investigation charged Taleyarkhan with wrongdoing.

Still, questions lingered. Even the subcommittee on investigations and oversight of the House Committee on Science and Technology weighed in, criticizing what it regarded as a limited investigation by Purdue. (See PHYSICS TODAY, June 2007, page 36.) The university established a third investigation in November 2007. In its 18 July report to Purdue, the investigation committee charged Taleyarkhan with misconduct relating to the authorship of a scientific paper and to the characterization of a certain experiment as an "independent" confirmation of bubble fusion.

One of the sonoluminescence experts whose group has not been able to

reproduce Taleyarkhan's bubble nuclear fusion results is Kenneth Suslick of the University of Illinois at Urbana-Champaign. He regrets that the investigations did not look into how the science experiments were conducted, commenting that "justice has been done, but not completely."

For his part, Taleyarkhan commented by e-mail that "there is much more to this story than meets the eye, and the full truth will have to come out soon."

The investigation committee was chaired by Purdue's Mark Hermodson, a biochemist. Its six members included three researchers from other universities and one from a national lab. The committee considered 12 allegations and found sufficient evidence to cite Taleyarkhan with research misconduct in two cases.

Both cases deal with the publication of results from an experiment in which Taleyarkhan had been "heavily involved," according to the committee. The research paper was originally submitted to (and rejected by) *Physical Review Letters* with Yiban Xu, a postdoctoral fellow, as the sole author. Despite Taleyarkhan's apparent involvement, the committee concluded that a senior mentor may choose not to have his name appear as an author of a publication for a number of legitimate reasons. The *PRL* reviewer commented that with only one author, the needed cross checks and witnessing of results seemed lacking. Subsequently, the committee reports, "Taleyarkhan with falsifying intent caused" Adam Butt, a master's student of Taleyarkhan's, to be added to the paper as a coauthor. In his statement, Butt asserted that his only contribution was to check that data had been correctly transferred from a spreadsheet and to suggest some minor editorial changes to the manuscript. The paper, with Xu and Butt as coauthors, was published in *Nuclear Engineering and Design* in 2005. The investigation committee concluded that Taleyarkhan had compelled the addition of Butt's name to create an appearance of collaboration between Xu and Butt.

The second instance of misconduct cited by the committee concerned a paper published by Taleyarkhan and his colleagues in *PRL* in 2006, in which they asserted that their 2002 observations of bubble fusion "have now been independently confirmed." The independent confirmation cited was the 2005 *Nuclear Engineering and Design* paper by Xu and Butt. The committee stated that "Dr. Taleyarkhan himself well knew the degree of his direct mentoring, editing and promotion of Dr. Xu's work and the resulting publication." It concluded that the effort to characterize Xu's experiment as "independent" was research misconduct.

Taleyarkhan appealed the investigation's findings but on 21 August the university's appeal committee concluded that the committee had followed due process and had an evidentiary basis for its conclusions. **Barbara Goss Levi**

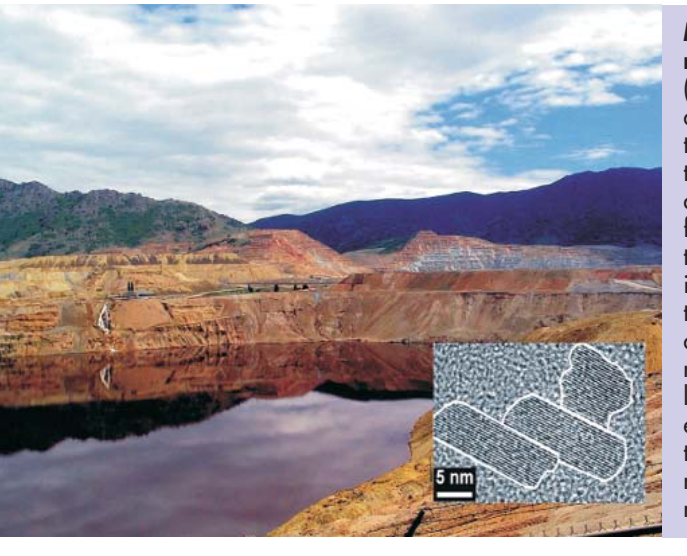
NSF–EPA centers study safety of nanomaterials

With belt-tightening the norm these days, a 17 September announcement by NSF and the US Environmental Protection Agency was especially welcome: The two agencies upped their investment in studying the safety implications of nanotechnology from the intended $25 million to $38 million. That money goes to research in an area for which lawmakers threatened last spring to mandate more spending (see PHYSICS TODAY, June 2008, page 24).

The increase is to create two multicampus, interdisciplinary research centers rather than one. The Center for Environmental Implications of Nanotechnology headed by the University of California, Los Angeles, will get $24 million, and the CEIN spearheaded by Duke University will get about $14 million. "It's unusual that we are funding two and making a much bigger investment [than planned]," says Alan Tessier, a program director in the division of environmental biology at NSF, which is ponying up the additional funding for a total contribution of $33 million. "But the recommendations on both centers were unanimous. The two are complementary in type of science and approach, and environmental health and safety is a priority of the National Nanotechnology Initiative. We saw an opportunity."

The centers' goal, says UC-CEIN director André Nel, "is to establish a scientific basis [for] the safety assessment of nanomaterials through the use of a hard-core predictive science." Adds Mark Wiesner, director of the Duke center, "We are looking from the molecular level up to ecosystems. How have cells adapted over time? What's different about manufactured nanomaterials compared to what's out there in nature? And what are the impacts on the environment? Those are key questions." Although there may be some overlap with existing nanocenters, Wiesner says, the CEINs "are the first to look at physical, biochemical, and ecological issues. Others look at applications of nanomaterials and the social dimensions of nanotechnology." (See the article by Cyrus Mody in PHYSICS TODAY, October 2008, page 38.)

Research at the Duke CEIN—whose main partners are Carnegie Mellon University, Virginia Tech, and Howard University—will center on 32 closet-sized ecosystems, or mesocosms, to be set up in the forests near the Durham, North Carolina, campus. "We can introduce nanomaterials and monitor the mesocosm for a year or more to understand how [the nanomaterials] move and are transformed—through oxidation, reduction, agglomeration, loss of coatings," says the center's deputy director, Greg Lowry of CMU. "We will focus on a metal, a metal oxide, and a carbon nanomaterial." The metal, he adds, will "probably be silver, because it's used in so many commercial products."



MICHAEL HOCHELLA AND KELLY HAUS, VIRGINIA TECH

Mineral nanoparticles (inset) serve as a vehicle for transporting toxic heavy metals downstream from areas near the Berkeley Pit in Butte, Montana. Such interactions of nanomaterials with life and the environment are the focus of two new NSF–EPA nanocenters.