

Tiger Teams Draw Researchers' Snarls

They were unleashed by Admiral Watkins to enforce safety and environmental rules, but scientists complain that they are eating into research time and budgets

A NEW GROUP OF PREDATORS—"TIGER teams"—is on the prowl. Their territory is the Department of Energy (DOE) research and weapons production network; their prey, violations of the federal regulatory code. James Watkins, head of the DOE, bred these human tigers in 1989 to serve as a special inspection force reporting to headquarters, and the resulting fix-up costs are running into hundreds of millions of dollars. The tigers were set loose to stalk and destroy bad old habits and enforce a new ethic of strict compliance with federal rules on environmental purity, worker safety, and public health. But, as scientists at the labs are discovering, a visit from a hungry tiger team can eat up precious hours—and huge amounts of discretionary funds—that might be devoted to research.

While everyone concedes that mistakes of the past must be rectified, especially chemical and radioactive spills at the weapons plants, there is growing anger among researchers that this fault-finding is being carried too far. Researchers at the Lawrence Livermore and Oak Ridge National Laboratories went public last fall, asking DOE to back off. They were rebuffed. Since then, people at other labs have been feeling the tigers' hot breath, and are grumbling less publicly about the disruption these teams can wreak. Few government scientists—and no lab heads—want to advertise it, but many believe that the tigers' rigid approach achieves very modest changes at great expense.

Take the case of the Livermore paintbrush. It began when a prowling tiger pounced on a brush left under a fume hood at the Livermore lab. Someone in the lab had used it to apply ordinary paint to a piece of equipment, setting it down to dry so that it could be safely tossed in the trash later. The tiger threatened to cite the lab for a violation, arguing that the use of the hood could be interpreted as "processing waste without a permit." The Livermore staffer dutifully wrapped the wet brush in two layers of plastic, as instructed, and disposed of it as costly hazardous waste. (Aerosol spray cans—the kind consumers regularly toss in the

trash—must be handled the same way.)

It isn't always this absurd. Sometimes lab scientists manage to reach an accommodation with the tigers. At the Brookhaven National Laboratory, a tiger team member saw that scientists hadn't made sure some of the oscilloscopes had been calibrated recently. He was poised to hit the lab with a "Class II" violation—not life threatening, but serious. They ought to be removed, he announced, because they were useless without regular testing. Lab officials explained that they were used only to count pulses in the accelerator ring, a task that doesn't require accurate peak measurement. But the explanation wasn't going to be enough to get those oscilloscopes into compliance, so the lab quickly improvised a solution that made everyone happy: It printed up a batch of labels saying, "Not Part of Calibration Program," and slapped them on everything in sight.

Tales like these have become part of the lab folklore ever since Watkins unleashed the tigers. Over the past 2 years, tiger teams have visited 20 facilities, generally citing scores of violations at each place. Though many are trivial, problems identified by the tigers were deemed serious enough to shut down a fusion reactor at Sandia National Laboratory (see box) and to halt construction at Argonne National Laboratory. And the bills required to bring some labs into full compliance with the rules are anything but trivial—\$1 billion at Oak Ridge alone, for example (see table below). The chief expenses are generally for new toxic waste facilities, bringing utilities up to code, and

cleaning up old contamination.

This "self-flagellation," as one laboratory official in New Mexico calls it, is being carried out on all fronts under Watkins' orders. A former chief of naval operations, "the Admiral" has made it clear that he intends to run a tight ship. He created the tigers to execute a "10-point program" of reform designed to whip DOE facilities into shape. Providing more than enough impetus for this drastic program was the embarrassment that ensued from the FBI's raid of DOE's weapons plant at Rocky Flats, Colorado, in search of "environmental crime." Like other weapons production plants, Rocky Flats had focused for years on its military mission, while environmental and safety problems accumulated.

Another fiasco like the one at Rocky Flats was brewing at a DOE-funded waste research facility in West Valley, New York, when Watkins intervened in 1989. He headed off embarrassment by taking the initiative and essentially having DOE run the raid itself. Watkins was furious that he hadn't been warned in advance by local DOE managers about the looming crisis, however. And one reason for creating the tigers, says DOE official Lawrence Weiner, was to give the Admiral "eyes and ears" in the field. Weiner, sent in by DOE to help with the Rocky Flats and West Valley cases, now runs the "special operations office" that deploys the tigers.

In the "10 points" speech on 27 June 1989, Admiral Watkins said that he wanted to introduce a "new culture of accountability" to everyone in the DOE family. However, the tactics Watkins chose for the campaign are reminiscent of another cultural revolution—Mao Tse Tung's. The tigers are recruited for service from offices throughout the vast DOE network. They get the equivalent of the Red Guards' little book in a white plastic binder called the "Tiger Team Guidance Manual," complete with quotes from the Admiral's 10 points. The recruits undergo a training session in which they learn to use jargon: People must "buy into" the new culture and "take ownership" of their management

Some Tiger Targets

Laboratory	Adverse findings	Cost to comply* (nearest \$10m)
Argonne	292	400
Brookhaven	157	80
Lawrence Berkeley	247	50
Lawrence Livermore	228	290
Oak Ridge	413	1000
Princeton Plasma Physics Lab	250	20
Sandia, (Livermore, CA)	201	110

* Laboratory's own estimates; costs are spread over several years.

problems. The trainees, sometimes called "tiger cubs," also learn to shock jaded audiences: For example, they like to cite the case prosecuted by a U.S. attorney in Baltimore in which several government employees received sentences for committing environmental crimes.

After learning the routine, the tigers band together in packs sometimes as large as 60 strong and descend on a laboratory, meeting with the local press and issuing public statements as they go. They also set up a local hotline so that anyone who's inclined to can spill information anonymously. They write up their findings, then negotiate an "action plan" with the laboratory—basically, a list of promises to clean up physical problems and instill a better attitude in the staff.

Whether all this list-making will lead to real change is an open question. James Werner, a senior environmental engineer at the Natural Resources Defense Fund, an environmentalist group, says the project is "great, as far as it goes." But he says the tigers are basically "reinvestigating problems" that were well documented 4 years ago in a DOE-wide "environmental survey" ordered by then secretary John Herrington. However, Werner agrees that the current investigations are broader because they also seek out "root causes" in staff and management attitudes.

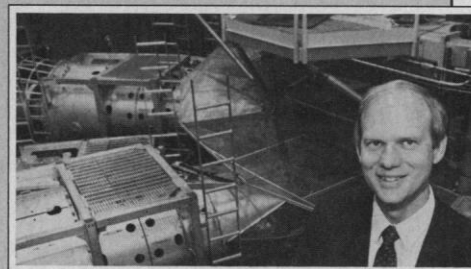
The managers are often stuck in the middle, playing a schizophrenic role, defending the local staff to headquarters and justifying the tigers to the staff. So when the tigers arrive, the lab chiefs welcome them with grim enthusiasm. The labs have been instructed to conduct a "pre-assessment" anticipating everything the tigers will find wrong. Those who fault themselves the most win points in subsequent DOE write-ups. This creates a competitive dynamic of fault-finding in which the lab management, local DOE overseers, and the tigers all vie to come up with the most negative results. The Lawrence Berkeley Laboratory, for example, was so determined to prove its sincerity that, director Charles Shank says, it offered the tigers a whopping list of 20,000 self-identified faults. The tiger chief on this case, Dennis Krenz of DOE's Albuquerque office, was impressed. He says his own team's list was bigger, but not by much, overlapping Berkeley's self-critique on 70% of the items. Shank says he received a personal commendation from Watkins for conducting "the most complete self-assessment of any lab."

Berkeley got into the spirit of things, creating and pasting up a clever tiger poster ("Maintain the Momentum") and holding hours-long indoctrination sessions for the staff. One chemist grumbles: "It was weird, seeing all these world-class scientists sitting there listening to a 2-hour lecture on lab

"Buying Into" the Reforms

J. Pace VanDevender, a research manager at the Sandia (Albuquerque) National Laboratory, says he started out being "hostile and skeptical" about the Department of Energy's (DOE) self-purification by tiger team inspections but has now seen the light. He calls himself a "supporter" who believes that "in the long term even our research will benefit by some of the lessons we can learn" from the tiger teams.

VanDevender, chief of pulsed power sciences at Sandia, 1 year ago let the "tiger cubs"—a training group—visit the largest facility in his domain, the particle beam fusion accelerator II, or PBFA-II. Costing about \$30 million a year, it is testing a light ion beam approach to inertial confinement fusion. The staff was already "under the gun," says VanDevender, because a peer panel from the National Research Council was studying the quality of the science for a report on fusion research and had temporarily "suspended judgment" on PBFA-II. "People were working very hard," trying to reach promised milestones, "changing major pieces of hardware between target experiments and ion source experiments, when the tigers arrived." It quickly became apparent that scientific goals outranked housekeeping. "We had not appreciated...that housekeeping was a fundamental part of safety," says VanDevender.



Convert. J. Pace VanDevender

Although the PBFA-II crew had considered the facility to be in good shape, the tigers spotted many faults. An egregious one, according to VanDevender, was that someone had left a ladder standing in front of a fire extinguisher. With tiger cubs looking over his shoulder, VanDevender decided to shut the machine down "until we could address all the safety concerns." He polled all the staff for their views and reorganized operating procedures, placing a much greater emphasis on planning, documentation, and thoughtful allocation of time and resources.

There is more paperwork now, VanDevender says. Things move at a deliberate pace. But he insists the process is not just safer but at least as flexible as before. "What it means is that you have got resources in place to handle contingencies and new opportunities." He argues that the attention to safety and environmental detail that's required by the tigers also yields higher quality scientific data. This is what happens if you "buy into" the reform, says VanDevender. But it's also possible to take the "low road"—blindly adhering to minutiae—and that leads to "disaster."

It is too soon to know whether productivity at PBFA-II is better or worse, according to VanDevender. But he does have anecdotal evidence of improvement. "Our progress as judged by the [NRC review panel] was outstanding. And our program, which frankly was scheduled to be terminated, was endorsed." And this year, the budget actually went up. ■ E. M.

safety; they could have conveyed the information in 5 minutes."

The lab directors themselves, pressured to salute the green flag of reform, are starting to speak like converts. Martin Blume, for example, deputy director of Brookhaven, says: "There's no doubt in my mind that the laboratories needed a renewed emphasis on safety and environmental protection," although he regrets that DOE has taken a "confrontational" approach. Dennis Parzyck, assistant director of the Argonne Laboratory, which spent 6 months preparing for the tigers and endured the harshest criticism of any lab, says, "We believe, in the end, when all is weighed, that there is a

significant benefit to the time invested."

To help others get ready for the ordeal, Brookhaven's Blume took up a second career as a self-assessment coach. He visited Lawrence Berkeley, the Stanford Linear Accelerator, and the Princeton Plasma Physics Laboratory, instructing the staff on the best manners and actions to use in responding to the tigers.

But Blume's coaching was not enough: At Lawrence Berkeley, the tigers reportedly went berserk when they found a bottle of chloro methyl methyl ether in a chemical storage refrigerator in the lab of Peter Schultz, a young faculty member who's admired for his outstanding work in bio-or-

ganic chemistry. The tigers wanted to impose immediate penalties, and the scuttlebutt is that the decision went all the way to the highest levels of DOE in Washington, D.C., before being resolved. The lab was not closed. The exact offense was a failure to store a carcinogen in a properly labeled, well-ventilated, double-containment storage area free of flammables. Tiger team leader Dennis Krenz says his staff would have shut down the lab had there been a pervasive pattern of lax handling of carcinogens, but on further investigation, he found there wasn't.

Schultz says the tigers are correct "in their judgment that it wasn't stored in secondary containment." But he thinks DOE's new campaign for cleanness and safety may be simplistic. He argues that it isn't sensible to apply the same rules to a small research lab as to a huge industrial plant. "Somebody should establish a set of safety standards that discriminates between whether you use milligrams or tons of a reagent," Schultz says. The guidelines "should be based on scientific principles" rather than legalisms, because a lab like his uses—and creates—many chemicals that regulators have never heard of.

At times, adhering to the letter of the law has produced contradictory results, as in the case of some vintage supplies at Livermore. When officials at the lab heard that the tigers were coming, they gave away loads of old chemicals because the labels didn't carry the correct hazard warnings. And where did those dangerous substances end up? Down the road in the stockroom of the local high school, according to a Livermore staffer. And Livermore wasn't the only one; other labs also tossed out thousands of dollars worth of reagents in their zeal to comply with the tigers' ethic. Alfred Duba, a geophysics group leader at the lab, cites this and other examples of growing formalism, saying, "It'll be the death of science."

Duba is one of 400 scientists, engineers, and support staffers at Livermore who sent a petition to Watkins last June protesting that the tiger teams were "accelerating the trend towards micromanagement of science by non-scientists." They warned that they saw a "loss of independence," and a steady growth in bureaucracy "at the expense of an atmosphere that once fostered scientific and technical productivity." They begged Watkins to "recognize the mounting crisis" and "help turn back the bureaucratic tide." Watkins received a second letter in October signed by 20 Corporate Fellows—the top line of the technical staff—at the Oak Ridge National Lab. They, too, complained about the "esca-



Indoctrination. Berkeley's official pinup.

lating overhead" costs at the lab, particularly those related to cleanup and compliance, as well as "unprecedented intrusions" on the lab's "authority and integrity by burdensome bureaucracies, rigid procedures, and micromanagement." And like their colleagues, they foresaw an "erosion of morale and creativity" unless the trend could be stopped.

Watkins responded to both in blunt terms. "I do not believe that the development and implementation of formal procedures" to protect the environment, safety, and health are inconsistent with good science, he wrote. "I firmly believe that performing research in a safe and environmentally responsible manner is of equal importance to the quest of knowledge itself." Furthermore, Watkins said, the adverse findings reported by the tiger teams were "by no means trivial." Significantly, Watkins directed his comments on the Livermore protest to lab director John Nuckolls, and some interpreted this as a message to keep the troops in line. Or as one official says, "Sometimes it feels like the Admiral has demoted us all to seaman, second class."

Indeed, the gist of DOE's response to scientists who find the tough, new regime burdensome is: It's the law, and the law is not debatable. Asking for the tiger teams to lighten up doesn't go over well, and those who point out bad logic in the rules may be seen as prima donnas, asking for special treatment. Says Weiner: "Nobody should have that kind of authority—to say that this is trivial and therefore I won't comply."

And the record doesn't help the scientists' case. The tiger team reports show that the problem of noncompliance is not limited to the weapons production facilities. For example, the case that triggered the sharpest response from Watkins so far was the review of Argonne National Laboratory, which is run by the University of Chicago and counted among the elite labs. On the inspection tour at Argonne, the tigers found a worker in an 8-foot-deep trench with no shoring and no means of quick escape while a backhoe was operating at the other end. The tigers also spotted a window washer working without a harness. Shielding and radiation monitors around an accelerator had been tampered with, and—worse, from the tigers' viewpoint—Argonne staffers tried to argue their way out of the jam. Watkins immediately ordered a partial halt to construction at the lab, and shot off a letter saying he was "deeply disturbed" and demanding to know how Argonne could be "so deficient."

Argonne will be spending \$400 million in the coming years to increase its monitoring staff, develop new safety and waste programs, and clean up old messes.

Which brings up a critical question: Who is going to pay for all this work? Watkins has promised that some funds will be allocated to the labs from DOE's headquarters budget, but it's clear that most of the money will have to come from local budgets. Says Nicholas Samios, director of Brookhaven: "As overhead goes up, that means there will be less money for research; no question about it."

Is the trade a good one for the public, in terms of the amount of extra safety and environmental quality that's gained while other opportunities are let go? That remains an unanswered question, although every lab director who spoke with *Science* agreed that some good will come of the effort. But Samios contends that "society still hasn't done a proper risk/benefit analysis" to find out how much scrubbing is enough.

But one figure suggests that some labs may now be nearing the practical limit on what they can reasonably do to reassure outsiders of their good intentions. Robert Hughes, president of Associated Universities Inc., which runs Brookhaven for DOE, estimates that the lab experienced 270 individual reviews, assessments, or evaluations in 1990. It may be hard to go much higher—unless the laboratory devotes itself full time to self-criticism—because there aren't 270 working days in a year. ■ **ELIOT MARSHALL**

With reporting by Marcia Barinaga.