results would be essentially identical to those Needleman published in 1979—namely, that for every 10 parts per million increase of lead in a child's tooth there was a two point drop in IQ. Paul Mushak, a consultant in health and chemical sciences in Durham, North Carolina, sharply disputed Ernhart's contention that Needleman had not fully cooperated with a 1983 investigation of his work conducted by a panel of the EPA. Finally, Joel Greenhouse, a statistician from Carnegie-Mellon University, criticized the statistical methods used by Marsh's panel to conclude that something might be amiss with Needleman's research.

Since his work was first challenged, Needleman has insisted that any questionable analyses or data reporting that appeared in the 1979 paper would fall under the heading of scientific difference of opinion, not misconduct. And he says he asked for an open hearing to make that point clear. "I shudder to think what would have happened if it had been closed," he told *Science*.

He is also trying to fend off the charges more directly: He has asked the courts to toss out the whole investigation. Last month, he filed a class-action suit in federal district court against NIH, OSI, and Pitt claiming that the definition of misconduct as "practices that seriously deviate from those that are commonly accepted within the scientific community for proposing, conducting, or reporting research" is too vague, and virtually impossible to defend against. The suit also argues that it is unfair to investigate him for events that occurred before the current misconduct rules came into effect. And Needleman claims that since he was not allowed to be formally represented by Lieber during last week's hearing (although Lieber sat at his elbow throughout the day) or subpoena witnesses—he wanted NIH fraud-buster Walter Stewart to testify—his constitutional right to a fair trial was violated.

The Cooley panel hopes to wrap up its work by the end of this month, and Needleman will have a chance to comment on their findings. But Needleman's lawyer worries that even an open forum will not protect scientists from attacks from those seeking to discredit their work, as he claims Scarr and Ernhart have done. "They've taken a research debate and turned it into a blood sport," he says.

Still, there may be more open forums like this if Needleman's strategy appears to work to his advantage. "As a rule, it is the accused who has the most to lose [in a misconduct case]," says Paul Friedman, dean for academic affairs at the University of California at San Diego medical school, so if he or she asked for an open hearing, "it would be very difficult to deny the request." If he's right, misconduct hearings could become even more of a spectator sport in the 1990s.

–Joseph Palca

COLD FUSION

A Japanese Claim Generates New Heat

They're back—claims of cold fusion, that is. Actually, they never really went away. The original experiments by chemists Stanley Pons and Martin Fleischmann may have been discredited in the eyes of many observers soon after they were hailed in 1989, but die-hards around the world have continued churning out reports of excess heat when an electric current is run through chunks of palladium immersed in heavy water. Last week, Akito Takahashi added his claims to the pile. And even in a field where eyebrows have become permanently raised, Takahashi has managed to cause a bit of a stir.

Takahashi, a professor of nuclear engineering at Osaka University in Japan and a respected specialist in the physics of conventional hot fusion reactors, has issued one of the most startling claims since Pons and Fleischmann themselves. He says his cold-fusion cell produced excess heat at an average rate of 100 watts for months at a time. That's up to 40 times more power than he was putting into the cell, and more power per unit volume (of palladium) than is generated by a fuel rod in a nuclear reactor.

Takahashi, who had previously announced his results in Japan, made his first U.S. presentation at—of all places—the Massachusetts Institute of Technology (MIT), home of some of cold fusion's loudest and most derisive critics. "I was worried," said Takahashi afterward. "I thought everyone would attack me." As it happened, many of the attendees praised Takahashi's experimental innovations...but then again, most of the skeptics had stayed home.

Among the innovations that caught the fancy of attendees: Instead of the usual palladium rods, Takahashi used small sheets, which he guessed might make it easier for deuterium atoms from the heavy water to snuggle into the crystal lattice of the metal and—he hoped—undergo fusion. He also kept varying the current in the cell, guessing from the bursts of heat seen in earlier experiments that the process might thrive under transient conditions. His reward, he told the MIT audience, was so much heat that he had to lower the average current repeatedly and install a cooling coil to keep the water in the cell from boiling. Even then the temperature continued to rise week after week. Finally, he said, "we were very much afraid of an accident, and had to stop." As well he might have been, considering the January explosion of a cold-fusion experiment at SRI International in Menlo Park, California, (*Science*, 10 January, p. 153) that killed a researcher.

Missing neutrons. Among the largely sympathetic audience, a few doubters asked pointed questions about the calibration of the calorimetry—the measurement of heat output—and other possible sources of false readings. Nor has Takahashi shaken the biggest doubt plaguing claims of cold fusion: the lack of the plentiful neutrons any nuclear process should produce, according to current physics. Indeed, Takahashi's neutron readings were not only low; they were inversely correlated with heat production.

For many physicists, that closes the door on any claims of fusion. "If it's a nuclear process, known or unknown, it has to be producing on the order of billions of times as many particles as are being observed here," says Richard Petrasso, one of a small group of physicists at the MIT Plasma Fusion Laboratory who have made a virtual pastime out of shooting down cold-fusion claims. "Where are the particles? It's a lot easier to believe the calorimetry is at fault than all of nuclear physics."

Cold fusion supporters would rather look beyond standard theory. MIT electrical engineer Louis Smullin echoed the views of several supporters at the Takahashi presentation when he told *Science*: "You might be able to argue that with better calibration you'd only get 50 watts instead of 100 watts, but 50 watts is still a big number. I'm not concerned about the lack of the neutrons you would expect from a [conventional] fusion reaction. This is a different ballgame, and it could be a different reaction."

Indeed, cold-fusion aficionados are already positing exotic processes that could account for the Japanese observations. Takahashi himself speaks of a four-body nuclear reaction that yields no neutrons at all. And Peter Hagelstein, an MIT x-ray laser researcher who has been focusing on cold fusion for the past 3 years, asserts in a paper to be published in the *Journal of Fusion Technology* that neutrons are emitted in cold-fusion reactions—but are promptly absorbed by the palladium lattice.

But those proposals aren't making cold-fusion claims any more palatable to the physics community as a whole. For now, Takahashi and hundreds of other researchers keep laboring over their (gently, they hope) bubbling cells, recording their provocative output and trying to ignore the chorus of voices saying they are wasting their time.

–David H. Freedman

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