

DOE Warms to Cold Fusion

Whether outraged or supportive about DOE's planned reevaluation of cold fusion, most scientists remain deeply skeptical that it's real.

The cold fusion claims made in 1989 by B. Stanley Pons and Martin Fleischmann didn't hold up. But they did spawn a small and devoted coterie of researchers who continue to investigate the alleged effect. Cold fusion diehards say their data from the intervening 15 years merit a reevaluation—and a place at the table with mainstream science. Now they have the ear of the US Department of Energy.

"I have committed to doing a review" of cold fusion, says James Decker, deputy director of DOE's Office of Science. Late last year, he says, "some scientists came and talked to me and asked if we would do some kind of review on the research that has been done" since DOE's energy research advisory board (ERAB) looked at cold fusion nearly 15 years ago. "There may be some interesting science here," Decker says. "Whether or not it has applications to the energy business is clearly unknown at this point, but you need to sort out the science before you think about applications."

DOE is still working out the details, Decker says, but a review of cold fusion will begin in the next month or so and "won't take a long time—it's a matter of weeks or months."

Turning up the heat

Last summer, after the 10th International Conference on Cold Fusion in Cambridge, Massachusetts, participants came away energized, says the conference's organizer, MIT theorist Peter Hagelstein. About 150 people attended the conference; the number of people working on cold fusion or, as some of them prefer to call it, low-energy nuclear reactions, is perhaps several hundred worldwide, most of them outside the US. Says Hagelstein, "Everyone was convinced things would start changing. The question on the table is, Can we establish to the satisfaction of the scientific community that there is science here?"

"The field has made a huge amount of progress," Hagelstein says. "In 1989, it was not clear if there was an excess heat effect or not. Over the years, it's become clear there is one. It wasn't clear if there was a low-level

emission of nuclear products. Over the years it's become clear that, yes, there is. In addition, other new effects have surfaced."

"It's either my good luck or my bad luck, but I discovered there was something worthy of pursuit," says Michael McKubre, an electrochemist at SRI International, a nonprofit research institute in Menlo Park, California. McKubre's experiments are along the lines of Pons and Fleischmann's. A typical setup consists of a palladium cathode at the center of a helical platinum anode in a solution of heavy water with lithium salt. An applied current dissociates the deuterium, and deuterons load into the palladium. Experiments take a couple of weeks and "leaving them to sit is where most of the tricks are," says McKubre. Among the tricks, he says, are loading the palladium with sufficient concentrations of deuterons and increasing the signal-to-noise ratio in heat and helium measurements. "The numbers are what you expect for two deuterons fusing to produce helium-4, with about 24 MeV per helium nucleus. There is a nuclear effect that produces useful levels of heat. I know it's true."

"With knowledge comes

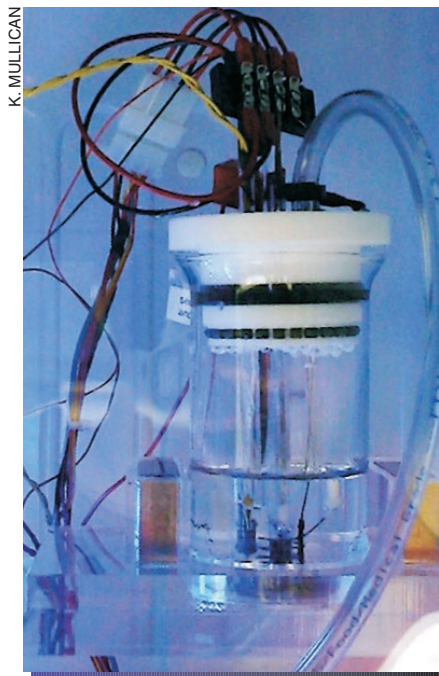
responsibility," continues McKubre. "We know that this has economic implications and, potentially, security implications. The main application that cold fusion enthusiasts foresee following from their work is a clean source of energy; transmutation of nuclear waste and tritium production to augment weapons are also on their list. But, says McKubre, to solve "the various problems in scaling up the effect to make it more easily studied and potentially useful, we have to involve the scientific community."

As it is, the scientific community generally shuns cold fusion. "There is pretty much no possibility for funding in the area at this time, and no possibility of getting published," says Hagelstein. "Because the area is tainted, colleagues don't want to be seen talking about it." Adds Randall Hekman, a former judge and founder of Hekman Industries, an energy exploration company in Grand Rapids, Michigan, "There seems to be a scientific McCarthyism that puts a chilling effect on anyone who gets into this field. I feel for the scientists who do this work and who are being ostracized. That's got to change."

Change is exactly what cold fusion researchers hope will follow from the DOE review: They want vindication, funding, and, with those, better chances of developing applications of cold fusion. Says Hagelstein, "If the review is done properly, it should come back with a thumbs up."

A long shot

Among scientists, skepticism about the credibility and reproducibility of cold fusion remains widespread. "Nobody is smart enough to say it is absolutely impossible, but extraordinary claims demand a very high standard of proof," says Steven Koonin, who recently took a leave from Caltech to become chief scientist at the London-based energy company BP and who served on the original



K. MULLICAN

Hot air? A smattering of scientists around the world working with Pons-Fleischmann-style electrochemical cells (left) and other experiments continue to seek explanations for the heat they say is released in low-energy nuclear reactions.

ERAB panel. The best route to respectability, he says, would be for cold fusion researchers to publish in respected refereed journals. "I think a review is a waste of time," says Princeton University physicist Will Happer, another member of the earlier ERAB panel and former head of DOE's Office of Energy Research (now the Office of Science). "But if you put together a credible committee, you can try to put the issue to bed for some time. It will come back. The believers never stop believing."

And the skeptics are raising their eyebrows at DOE because of the appearance of political favors in setting up the meeting between Decker and cold fusion researchers. According to Hekman, "I am from Michigan. [Energy Secretary Spencer Abraham] is from Michigan. I know him. That opened the door." But, he adds, "we had to jump through hoops. We had to make a prima facie case first before

any meeting would be set." Another Michigan connection is representative Vernon Ehlers (R-MI), a physicist by training, who says that he is "personally very skeptical" about cold fusion, but "it's likely time for a new review because there is enough work going on and some of the scientists in the arena are from respected institutions." Ehlers says that although he made an inquiry to DOE about a cold fusion review, "there was no political pressure."

Some scientists, too, are sympathetic to the cold fusion cause. "There are quite a few people who are putting their time into this. They are working under conditions that are bad for their careers. They think they are doing something that may result in some important new finding," says MIT's Mildred Dresselhaus, an ERAB panel veteran and former head of DOE's Office of Science. "I think scientists should be open minded. Historically,

many things get overturned with time." Noting that DOE's science budget has not increased in years, she adds, "When you feel poor, you don't invest in long shots. This is kind of a long shot."

"The critical question is, How good and different are [the cold fusion researchers'] new results?" says Allen Bard, a chemist at the University of Texas at Austin. "If they are saying, 'We are now able to reproduce our results,' that's not good enough. But if they are saying, 'We are getting 10 times as much heat out now, and we understand things,' that would be interesting. I don't see anything wrong with giving these people a new hearing." In ERAB's cold fusion review in 1989, he adds, "there were phenomena described to us where you could not offer alternative, more reasonable explanations. You could not explain it away like UFOs."

Toni Feder

French Scientists Take to the Streets to Save Research

Researchers in France have quit the administrative parts of their jobs to show the government and the public the seriousness of their concerns about the country's research enterprise and universities.

Enough. That's what some 1000 lab directors from across France were telling their government when they resigned en masse from their administrative responsibilities on 9 March. Enough budget cuts. Enough job reductions. Enough loss of autonomy.

In resigning—from their administrative duties only, not from their scientific positions—the researchers were carrying out a threat made in a petition to the government. The "Sauvons la Recherche" (save research) petition says that "fundamental research is currently being abandoned by the state." It also says, among other things, that maintaining a topflight research capacity is essential; that targeting only specific research areas is untenable; that without fundamental research, applied research will collapse; and that, if the government does not act quickly, young scientists will make their careers elsewhere, and France will lose the capacity to train the next generations of scientists. In the two months between 7 January, when it was first posted on the Web, and the day of the resignations, the petition was signed by 65 000 researchers, or about 65% of the country's total research force (see <http://recherche-en-danger.apinc.org>).

Acting "collectively against the planned destruction of France's re-

search capacity," the petitioners made three requests: immediate payment of money owed CNRS and other research agencies; more permanent positions in both research agencies and universities; and an open discussion leading to a long-term policy plan for research.

Government response

By the petitioners' deadline of 9 March, the government had taken some steps in their direction. In late February, research minister Claudie Haigueré announced that payment of €294 million (roughly \$364 million) owed the national research agencies from 2002 and 2003 would be accelerated and completed this year. The government will also create 120 additional permanent jobs in the research agencies and set up a national committee to plan the future of research, she said.

But the government's response is not sufficient, according to the researchers. "They say they will release money owed to CNRS and INSERM [the French Institute of Health and Medical Research]. That is good. But as far as jobs, we are getting far from what we want," says Georges Debrégeas, a CNRS physicist at the Collège de France in Paris and a leader of the Sauvons la Recherche move-

ment. Researchers want 550 more permanent jobs in the research agencies plus 1000 in universities this year—the agency positions had been converted this year into temporary contracts. "We cannot engage in discussion with the government as long as we don't get these emergency measures," says Debrégeas.

The government's initial proposal for a national committee to look into the future of science was met with distrust about its inclusiveness. "We want a public debate, where people from different parts of the country, from universities and labs, take part," says Debrégeas. "The ministry wants it to be consulting heads of organizations and then proposing something that is already written. That would not allow us to propose reforms."

Acting as go-betweens in the days leading up to the resignations, Etienne-Emile Baulieu and Edouard Brézin, the president and vice president, respectively, of the French Academy of Sciences, suggested that the academy organize a forum for formulating a long-term research strategy later this year. "The Sauvons la Recherche movement trusts us, and the government is more likely to listen to us than to the movement," says Brézin, who is also president of the French Physical Society and who, like Baulieu, did not sign the petition but sympathizes with the protestors. "One of the main questions our consultation should settle is, Is it better to keep money at the ministry level? Or should it go to the