Electrochemists Fail to Heat Up Cold Fusion

The meeting was supposed to be a chance to strengthen the case for cold fusion, but it did not work out quite as planned

THE DECK WAS STACKED in favor of cold fusion, but it threw up a deuce.

When the Electrochemical Society announced it would hold this special session last Monday, it had invited contributions from "research groups who have verified the initial reports [of cold fusion]," but it made no mention of groups with negative reports. The session's ten speakers included Stanley Pons and Martin Fleischmann, the two electrochemists who claim to have produced fusion in test tubes of heavy water, and most of the rest were at least friendly to those claims. Only Nathan Lewis of Caltech, who said he had to fight tooth and nail for a place on the panel, was outright critical.

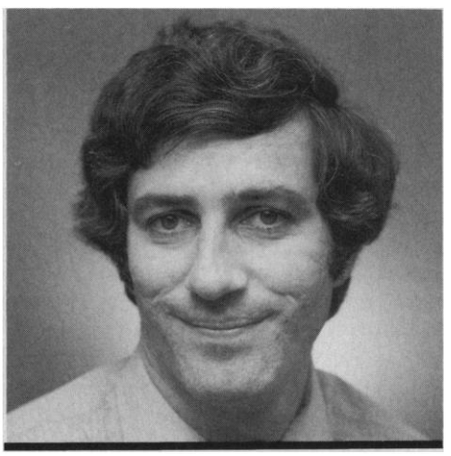
Still, the claims of cold fusion took their licks here. By the end of the evening, the only claim that seemed solid was that some electrochemical cells are producing excess amounts of heat that cannot be easily explained. A month and a half of tests and verification efforts have produced little other evidence for the alleged fusion breakthrough. And many chemists continue to be frustrated by the skimpy amount of experimental detail made public by Pons and Fleischmann.

The session was a mirror image of one a week earlier at a Baltimore meeting of the American Physical Society. There, one physicist after another had reported negative results and challenged the experimental procedures of Pons and Fleischmann. Steven Koonin, a colleague of Lewis at Caltech, had even said the claims are the result of "incompetence and delusion," and eight scientists of a nine-member panel had concluded that cold fusion is a fantasy.

Now was to be the moment for the electrochemists to strike back. Pons and Fleischmann, who declined to attend the Baltimore meeting, said they would present their latest data and defend themselves against the physicists' charges.

Pons, who is a professor of chemistry at the University of Utah, announced that one cell had produced a "burst" of heat, generating 4.2 megajoules of energy over a 2-day run, or 50 times the electrical energy put into the cell. Robert Huggins of Stanford provided some support when he reported up to 40% more heat in fusion cells than in control cells that use normal water. Uziel Landau of Case Western Reserve University claimed 0.144 watts of excess heat, "the same order of magnitude as Pons and Fleischmann," in a cell using 0.25 amperes per square centimeter of current. And Supramaniam Srinivasan from Texas A&M quoted up to 25% extra heat over controls.

Furthermore, Fleischmann, who is from Southampton University in England, rebutted criticisms of the experiment's temperature measurements. Lewis had said the measurements were tainted because Pons and Fleischmann had failed to stir the solution in the cells and prevent hot spots from forming. Fleischmann replied that the bubbling of gases formed by the electrolysis in the cells "is one of the most effective mixing processes known to man." He showed a videotape of the bubbling, which stirred dye into the liquid in only 20 seconds.



"We've learned just how easy it is to fool oneself into believing that there is an effect."

—Nathan Lewis

But if the heat measurements stood up reasonably well, the session unearthed no evidence that the heat is being produced by fusion, other than Pons and Fleischmann's oft-repeated assertions that there is too much heat for it to be anything else.

If the heat comes from the fusing of pairs of deuterium atoms as claimed, then fusion products should be present in the palladium electrodes where the alleged fusion is taking place. One such product would be neutrons, and Steven Jones of Brigham Young University has said he does see a few neutrons produced by electrolytic cells. But the observed number of neutrons are only one-billionth the number expected for the heat production.

More recently, attention has focused on a fusion reaction that would produce helium-4. If this reaction is causing the energy, then helium-4 should be left behind in the palladium electrodes, and it should be detectable in the electrodes by relatively simple tests.

The two scientists, however, have not offered any data from such tests. Fleischmann acknowledged the seriousness of this gap in their published record. Failure to detect helium-4, he agreed, "would eliminate a very substantial part" of their claims. Nevertheless, when questioned at the session, Pons still refused to provide any information, saying that he and Fleischmann had made "commitments" which they could not discuss but which in due course would provide for the helium measurements. Asked to elaborate, Pons said, "We have reasons not to do so."

Two members of the audience said their own labs would gladly test for helium-4, using only small portions of one of the electrodes and finishing within 3 days. Pons and Fleischmann did not accept the offer.

Lewis, an electrochemist, has taken on the role of principal antagonist toward the cold fusion claims. Along with physicist Charles Barnes, he headed up a 17-member team that looked carefully at the claims, running the experiment in many configurations. The team concluded that the electrochemical cells produce no excess heat, but that a number of easily made mistakes seem to imply that they do. "One of the main things we've learned during the course of these experiments is just how easy it is to fool oneself into thinking that there is an effect when there actually is none," he said. "Each time this has happened to us, we've uncovered an artifact in the measurements that accounts for the erroneously high numbers."

"This situation will only be resolved," Lewis said before the meeting, "when laboratories are given free rein to test those cells [of Pons and Fleischmann]. We can amass all this other evidence, but until then we will not know for sure."

■ **ROBERT POOL and T.A. HEPPENHEIMER**

T.A. Heppenheimer is a free-lance journalist based in Los Angeles