Cold fusion sparks a revolution in science

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The announcement of Professors Martin Fleischmann and B. Stanley Pons on March 23 that they had discovered a room-temperature fusion process using an electrolytic cell with a palladium cathode was like a shot heard around the world. The University of Utah press conference made headlines internationally, and enterprising researchers raced to try and replicate the seemingly simple experiment that produced excess heat from heavy water.

The promise of virtually inexhaustible amounts of energy from thermonuclear fusion was not new. Forty years of laboratory experiments trying to capture the process of the Sun—the fusion of hydrogen atoms and the release of large amounts of energy—has brought the process of "hot" fusion near to commercialization. But conventional fusion requires the heating and confining of ionized hydrogen gas (plasma) at temperatures of millions of degrees in large-scale reactors. In contrast, Fleischmann and Pons were talking about a room-temperature solid-state process on a small scale—bathtub size.

The Fleischmann-Pons work called into question some fundamental concepts of nuclear physics and chemistry; new thinking was demanded. Therefore, it was not surprising that the scientific community, the press, the government, and the public soon began taking sides, believers vs. nonbelievers, as one scientist labeled the battle.

The naysayers doubted that Fleischmann and Pons had discovered anything new; they attributed the reported results to mismeasurement, sloppiness, or, as a *New York Times Magazine* article by two Brookhaven National Laboratory authors alleged, "pathological science." At one scientific meeting (the American Physical Society May 2 in Baltimore), the naysaying scientists were downright nasty and insulting to the supporters of cold fusion. Another line of attack came from the zero-growth environmentalists—Jeremy Rifkin, Barry Commoner, John Holdren, Paul Erlich, et al.—terrified that cold fusion might work and make possible an inexhaustible energy source that would lead to more population growth. As Rifkin complained, such a cheap source of energy would be "the worst thing that could happen to our planet." But as early as mid-April, announcements began to be made by other researchers and laboratories around the world who had replicated the experiment and produced excess heat. And even earlier than that, Dr. Steven Jones, a fusion scientist at Brigham Young University in Provo, Utah, documented his independent work (going back to 1986) with electrolytic fusion in a variety of materials, producing minute amounts of fusion (rates of about 100 trillion times less than those reported by Fleischmann and Pons). Among the U.S. laboratories announcing positive results were Prof. John Bockris's group at Texas A&M, Prof. Robert Huggins at Stanford University, the University of Washington, and Case Western Reserve.

Fleischmann, Pons, and University of Utah representatives testified before the House Science, Space, and Technology Committee on April 26 to make the case for a U.S. investment in cold fusion research and development, making it clear that they thought that both cold fusion and "hot" fusion—as the conventional fusion program had come to be known—should be funded. Fleischmann told the congressmen that, while hot fusion would supply electricity on the industrial scale, cold fusion applications would probably be smaller scale. The Utah spokesmen suggested funding of $25 million, and said that the state had approved putting $5 million into the effort.

The U.S. Department of Energy sponsored a workshop on cold fusion at Santa Fe, New Mexico May 23-25, with many papers presented supporting the Fleischmann-Pons results and many presenting both negative results and the theoretical impossibility of cold fusion. A subsequent panel set up by the DoE advised that cold fusion merited further study, but established a go-slow policy, in part dictated by the fears of the conventional fusion researchers that their funding would be cut.

But as much as the naysayers escalated their disparaging reports that cold fusion was a mistake, reports of successful and innovative cold fusion experiments—producing excess heat, neutron bursts, and tritium—continued. As one Texas A&M scientist put it, it was in the "Third World" universities—including in the U.S.—that researchers were able to replicate Fleischmann and Pons's experiments, and they would have to work twice as hard to prove to the Ivy League establishment scientists that they were right. The situation became so sharply polarized, however, that many successful experiments were not discussed publicly, for fear that the researchers and institutions would come under attack from the press and the scientific establishment! In some cases, the particulars of the research were being kept under wraps at the advice of the patent lawyers.

With a $5 million budget allocated by the state, the National Cold Fusion Institute opened at the University of Utah in August and began a series of experiments, pulling in researchers from around the country. By late summer, both India and Japan had teams of researchers experimenting with varieties of cold fusion, and India had announced its intention to push for commercializing the technology, because the early results indicated that the process could be scaled up to produce electricity at competitive rates.

A closed Washington, D.C. meeting sponsored by the National Science Foundation and the Electric Power Research Institute Oct. 16-18 and attended by 50 scientists, including Edward Teller and Paul Chu (the discoverer of high-temperature superconductivity), put forward a more positive "consensus" statement on the state of the research. The meeting established that, while the process was not understood, the fact that *something* was happening to produce excess heat, neutrons, and tritium was indisputable.

What will the future bring?

The researchers who have successfully produced results with a Fleischmann-Pons type of apparatus are convinced that cold fusion will fulfill its promise—if they have adequate funding to continue their research. Hal Fox of the Fusion Information Center, a private corporation established to promote cold fusion development, is organizing private investment now to develop cold fusion applications in the near future. As Fox pointed out (*EIR*, Dec. 1, 1989), the Japanese have perfected this kind of rapid technology transfer, and now the United States should learn from their success.

The latest cold fusion presentations at the annual meeting of the American Society of Mechanical Engineers in San Francisco Dec. 12 were positive enough to cause any respectable naysayer to start eating his hat. A team from Oak Ridge National Laboratory reported its success and noted, "Cold fusion is a fact; there is no way to deny it."

Also impressive were the results announced by Stanford's Robert Huggins. Huggins, who founded the solid-state ionics laboratory at Stanford, specializes in the motion of species in metal lattices. He reported on results from a second round of experiments, where a closed cell is producing net power on the order of 36 megajoules over a period of two weeks. In an interview to be published in *21st Century* magazine, Huggins stated that by spring 1990, there would be enough of the experimental details published from his and other experiments in technical papers so that any laboratory should be able to set up an experiment to produce net energy from cold fusion.

New starts for space science

by Marsha Freeman

On July 20, 1989 President George Bush announced that his administration would set the United States back on the path to frontier manned exploration in space. The detailed plans to accomplish the colonization of the Moon and Mars at the beginning of the 21st century are currently being formulated. Their implementation will revitalize the U.S. technology base and restore a sorely needed spirit of adventure and optimism.

The year also saw the end of an era in space exploration and the start of a new one. After a 12-year journey, the Voyager II spacecraft made its final planetary encounter at Neptune, and the Space Shuttle deployed the Magellan and Galileo spacecraft to Venus and Jupiter. These will be the first applications of 1980s technology to the mysteries of the Earth's neighbors in the solar system, and will provide us with a greatly enhanced look at the planets.

The Soviet space program suffered one of its most embarrassing and disappointing failures this year, with the loss of *both* of its Phobos spacecraft on their way to Mars. In addition, manned flights to the Mir space station were suspended as the Soviets surprised the international space community by announcing that budget constraints would not allow the station to be manned on a continuous basis. Enthusiasm for international space cooperation with the Russians was dampened somewhat by these failures and difficulties.

Completing the mission of Apollo

In early November, the National Aeronautics and Space Administration (NASA) submitted a study to the National