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New Cold Fusion Evidence Reignites Hot Debate

By Mark Anderson

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Telltale neutrons appear, but skepticism remains

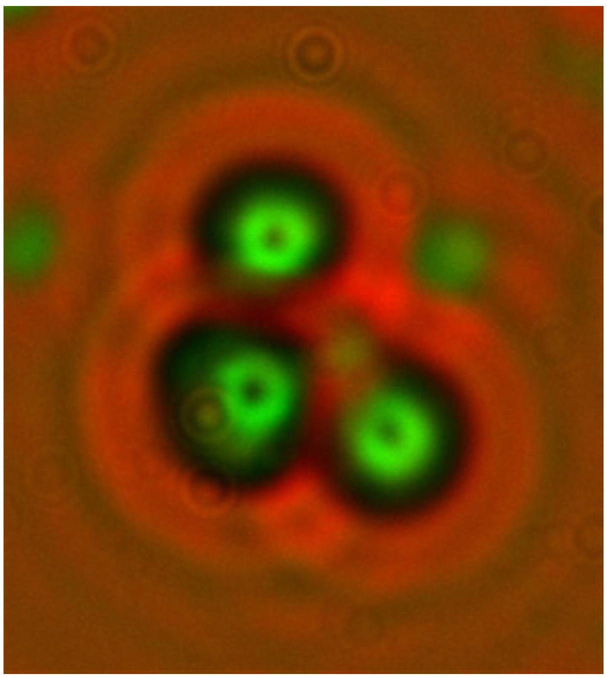

PHOTO: PAM BOSS/SPACE AND NAVAL WARFARE SYSTEMS CENTER

25 March 2009—On Monday, scientists at the American Chemical Society (ACS) meeting in Salt Lake City announced a series of experimental results that they argue confirms controversial "cold fusion" claims.

Chief among the findings was new evidence presented by U.S. Navy researchers of high-energy neutrons in a now-standard cold fusion experimental setup—electrodes connected to a power source, immersed in a solution containing both palladium and "heavy water." If confirmed, the result would add support to the idea that reactions like the nuclear fire that lights up the sun might somehow be tamed for the tabletop. But even cold fusion's proponents admit that they have no clear explanation why their nuclear infernos are so weak as to be scarcely noticeable in a beaker.

The newest experiment, conducted by researchers at the U.S. Space and Naval Warfare Systems Center, in San Diego, required running current through the apparatus for two to three weeks. Beneath the palladium- and deuterium-coated cathode was a piece of plastic—CR-39, the stuff that eyeglasses are typically made from. Physicists use CR-39 as a simple nuclear particle detector.

After the experiment, the group analyzed the CR-39 and found microscopic blossoms of "triple tracks." Such tracks happen when a high-energy neutron has struck a carbon atom in the plastic, causing the atom to decay into three helium nuclei (alpha particles). The alpha particles don't travel more than a few microns, though, before they plow into other atoms in the CR-39. The result is a distinctive three-leaf clover that, to physicists, points to the by-product of a nuclear reaction.

"Taking all the data together, we have compelling evidence that nuclear reactions [are happening in the experiment]," says physicist Pamela Mosier-Boss of the Navy group.

Reached by e-mail, Frank Close, a particle physicist at Oxford University, says he's still skeptical. "There are many sources of neutrons in the natural environment, including...cosmic-ray sources," he says. He adds that some of the earliest cold fusion experiments in 1989 confused cosmic-ray signals for cold fusion evidence.

In fact, 20 years to the day before Monday's press briefing, Stanley Pons and Martin Fleischmann of the University of Utah announced the very first cold fusion experiment. Their apparatus, they said, was somehow producing 1.75 watts more heat than the electric power they sent in. Their results, however, were not reliably reproducible. Experimental errors couldn't be ruled out. And, like present-day proponents, Pons and Fleischmann couldn't explain how or why nuclear physics fit anywhere into what they were observing. So for most of the scientific community, cold fusion was largely discredited and discarded before the 1990s had even begun.

Yet as the ACS panelists stressed on Monday, scores of scientists followed up on Pons and Fleischmann's experiments despite the "crackpot" label that soon dogged cold fusion research. Along the way, cold fusion was rebranded as "low-energy nuclear reactions," or LENR. And, the panelists said, although rarely reported in the mass media, hundreds of LENR experiments over the past two decades have been published in peer-reviewed science journals.

According to Edmund Storms, retired nuclear scientist from Los Alamos National Laboratory and author of *The Science of Low Energy Nuclear Reaction* (World Scientific, 2007), experiments confirming Pons and Fleischmann's finding of excess heat have now been published in 150 different papers in journals and conference proceedings around the world. The reported excess heat, he says, ranges from milliwatts up to 180 watts.

Steve Krivit, editor of the online LENR newsletter *New Energy Times*, says experiments have dominated the field to date. In contrast, LENR theory is lacking. The primary problem, the same one that has marginalized LENR for two decades, is that before two positively charged hydrogen nuclei can move close enough to each other to fuse into helium, they first must overcome their nearly overwhelming electric repulsion. The only known and widely accepted way to do that is based on what stars and multibillion-dollar "hot fusion" reactors do: squeeze the nuclei into as small a space as possible and kick the temperature up to tens of millions of degrees.

"Some people have accused the [LENR] field of wishful thinking, and it's unfortunate, because the experimental evidence is, in my opinion after eight years, unambiguous," says Krivit, who is also coeditor of the *Low-Energy Nuclear Reactions Sourcebook* (Oxford University Press, 2008).

Ludwik Kowalski, formerly a physics professor at New Jersey's Montclair State University, now retired, says that throughout the 1990s and into the 2000s, he was as skeptical as anyone about cold fusion. But in 2007, he conducted his own CR-39 experiment, as described in an earlier paper by the U.S. Navy group.

"I got the same result they got, exactly," Kowalski says, noting that the CR-39 tracks he saw traced the outline of the cathode wire and were highly suggestive of nuclear activity. "Now I think there are serious indications that there is something behind this."

About the Author

Mark Anderson is an author and science writer based in Northampton, Mass. In February 2009, he toured Plastic Logic's Dresden, Germany, fab for a peek at how that company's e-reader will come together.

To Probe Further

An archive of low-energy nuclear reactions research is available at LENR-CANR.org., including the U.S. Department of Energy's 2004 report on LENR.

The research that the U.S. Navy group reported at the American Chemical Society meeting has been published in the journal Naturwissenschaften.

Two other sources of LENR research are The Science of Low-Energy Nuclear Reaction, by Edmund Storms (World Scientific, 2007) and the Low-Energy Nuclear Reactions Sourcebook, Jan Marwan and Steven B. Krivit, eds. (Oxford University Press, 2008).