

Dif-fusion: Beware the Ideas of March

More than 40 sunrises powered by old-fashioned fusion have passed since the day B. Stanley Pons and Martin Fleischmann told the world they may have found a new, room-temperature route to potentially practical fusion power. While wanting to believe the claims, most scientists say their skepticism mounts as the days pass without convincing independent experimental confirmations. Some who have tested Pons' and Fleischmann's claims already have written them off as misinterpretations of imperfectly performed experiments.

In March, two separate reports of tabletop cold fusion at room temperature sparked a research firestorm that might now quickly die out. It all started with a press conference at which Pons, of the University of Utah at Salt Lake City, and his British colleague Fleischmann claimed to have measured far more heat energy emerging from an electrolytic cell than they put into it in the form of electricity. In their cell, an electric current passes between palladium and platinum electrodes immersed in a solution of so-called heavy water and lithium. The current splits the heavy water into its atomic constituents, oxygen and the hydrogen isotope deuterium.

Pons and Fleischmann contend that the deuterium nuclei in their experiments, instead of reforming into deuterium gas and bubbling out of the container as would happen with most other electrodes, pack into the unusual palladium metal at such high densities that some of them fuse. Poorly understood nuclear events appear to account for the excess heat, they conclude.

In the second, less spectacular March revelation, Steven E. Jones of Brigham Young University in Provo, Utah, told a gathering of physicists at Columbia University that he and co-workers at Brigham Young and the University of Arizona at Tucson had evidence for extremely low levels of cold fusion occurring in an electrolytic cell akin to, but different from, Pons' and Fleischmann's. Jones said his group observed modest excesses of what appeared to be fusion-produced neutrons emitted from titanium electrodes, though the levels measured were so minuscule that no excess heat would be observable. He said at a press conference following the meeting that it would be "20 years to never" before the putative new route to fusion could become practical.

But since the March announcements, only a handful of perhaps hundreds of hastily assembled cold-fusion research groups worldwide have reported evidence that provisionally confirms some

of the earlier observations, mostly those of Jones' group. The vast majority of labs have found no signs for either the excess heat claimed by Pons and Fleischmann or the small excess of possibly fusion-produced neutrons claimed by Jones' team.

Only one group besides the Pons-Fleischmann duo has publicly reported evidence of getting more energy out of their cell than they put into it. Stanford University materials scientist Robert A. Huggins testified at an April 26 congressional hearing that his group had confirmed the observation of excess heat, though he stopped short of suggesting nuclear fusion was the explanation.

That night, Huggins' experiments came under sustained attack at a cold-fusion session at a meeting of the Materials Research Society in San Diego. Commenting on the congressional hearing, Howard Birnbaum of the University of Illinois at Urbana-Champaign wryly jested: "Never mind the peer review, pass the pork." And scientists in the audience raised objections ranging from faults in Huggins' overall experimental design to possible interpretational pitfalls based on subtle experimental details.

At the same meeting, chemist Linus Pauling of Palo Alto, Calif., also voted thumbs down on cold fusion. Previewing a 300-word letter he had submitted to NATURE, he outlined a chemical mechanism he argues could account for the excess heat. In short, he says, as the deuterium packs into the palladium, bonds form between them and the metal atoms. These bonds then break, releasing enough heat, Pauling suggests, to account for Pons' and Fleischmann's claims.

At an April 29 gathering of fusion researchers in Washington, D.C., MIT nuclear physicist Martin Deutsch also went on the record as disbelieving the claims. "In one word, it's garbage," he told SCIENCE NEWS. Deutsch says the cold-fusion reports he is aware of are not suitable for publication because they lack the care he would expect even from an undergraduate researcher. In the passion of the moment, scientists are failing to do even simple but crucial control experiments, he adds.

Chemist Nathan Lewis of the California Institute of Technology in Pasadena has aired what may be the most damaging refutation to date of Pons' and Fleischmann's claims. In a special session at last week's American Physical Society meeting in Baltimore, he described an exhaustive series of experiments in which he and co-workers explained all of Pons' and Fleischmann's original lines of evidence as the result of either faulty assumptions in their calculations or poorly

controlled experiments. In another of many refutations, Caltech's Steven E. Koonin went so far as to suggest Pons and Fleischmann had deluded themselves. Although invited to attend the meeting, neither Pons nor Fleischmann could make it and so were unable to mount a defense. Jones and his University of Arizona colleague Johann Rafelski did participate.

The drama that has been unfolding for the past six weeks has exposed science to the bone, notes Edward F. Redish, nuclear physicist at the University of Maryland at College Park and chairman of the American Physical Society's cold-fusion session. Normally, scientists challenge each other's preliminary results behind closed laboratory doors, then by peer review of manuscripts and finally by wider scrutiny in the open scientific literature. Only after such a multi-tiered review do the original preliminary findings evolve into an accepted piece of the scientific puzzle, Redish says. In the recent fusion fury, this entire process has occurred in the open.

But the sun may be setting on benchtop fusion, at least as portrayed by Pons and Fleischmann. Echoing his colleagues' emerging consensus, Koonin says the prognosis at this point is "gloomy but not yet terminal."

— I. Amato

Relative downfalls behind elder abuse

The increasing awareness that some elderly persons are physically abused and neglected by family members has been accompanied by a widespread assumption about elder abuse: that it is inflicted by well-meaning individuals, often the adult children of victims, who are pushed over the edge by the stress of caring for a frail, dependent old person.

But that assumption is turned on its head by findings from the first large-scale random sample of elder abuse in a metropolitan area. Relatively well-functioning elderly people are usually the victims of abuse, which is often inflicted by emotionally disturbed or violent family members, say psychologists Karl Pillemer and David Finkelhor of the University of New Hampshire in Durham. A typical abuser is a spouse who depends on the victim for money, transportation, housing and household repairs.

Pillemer and Finkelhor randomly selected subjects aged 65 and older from 1985 town lists in the Boston area. Interviews with 2,020 individuals identified 61 cases of elder abuse. This yields an estimate of 32 victims per 1,000 elderly