

The good, bad and ugly

Nicholas Wade

Bad Science: The Short Life and Weird Times of Cold Fusion. By Gary Taubes. *Random House*: 1993. Pp. 503. \$25.

THE scientific method is a device to compel objectivity and restrain the natural urge of experimenters to believe in their own ideas. One of the more surprising lessons of the cold fusion episode is how many researchers pay scientific method scant attention when it gets in their way. *Bad Science* relates how not only the protagonists of cold fusion but many scientists who claimed confirmatory results were willing to neglect such basic cautions as running controls, understanding their experimental apparatus and checking their results before publication.

When Stanley Pons and Martin Fleischmann announced at a press conference on 23 March 1989 that they had initiated nuclear fusion at room temperatures, their claim had not been accepted by any peer-reviewed journal. Within a few weeks it also became clear that they had failed to conduct proper controls and had no credible data to prove that their experiment produced neutrons, tritium or even excess heat. What they had was nothing. Yet they started an avalanche that swept up scientists all over the world, mesmerized gullible backers from the Utah state legislature to the Electric Power Research Institute, and wasted tens of millions of dollars of seemingly not-so-scarce research funds. Even now the rubble has not completely ceased to jitter.

The main scientific elements of this bizarre tale have already been well told, for example by Frank Close in his book *Too Hot to Handle* (Allen Lane/Princeton University Press, 1990; reviewed in *Nature* 350, 29 (1991)). But Taubes, through extensive reporting, has added a wealth of detail that makes the episode a case study in the sociology of science, as well as an often hilarious chronicle of the extremities of human folly.

Pons and Fleischmann refused to be interviewed, so their side of the story could not be given here. *Bad Science* also recounts the antics and errors of many others who got drawn into the quicksand of cold fusion. Electrochemists at Texas A&M University gave cold fusion a major lift when they reported finding excess heat from cells with heavy water and platinum electrodes. But they, like Pons and Fleischmann, had neglected to do controls with ordinary water. Only after their press conference, when they did the controls and found that those too produced excess heat, did they realize that they were looking at an experimental artefact; the excess heat was caused by a thermometer

that was acting as a second cathode.

Scientists at the Georgia Tech Research Institute held a press conference to announce that they had generated neutrons from a Pons–Fleischmann cell. Later, when they became more familiar with their neutron counters, they learned that the devices were so sensitive to temperature as to respond to the warmth of a human hand as if to a burst of neutrons.

A committee appointed by the US Department of Energy made the rounds of all laboratories claiming to have detected cold fusion. One of its members, Allen Bard, returned from these visits deeply depressed by the low quality of science he had seen. The proponents of cold fusion paid no attention to details such as measurement errors or statistical fluctuations. "It was as if, when confronted with salvation they could ignore common sense, as if nature wouldn't possibly lie to them on such an important matter", Taubes comments.

The author is deliciously comprehensive in listing those who lent their support in varying degrees to cold fusion. The editorial page of *The Wall Street Journal* attributed criticism of cold fusion to "the compulsive naysaying of the current national mood". The *Salt Lake City Tribune* regularly boosted the home team's discovery. More surprisingly, so did *Newsweek* with a rash endorsement that "As Pons and Fleischmann found, sometimes the long shots do pay off."

Where newspapers led, sober scientific societies followed. To let cold fusion proponents present their results at an early meeting, the American Chemical Society waived its by-law prohibiting presentation of results that had not been peer reviewed. The by-law's purpose had been to discourage dissemination of specious findings. Favouring the positive, the Electrochemical Society arranged a symposium calling for "confirmation results" only.

Another clear sign of ir-

rational forces at work was that, following the egregious example of Pons and Fleischmann, the many chemists who jumped aboard the fusion train were surprisingly insouciant, indeed almost completely negligent, about protecting themselves from the intense radiation that their experiments should have generated if successful. Taubes notes an apposite joke that went the rounds, on how to tell the difference between a chemist and a physicist doing a cold fusion experiment: "The chemist believes fusion is occurring and shields the apparatus with a plastic dishpan. The physicist does not believe fusion is occurring, and shields the apparatus with tons of lead bricks."

Taubes has an agreeably sardonic style in perfect keeping with the ripeness of his material. *Bad Science* furnishes many serious lessons for the historian. Just as physiologists learn about the body's normal functions from its pathology, young researchers might usefully study this book, since it bears compelling witness to the human mind's irrepressible propensity for self-delusion. □

Nicholas Wade is science editor of *The New York Times*.



MARASMIUS oreades, the 'fairy ring' fungus. The picture was painted in 1894 by Beatrix Potter, today perhaps better known for her creation of *The Tale of Peter Rabbit*. Hundreds of her natural history watercolour drawings, mainly of fungi, can be seen in the Armit Trust collection in Ambleside, England, and are reproduced in *A Victorian Naturalist: Beatrix Potter's Drawings from the Armit Collection* by E. Jay, M. Noble and A. S. Hobbs. Warne (Penguin), £25.