and triumphs. In some hero folk tales, a final stage is added in which the hero succumbs to hubris and is destroyed. In paleoanthropology the heroes are particular primate species. The tests depend crucially on the views that the paleoanthropologist has of the mechanisms of evolution. In traditional folk tales, the donor appears in an animal or human form, but in evolutionary narratives the hidden agents are evolutionary principles or forces, such as orthogenesis and natural selection.

Landau uses this framework to lay out the views of Darwin, Keith, and Elliot Smith but inexplicably not Huxley and Haeckel. For more recent workers, she introduces a variation on the hero story—the mysterious birth. According to this literary archetype, the hero is born in obscurity or is cast out into the world soon after his birth without knowing his true identity. His primary test is to discover who he actually is. Landau sees the search for missing links as clearly exemplifying the archetype of the mysterious birth. However, she scarcely alludes to this narrative form in her ensuing discussions of recent battles over human ancestry.

For my part, I do not find Landau's use of these narrative archetypes all that illuminating. If anything, they intrude upon her own narratives. But my primary objection to Landau's main thesis is that archetypical stories are too malleable. With enough ingenuity, any sequence can be made to fit any archetype. When I was a very young man in the army, I went with some of my buddies to see *Turandot* at the Wiener Staatoper. (We were not your typical GIs.) While we waited for the performance to begin, I recounted the story of Orpheus descending depicted on the fire screen. A group of American tourists sitting in front of us overheard my story but thought I was describing the opera. One of them turned to thank me, but before I could explain the misunderstanding the opera began. For the next three hours, they followed Turandot's descent into the underworld to reclaim her beloved Eurydice. My brief description had really helped them understand the opera.

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The Events Stemming from Utah

Too Hot To Handle. The Race for Cold Fusion. FRANK CLOSE. Princeton University Press, Princeton, NJ, 1991. x, 376 pp., illus. $24.95.

Several weeks ahead of its publication the contents of *Too Hot To Handle* were spilled out on the front page of the *New York Times*. Rare as such an event may be for a book about science, it should come as no surprise given the subject of this one. Indeed, this latest media scoop gives support to Frank Close's thesis: *nothing* about cold fusion has been ordinary or typical or normal. It is weird science from start to finish.

The *Times*'s writer, William J. Broad, drew on Close's informed analysis to conclude that Stanley Pons and Martin Fleischmann's claim of sustained room-temperature, energy-producing nuclear fusion had lost its last bit of credibility in the wake of revelations about invented data and breaches of ethics. Broad focuses on one telling episode from the book: a masterful investigation by Close of the mystery of the "mobile peak." If nuclear fusion is going on inside those electrolytic cells, then according to conventional physical theory one should observe a pronounced peak at energy levels corresponding to gamma rays produced by neutron capture. In their "preliminary note," Pons and Fleischmann reported observations of a spike at 2.5 MeV as evidence for nuclear fusion. After Fleischmann was told that the peak was at the wrong energy level for nuclear fusion, the two chemists without explanation moved the peak so that it was centered at the far more interesting 2.2 MeV. The intriguing possibilities that lie behind these twin peaks—incompetence, error, bad judgment, ethical breaches, fraud—may never be untangled.

The *Times*'s story does not comment on Close's rationale for writing the book and how that shapes his interpretation of the events. This question is important in assessing a book that assumes the role of setting the record straight. *Too Hot To Handle* seeks to close the book on cold fusion not only as a claim about heat, neutrons, tritium, gamma rays, and helium but also as an object lesson in how good science really works.

Close builds not one but three frames to structure his story, which is the most richly detailed and best-documented account of cold fusion we have to date. The book is at once an accurate chronology of what happened and when, an up-close look at the individuals and research groups who did most to shape the events, and a primer on nuclear physics and electrochemistry. As theoretical physicist and science popularizer, Close shuttled between posts at Oak Ridge in Tennessee and Rutherford Appleton Laboratory in Britain, collecting a hundred or so interviews with fusioneers and their foes: this first-handedness gives his tale both color and authority. Quite possibly the most bizarre development in Close's chronology of the roller-coaster reality of cold fusion was the near simultaneity of Pons and Fleischmann's visit to Capitol Hill in search of $4.5 million and, up the road in Baltimore at a gathering of the American Physical Society, the first public denunciation of the claim in a scientific venue—one that raised the possibility not only of incompetent but of unethical behavior. Close gets us behind the scenes: Steve Koonin, Nate Lewis, and their colleagues at Caltech had found no signatures of fusion, but they still suspected that perhaps "Fleischmann and Pons were really just holding some secret back and we all were not as smart as we thought we were!" (p. 205). But with announcement of a congressional cold fusion hearing, the Caltech researchers felt that they had to go public in order to save taxpayers from more government waste. Ironically, they were able to get on the APS program at the last minute only because Fleischmann and Pons had declined the invitation to attend.

Close's reports of far-flung attempts to confirm or deny cold fusion make fascinating reading: the poignant tale of two University of Washington graduate students who used a novel hollow palladium tube—and got tritium!—only to have their claim overturned by a spectrometer with higher resolution; the disturbing tale from India, where cold fusion was looked on not only as an energy panacea but as a source of neutrons for uranium enrichment with obvious implications for weaponry. Unfortunately, when Close takes time to develop these local stories, it is easy to lose one's place in the overall sequence of events. The primer on physics and chemistry suffers even more from a bothersome redundancy. Readers with modest science backgrounds will not be confused by Close's explanations of these matters, which are clear and to the point. But they will certainly lose patience at the number of times we are told the same natural facts.

How does Close *interpret* the goings-on? He ignores the sociology of science and has no theory to order the significance of observed events. He ignores as well the history of science and grounds his assertion that cold fusion is atypical not on a review of like

cases from the past but on 20 years of developing an "intuitive 'feel' " for "what constitutes good science" (p. 3). When scholarly studies of the affair do appear, they will not consider Close's book a distanced and neutral reconstruction of already settled events but an insider's account that played a part in the closure of the events. Close has goals beyond scholarship: cold fusion is dissected in order to put good science in its best possible light, to prevent the public from forming a perception that "cold fusion" was something scientific. "If these events become regarded as a norm for science then public confidence would be threatened. It is important that the public see that the test-tube fusion story is *not* typical of normal science" (p. 2).

With that goal in mind, Close begins his interpretation in a curious way: "The idea that established science was somehow attempting to censor cold fusion research is utterly out of line with what science and scientists are all about" (p. 3). But in that case, why bring up this "conspiracy" idea not just once but several times? Close reports later, for instance, that Peter Bond, chairman of the physics department at Brookhaven National Laboratory, was asked by a reporter to comment on a claim that "the big labs *are* seeing fusion but are keeping it secret because the big oil companies have bought them off!" (p. 145).

Close never intends conspiracy as a plausible interpretation. Instead, it serves the rhetorical function of straw man: it exaggerates the social, political, economic, and psychological sides of science into an absurdity easily knocked over, so that the "correct" view of good science is alone left standing. Close constructs a strategic demarcation in which good science is put on one side of the border (those who refute cold fusion go here) and everyone and everything that kept cold fusion alive go on the other. The implication: if good science had been allowed to run its normal course, cold fusion would have been settled within days rather than months, no brouhaha at all, and the United States would not have spent $30 million chasing a chimera.

Candidates for a scapegoat for the fiasco abound: chronically misinformed journalists who produce "factoids" (p. 17) while they hype false hopes and pressure scientists to hold weekly press conferences in lieu of peer review; greedy university administrators who stoop so low for fame and gain that they make a $500,000 "anonymous" donation to the Cold Fusion Institute out of their university's own coffers as a way of reassuring the state of Utah that its $4.5 million was indeed attracting outside commercial investments; gullible politicians who fail to recognize that the good scientist/expert knows best (p. 35) and who challenge the authority of *Nature* with the arrogant response, "We are not going to allow some English magazine to decide how state money is handled" (p. 12); patent attorneys who make it impossible for scientists to share details of their research in a timely and cooperative manner.

As victims of villains from outside good science, Pons and Fleischmann themselves end up beyond the pale. Media hoopla catches them off guard, while patent lawyers and university administrators force them to put priority and secrecy above reliability and validity. In this pressure-cooker, Close suggests, Pons and Fleischmann's dealings with Steven Jones (the physicist from Brigham Young University doing research on muon-catalyzed fusion) could not remain a friendly rivalry but digressed into an obsessive, pathological drive to be first. Jones's report of a few observed neutrons coming from a similar kind of cell instantly convinced Pons and Fleischmann that their own heat measurements really represented fusion and that Jones was ready and willing to scoop them. Being "under intense pressure month after month," the two chemists "reacted irrationally while in the glare of media attention" (p. 327) by: forging ahead without consulting the long scientific literature on unsuccessful fusion attempts; releasing results prematurely; failing to double-check their findings; refusing to consult their knowledgeable peers in physics; choosing not to do the controlled experiments required to distinguish artifacts from facts; and, in the end, ignoring anything inconsistent with their claim to fame. Understandable psychology perhaps, but, for Close, not science.

This reading of the affair puts blame on external forces; real science rides in only to slay falsehoods. Such an image of scientists is certainly salutary for the profession at a time when allegations of laboratory fraud and mismanagement of research funds make the newspapers almost as frequently as cold fusion once did. Interestingly, however, the interpretation undermines Close's thesis that cold fusion is atypical; his reading is all too familiar for those acquainted with the rhetoric of earlier generations of "statesmen" of science. It is a play on the time-honored trope "If it works, praise science; if it fails, blame everything else."

Science could not get on without patent attorneys to protect the commercialization of new facts, without university administrators able to wangle funds from legislatures, without competition among specialists for priority and among universities for grant money, without the media to hype breakthroughs—real or promised. Close says as much: "Paradoxically, the very fact that test-tube *fusion* is news has grabbed public attention and ironically could be the headline that . . . attracts money from Congress—for *hot* fusion." (p. 48). If a viable fusion energy source does—many years and millions of dollars from now—emerge from (say) the Princeton tokamak reactor, no one will blame the media or university administrators or gullible politicians for anything, but neither will they get much praise. That will be reserved for good science. But when things go wrong, as they did for fusion of the cold kind, that necessary infrastructure—with all its interests, politics, pressures, passions, and pathologies—is cleaved off and blamed for not allowing good science to take its natural course. *Too Hot To Handle* makes it plain why there is nothing real about cold fusion (for now), but public understanding of science is not enhanced by its idealization.

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Epochs in Physics

The Joy of Insight. Passions of a Physicist. VICTOR WEISSKOPF. Basic Books, New York, 1991. xiv, 336 pp. + plates. $24.95. Alfred P. Sloan Foundation Series.

"Given a choice, I would have wanted to live as a scientist in the nineteenth century," remarks Victor Weisskopf in this autobiography. Born in 1908 and still active in science and public affairs in 1991, Weisskopf has instead played a primary role in the transformations that marked the 20th century. He was a participant in the development of quantum mechanics and nuclear physics in the '30s and a leader of the Manhattan Project during World War II. After the war he became an international statesman of science, furthering the goals of humanism and worldwide cooperation.

Weisskopf grew up in a completely assimilated wealthy Jewish Viennese family, for whom music and opera were serious matters. To attend an operetta, he notes, would have been "considered below our family's dignity." In intellectual, warm, and supportive surroundings Weisskopf grew up discovering socialism and Beethoven before girls. After two years at the University of Vienna, he arrived at Göttingen in 1928, just missing the birth of quantum mechanics, but as a graduate student he collaborated with Eugene Wigner on a celebrated paper on line shape. As do all accounts of these years,