Book Review: The Good, the Bad, and the Ugly Aspects of Gary Taubes' *Bad Science*
By Steven B. Krivit

Bad Science: The Short Life and Weird Times of Cold Fusion, Random House, New York, N.Y., ISBN 0-394-58456-2, (June 1993)

In 1993, Gary Taubes and Random House provided a concise description of Taubes' book *Bad Science: The Short Life and Weird times of Cold Fusion*: "A science journalist brings to life one of the greatest scientific frauds of our times with the story of the two obscure researchers who claimed to have discovered a clean, no-fuss method for harnessing the energy of a hydrogen bomb."

That description clearly states Taubes' thesis and his accusation: Fleischmann and Pons were the perpetrators of one of the greatest scientific frauds of our time. However, after four years of work, Taubes was in an awkward position. "Cold fusion" research was still ongoing, and other scientists were reporting successful results.

Publishers Weekly provided Taubes' explanation for this discrepancy: "Taubes considers these latest developments part of an ongoing fiasco — the quasi-scientific pursuit of a nonexistent phenomenon. He steers readers smoothly through the technical details in this scientific detective story."

Library Journal began its review of Taubes' book with this statement: "Cold fusion never existed. Even though its 'discovery' by two University of Utah chemists — Stanley Pons and Martin Fleischman — was proclaimed with fanfare in 1989, the idea has been thoroughly discredited."

Although Fleischmann and Pons' initial hypothesis was discredited, significant positive experimental results were reported even in the first year of the 1989 controversy. Taubes overlooked this. He did not consider an alternate explanation: Perhaps there was something new under the sun, not fusion but perhaps a new nuclear process.

The two chemists even raised this possibility in their very first paper: "The most surprising feature of our results, however, is that [fusion] reactions are only a small part of the overall reaction scheme and that the bulk of the energy release is due to an hitherto unknown nuclear process or processes."

Taubes is an eloquent writer with an engaging and entertaining style. His book contains a uniquely comprehensive array of detailed and reliable facts. However, it should be used cautiously as a historical reference. I have spoken with many of the same sources as

Taubes, and found his accuracy for specific dates and events to be extremely reliable. When providing direct quotes from sources or citations of documents, he was generally accurate, making a scholarly contribution to the historical record. In some cases, he preserved facts unavailable to later writers. However, there are four fundamental deficiencies in his book. However, readers who do not read other, more current books on this history may not recognize these four fundamental deficiencies.

Pathological Skepticism

The first deficiency is Taubes' thesis that there was no experimental evidence for any discovery: neither fusion nor a possible new, unrecognized nuclear phenomenon. For the positive results, he used three methods to persuade readers to dismiss those results. The first method was simply to selectively ignore certain positive results.

The second method was to speculate, without precise investigation, about why some positive claims "were likely" to be in error. Making guesses about possible scientific errors without directly examining the specific evidence is as ineffective as making positive experimental claims without directly examining the specific evidence.

The third method was to provide readers with definitive-sounding statements about why a given measurement was wrong when, in fact, Taubes was fundamentally unaware of the facts. There may be no statement in his book that is as fallacious and destructive as this: "So Pons and Fleischmann had only speculated that they could generate more energy in a fusion cell than they consumed."

In another example, Taubes wrote that "Pons and Fleischmann had not stirred their cells, and Lewis came down hard on this point." But Taubes knew that Pons and Fleischmann had designed their cells so that the natural motion of the bubbles of deuterium and oxygen coming from the electrodes would do the stirring. Taubes sat in the lecture hall at the Los Angeles Bonaventure Hotel during the Electrochemical Society meeting and heard Fleischmann say, "Gas evolution is the most efficient method of mixing known to man."

Taubes could have read the very detailed 58-paper 1990 Fleischmann-Pons paper and learned that they had placed an array of 5 thermistors, displaced radially and axially, that showed a maximum electrolyte temperature variation of +/- 0.005 degrees except where it was in contact with the bottom of the Kel-F support, where the variation reached 0.01 degree.

It's hard to be sympathetic with Taubes for his lack of proficiency in the most fundamental of Fleischmann and Pons' data sets because his book starts with these words: "The cold-fusion episode teaches two lessons that can be applied as meaningfully to journalism as

to science: 1. Do your research, because nothing is as simple as it seems. 2. Make sure you've got the story right before you publish."

Hearsay and Gossip

The second deficiency is Taubes' heavy reliance on hearsay and gossip. Throughout the book, Taubes frequently quotes one source who is quoting another. In legal terms, this is called hearsay and is generally inadmissible in court. For most investigative journalists, using secondhand information is a last-resort option, typically used only to provide context and background. However, Taubes used secondhand quotes pervasively. When Taubes introduced the *dramatis personae* whose characters he prepared to denigrate, he relied heavily on negative opinions about those characters from other people — in other words, gossip.

Ethical Breach

His third deficiency is to invite some of the most outspoken opponents of the new field to read the book before publication and to suggest editorial changes. Taubes named and thanked these reviewers on the first page of his book. Most were key participants in the conflict. By choosing them, Taubes was writing history the way they wanted it to be told. No ethical investigative journalist or neutral historian would allow the subjects on one side of a bitter conflict to read an advance copy, let alone suggest editorial changes.

Three of the reviewers (Richard Garwin, Steve Koonin, and John Huizenga) were members of the U.S. Department of Energy's 1989 Cold Fusion Review Panel. Garwin had taken a leading role in opposing the new science, publicly betting against it as early as April 20, 1989. Koonin had publicly accused Fleischmann and Pons of "incompetence and perhaps delusions" on May 1, 1989. William Happer, a former head of the DOE's Office of Energy Research, had made derogatory comments about Fleischmann and Pons based on their television appearance. These panel members advised the Department of Energy to discard the new science. Nathan Lewis, after making fundamental mistakes in his recalculation of Fleischmann and Pons' heat measurements, publicly shamed them by accusing them of self-deception.

Garwin, Koonin, Happer, and Lewis shared a common link: They were all members of JASON, a secretive, invitation-only group of elite scientists hired by the U.S. government to provide scientific advice. Taubes' comfort in giving these opponents advance access to his manuscript suggests that he was confident that they would be pleased with it. From my knowledge of this conflict's history, Taubes accurately conveyed the perceptions and attitudes of most of these opponents. He was, in effect, the biographer of the naysayers, deniers, an angry mob that, in the words of *Nature* editor David Lindley, conducted a "hanging party" intended to destroy its victims, Fleischmann and Pons. Any scientist who

had the courage to openly pursue the research risked similar vilification. As a result, Taubes' book stands less as an authoritative reference on the early "cold fusion" conflict and more as an accurate record of the naysayers' and deniers' perceptions, attitudes, and anger.

Ignore Progress

Taubes' fourth deficiency is his choice to ignore numerous positive scientific results. Despite conducting interviews between March 1989 and November 1992, he overlooked many opportunities. Positive results were presented at the Electrochemical Society meeting on May 8, 1989, at the Department of Energy Workshop on Cold Fusion Phenomena on May 23-25, 1989, at the National Science Foundation/Electric Power Research Institute workshop on October 16-18, 1989, and at the International Conference on Cold Fusion on March 29-31, 1990, among others.

Trail of Destruction

No account of Taubes' book is complete without ensuring that readers are aware of what Taubes did in June 1990 and its relevance to his book. Taubes wrote an article in *Science* magazine and depicted electrochemist John O'Mara Bockris, at Texas A&M University, and his graduate student Nigel Packham, as science frauds. The article gave the impression that they had spiked their "cold fusion" cells with tritium to fake positive results.

There had been no university investigation, let alone official determination. By his own admission, Taubes had no material evidence, "no smoking gun," as he wrote. There were no witnesses. Taubes and *Science* nevertheless depicted Bockris as a fraud with innuendo, gossip, and rumors, casting doubt on Bockris' reputation for the rest of his life. Taubes had even used intimidation tactics and threats to get Packham to confess.

In multiple ways, Taubes didn't clearly think through his accusation of Bockris and Packham. Packham would have had to have spiked 13 cells, some multiple times, over a period of weeks, without anyone noticing. By that time, two other groups at Texas A&M had produced tritium in their electrochemical cells and even reported their results to the Department of Energy's review panel. Their cells would have had to have been spiked, too. Kevin Wolf, the leader of one of those groups, was spared Taubes' malevolence because Wolf withdrew his results in a sidebar published along with Taubes' main article. Meanwhile, tritium production was reported by government laboratories in Italy, Korea, and India.

Taubes destructive journalism was not recognized as such at the time because the idea of producing tritium in such cells was considered inconceivable. In his book, Taubes had to

maintain his justification for his attack, which oddly targets Bockris rather than Packham, suggesting a personal vendetta. Since Taubes had no evidence, he used character assassination to defame Bockris. Therefore, nothing in Taubes' book about Bockris should be assumed to be fact.

When I was writing my three-book 2016 series on this history, I asked Taubes what he had to offer for his defense of his cruel treatment of Bockris and Packham. Here's what he wrote back: "If you believe in the laws of nuclear physics, then the presence of the tritium in the cells, particularly so without neutrons being generated, as in Wolf's laboratory was, in effect, hard evidence of fraud. If the tritium were legitimate, this was a historic discovery virtually without parallel in science."

Taubes did not understand that there are no laws of nuclear physics that say it is impossible to produce tritium in electrochemical cells. Taubes did not recognize that, in science, experiment comes first, then theory. If the well-measured tritium production was not correlated to the rate of neutron production that would be expected based on nuclear fusion theory, then the fusion theory did not apply.

Had Taubes not been hell-bent on contributing to the destruction of honest scientists and a newborn field of science, he could have had the privilege of reporting a historic discovery virtually without parallel in modern science.