

## Books

The website has selected three books for comment, one by chemist Ed Storms and the others by engineers Charles Beaudette and Jed Rothwell.

- Book Review: *The Science of Low Energy Nuclear Reactions* by Edmund Storms (World Scientific Publishing Co., Singapore , 2007)

*The Science of Low Energy Nuclear Reactions* is an important book. Its subtitle is "A Comprehensive Compilation of Evidence and Explanations about Cold Fusion". The book is much more than this. It is a remarkable story about a remarkable period in science. In part the book is an autobiographical description of events that happened at Los Alamos NM following the famous cold fusion announcement by Pons and Fleischmann in March 1989. As described in Forward 1, the book "is a well written, easily readable account of the birth and early childhood of a field whose limits and applications have not yet been revealed". Pons and Fleischmann claimed that they had achieved release of nuclear fusion energy by using the electrolysis of heavy water to deposit deuterium onto a palladium metal cathode. These claims would have been ignored if Pons and Fleischmann had not been recognized authorities. Fleischmann was a member of the Royal Academy in England, and Pons was the Chairman of the Chemistry Department at the University of Utah. Both had extensive publications. When Stanley Pons and Martin Fleischmann announced their discovery of cold fusion, Ed Storms was working as a materials scientist in a space nuclear propulsion program at Los Alamos. Plans for duplicating the Pons-Fleischmann experiments began the next day and Ed joined the effort shortly thereafter. His book starts with those formative days of cold fusion. He writes with the authenticity that only an active participant can provide. His book is destined to be a primary source for future historians.

The first weeks following the March 23 announcement was a period of intense excitement throughout the chemistry and physics worlds. Though almost nobody really thought that nuclear reactions could be carried out using chemistry, the claims had to be checked. This looked easy to do. Rapid testing followed. There were only a few apparent successes, and most attempts failed. A tide of ridicule followed. As Storms tells the story, a climax occurred at the May 1, 1989 meeting of the American Physical Society in Baltimore. "Major damage was done to the field by the hubris and misdirected self-confidence of a few people. Thus, a myth was created that even today continues to have a negative impact". For one thing, a proper repeat of the Fleischmann and Pons tests takes far more time than had passed since the announcement. There developed a stranglehold of inappropriate theory, based largely on the false assumption that cold fusion had to be a form of hot fusion, and therefore accompanied by neutrons and energetic particles. It is doubtful that a better description of these early events will ever be written.

Ed's laboratory studies on cold fusion began almost immediately after the announcement. Storms joined a just starting laboratory test program. Working with Carol Talcott, they ran more than 250 electrolysis experiments looking for tritium. Tritium was an expected product of any then known fusion reaction. Most of the runs showed no tritium, but a few showed larger amounts than could be explained as contamination. When reaction tritium was found, it was found in the electrolyte and was not present in gas that is liberated by electrolysis. Farkas has shown that the gas in bubbles formed on palladium during electrolysis originates in microcracks, which receive interior deuterium. Therefore, tritium entering the water by reversible chemistry had to come from reactions occurring on or near the metal surface. They published their results in 1990. The studies convinced Ed that something nuclear sometimes occurred. The studies also led to their marriage and Ed's new career as a continuing researcher in a developing international cold fusion program. Ed and Carol built a unique and beautiful house not far from the Sante Fe Institute, and a very enviable home laboratory where Ed continues to conduct his research experiments.

Ed's home lab studies have reinforced his conclusion that long electrolysis onto bulk metal can produce a nuclear active environment on or near the surface of his metal cathodes. This location has the desirable effect that he now sometimes uses a layer of test metal plated on a substrate instead of a bulk pure metal in his electrochemical tests. One run described in the book used palladium deposited on platinum. The run produced excess heat. Post-run surface analysis showed Pd, Pt, and some oxygen along with Fe and Cu impurities. He thinks near surface LiPd alloys may play a role. Since bulk palladium is expensive, the ability to use plated surfaces has \$ value for the home researcher.

The book's role as a compilation of evidence and explanations is an extension of Ed's long standing role as a scientific reviewer of the field. He published a major review summary in 1991. This compilation of results has continued to grow. He and Jed Rothwell created an Internet accessible library from which LENR research papers can be downloaded without charge. There have been more than 640,000 downloads from a selection of more than 500 full text technical papers. They have maintained an ever updated bibliography on the [www.lenr.org](http://www.lenr.org) website. This bibliography is a bit overwhelming in its size. The new book is helpful in that it provides a separate bibliography for each chapter. This grouping of references makes it easier to locate research material related to a reader's individual interests.

Despite the size of Ed's bibliography, in my view there are a few important references missing. Among them, there is no reference to the work of Chernov and Tyurin, who have identified an energy storage mechanism that exists in metal hydrides and is absent in pure metals. This energy is stored in vibrating hydrogen atoms. Its sudden release

seems to be responsible for a rapid loss of stored deuterium. The sudden deloading destroys the conditions needed to produce heat in palladium electrodes. This problem seems not to occur in the Arata and Zhang nanometal studies, which promise a shorter road to commercial heat.

Ed discusses the exciting playground of ideas developed by theorists trying to explain cold fusion and other low energy nuclear reactions. As he points out, there is no consensus. My personal criticism of the book is that it does not separate theories that are consistent with quantum mechanics physics from those that invent new "theory". Quantum mechanics has been highly successful in modeling the submicroscopic world. I don't think that theories that violate quantum mechanics are competitive. Ed favors a "hydrino" theory which violates some of the well established rules of the quantum physics that underpins the 21st Century world.

Ed is to be commended for his book. It belongs in the houses of all those interested in an ecologically friendly, new source of clean energy, energy that does not contribute to the greenhouse effect and whose use would simplify the nuclear arms anti-proliferation effort.

- Comments on *Excess Heat and Why Cold Fusion Research Prevailed* by Charles G. Beaudette, (Oak Grove Press, LLC, 2002). The first part of book is available from the LENR library, accessible via our LENR link.

Beaudette examines the excess heat results reported by several experimenters from an engineer's point of view. The book provides a reliable assessment, is a good read, and also documents early cold fusion history.

- Comments on *Cold Fusion And The Future* by Jed Rothwell. An electronic version of the book is available from LENR-CANR.org, accessible via our LENR link.

Rothwell's book is a uniquely creative and imaginative view of a future world, with equally creative and imaginary art. It is a fun read, educationally sound, and very clear in the way that it describes the measurement of cold fusion heat. Its quirky chapters on "wild and crazy" cold fusion applications should appeal to the younger generation.