CHAPTER 1

Introduction

Manmade nuclear fusion was produced well before Fleischmann and Pons came along, but only with great difficulty and expense. Over the last 60 years, the machines have grown in complexity and have now culminated in the proposed ITER[a] hot fusion reactor, shown in Figure 2, which is being constructed in France as well as a similar independent project in China.[1] Even though this research has cost over 16.5 billion dollars,[2,b] efforts up to now have not produced more power than it takes to run the huge machine.[3]

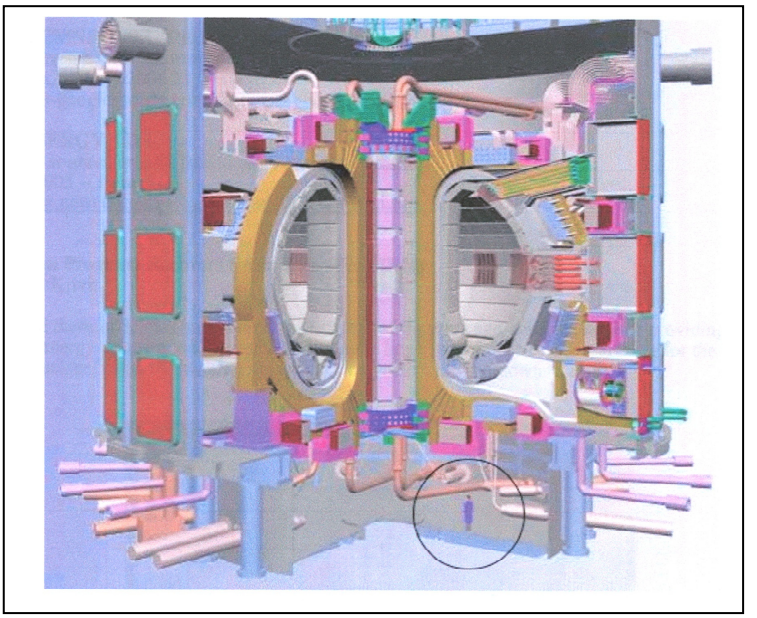

Figure 2. Proposed ITER hot fusion reactor. (From www.iter.org)

In contrast, the new cold fusion method appeared to be so simple that any household could afford the device and hope to use it to supply all domestic energy. Instead of a huge central generator of unimaginable complexity and cost, the Fleischmann-Pons device is something a bright high-school student might understand and afford to construct. Essentially it is a glass container in

[a] ITER is an attempt to harness thermonuclear power and is supported by the European Union, Japan, China, India, South Korea, Russia, and the United States. The latest version is being built at an estimated cost of 12 billion dollars.

[b] Source: Department of Energy as of year 2000 in FY2000 dollars adjusted for inflation.

which two metal rods are immersed in an electrolyte made by mixing heavy-water (D_2O) with a lithium salt (LiOD). A conventional constant-current power supply forces current to flow between the rods. This current releases deuterium from the heavy-water, allowing nuclear reactions to occur at the negative electrode if the conditions are right. From then on, the process gets complicated, but still looks simple. Of course, a practical source of energy would be bigger and more complex, perhaps the size of a refrigerator located in every home. Unfortunately, despite this outward simplicity, the actual mechanism producing the "cold fusion" reaction has, so far, defied complete understanding and has resisted easy replication. As a result, the claims have been very hard for many people to believe. It is this failure to understand and accept a discovery of potentially immense importance that makes this unusual saga worth our time and interest.

Just what is cold fusion and how does it differ from hot fusion? Cold fusion and hot fusion both involve a nuclear process, but the mechanisms and end products are different. Hot fusion requires a very hot plasma (ionized gas), which is used to force the nuclei close enough to fuse. This process takes considerable energy, supplied by the very high temperature, because all nuclei repel one another as a consequence of the Coulomb barrier. In contrast, cold fusion occurs in a relatively cool solid in which a process operates much like a catalyst, *i.e.* by neutralizing or lowering the barrier without the need for high energy. Once this barrier is overcome, hot fusion makes energetic neutrons and tritium in equal amounts, while cold fusion makes mainly helium (^4He), with few emissions of any kind being detected outside of the apparatus. In short, brute force is used to cause hot fusion, while cold fusion requires a complex solid environment in which a process similar to seduction can operate. Hot fusion has been studied for more than 60 years by many and, arguably, is well understood. Cold fusion has been studied for only 18 years by a few and is hardly understood at all. Cold fusion is a clean energy source resulting in essentially no radioactivity. Hot fusion results in the generation of considerable amounts of radioactive elements. Cold fusion has been difficult to replicate. Hot fusion has been difficult to be make useful.

Initially, cold fusion caught popular imagination because two researchers working in their own laboratory and using their own money discovered what seems to be an ideal energy source. For a brief time, Fleischmann and Pons became known to people all over the world. Even now, almost 18 years later, many people remember them with interest. As energy prices soar, this memory becomes bittersweet because over the years the press and a few outspoken scientists have given the impression that this beautiful promise had failed and Fleischmann and Pons had just made a stupid mistake. Imagine the outrage people feel when they realize the claims are real after all, not a mistake, and this ideal energy source would now be available to mankind

were it not for a false myth being spread by people who insist the claims are false. Despite this opposition, active studies continue in at least eight countries[c], and evidence that Fleischmann and Pons are right continues to mount.

Books describing the history and politics of cold fusion were written by David Peat,[4] Eugene Mallove,[5] Hal Fox,[6] Frank Close,[7] John Huizenga,[8] Gary Taubes,[9] Nate Hoffman,[10] Charles Beaudette,[11] Bart Simon,[12] Steve Krivit/N. Winocur,[13] Roberto Germano,[14] and Thomas Stolper[15]. Books discussing certain aspects of the science are provided by Hideo Kozima,[16,17] Tadahiko Mizuno,[18] and Joe Champion.[19] One by Jed Rothwell[20] even predicts the future based on cold fusion being successfully applied.[d] These sources of information can be added to the efforts of Hal Fox (Fusion Information Center, Inc.), who published a monthly update of the field called "Fusion Facts" from 1990 to 1994. Later he became the founder and editor of *New Energy News* and *Journal of New Energy*, which published many important papers. Bruce Lewenstein[21-27] (Cornell University) has addressed the sociology of the saga, which historians of science will be examining for many years in an effort to understand what went wrong with the scientific process when it was applied to this subject. The archive he created at Cornell University is a valuable resource of public information. Similar information can now be found at www.newenergytimes.com where Steve Krivit publishes his insightful editorials about the field. Dieter Britz provided a very valuable collection of published papers on the web, which has now been incorporated into the www.LENR-CANR.org website, administered by Jed Rothwell. This website gives access to all of the published information and links to other sources. The www.iscmns.org website, maintained by William Collis, provides information about the International Society of Condensed Matter Nuclear Science and gives access to the new journal, *Journal of Condensed Matter Nuclear Science*. Current information can also be obtained at http://world.std.com/~mica/cft.html, which is maintained by Mitchell Swartz. *Infinite Energy*, founded by the late Eugene Mallove, continues to publish articles about cold fusion under the competent editorship of Christy Frazier. Scott Chubb has been effective in having sessions devoted to cold fusion made part of various American Physical Society meetings. As a result of the efforts made by all of these people, combined with the extensive written literature, facts about the subject are slowly seeping into the collective consciousness.

[c] China, France, Israel, Italy, Japan, Russia, US, and Ukraine.
[d] Additional information and sources can be found at http://worldcat.org/search?q=su%3ACold+fusion.&qt=hot_subject.