



Research Article

# Cold Fusion – from the Laboratory to the World Setting the Stage for ICCF-17

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## Abstract

The objective of ICCF-17 is to allow international groups of scientists to present their data to further the collective understanding of scientists working in the field and so that skeptical members of the mainstream scientific community, the media, and the public will see the evidence that “Cold Fusion” is real. Indeed several groups are currently developing commercial products that produce energy using the “Cold Fusion” phenomena. Ultimately, the reality of cold fusion will be determined by the public acceptance of commercial devices. People and companies who continue to deny the existence of cold fusion will become irrelevant as the applications are placed into service.

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## 1. Introduction

The announcement by Fleischmann and Pons on March 23, 1989 that their experiments that produced more excess energy than could be accounted for via chemical means launched a frenzy of efforts around the world to confirm and improve upon their claims. If the phenomenon which was named as “Cold Fusion” by the media could be successfully developed, it offered the potential to supply the world with abundant, low-cost, green, and safe nuclear energy without hazardous waste.

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### 1.1. The early months

Within hours of the press conference announcement, several universities and laboratories around the world initiated programs to replicate the results. Examples include the Bhabha Atomic Research Centre (BARC) in India where within a few days of the March 23rd announcement, 12 teams comprising about 50 scientists were formed to look for the nuclear origin of Cold Fusion. Less than 1 month later on 21 April, neutrons were first detected. Within a year, all 12 teams had detected both neutrons and tritium. The results were reported at ICCF-1 in August, 1990 [1]. In the U.S., the Electric Power Research Institute redirected contracts that were in place at Texas A&M University for fuel cell research to focus on “Cold Fusion”. Within two months, their experiments showed excess heat, tritium, and neutrons [2]. In Frascati, Italy, titanium shavings were placed in high pressure deuterium gas and then cooled to 77 K. As the samples warmed, neutrons were detected at 200 times background [3]. Groups in Hungary, the USSR, Japan, Brazil also conducted experiments. Several of the groups were successful in obtaining confirming experimental data but others including groups at California Institute of Technology and the Massachusetts Institute of Technology claimed that their experiments had not produced any excess heat. In spite of the many successful results, cold fusion was discredited by several speakers at the annual American Physical Society meeting in Baltimore in May. Ironically, the Caltech and MIT results were later analyzed by other groups to show that they had in fact produced excess heat but by late 1989, most scientists, the media, and the public considered cold fusion dead and cold fusion subsequently gained a reputation as pathological science [4].

### 1.2. DOE Reviews

In November, 1989 the Energy Research Advisory Board set up by the U.S. Department of Energy issued their report. Although most people believe that the report disproved “Cold Fusion,” that is not the case. There were several recommendations and conclusions but they summarized their finding with the statement: *“Consequently, with the many contradictory existing claims it is not possible at this time to state categorically that all the claims for cold fusion have been convincingly either proved or disproved.”*

Even though the DOE report *“recommended against establishment of special programs to develop cold fusion,”* the Panel was *“sympathetic toward modest support for carefully focused and cooperative experiments within the present funding system.”* However, to date proposals submitted to DOE for funding have all been ignored, in many cases without even reviewing the proposal or replying to the submitter. Additionally, the DOE findings and the resulting public opinion have had a chilling effect on other potential sources of support for cold fusion research.

The second DOE review was conducted in 2004 with a report issued in December, 2004. Although several of the individual reviewers believed that the experimental evidence provided significant support for the “Cold Fusion” phenomenon, the majority conclusion was: *“While significant progress has been made in the sophistication of calorimeters since the review of this subject in 1989, the conclusions reached by the reviewers today are similar to those found in the 1989 review.”* The details of these reports are beyond the scope of this paper but the complete reports are available along with reviews and analysis of the DOE findings by several individuals at: <http://newenergytimes.com/v2/government/DOE/DOE.shtml> and [http://lenr-canr.org/wordpress/?page\\_id=455](http://lenr-canr.org/wordpress/?page_id=455)

### 1.3. Impact of the U.S. DOE decisions

The decisions by the DOE not to fund cold fusion research and the incorrect belief that cold fusion was bad science impacted funding for cold fusion research throughout the world. Governments and companies did not fund cold fusion research for fear of being accused of wasting money. And, the US patent office does not issue patents for cold fusion related inventions which reduces access to venture capital funding.

## **2. Research has Continued**

In spite of the DOE reports, public opinion, and lack of funding, many groups around the world continued their experimental efforts while others worked on new theories to explain the phenomena. Scientists who had observed experimental results that could not be explained using conventional theories continued their efforts in spite of very limited funding. They were driven by the desire to be the first to understand and exploit cold fusion for whatever benefits it could provide.

In an attempt to more accurately describe the underlying physics and reduce the stigma associated with the name “cold fusion,” that had been used by the media, several names have been proposed including the Fleischman–Pons effect, Low Energy Nuclear Reactions, Lattice Assisted Nuclear Reactions, and Chemically Assisted Nuclear Reactions. The experimental evidence clearly shows is that nuclear reactions are involved but one of the challenges in selecting the best name is that the actual underlying nuclear processes that are occurring are not known. Suggestions range from “conventional” fusion on a nano-scale, fusion triggered by an unknown tunneling reaction, to other theories that do not even involve fusion. At the press conference, Fleischmann offered the opinion that it was an unknown nuclear reaction. Although Low Energy Nuclear Reactions (LENR) has the widest acceptance within the community, because of the media, the phenomenon is still best known to the public as “cold fusion.”

In the 23 intervening years, the body of worldwide experimental evidence has grown to include increased repeatability, increased levels of excess heat, transmutations to new elements, and nuclear emissions including X-ray, gamma radiation, alphas, protons, and neutrons. These experimental results have been published in 3500 technical papers, conference proceedings and articles [5]. A complete breakdown is available at: <http://lenr-canr.org/acrobat/RothwellJtallyofcol.pdf> Individually and collectively, these results provide compelling evidence that nuclear reactions are involved and they substantiate many of the original claims by Fleischmann and Pons.

## **3. Current Status**

Within the last two years, the pace of development has increased, stimulated by new claims that a cell using Nickel powder in a high temperature Hydrogen gas environment could reliably produce significant excess heat. Although the initial claims have not been independently verified, multiple groups are reporting similar results using similar cell designs. At least one of the groups hopes to have a commercial product available by the end of 2012. These new results have reinvigorated research and new groups of scientists are joining in the race searching for a new energy source.

## **4. ICCF-17 Objectives**

ICCF-17 promises to be a very exciting conference. Most of the groups who are known to be working toward commercial products will attend the conference and make presentations. In most cases, this conference will be the first public presentation of their results and plans for the future. In addition, leaders in the development of theories to explain the phenomenon will present their theories in individual presentations and as participants in a panel discussion. More than 80 abstracts were received from scientists in 15 countries for presentation in both oral and poster sessions. The conference schedule was adjusted to maximize the number of presentations and provide time for interaction between scientists.

The first objective of ICCF-17 is to carry on the tradition of the previous ICCF conferences to allow international groups of scientists to present their data to further the collective understanding of scientists working in the field. The second objective is to end the misunderstanding and the skepticism on the cold fusion of the mainstream scientific community, the media, and the public by showing the evidence that “cold fusion” is real. And the final objective is to start an international concerted effort to expedite the commercialization of energy generation devices based on LENR

to solve the immediate energy and environmental problems of the world and to prevent the possibility of misusing the LENR for the destructive purposes.

## 5. History of Scientific Revolutions

History is full of examples where scientific revolutions face resistance from the mainstream scientists and media. Galileo was charged with heresy because he supported Copernicanism at the time when the mainstream belief was that the earth was the center of the universe. He was convicted in a Roman inquisition, forced to recant, and spent the rest of his life under house arrest [6]. As a post-doc at the Paris observatory, Ole Roemer used Cassini's own data to conclude that the speed of light was approximately 186,000 miles/s, challenging the mainstream belief that the speed of light was infinite. He was ridiculed by Cassini and others and ultimately left his pursuit of a scientific career [7]. The Wright brothers were unable to even get the media to witness their flying demonstrations and Scientific American published an article calling them "the lying brothers" [8]. Many Nobel prize winners were ridiculed when they initially announced their discoveries [9]. These and many additional examples share a common theme starting with initial ridicule leading to acceptance only after the "old guard" of the scientific establishment has been replaced. A quote attributed to Max Planck applies: *"A new scientific truth does not triumph by convincing its opponents and making them see the light but rather because its opponents eventually die, and a new generation grows up that is familiar with it."* This quote has been shortened to *"Science advances one funeral at a time"* [10].

Cold Fusion has overcome many of the same issues that previous revolutionary scientific breakthroughs have confronted and the potential payoff could rank cold fusion as one of the greatest discoveries of all time.

## 6. The Future

At this point, it is impossible to predict the future impact of the successful implementation of cold fusion. When the first transistor was developed, it was used to replace radio tubes. No one imagined the solid state electronics industry which grew out of that device. The original transistors were approximately 5–10 mm in diameter and cost a few dollars each. Today, more than 1 billion transistors can be contained within a single chip costing less than 0.000001 cents per transistor [11]. Solid state electronics devices have contributed to a significant improvement in the standard of living throughout the developed world.

Cold fusion could have an even greater impact by providing green low-cost energy for both developed and developing countries. Some obvious examples which will become technically and economically possible include small energy devices to provide heat and electricity to remote locations, large scale desalination which can transform deserts into farm lands and meadows, and economical transportation. Cold fusion will increase the sustainable development of human civilization on the planet earth.

Cold Fusion is a scientific revolution of unimaginable impact. While it will provide tremendous benefits, it will also disrupt large segments of the current world economy. Many countries rely on the sale of oil and many companies exist to refine and transport oil to the consumers. A significant percentage of the world's current workforce is directly involved in energy-related enterprise. Just as what happened after the invention of transistor, some companies will disappear while new industries will evolve to take advantage of changing economics of energy. New products that were not possible in a world with limited, high-cost energy will appear.

The change will not be easy but the benefit to the public of safe, low-cost, abundant, green energy will drive the revolution.

The future starts now.

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