FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

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***Fusion Facts* Now Reports on Both Cold Fusion and Other Enhanced Energy Devices.**

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CONTENTS FOR MARCH 1992

COMING IN APRIL 1992

Commercialization of Cold Fusion Begins!

A. THIRD ANNIVERSARY SCOREBOARD

By Hal Fox, Editor-in-Chief

The following cold fusion milestones are printed in normal type for positive reports and *printed in Italics for the negative reports.* Publications are *also in italics.*

DATES EVENTS

3/23/89 The U. of Utah calls a press conference and has Professors Martin Fleischmann and B. Stanley Pons announce the discovery of cold fusion producing excess energy (F-P Effect).

3/25/89 Utah's Governor Bangerter calls special session of Utah legislature.

3/30/89 Prof. Steven Jones of BYU announces previous work that demonstrates fusion can occur at room temperatures in a metal lattice.

4/5/89 Brookhaven National Laboratory tentatively confirms solid-state fusion similar to BYU.

4/7/89 *Jrnl. of Electroanalytical Chem.* accepts Fleischmann, Pons, Hawkins paper for publication.

4/8/89 Utah Legislature approves $5 million for cold fusion funding.

4/9/89 *Skeptical scientists begin publishing information on why F-P Effect can't be fusion.*

4/12/89 Dr. Mathews et al., Indira Gandhi Centre for Atomic Research at Kalpakkam, India, has first success in temperature rise in F-P Effect.

4/12/89 *Tass* reports that Runar Kuzmin of Moscow University's Physics faculty replicates F-P Effect.

4/13/89 Dr. Peter Hagelstein of MIT (and others) announces theory that explains the F-P Effect.

4/17/89 Fusion Information Center, Inc. (future publisher of *Fusion Facts)* incorporates in Utah.

4/18/89 *Wall Street Journal* reports that Fusion Fever hits Japan - emergency scientific conference called at Yokohama National University with 600 attending.

4/18/89 Scientists at Italy's National Agency for Alternative Energy announce evidence of cold fusion similar to F-P Effect.

4/20/89 Utah's Governor Bangerter signs $5 million cold fusion funding bill.

4/20/89 Nature agrees to publish Jones' paper but not one submitted by Fleischmann and Pons.

4/21/89 Successful replication of F-P Effect is reported by Dr. Huggins at Stanford, and by physicists in Czechoslovakia and India.

4/25/89 U.S. Secretary of Energy James D. Watkins directs his 10 national laboratories to set up cold fusion efforts. Tata Institute in Bombay, India, reports excess heat from titanium.

4/26/89 Dr. Pons briefs the House Science, Space and Technology Committee on the reality of cold fusion.

4/28/89 *Deseret News* reports two national labs confirmed F-P Effect. More than 100 scientists are assigned by Japanese Ministry of International Trade and Industry (MITI) to do cold fusion research.

4/30/89 *Nature speculates that F-P experiment is fatally flawed and will never be verified by other scientists.*

5/2/89 *Attendees at American Physical Society spring meeting in Baltimore cheer Koonin when he states, "Based on my knowledge, the experiment is wrong. It suffers from the incompetence and delusions of Drs. Pons and Fleischmann."*

5/4/89 Third team at Texas A&M, headed by Dr. Bockris, confirms F-P Effect.

5/7/89 Lengthy article in *The Indian Post*, Bombay, reports ten teams in India replicate the F-P Effect.

5/9/89 Pons and Fleischmann provide additional cold fusion data at meeting of the Electrochemical Society in Los Angeles.

5/15/89 *"Cold Fusion Appears Dead," says nuclear physicist Peter D. Zimmerman in special to the LA Times.*

5/15/89 *Wall Street Journal reports on publication of Dr. Steven Jones (BYU) paper in Nature and the subsequent negative comments by Nature's editor.*

5/18/89 Indian scientists hold a cold fusion meeting at Bhabha Atomic Research Centre (BARC) near Bombay. Ten teams report success.

5/22/89 Case-Western Reserve, Texas A&M, U. of Washington, U. of Florida, and the Italian Frascati Labs have all confirmed crucial parts of the F-P Effect.

5/24/89 *WSJ* reports on fusion successes at Texas A&M.

5/23/89 DOE/Los Alamos National Lab. sponsor 3-day workshop on cold fusion at Santa Fe, N.M. F-P Effect is strongly supported by Texas A&M group. *Many negative reports (could not replicate) and many negative theories showing that FP Effect could not occur.* Some 20 papers are supportive of F-P Effect. Jones' work at BYU is fully substantiated.

5/25/89 A team of Mexican scientists report confirmation of solid-state fusion, Swedish physicists at Manne Siegbahn Institute for Physics, and Stanford reports fusion successes.

6/5/89 *Fusion Power Associates annual meeting in Washington hears from a panel of fusion scientists that they doubt that the Fleischmann-Pons effect is fusion.*

6/6/89 Prof. A. John Appleby of Texas A&M states, "We are now very comfortable that what we are seeing here is something that is not chemical; it is something nuclear taking place." Los Alamos reports confirmation of large tritium production from Texas A&M.

6/10/89 *Prof. George Basalla (special to The Baltimore Sun) explains that cold fusion is a myth.*

6/11/89 Fusion Information Center (in first issue of *Fusion Facts*) announces that cold fusion is real and has commercial possibilities.

6/16/89 *British scientists at Harwell Laboratory call F-P Effect a "mad idea."*

6/23/89 Drs. Storms & Talcott (LANL) announce tritium in "significant amounts" in two F-P cells.

7/1/89 *Ames National Laboratory in Iowa gives up on reproducing the F-P Effect.*

7/10/89 Bockris sends scorecard to *Nature*: **Neutrons reported by:** Texas A&M; Indira Center, India; U of Sao Paulo, Brazil; U of C. at Santa Barbara; U of Fla. at Gainesville; Cai, Chinese Academy of Science; and Rome scientists. **Tritium reported by:** Texas A&M (2 teams);

Rome scientists; Los Alamos National Lab; and Mexico scientists. **Excess heat reported by:** Texas A&M (3 teams); Tata Institute; Stanford U; Portland State U; Independent U team; Rome scientists; and Los Alamos National Lab.

7/12/89 *"There is no persuasive evidence that a new nuclear process was discovered last winter by University of Utah cold fusion researchers, according to preliminary draft report released July 12, 1989, by a DoE panel."*

7/21/89 Utah's Fusion/Energy Advisory Committee allots $4.3 million to University of Utah for National Cold Fusion Institute (NCFI).

8/1/89 Ten teams report success in cold fusion conference held in Japan on 7/31/89, and on 8/1/89 an announcement is made that 80 scientists from 15 Universities in Japan were selected to work on cold fusion.

8/5/89 U. of Utah Regents approve NCFI.

8/24/89 Japan organizes an Institute of Fusion Science under the leadership of Dr. Hido Ikegami.

Sept. 1989 George Miley, editor of *Fusion Technology* announces special section in his journal of the *American Nuclear Society* to be devoted to cold fusion.

10/16/89 NSF & EPRI three-day conference begins in Washington, D.C. with 35 positive papers, *2 negative papers.* The conclusion, "These results cannot be explained as a result of experimental artifacts, equipment error, or human errors."

10/16/89 Four-day meeting of Electrochemical Society begins in Hollywood, Florida. Twenty cold fusion papers are presented, mostly positive.

10/31/89 *DoE Cold Fusion Panel of ERAB approves final report stating that experiments thus far, "do not present convincing evidence that useful sources of energy will result from the phenomena attributed to cold fusion."*

Nov. 1989 *Douglas R.O. Morrison labels cold fusion as pathological science.*

12/1/89 BARC releases 20 cold fusion reports April-Sept 1989. Over 50 scientists report mainly positive results.

12/12/89 ASME hosts session of cold fusion with several positive papers plus theory papers. Oak Ridge reports on excess heat, neutron emission, and tritium production.

12/15/89 and 12/23/89 *Both Science News and Science report negatively on the ASME cold fusion session.*

Dec 1989 Cold Fusion, the Making of a Scientific Controversy by F. David Peat is the first book on cold fusion. *Nature labels the book as "stubbornly uninformative."*

Dec. 1989 Drs. Storms and Talcott's work, "Electrolytic Tritium Production" is released by LANL. Significant tritium is found in 11 of 53 cells.

Jan. 1990 *Fusion Facts* names Pons and Fleischmann as "Fusion Scientists of the Year 1989."

Jan. 1990 *Dr. Gajewski, DoE Division of Advanced Energy Projects, announces availability of some funding for cold fusion. $2 million is slashed from his fiscal 1990 funds and Gajewski is replaced.*

2/1/90 Dr. Fritz Will begins as head of NCFI at U. of Utah.

3/28/90 Three-day first annual cold fusion conference opens at University of Utah. Los Alamos (several workers), Oak Ridge (Scott), Navy at China Lake (Miles), SRI - EPRI (McKubre) all reported positive results. *President of American Physical Society labels conference as the last seance for a dying corpse. Nature says cold fusion, "attracted too much enthusiasm and too little derision."*

March 1990 Dr. Matsumoto reports cold fusion in ordinary water.

May 1990 Edmund Storms submits list of successes in tritium (16), Neutrons (15), and Excess Heat (19). Drs. Pons and Fleischmann plead for more solid research, less personal attacks.

June 1990 *Fusion Facts* publishes summary of successes. Dr. Noninski reports that Lewis, et al. data shows excess heat - contrary to their negative report.

June 1990 Cold Fusion: Everything Known So Far by Rix Dobbs is second book on cold fusion.

6/15/90 *Gary Taubes accuses Texas A&M of spiking its tritium measurements.*

July 1990 Drs. Storms and Talcott at LANL report 12 out of 53 cells produce tritium. Dr. Takahashi reports on surprising finding of high energy neutrons from cold fusion.

7/23/90 Cold fusion session at World Hydrogen Energy Conference #8 is held in Hawaii. Hawaii's molten-salt cold fusion achieves more than 500% excess heat. *Weismann (Brookhaven) & Morrison present negative results. Later, DoE awards Weismann with new cold fusion study contract.*

Aug. 1990 Cornell announces its cold fusion archives.

Sept. 1990 Dr. Giuliano Preparata, visiting scientist at NCFI, presents his theory paper. Dr. Robert T. Bush pursuing cold fusion model. Dr. Matsumoto reports new particles with cold fusion. Dr. Yamaguchi reports gigantic energy bursts. *Papers from France and Germany report negative cold fusion results.*

9/18/90 Dr. Beuhler's, et al. paper on Cluster-Impact Fusion is printed in *Physical Review Letters*.

Oct. 1990 *Fusion Facts* reports on 112 positive papers from 16 countries.

10/22/90 First day of three-day conference on Anomalous Nuclear Effects in Deuterium/Solid Systems begins at BYU, Provo, Utah. Most important announcement: **helium-4 found in Pd Electrode.** Czechoslovakia reports low-level neutrons. Los Alamos (Menlove) reports reproducible neutrons from Ti and Claytor reports on tritium production. Dr. Bush reports on experimental data that fits model predictions.

11/7/90 NCFI hosts scientific review of cold fusion work.

Dec. 1990 Drs. Pons and Fleischmann leave Utah.

Jan. 1991 *Fusion Facts* names Drs. Liebert and Liaw as Fusion Scientists of the Year 1990. Pons & Fleischmann international patent application becomes available to public. More successes reported with the Bush model (TRM).

1/19/91 *New Scientist presents two-sides to cold fusion. "Cold Fusion Never Was" by Frank Close* and "Cold Fusion Still Is" by John Bockris.

March 1991 Dr. Miles (China Lake) and Dr. Bush (U. of Texas, Austin) report that helium-4 is the nuclear byproduct of cold fusion.

March 1991 *The Britannica Book of the Year reports that cold fusion, "was generally regarded as nonexistent."* BARC (India) reports tritium produced in plasma-focus device. A. Takahashi (Osaka U.) reports successes with hi-lo current.

April 1991 Russian scientists (Karabut et al.) get excess heat from gas-plasma device.

May 1991 Dr. Srinivasan (BARC, Bombay, India) in "Whither Cold Fusion" persuasively pleads for rational reviews of cold fusion literature by the skeptics. Szpak's work on electrodeposited Pd deuteride published in *J. Electroanal. Chem.* News that Ozgen et al. in Turkey find excess heat. Several publications, notably *21st Century Science & Technology, Chem & Engr'g News, Current Science, and Bungei-Syunju* are all commenting positively on cold fusion developments. Monumental and positive review by Edmund Storms (363 references) released.

5/15/91 Eugene Mallove's book Fire from Ice - Searching for the Truth Behind the Cold Fusion Furor is published. *Frank Close's book Too Hot to Handle: The Race for Cold Fusion is also released and is largely an attack on perceived mistakes made by Pons and Fleischmann.*

June 1991 Dr. Gene Mallove resigns from MIT rather than be party to publicizing inaccurate statements about cold fusion. *Fusion Facts* publishes review of 242 positive papers from 23 countries.

6/30/91 First day of five-day Second Annual Conference on Cold Fusion begins in Como, Italy. Over 200 scientists attend, present papers. All but very small number of papers report positive findings. Excellent summaries of work in China, Japan, Italy, and Russia are presented. There is no longer any legitimate question about reality of cold fusion. Drs. Bush & Eagleton set a record on amount of excess heat per cubic cm of Pd. Spain receives government support for cold fusion research. Drs. Fleischmann & Pons report continued and increasing successes. Abstract received on Dr. Mills' work with light water and Ni cathode. NCFI reports tritium "every time." Use of $Pd_{77}Ag_{23}$ is reported. Many positive results from many countries.

July 1991 NCFI spends available funds and issues final reports.

7/1/91 *Fortune Magazine* notes, "Cold Fusion heats up again," and reports progress at SRI, International (funded by EPRI).

7/17/91 J. Sevilla presents what may be the first cold fusion doctoral thesis to an international jury at the Universidad Autonoma de Madrid and is now Dr. Sevilla.

Aug. 1991 The dramatic excess energy results of Dr. Shoulders is shown in U.S. patent #5,018,180 and prompts *Fusion Facts* to extend its reporting to Enhanced Energy Devices. Randell Mills paper on excess heat production using potassium carbonate and nickel cathode is published in *Fusion Technology.* Dr. Noninski et al. replicate Dr. Mills' work.

8/10/91 *The Times (London) reports, "Martin Fleischmann thought he had observed cold fusion, the key to endless cheap energy. But science derided his claims."*

Sept. 1991 Japanese magazine *Bungeishunju* publishes article, "The Reality of Cold Fusion Can No Longer Be Denied."

Sept. 1991 *Executive Intelligence Review*, a Washington, D.C. weekly, publishes a lengthy positive article on the highlights of the Como conference.

Nov. 1991 Dr. Chambers, et al. reports that Naval Research Lab finds neutrons. Dr. Matsumoto, et al. (Hokkaido Univ, Japan) reports on heavy elements produced during cold fusion. Dr. Kyung Suk Yun, et al. in Korea report five heat bursts.

Dec. 1991 Dr. Robert T. Bush announces that cold fusion is "Alkali-Hydrogen Fusion." Drs. Bush and Eagleton extend Mills' work and show that their modifications produce nuclear reactions.

Dec. 1991 *Scientific American prints, "Perhaps the most noteworthy parties overlooked by the Ig Nobel Prize committee were B. Stanley Pons of the University of Utah and Martin Fleischman [sic] of the University of Southampton, the discoverers of cold fusion."*

12/15/91 Dr. Nielsen et al. of Denmark prove unusual behavior of Nickel-hydrogen chains building on surface of nickel metal.

Year end 1991 A total of 52 patent applications on cold fusion are available through international patent filings. Over 300 signatures have been collected by **Cold Fusion Advocates** on a petition to Congress to hold public hearings on cold fusion.

Jan. 1992 Drs. Robert T. Bush, Robert D. Eagleton, and Randell L. Mills are awarded "Fusion Scientists of the Year 1991" for their pioneering work with excess heat from light water electrochemical cells. Dr. Mills reports that he has a one-kilowatt light-water cell running.

1/2/92 Dr. Andrew Riley (formerly with NCFI) is killed in a cold fusion experiment accident at SRI, International, Palo Alto, California. This is the first known fatality in cold fusion research.

1/17/92 *Science, published by the American Association of the Advancement of Science, pokes fun at Dr. Fleischmann for his recent presentation to scientists at MIT.*

1/27/92 Prof. Akito Takahashi (Nuclear Engineering, Osaka University, Japan) reports on a modified Pons-Fleischmann cell that has averaged 150 watts excess heat since mid December. Report receives wide-spread media coverage in Japan.

Feb. 1992 Comparison of hot fusion vs. cold fusion: Hot fusion -- $20 billion spent to achieve output energy equal to 12% of input. Cold Fusion -- $25 million spent to achieve output heat equal to 400% of input.

Feb. 1992 Dr. Yamaguchi et al. reports on new method of inducing excess heat 100% of the time.

2/17/92 U. S. reports that it will pledge $25 million to help Russian nuclear physicists.

2/22/92 Fusion Energy Applied Technology, Inc. of Utah announces that its $25 million in assets will be used for cold fusion development and commercialization.

MARCH 1992: THREE-YEAR SUMMARY

Three-year summary of cold fusion: While DoE still sleeps, the dedicated and unprejudiced energy scientists in over 25 countries have continued to develop cold fusion. Now, at least three approaches (Pons-Fleischmann, Bush-Eagleton, and Takahashi) indicate that commercialization of cold fusion is achievable in the near future.

Although unfairly and severely ridiculed, Pons and Fleischmann should receive the Nobel prize for their enormously important discovery. Their path-showing has resulted in over 250 positive papers from more than 25 countries proving that cold fusion is real. The year 1992 will prove to be the year when it was widely recognized that clean, inexpensive, and virtually inexhaustible energy could be produced by cold fusion.

TO THE DEDICATED SCIENTISTS: In the midst of ridicule, with inadequate funding, with a somewhat hostile press (egged on by the hot fusionists), you have proven the existence of a new energy source. Thanks to all of you, especially to Drs. Pons and Fleischmann. You are preparing the tools to build a better, cleaner world by being, thinking, believing and doing. Your leadership is building a better world!

B. *BUSINESS WEEK* FINDS COLD FUSION

MEDIA BREAKDOWN - COLD FUSION ALIVE
Courtesy of about one dozen readers.

Otis Port - "Cold Fusion isn't Dead in the Water Yet," *Business Week*, March 2, 1992, p 90 & 92.

EDITOR'S COMMENTS

With a lead-in of "Scientists around the world are discovering something tantalizing -- but what is it exactly?" Loaded with data from *Fusion Facts*, Otis Port writes a reasonable report about cold fusion. Port cites the latest Bush-Eagleton experimental findings; a report from EPRI (reports on 10 to 20% excess heat); Takahashi's work in Japan; Noninski's work replicating Mills' light water experiments; Melvin Miles work at China Lake; and "Baloney" from David Lindley of *Nature.*

An included data box in the article cites 50 labs as finding neutrons; 40 labs getting tritium; 6 labs finding helium-4; 4 to 10 labs finding both neutrons plus tritium; and zero labs finding neutrons plus tritium plus gamma rays.

Although not a result of *BusinessWeek's* article, this same week brought a report that EPRI has raised its funding of cold fusion R&D to $12 million for the next 3 years. *Fusion Facts* commends *BusinessWeek* for its recognition of the work in cold fusion. Other responsible publications are now expected to inform their readers about the latest developments in cold fusion. It is even possible that presidential candidates may find that the problems of energy and pollution can be strongly alleviated by further development of this U.S. discovery.

C. NEWS FROM THE U.S.

CALIFORNIA - TUNNELING

Courtesy of Mario Rabinowitz

Arthur Cohn & Mario Rabinowitz (EPRI), "Classical Tunneling," *International Jrnl of Theoretical Physics*, Vol 29, No. 3, 1990, pp 215-223, 12 refs, 2 figs.

AUTHORS' ABSTRACT

A classical representation of an extended body over barriers of height greater than the energy of the incident body is shown to have many features in common with quantum tunneling as the center-of-mass literally goes through the barrier. It is even classically possible to penetrate any finite barrier with a body of arbitrarily low energy if the body is sufficiently long. A distribution of body lengths around the deBroglie wavelength leads to reasonable agreement with the quantum transmission coefficient.

EDITOR'S COMMENT

The Coulomb barrier is frequently cited in cold fusion papers and presentations as the "key" barrier to the theoretical explanation of cold fusion. Although this paper is two years old, it may help theorizing about the cold fusion problem. In a discussion with Dr. Rabinowitz, he used the analogy of a snake climbing over a wooden fence -- that the center of mass of the snake need never get as high as the fence. The longer the snake the lower the center of mass. The following question occurs: Could the barrier be thought of as varying in "penetrability" in time? For example, Aspden teaches us about "The No-Neutron Deuteron", *Fusion Facts*, Vol 1, No. 9, page 1-6. Take Aspden's approach (that the deuteron is a constantly-changing combination of five particles -- 2 antiprotons & 3 positrons) and that as this dynamic, energetic deuteron goes through its rapid changes that the instantaneous charge between two deuterons (the "barrier") may also change. Then "tunneling" (a name that imparts no sense of how penetration is achieved) could be deemed as lowered barrier penetration. Snaking or penetration, we are indebted to Dr. Rabinowitz for using his creativity to provide a view of "tunneling" that appeals to our physical senses rather than to our belief system.

CALIFORNIA - SUPER CAPACITORS

Courtesy of Dr. Samuel Faile

David P. Hamilton (Ed. of ScienceScope), "SDI 'Supercapacitors' to See Civilian Application," *Science*, Vol 255, No 5046, 14 Feb 1992, p 787.

SUMMARY OF ARTICLE

The brief inset article reports that the super capacitor is a spin-off from work sponsored by the Strategic Defense Initiative and that the capacitor may have applications to the electric automobile to store energy that could be used for acceleration. The developer of this super capacitor is Pinnacle Research Institute in Los Gatos, California. These capacitors, based on large surface-area metal sponge, could help extend battery life in an electric auto by more than 400-fold, suggests a DoE official.

CONTRIBUTING EDITOR'S COMMENTS

Dr. Faile reports, "The Institute is located at 141-B Albright Way, Los Gatos, CA 95030. By writing to Mark Goodwin at the same address, one can obtain further information in a two-page product summary." [Dr. Faile talked to Dr. K.C. Tgai.] "Dr. Tgai has kept up with the cold fusion field and was even offered a cold fusion job with EPRI. . . . The call to Dr. Tgai was originally due to my curiosity about [super cap]. I speculated that cold fusion engineers would find a way to produce electricity, in say a year, and that the supercapacitors would be useful for cold fusion powered cars to obtain the power necessary for acceleration. . . . The supercapacitors were initially developed for driving orbital lasers.

MINNESOTA - COLD FUSION & SPACE POLICY

Courtesy of the author.

Dana Rotegard, "Fusion, Cold Fusion, and Space Power," *Space Power*, Vol 10, No 2, 1991, pp 205-215, 23 refs.

AUTHOR'S SUMMARY

This paper critiques American science policy through a consideration of two examples - cold fusion and asteroid mining. It points out that the failure of central planning in science and technology policy is just as marked as in more mundane activities. It highlights the current low level of debate and points out some technical issues that need to be addressed. It concludes with evidence that the alliance of flawed policy options is further lowering the level of debate.

EDITOR'S COMMENTS

Commenting on the cold fusion controversy, Rotegard states, "The issue should be the province of specialist in metallurgy, quantum mechanics and experimental design in the physical sciences. However, Kuhn's The Structure of Scientific Revolution [U of Chi Press, 1970] argued persuasively that the human politics in science **limit the reception of new thinking, and this is particularly true when new thinking threatens established public funding patterns**." The controversy about cold fusion is not about science but about funding. Scientific arguments are only the window dressing to the real problem of *Don't mess with my hot fusion budget!* Rotegard also states, "The financial implications of cold fusion to established hot fusion workers has led to the most extreme possible positions being taken at once." Later in his paper, Rotegard explains, "Since 1951 over twenty billion dollars of federal funds have been spent on hot fusion research. . . . The *political incorrectness* of cold fusion stems from the reliance by institutions researching DT fusion on substantial, long term federal support to achieve their goals and the perceived necessity of presenting a common front to Congress. The defensiveness of this well connected lobby has distorted the public debate about the validity of cold fusion experiments. . . . The critics denouncing cold fusion as illusionary after reporting negative results have largely lacked this professional experience [electrochemistry, etc.] and have often begun their condemnations after only a few weeks in the laboratory. . . . I would conclude that cold fusion is almost certainly real and warrants extensive research." The author continues to discuss matters of space exploration, especially as related to the mining of asteroids. He points out that the asteroids can be expected to carry 8 to 10 times as much platinum group metals as typical rich minable earth ores.

MISS & CALIF - SONOLUMINESCENCE

Courtesy of Dr. Sam Faile

Lawrence A. Crum (Univ of Miss) & Seth Putterman (Univ of Cal at Los Angeles), "Sonoluminescence," *APS NEWS*, Vol 1, No 3, March 1992, pg 1.

EDITOR'S COMMENTS

This short review of the work by Crum and Putterman states, "Scientists now realize that nature has been providing spontaneous picosecond flashes of light long before the advent of lasers. Surely it is amazing that the measurement of light flashes generated by an audible sound field requires the use of detectors which are faster than those used in high-energy physics." These sound-caused flashes of light lasts for less than 50 millionth of a second and has a highly repetitive cycle time of about 50 milliseconds under appropriate experimental conditions. It is probable that learning to explain this phenomena will lead to some new science. Hopefully, this subject will not be as abhorrent to the American Physical Society as are the new findings of cold fusion.

NEW YORK - EXCESS HEAT FROM ALUMINUM

Arthur Wasserman (Consultant), "Electrochemical Method of Reducing Aluminum Oxide and Producing Additional Energy," *Fusion Technology*, Vol 21, No 2, March 1992, pp 168-169, 1 fig, 1 table, 6 refs.

AUTHOR'S ABSTRACT

Previous experimental work done in conditioning the surface of aluminum for plating is described. Cathodic reduction of the aluminum oxide surface is used with the suggested possibility of its replacement with aluminum hydride. Thermodynamic data are also presented to estimate the energy required to achieve this reduction. Based on these thermodynamic data, such reduction would require energy in excess of the calculated joule input, which suggests the development of excess energy.

EDITOR'S COMMENTS

Mr. Wasserman has been doing these kinds of experiments for over 35 years. This appears to be an interesting anomaly. You may want to replicate Wasserman's findings and share your results with *Fusion Facts*. Wasserman concludes his article with, "The energy required to produce the reduction of aluminum oxide is in considerable excess over the amount supplied to the electrolytic cell. This energy, over the amount supplied to the electrochemical cell to reduce the aluminum oxide, is held in the electrolyte that serves as a heat sink and can be transferred to other areas as a power source."

COMMENTS FROM DR. FAILE

March 2, 1992. MORE ON WASSERMAN'S RESULTS, By Dr. Samuel P. Faile

Mr. Arthur Wasserman obtains a temperature rise of about six degrees when subjecting aluminum to cathodic conditions. This measurement is in contrast to one degree C for iron and copper. The surface then acts as if it has been reduced for hours even when left in air. This remarkable situation could possibly be explained by an $Al^{27} + H^{1} \rightarrow Si^{28}$ nuclear combination. If the surface developed a thin layer of silicon this layer could mimic the conditioning. Also silicon does not react with air as readily as would aluminum or aluminum hydride. If Mr. Wasserman has saved some of the old specimens, the modern techniques for examining surfaces could be used. Wasserman has a patent of interest that was issued May 26, 1959, U.S. Patent No. 2,888,387.

NEW YORK - HIRING RUSSIANS
Courtesy of Dr. Sam Faile

William J. Broad, "U.S. Plans to Hire Russian Scientists in Fusion Research," *New York Times*, March 6, 1992, pp A1-A4.

EDITOR'S COMMENTS

Bill Broad reports on the U.S. government's decision to pay $90,000 to hire 116 scientists and technicians. The research is to be done at the Kurchatov Institute of Atomic Energy in Moscow. The funds are coming from the U.S. DoE. The Bush administration has pledged to spend $25 million to help keep the Russian atomic energy research directed toward peaceful rather than weapon purposes. The amount being paid is equivalent to $65 per month per scientist, which under current exchange rates is 6,500 rubles per month. The unofficial average monthly wage is about 900 rubles. We commend the government for this action. See *Fusion Facts* Vol 3, No 8, February 1992, pg 19, for a letter "Hire the Soviets", from Dr. John O'M Bockris. Bockris suggests that we hire the soviet scientists for more than just nuclear energy research.

OREGON - VACUUM FLUCTUATIONS
Courtesy of Sam Faile.

Daniel Gauthier, Yifu Zhu, & Thomas Mossberg (Univ of Oregon), "Turning off the Vacuum with Lasers," *APS NEWS*, Vol 1, No 3, March 1992, pg 16-17.

EDITOR'S COMMENTS

This newsletter from the American Physical Society reports on work at the U. of Oregon in which laser frequencies are used to make changes in the lifetime of an atomic state (atoms with electrons above the ground state). This finding was previously made within cavities or waveguides and the experimental data used to explain some aspects of vacuum energy. This new approach to effect quantum fluctuations may lead to a better understanding of quantum phenomena.

TENNESSEE - PHOTON-COUPLING MECHANISM

Oakley H. Crawford (Oak Ridge Nat'l Lab, Tennessee), "Examination of a Proposed Phonon-Coupling Mechanism for Cold Fusion," *Fusion Technology*, Vol 21, No 2, March 1992, pp 161-162, 4 refs.

AUTHOR'S ABSTRACT

The proposed nuclear energy in an atomic lattice (NEAL) mechanism for nuclear fusion in a cathode during electrolysis of D_2O is examined. In this mechanism, coupled harmonic motion of deuterons is supposed to lead to a reduction in the width of the Coulomb barrier for proton-deuteron (p-d) fusion in palladium, thereby substantially increasing the fusion rate. Instead, it is argued that deuteron-deuteron coupling does not have an important effect and that interaction with phonons does not enhance the p-d fusion rate.

EDITOR'S COMMENTS

The author, after making certain assumptions, setting up appropriate equations, and discussing the consequences makes the following statement: "I conclude that the coupling between deuterons does not appear to have a large effect on the p-d fusion rate in a deuterated solid and that interaction with phonons, in the sense of the NEAL mechanism, does not enhance the p-d fusion rate."

TEXAS - COLLISIONLESS DISINTEGRATION
Courtesy of the Author

Dennis Letts (12015 Ladrido Lane, Austin, RX 78727), "Collisionless Disintegration of Deuterium and its Role in the Cold Fusion Effect," Unpublished paper, Received Feb. 18, 1992, 7 manuscript pages, 5 refs, attached copies of published data.

AUTHOR'S ABSTRACT

It appears that D-D collisions are not the source of excess heat production reported in various cold fusion

laboratories around the world. Instead, it seems that a collisionless disintegration of the deuterium nucleus occurs when one of its nucleons flips from a -1/2 spin state to a +1/2 spin state in the presence of the magnetic field produced by its orbiting electron. The other nucleon does not flip, creating a singlet state which is not an allowed ground state for deuterium. The nucleus uncouples, releasing 2.23 MeV of energy.

Of all the deuterium atoms occluded in a typical cold fusion palladium cathode, the lower energy level population exceeds the high energy level by approximately 26 ppm. Of these "excess nuclei", 54% will uncouple when they flip to the higher energy level. Therefore only 14 ppm of the deuterium atoms occluded in the palladium cathode provide the fuel base for excess heat production observed during cold fusion experiments. This idea was developed by the author and applied to three sets of experimental data reporting excess heat production; the objective were to:

1. Calculate the number of hours excess heat production should be observed.
2. Calculate total excess heat that should be generated over the production period.
3. Compare results to experimental data.

RESULT: In all three cases close agreement between theoretical and experimental data was obtained.

Development of the theory and its application to the three sets of experimental data are detailed in this paper.

AUTHOR'S CONCLUSION

The close agreement to three sets of experimental results for excess heat generation leads the author to conclude that collisionless disintegration of deuterium is the physical process responsible for the production of excess heat and not the fusion of deuterium. In short, cold fission is occurring, not cold fusion.

AUTHOR'S PROPOSAL FOR FURTHER WORK

The author lists the following areas for further investigation:]

1. Derive a rate equation for collisionless disintegration.

2. Determine how energy is transferred to lattice during relaxation.

3. Calculate rate of lower energy level re-population.

4. Determine how the liberated neutrons may re-combine within the cathode to produce tritium and other by-products that have been detected.

5. Explain how the net production rate of neutrons would end up at about 10^4 neutrons per sec. -- the rate commonly detected during excess heat generation.

6. Determine methods to increase the number of nuclei that remain in the lower energy level.

7. Determine methods to increase the rate of disintegration of the deuterium nucleus.

8. Determine a probable source for the radiation or other energy that triggers the spin flip of the deuterium nucleus to the higher energy state.

EDITOR'S COMMENTS

The close agreement of Dennis Letts' theory with the three sets of published data (which he used to test his model) is the main reason for the review of his paper. In addition, this editor is not aware of any previous consideration of this approach to cold fusion. Those who would like to review this work are invited to write to the author for a copy. The following is the author's address: Dennis Letts, 12015 Ladrido Lane, Austin, TX 78727.

D. NEWS FROM ABROAD

BULGARIA - LIGHT WATER EXCESS HEAT

V.C. Noninski (LEPGER, Sofia, Bulgaria), "Excess Heat During the Electrolysis of a Light Water Solution of K_2CO_3 with a Nickel Cathode," *Fusion Technology*, Vol 21, No 2, March 1992, pp 163-167, 5 figs, 17 refs.

AUTHOR'S ABSTRACT

Experimental results of differential heat loss calorimetry measurements during the electrolysis of light water solutions of K_2CO_3 and Na_2CO_3 with a nickel cathode are presented. A significant increase in temperature with every watt input, compared with calibration experiment, is observed during the electrolysis of K_2CO_3. This effect is not observed when Na_2CO_3 is electrolyzed. No trivial explanation (in terms of chemical reactions, change in heat transfer properties, etc.) of this effect has been found so far. If the nontriviality of the observed overcoming of the energy breakeven barrier is further confirmed, this phenomenon may find application as an important new energy source.

AUTHOR'S CONCLUSIONS

The experimental results presented here show that there is more evidence than usually considered for the eventual production of excess energy during the electrolysis of

water. Therefore, further efforts seem to be justified for verifying the claim of Fleischmann and Pons for overcoming the energy breakeven barrier through electrolysis. Contrary to the opinion expressed in Refs. 16 and 17 [*Nature*, **338,** p 691 and p 701], it does not seem plausible that light water should be used as a "control" when excess energy is being sought during the electrolysis of heavy water.

EDITOR'S COMMENTS

In this editor's opinion, Dr. Noninski is a very competent and brilliant scientist and, therefore, his findings in replicating Mills' and Kneizys's experiments with light water should be taken seriously. As has been printed earlier in *Fusion Facts*, using light water as a control is not necessarily the best idea. Early in 1989 Pons and Fleischmann were severely criticized for **not using light water as a control.** They had decided that a Pd rod "that didn't load" and used in a heavy water cell was a more appropriate control.

CANADA - SEARCH FOR HELIUM

W. Brian Clarke & Roland M. Clarke (McMaster Univ., Ontario), "Search for ^3H, ^3He, and ^4He in D_2-Loaded Titanium," *Fusion Technology*, Vol 21, No 2, March 1992, pp 170-175, 18 refs, 3 figs, 2 tables.

AUTHORS' ABSTRACT

A search is described for ^3He, ^4He, and tritium produced when D_2 is absorbed by titanium sponge, or released when titanium deuteride is heated. The D_2 is prepared from pre-nuclear-era D_2O, which has a tritium/deuterium (T/D) ratio of 1.8×10^{-15}. Two reservoirs of titanium sponge in a vacuum system attached to the inlet line of a mass spectrometer are heated to allow rapid transfer of D_2 from one sponge to the other. significant amounts of ^3He and ^4He are released only after the deuterium content is increased to reach $TiD_{1.5}$ in one sponge. Then ^3He and ^4He are decreased as the D_2 is transferred back and forth. When the titanium is loaded to a composition of $TiD_{2.0}$, ^3He and ^4He increase during the next two transfers, then decrease. When the D_2 is replaced by H_2, then D_2-H_2(1:1), ^3He and ^4He decrease steadily, indicating that the transfer process causes partial release of ^3He and ^4He trapped in the titanium. This view is supported by the fact that all fractions appear to have a constant $^3He/^4He$ ratio of 3.0×10^{-7}. We believe that this helium is introduced from the cover gas used during the manufacture of the titanium sponge and that it has nothing to do with cold fusion. Assuming that the appropriate time is the transfer time of about 1 hour, the following upper limits are calculated: 1.4×10^{-21} fusion/d-d per sec for d + d ----> ^3He + n, and 2.0×10^{-15} fusion/d-d per sec for d + d --> ^4He. The limit for the ^3He channel is in agreement with the value of 10^{-23} fusion/d-d per sec. After a series of transfers, the D_2 is sealed in a container made of low-helium-permeability glass. After a decay time of 1.5 yr, tritium is assayed by measurement of ^3He. The T/D ratio is found to be 6.4×10^{-15}, significantly higher than T/D in the D_2O. At present, because the possibility of tritium contamination cannot be eliminated, the excess tritium is viewed as a upper limit for production by cold fusion. Assuming that the appropriate time is the total transfer time of 16 hour, an upper limit is obtained for d + d --> t + p of 1.6×10^{-19} fusion/d-d per sec. Assuming that the appropriate time is the time D_2 was resident in either titanium sponge, 360 hours, the upper limit is 7×10^{-21}. These limits are not in agreement with a rate of about 10^{-14} fusion/d-d per sec.

EDITOR'S COMMENTS

The author's state that after a series of degassing the titanium sponges, "After the second transfer, additional D_2 was loaded into the left titanium to bring the composition to $TiD_{1.5}$, and then the transfers were continued. It was shocking to observe such relatively large amount of ^3He and ^4He released in the third transfer." Later, the authors decided that there was some quirk in the way the Ti sponge stored the gases and that cold fusion was not responsible for the helium observed. In their conclusions, the authors discuss work by Mamyrin et al. where they had found widely varying amounts of helium in various metals. Therefore, the authors conclude, "The T/H ratio in the hydrogen absorbed by the metal samples used by Mamyrin et al. may have been much higher than that if the samples were close to releases of tritium by industry or by thermonuclear testing in the USSR. Although it is much more interesting to claim that cold fusion is the source of excess ^3He in metals, we believe that such claims should not be taken seriously unless it can be proven that man-made tritium is not responsible." This logical approach will be comforting to the "hot fusionists" who would not like to find evidence for cold fusion. However, the authors do not refute the many experiments that have found strong evidence for the production of tritium in titanium that is thought to be a result of cold fusion.

INDIA - COLD FUSION FICTION?

Courtesy of Subbiah Arunachalam

P. Hari (New Delhi), "Cold Fusion - Fact or Fiction?," *The Economic Times*, Jan 18, 1992, p 9, [previously printed in the December 1991 issue of *Indian Journal of Technology.]*

EDITOR'S COMMENTS

This largely negative article comes from a country where ten teams of scientists had reproduced all or part of the Pons-Fleischmann findings within three weeks after the March 1989 announcement. This report shows the pervasive influence of the hot fusion group in India. Similar controversy has been observed in England, Europe, and in the U.S. The article makes such unsubstantiated statements as "Soon after, however, the majority of the scientific community concluded that the Utah chemists had not done enough thinking before announcing the results of their experiments." The article concludes with, "Pons and Fleischmann had to pay for the hurry with which they went about their task. As *Nature* said, 'the message that need to be proclaimed loudly is that, however misguided or wrong a few individual scientists may be, the institution of science is robust. Small mistakes by their triviality may long survive undetected in a literature that is no longer consulted, but mistakes over the major issues are picked up quickly.' In this case, it was very quickly indeed." *Fusion Facts* continues to be amazed at how few science writers read the literature on cold fusion. After hundreds of positive papers, many science writers are still quoting each other or the hot fusion experts on cold fusion. This action is detrimental to science and, more important, serves to slow viable solutions to our world's problems of energy and environmental pollution.

JAPAN - 100 MEGAJOULES EXCESS ENERGY
Courtesy of Jed Rothwell.

Verbal and media reports from Japan cite an ongoing experiment by Dr Takahashi in which he is getting extraordinary amounts of excess heat from a 25x25x1 mm palladium plate. Takahashi is getting a few hundred percent excess energy. This extra energy has been produced over a period of more than 2 months and now amounts to over 100 megajoules or over 8,000 eV per atom. Takahashi is expected to talk about his work at MIT and Texas A&M in April 1992. Following is a review of Professor Takahashi's paper:

Akito Takahashi, "Nuclear Products by D_2O/Pd Electrolysis and Multibody Fusion," *Proceedings ISEM - Nagoya, Jan 1992*, (draft), 5 pages, 9 refs, 3 figs.

AUTHOR'S ABSTRACT

Excess heat of 200 W/cc level (2-3 times the input power in average) and more than 100 megaJoules total, very low (n/t) ratio 10^{-5} and weak neutron emission with 2.45 MeV and 3-7 MeV components were observed by pulse electrolysis experiments with D_2O/Pd cells. To explain the observed chaotic results, the theoretical model of competing multibody deuteron fusions has been extended and it can explain most experimental results. Cold fusion is the multibody fusion of hydrogen isotopes in metal lattice.

AUTHOR'S CONCLUDING REMARKS

Cold fusion is very likely the multibody fusion of hydrogen isotopes in metal lattice. The presently reported experiments have confirmed that clean power generation, already useful in level and gain, with extremely low level of neutron and tritium really happens. Puzzles are now almost solved. Deuteron loading method into Pd was the key to meet excess heat and other nuclear products. The L-H current operation of electrolysis and homogeneous loading from both sides of Pd plate showed remarkable effect. Improvement of this method is expected to control power level and time-variation of cold fusion. Using the same method, but loading from one side of Pd plate, we had already obtained low level excess power in Experiment-C, which makes the author confident of the reproducibility about Experiment-C. However further confirmation experiments are, of course, needed. Many things are left to be solved; further studies, e.g., on electron screening effect under transient conditions, in-situ and off-line helium analysis, charged particle spectroscopy for direct confirmation of multibody fusion, condition of metal fabrication, effect of impurity, other metals and alloys than Pd, triggering mechanisms by electrochemical effect on cathode surface and by other methods, and so forth, have to be done. Assumed S-values in the present calculations have to be improved by cold fusion experiment itself.

JAPAN - "SCIENTIFIC AMERICAN"
Translation by Jed Rothwell

J. Takaki (Nihon Keizai Shimbun, Osaka Branch, editorial staff member), "Information - Cold fusion experiment yields stable heat reaction", *Scientific American - Nikkei Science*, March, 1992, pp 54-55.

Translator's Note: This article appeared in the Japanese edition of *Scientific American*. the title of this magazine sometimes causes confusion; the cover says *Scientific American* in English and *Nikkei Science* in Japanese. This magazine includes every article from the U.S. edition, translated into Japanese, plus some material unique to Japan. The March, 1992 edition carried this two-page description of Takahashi's work in the "Information" section, covering current events and fast-breaking news.

INTRODUCTION

"It's a real reaction." "No, it is all experimental error." - the debate about cold fusion goes on. Now, Prof. Akito

Takahashi, of the Osaka University Engineering Department has successfully produced a stable cold fusion heat reaction that continued for over a month. Using the now familiar method of electrolyzing heavy water with a hydrogen-absorbing palladium cathode, he reports measuring peak heat outputs several dozen times larger than the electrical input.

EDITOR'S COMMENTS

The article describes Takahashi's experiment including the electric-current cycling feature. The writer notes that a peculiar phenomenon has been noted: the heat output fluctuates in a periodic fashion with each cycle. During the low current part of the experiment the writer reports output heat is several dozen times larger than input energy. During the high current phase, the output is 2 to 3 times input. The excess power out is reported to be about 100 watts. This wattage in terms of power per cubic centimeter of Pd is very large. The writer describes Takahasi's theory that 3- and 4-body collisions are responsible for the nuclear reactions. Takahashi theorizes that the incidence of nuclear reactions requires a D/Pd ratio of 0.85 or greater. Tritium has been measured as a nuclear reaction byproduct of this experiment.

The writer notes that Asst. Prof. Tadahiko Mizuno of Hokkaido University, Nuclear Engineering Dept. has verified that D/Pd ratios as high as 1.4 have been achieved. Both tritium and neutrons have been measured and it appears that as the excess energy increases, the number of neutrons decrease. Takahashi explains that this is due to 4-body reactions which are aneutronic. The article explains that these improved results in a Pd/heavy water cell is due to the loading of the thin plate of Pd from both sides. Other labs are now trying to replicate the experiment including some in the U.S. The article concludes with the following, "Prof. Takahashi reports that several teams from the U.S. have also begun attempts at replication. It is said that some overly anxious foreign researchers fear that *the Japanese Government might begin targeted support to dominate the field."*

It is important to note that Professor Takahashi has been very open with all scientists in sharing the details of his experimental arrangement. Since giving his paper at the January 27, 1992 "International Symposium on Nonlinear Phenomena in Electromagnetic Fields" held in Nagoya, several other scientists have been trying to replicate the same experiment. We commend Prof. Takahashi both for his experimental insight and for the splendid scientific manner in which he has spent many hours to help others achieve similar results. *Fusion Facts* believes that this experiment may be one of the great "turning points" in the history of acceptance of cold fusion. We are, of course, greatly indebted to Jed Rothwell for providing us with many translations of Japanese articles.

JAPAN - EXCESS HEAT - 150 WATTS
Translated by Jed Rothwell

"Excess Heat, 150 Watts Average," *Nikkei Shimbun*, Jan 28, 1991.

Stable Heat Generating Reaction is Achieved. Neutron Emissions Detected. Osaka University Cold Fusion Experiment.

"On Jan. 27, during an international symposium in Nagoya, Professor Akito Takahashi of the Department of Nuclear Engineering, Osaka University revealed that he has achieved stable heat generation in a room-temperature (cold) fusion experiment. During the experiment which began in December, and ran for about one month, he got an average of 150 watts excess heat. Professor Takahashi says he considers it very likely that this excess heat is being caused by cold fusion. But other experts have not abandoned their cautious skepticism. The other experts give Takahashi high marks for the experiment which shows, for the first time, the connection between neutron emissions and excess heat, and offers a theoretical examination of the mechanism which might explain why fusion occurs. . . .

"The electrolysis device used in the experiment had a one millimeter thick, pure palladium plate as cathode. The anode was platinum wire wrapped in a coil around the cathode, about a centimeter away from the plate. The entire apparatus was submerged in heavy water and electrolyzed. The amount of electricity flowing between the anode and the cathode varied in two cycles, lasting six hours each; during the low phase 0.25 amperes was input; during the high phase 4.2 amperes was input.

". . . During the low, 0.25 ampere runs, total heat was between 50 and 70 watts; during the high 4.2 ampere runs, total heat was between 200 and 250 watts. During the low run, 1.25 watts of electricity was input; during the high run 90 to 100 watts was input. Thus, the excess heat was several tens of times larger than the input during the low run.

"The average excess including both low and high runs was 2 to 3 times the input. . . .total average of 150 watts excess heat output. The total amount of heat put out during the entire experiment amounted to 200 megajoules.

". . .In this study, for the first time, the researchers clearly determined that the number of neutrons declines as the strength of the reaction increases. The researchers also proved the replicability of the experiment by changing out the cathode midway through the experiment, and restarting the experiment without difficulty."
[Note: Takahashi says that this statement is not quite accurate. Ed.]

JAPAN - LOW TEMPERATURE FUSION

Translated by Jed Rothwell

"Low Temperature Fusion. Will it Boom Again?", *Yomiuri Shimbun,* February 3, 1992.

"The report of massive heat from a cold fusion experiment by Dr. Akito Takahashi, Osaka University (Dept. of Nuclear Engineering) is causing major repercussions. He reported that an electrolysis experiment output excess heat for over two and a half months. If this data is correct, the "dream of cold fusion energy," which had deflated, will once again boom. What is amazing is that this large amount of heat can still not be explained. The question is, "What is going on here?"

". . .Massive heat output has been reported from the U.S. by two teams: the originators of cold fusion at Utah U., and the team at Stanford Research [S.R.I. International], which recently suffered an accidental explosion; however, this is the first time that massive heat has been reported in Japan. Many comments were heard from the audience like, "it is too much for me to believe all at once" and "if true, this is amazing."

[In the newspaper article, a diagram shows the flat plate cathode (1x25x25 mm) surrounded by a rectangular grid spaced a reported 1 cm from the Pd cathode. See page 19 for a drawing of Takahaski's experiment. Ed.]

JAPAN - INTERFERENCE PHENOMENA

Takaaki Matsumoto (Hokkaido Univ), "Interference Phenomena Observed During Cold Fusion," *Fusion Technology*, Vol 21, No 2, March 1992, pp 179-182, 4 refs, 6 figs.

AUTHOR'S ABSTRACT

The interference phenomena of waves observed during a cold fusion experiment are described. Nuclear emulsions have successfully recorded two different interference phenomena of waves from an electrolyzing cell. It is inferred that the waves might be gravitational and antigravitational waves, which can be expected to be radiated from gravity decays of quad-neutrons.

AUTHOR'S SPECULATION

[Final paragraph] The waves that cause such strange interferences cannot be found among the known waves, such as electromagnetic and sonic waves. The two waves might be propagating by particles that we have never observed. Moreover, the two particles seem to behave in the opposite way to earth's gravity. One is attractive and the other is repulsive. These properties can be seen somewhat in the photographs of the microexplosion in Refs 1 and 2 [Author's previous papers, e.g. *Fusion Technology*, Vol 18, pg 356 (1990).] The outer black ring was traced by particles that are attractive to the gravity of the earth. On the other hand, the flare particles that come from the outer black ring are repulsive. Therefore, we can infer that the two waves might be gravitation and antigravitational waves, which are produced by the gravity decays of quad-neutrons during cold fusion.

JAPAN - METALLIC SURFACE STUDIES

Courtesy of Dr. Samuel Faile

Hideo Hasegawa (Tokyo Gakugei Univ), "Electron correlation on Metallic surfaces," *Jrnl of Physics, Condensed Matter,* Vol 4, No 4, 27 Jan 92, pp 1047-1055, 22 refs, 4 figs.

AUTHOR'S ABSTRACT

Electron correlation on metallic surfaces is studied for the first time with the use of the slave-boson functional integral method. The ground-state properties of the semi-infinite simple-cubic model in the non-magnetic state are investigated. The double occupancy, $theta_N$, and the band narrowing factor, q_N, on layer *n* are calculated as a function of the electron interaction. It is shown that [these two factors] on the surface show a peculiar behavior depending on the ratio U_1/U_B where U_1 denotes the interaction of the surface and U_B in the bulk.

AUTHOR'S INTRODUCTION

. . . During the last decade there has been considerable progress in our theoretical understanding of surface properties, particularly of transition metals (for a review see Freeman et al. 1985). The electronic structures of transition-metal surfaces have been calculated by using the first-principles local density functional (LDF) method or by using the realistic tight-binding model. These approaches have been very successful in explaining not only bulk properties but also surface properties. In these methods, however, the many-body effect is not properly taken into account, though the LSD [sic] method includes it in the form of a suitably averaged one-electron exchange-correlation potential. One of the examples showing the importance of its effect is **the fact that the d-band width of *bulk* Ni observed by the photoemission experiment is reduced by 25% compared to the value calculated with the LDF method.** This kind of many-body effect is expected to be more significant in the calculations of surface bands than in those of the bulk, because the effect of electron correlation on the surface is greater than in the bulk. It is desirable to include the many-body effect more correctly in the band calculation of the surface. It is the purpose of the present paper to

study the effect of electron correlation on a metallic surface by using the KR method. This is the first step going beyond the conventional approximations. As will be shown shortly, **electron correlation on a metallic surface is much more involved than that in the bulk.**

AUTHOR'S SUMMARY

. . . One of the interesting effects of electron correlation is that it works to suppress long-range order on the surface and in the bulk. Although calculated magnetic moments on Fe, Ni, and Cr surfaces are reported to be much enhanced compared with the bulk, it is possible that surface moments may be reduced from the calculated values if we take into account the effect of the electron correlation, which is neglected in the conventional band calculations. Calculations of surface moments including the effect of electron correlation are in progress, and will be reported elsewhere.

SWEDEN - TRM FUSION RATE

Magnus Jandel (Royal Inst of Tech, Stockholm), "The Fusion Rate in the Transmission Resonance Model," *Fusion Technology*, Vol 21, No 2, March 1992, pp 176-178, 8 refs, 1 fig.

AUTHOR'S ABSTRACT

Resonant transmission of deuterons through a chain of target deuterons in a metal matrix has been suggested as an explanation for the cold fusion phenomena. The fusion rate in such transmission resonance models is estimated, and the basic physical constraints are discussed. The dominating contribution to the fusion yield is found to come from metastable states. The fusion rate is well described by the Wentzel-Kramer-Brillouin approximation and appears to be much too small to explain the experimental anomalies.

AUTHOR'S CONCLUSIONS

By studying a resonant wave packet, we have, however, demonstrated that the time required to absorb a particle into the well is very long and equal to the decay time of the metastable state. This conclusion is unavoidable since Schrodinger's equation is unchanged by time reversal. Worledge's argument is hence valid for a long chain of barriers as well as for a single pair of barriers.

We have discussed the fusion rate in the proposed one-dimensional transmission resonance model, where the transmitted current is constrained to flow directly through the target nuclei. It is important to note that the deuterons behave quite differently in three dimensions. ...

This technical note shows that the transmission resonance model fails to explain the reported anomalous fusion rates. The intention is not, however, to exclude the possibility that new physical phenomena or subtle coherence effects could give rise to nuclear reaction rates in excess of the conventional WKB approximation. Cold fusion experiments should be judged on their own merits independent of the theoretical debate.

[Dr. Robert T. Bush has informed *Fusion Facts* that he is working on a 3-dimensional TRM. For further information on Bush's model see the forthcoming article in the May issue of *Fusion Technology* by Dr. Bush. Ed.]

E. SHORT ARTICLES FROM READERS

TRITIUM EVIDENCE FOR COLD FUSION IN F-P EXPERIMENTS

By C. Bauer[1], R. Morelli[2], and M. Paolini[3]

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AUTHORS' ABSTRACT

Some months after the first announcement of cold fusion by M. Fleischmann, S. Pons, and M. Hawkins, the scientific community appears to be prevalently skeptic about the reality of fusion. The main reason of this is incoherence between the measured heat excess and neutron emission.

However, there are two clear evidences for fusion: the production of $_2He^4$ and of $_1T^3$. The production of $_2He^4$ in F.-P. experiments has been recently reported by C. Walling [1] whereas the production of Tritium has not as yet been incontrovertibly reported [2,4].

We measured tritium directly in the solution subjected for two weeks to a classical F.-P. experiment obtaining clear evidence for a steady state concentration of $_1T^3$ at appreciable levels.

THE EXPERIMENT

The experiment started with a volume of electrolytic solution of 180 ml containing 0.1 M LiOD; the other conditions were as in reference [5]. The initial tritium counts by liquid scintillation were 395 ± 3% cpm due to the basal tritium content of the D_2O and LiOD employed [5]. After two weeks of electrolysis these counts raised to 1,253 ± 3% cpm.

The volume of the electrolytical mixture subjected to liquid scintillation counting, in a Beckman apparatus, was 0.8 ml, which was mixed to a 8 ml of the scintillation mixture. The percentage error was relative to 2 S.E. External standard ratio gave a quenching corresponding to about 80% counting efficiency with correspondingly higher values of the dpm's. The energy spectrum of the beta emission gave an energy maximum of 18 keV according to known tritium spectrum.

We obtained thus, a concentration of tritium by a factor of about three times the original level. Such a concentration of about 300% cannot be produced by isotope fractionation effects during electrolysis, which could be important especially when, as in our experiments, small volumes are electrolyzed for long periods of time. In fact, the total volume of the electrolyzed solution in our experiment was 180 ml; after 14 days (336 hours) of electrolysis, with a mean current intensity of 30 mA, we measured a volume contraction of approx. < 10%.

It is easy to calculate the volume of water gasified by electrolysis:

$$\frac{30 \times 10^{-3} \times 336 \times 3600}{96500} \times 9 = 3.38 \text{ ml},$$

the remaining of the lost volume (approx < 18 ml) being attributable mainly to evaporation.

Now, taking the most adverse hypothesis that tritium is completely discriminated by electrolysis and evaporation processes, remaining at 100% in the liquid solution whereas only hydrogen and deuterium are leaving it, the concentration of tritium should be increased by (180/162) x 100 = 111%. This is clearly a very high upper limit for the concentration of tritium attributable to isotope fractionation effects: our experimental value of about 300% is so clearly attributable to nuclear fusion effects.

We believe that our results are an important proof for the reality of fusion, according to the following accepted scheme for fusion chain reactions inside the palladium or by fusion neutrons escaping palladium and interacting with D_2O and LiOD of the external mixture:

$$_1D^2 + n \rightarrow {}_1T^3 + \quad + 6.2 \text{ MeV}$$

$$_1D^2 + {}_1D^2 \rightarrow {}_2He^3 + n + 3.2 \text{ MeV}$$

$$_1D^2 + {}_1D^2 \rightarrow {}_1T^3 + p + 4 \text{ MeV}$$

$$_1D^2 + {}_1T_3 \rightarrow {}_2He^4 + n + 17.6 \text{ MeV}$$

The disappearance of neutrons and the appearance of $_2He^4$ and $_1T^3$ according to the above scheme are the main points of the present debate on cold nuclear fusion [6].

We would like to point out that these evidences can be understood within a theoretical framework connected with some previously neglected aspects of electromagnetic interactions in condensed matter [7].

Notwithstanding that alternative explanations excluding fusion have been previously reported (see, for example, refs [8,9]) we believe that the $_2He^4$ and $_1T^3$ production are relevant proofs.

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EDITOR'S COMMENTS

This work was submitted to *Nature* and received a June 16, 1989 letter of rejection with comments about isotopic fractionation effects during electrolysis. The paper was modified to answer the objections, and resubmitted July 24, 1989. The paper was again rejected August 10, 1989

with the suggestions that the observed results could have been tritium contamination. *Fusion Facts* is pleased to print this article to help document some of the early results obtained in cold fusion experiments. Paper received by *Fusion Facts* March 9, 1992. For those interested, we have on file the two letters of rejection signed by Dr. David Lindley, Assistant Editor, *Nature.*

DoE - WOEFULLY MISINFORMED

An Opening to Energy Secretary James Watkins
By Dr. Eugene Mallove

[Drs. Eugene Mallove and Mitchell R. Swartz met the U.S. Secretary of Energy, James D. Watkins at MIT on February 12, 1992. As a former U.S. Navy Admiral, Secretary Watkins is undoubtedly unable to accept the possibility that his staff and/or advisors would indulge in "terminological inexactitudes" in reporting to him about cold fusion. The following are extracts from the discussion with Secretary Watkins.]

. . . As Watkins left the stage I handed him an envelope of cold fusion materials which contained: my "Cold Fusion 1991: Basic Facts," the petition to Congress with the list of the then 335 signers, dramatically present results and conclusions of the McKubre group from their Como paper, the announcement of the 3rd Annual Cold Fusion Conference in Nagoya, news of the SRI accident, . . . and an inscribed copy of Fire From Ice. The book inscription read, in part: "Hoping that when you have a chance to read this and the attached materials, you will quickly implement a program of research in light of research results as we now know them -- not as you knew them in 1989." . . .

Dr. Swartz then introduced himself to Admiral Watkins, and said that he was an MIT graduate who now had his own company that was working on cold fusion. The Admiral admonished Mitch with a smile, "Don't give up!" Then, "What are you looking at now in cold fusion?" Mitch responded with a few technical comments and then said, "Please, take another look at it -- maybe we can turn it around." Admiral Watkins replied: "We're dabbling in it a little -- but it's on the fringes of the fusion issue itself. We're looking at some of the other interesting aspects of the experiment which probably house some mysteries that need to be unlocked. It may or may not be fusion -- we don't rule out anything. But we've dropped way down in funding for it. . . ."

"Recalling the recent remarkable meeting in Japan (27 January), at which nuclear engineering Professor A. Takahashi of Osaka University and others reported spectacular heat results, I asked the Admiral, "Do you know what's going on in Japan?" Admiral Watkins said, "I talked to Will Happer {William Happer, Jr., the former Princeton University Physicist, since 6 August 1991 the Director of DoE's Office of Energy Research, who signed the November 1989 negative ERAB cold fusion report} who visited my offices and I asked him. Our people usually feel that he is pretty much on top of what is going on in Japan. He had just spent a long time in Japan. One of the big problems in Japan is they have not been sufficiently going after basic research. They have a very shabby infrastructure. They know they have a shabby infrastructure; they've got to beef it up. We've encourage them to beef it up. We said, 'You don't have enough Nobel laureates, you don't have enough people, and nobody wants to come here and do basic research science.' So when we hear a lot about basic research in Japan, we have to then almost shift to individuals. I don't know the particular scientist, but Will Happer from our Department knows them and I'll tell him to get back into it to see what they are doing . . ."

Then he characterized the current DoE role: "My guess would be what we are doing now is only to monitor what's going on in cold fusion, not to get engaged in .. {experiments}" He said DoE might be involved in some of the metallurgical issues or structure of palladium issues, **but he clearly was not informed about the latest work going on in the field.** In closing, I thanked him for his time and urged him to look at the materials that I had given him. He said, "O.K.," and thanked me. That was all.

Clearly, Admiral Watkins was in dire need of correct information about cold fusion research. If he were to personally examine the materials I gave him, there would be every reason for him to question the unsound assessment that the hot fusioneers, who surround him, have given him. But at least a channel of communication had opened, which we will be sure not to let close. . . .

It seems that at DoE it is "business as usual" on cold fusion. The DoE bureaucrats and hangers-on seem incapable of understanding that an energy earthquake is coming that will shake them to the ground. It is fascinating that the primary stated purpose of the administration's Nation Technology Initiative is "to promote U.S. industry's use of technology to strengthen the domestic economy and to compete in global markets; Federal agencies are joining together with the private sector." When will they wake up?

[The answer: When staff and advisors tell Secretary Watkins the truth about cold fusion. Ed.]

ANYON FUSION

By Chris Peacock

The fractional quantized Hall effect has for nearly 10 years been understood to be a consequence of the behavior of the phase component of the wave function of the participating particles, i.e. electrons (or the corresponding quasiparticles). One interpretation of this effect is that it represents the appearance of a powerful new gauge force operating at the quantum level between particles which otherwise strongly repel each other. Experimental investigations have been undertaken (inconclusively, as of 12 months ago) to try to determine whether the same model of anyons (intermediate between fermions and bosons) underlies the phenomenon of high-temperature superconductivity. The purpose of this note is to draw the attention of the Cold Fusion community to this body of work and to suggest that it may be worthwhile to construct similar models to attempt to explain Cold Fusion.

Fractional Quantum Statistical behavior has three necessary conditions for its appearance:

i) A population of identical particles,

ii) strictly confined to a two-dimension surface, and

iii) statistically transmuted by an operation which destroys temporal or spatial symmetry, or both.

In the putative case of high-temperature superconductivity, the identical particles are, of course, electrons (or holes), the two-dimensional surface is that of the superconductor itself, and the statistical transmutation accomplished by a type of trade with (hypothetical) external magnetic flux.

For a typical cell used in cold fusion experimentation, the same conditions can arise in different guise. The particles in question are, of course, either deuterium atoms or nuclei, the two-dimensional surface to which they are (at least transiently) confined is the surface of the electrode, and the symmetry breakdown accomplished, perhaps, by the flux of current across the same surface. Or consider cluster-impact fusion, where the particles once again would be deuterium (atoms or nuclei), the surface the time-dependent impact crater in the process of formation, and the symmetry destruction caused by the nature of the impact dynamics. It should be apparent that any reasonable and well-constructed environment satisfying the necessary conditions might be expected to manifest fractional statistical behavior.

Of course, the physical similarity itself can be suggestive, but may be coincidental, yet another parallel drawn from the area of high-temperature superconductivity may point to a possible explanation of a hallmark feature of cold fusion experiments: heat generation. Consider that a superconducting state represents a preferred correlated electronic motion - a type of liquid; the system of particles as a whole is in some (loose) sense bound. Were a similar situation to occur in the case of cold fusion, then in making a transition to a factional quantum state, the set of particles would be acted upon by an attractive force -- the potential energy of the system would decrease (effort would have to be expended to separate these particles), the surplus energy appearing in the form of heat. The exact mechanism for achieving heat would depend on a distinction not explicitly made thus far - whether the particles are atoms or nuclei. If they are atoms (or molecules?), perhaps the extra attractive force changes the nature of the atomic bond, allowing energy levels in the molecule to be lower than the usual atomic ground state. [Randell Mills' theory handles the idea of hydrogen electrons falling below the ground state.] If they are nuclear, we still have a situation of charged particles assuming a lower-energy state (by becoming bound). In either case, the mechanism would be charged particles radiating by dropping to lower energy levels. Note then, that "cold fusion" would accordingly release energy in two conceptually separate steps: partial overcoming of the Coulomb barrier by gauge forces due to a fractional quantum state, followed (possibly) by actual fusion releasing nuclear products, the probability of this raised by the countervailing anyon state in a straightforward way. Note also that if a significant fraction of energy is initially disposed of as heat, then the energies of the final nuclear products may be changed sufficiently to significantly alter the nature of the reaction in some way, even to the extent of changed branching ratios.

The interesting question, of course, would be the nature of the energy split-up between heat generation and actual fusion - a question relevant to theory as just discussed but also to potential technology implementation issues. If, as seems likely, the amount of energy available as liberated heat represents a small proportion (order of magnitude: a few percent or less) of the total energy available from actual fusion of the available particles, then it may make sense to concentrate research effort on transition from the anyon state to accomplishment of a high percentage of actual fusions, rather than on heat generation per se, as has been the case to date. Of course, this may, at least in principle, be easy to achieve since an increasing magnetic field which is orthogonal to a plane of anyon particles would tend to concentrate a set of charged particles without exerting forces which would tend to disrupt them from their planar confinement. Perhaps the ideal experiment to test this whole hypothesis would involve such a magnetic field applied to an explicit plane of (low temperature?) deuterium nuclei, confined, perhaps, by a pair of electrets with very uniform embedded positive

charge, facing each other at a distance of a few microns, the faces being very slightly concave. Application of the magnetic field (at the correct 'filling factor' - in analogy to FQHE [Fractional Quantum Hall Effect]) may induce anyon statistics, and thus heat generation and powerful intensification might results in a significant percentage of consequent fusions.

Of course, cold fusion may turn out to be a consequence of the intricacies of condensed matter physics, but the simplicity of the anyon fusion suggestion seems sufficient to warrant some initial experimentation.

REFERENCES

Frank Wilczek, "Anyons," *Scientific American*, May 1991, pp 58-65, and the accompanying references, as follows:

1. R.B. Laughlin, "The Relationship between High-Temperature Superconductivity and the Fractional Quantum Hall Effect," *Science*, **242**, pp 525-533, Oct 28, 1988.

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4. Goss Levi, "The Hunt for Anyons in Oxide Superconductors is Inconclusive," *Physics Today*, **44**, No 2, pp 17-20, Feb 1991.

6. B.I. Halperin, "The Quantized Hall Effect," *Scientific American*, April 1986.

F. LETTERS TO THE EDITOR

LETTER TO COLD FUSION RESEARCH ADVOCATES

From Henry P. Dart, III

[Mr. Dart is a retired attorney whose hobby is the study of science. He has contributed some novel ideas to some of his scientist friends. The following extract from his letter is used with his permission:]

". . . I enclose a copy of the article "Cold fusion isn't dead in the water yet" *Business Week*, March 2, 92, pg 90-92. This article is about as favorable to cold fusion as anything published recently in a journal of general circulation. Nevertheless, the tenor of the article is that, while cold fusion has a few adherents who firmly believe there is something to it, there is really no strong evidence to support it. It should be clear that a complete review of all of the facts by the Congressional Committee and a reversal or modification of the ERAB report will do much to keep cold fusion research alive without the necessity of government funding.

"Secondly, even if the government were inclined to finance cold fusion research, how would the money be allocated? And who would get the patent rights to any method developed through government funding? Will a new organization be formed similar to the hot fusion project? Or will cold fusion research simply be folded into that organization? Based on past performances, the active participation of the Federal Government in cold fusion would be the worst thing that could happen to us. All we want from the government at this juncture is to have the Congressional Committee cleanse cold fusion of the stigma that has been attached to it by the 1989 ERAB Report. We cannot even assume at this time that the Congressional Committee will do anything more than modify slightly the conclusions of the ERAB Report by finding that there is increasing evidence of a new source of energy that is poorly understood, and that research in this area is to be encouraged."

Henry Dart also suggests that the Cold Fusion Research Advocates could become a permanent dues paying organization and continue its cold fusion advocacy. [*Fusion Facts*, has taken the editorial position that if the government (read DoE) knew the truth about cold fusion and shared that truth with the media, then business and industry would fund cold fusion. Except for the support of educational research, and specialized military and space applications, there is no need for government funding of cold fusion. Ed.]

ELIMINATE THE MAD HATTERS

From Dr. Samuel Faile

Employees of companies making felt hats formerly used mercury to process the felt. Brain damage to such workers from mercury poisoning lead to the terms "mad as a hatter" and "mad hatters." A recent article in the *New York Times* stated that the continued use of fossil fuels could raise the amount of mercury in the atmosphere to dangerous levels by 2070. The effect would be to cause brain damage on a worldwide basis.

The obvious answer is the development of cold fusion energy systems as a replacement for the burning of fossil fuels. Fortunately, some enlightened energy companies (such as Southern California Edison) are quietly researching cold fusion. These companies could have a bright future by supplying cold fusion systems for energy and preserving their fossil-fuel resources for chemical feedstocks.

DoE STILL POSITIONED AT NO GO

Courtesy Jed Rothwell

Readers will remember that an 8-year DoE veteran [Dr. Gajewski] in the alternative energy projects office was transferred when he had the temerity to suggest that some funds were available for cold fusion studies. In a February 10, 1992 letter to Jed Rothwell, Walter M. Polansky (Director, Division of Advanced Energy Projects, DoE) writes the following: "The November 1989 report of the cold fusion panel recommended against any special Department of Energy funding for the investigation of phenomena attributed to cold fusion. . . . We have been monitoring the cold fusion research area since the issuance of that report and believe that its recommendations are still valid. We continue to be available to review any research proposal **of interest to the Department** [bold by Ed.]"

Jed Rothwell replies to Polansky as follows: ". . . you state that, 'the cold fusion panel was sympathetic towards modest support for ... experiments.' I am in communication with every top cold fusion scientist in the world, and to the best of my knowledge the Department of Energy does not sponsor *any* research in cold fusion, at any laboratory. If I am incorrect, please supply me with names and telephone numbers of researchers working in this area."

[*Fusion Facts* has reported on a DoE grant given to Dr. Harold Weismann of Brookhaven Laboratories. At Brookhaven, Dr. James McBreen reported positive results with cold fusion experiments and Dr. Harold Weismann reported negative results. DoE made fund available to Dr. Weismann [to continue his negative findings?] The largest cold fusion study that has been funded by DoE has been to Dr. Steven Jones at Brigham Young University to study volcanic emissions in search for evidence of tritium production etc. However, certain discretionary funds have been made available for cold fusion research at Oak Ridge and Los Alamos National Laboratory with positive results. Some DoE work is continuing but the term cold fusion is not being used. Ed.]

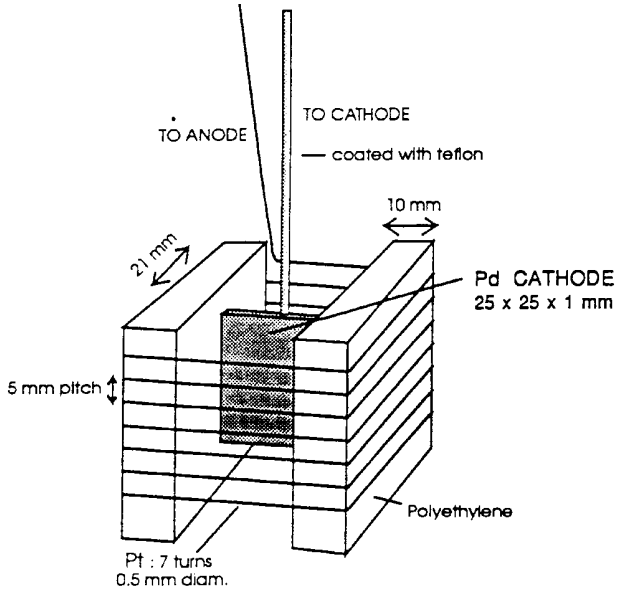
PROGRESS IN ITALY

From Jed Rothwell

Received February 26, 1992

"There is excellent news from Italy. Dr. Ikegami was there last week, and he gave a press conference which was attended by about 100 reporters. The newspaper *La Republica* wrote three big, positive articles about Takahashi [his experiments] and cold fusion."

DRAWING OF THE TAKAHASHI EXPERIMENT



[Redrawn from faxed drawing. Ed.]

REPLICATING THE TAKAHASHI EXPERIMENT

Courtesy of Jed Rothwell & Gene Mallove

The following questions and answers relate to information by which the Takahashi experiment might be replicated:

1. Q. Time to replicate?
A. Six weeks should be plenty of time.

2. Q. Loading time?
A. No one has replicated is yet, so we cannot be certain the experiment can be replicated easily or not. There was a report that the cathode was changed out, but that is not exactly accurate; the story is more complex.

3. Q. Closed cell or open cell?
A. It is an open cell and not pressurized. I add 150 cc of D_2O per week.

4. Q. Construction materials?
A. The cell is an Acrylite container. "Acrylite" is commercial name for acrylic glass. The heat transfer pipe is pyrex glass.

5. Q. Concentration of LiOD?
A. Use 0.3M LiOD (as contrasted to 0.1M as used by Pons and Fleischmann). The high concentration of LiOD increases the electric current. I thought it would be a good idea to make the current as high as possible.

6. Q. Processing of Pd?
A. I used the Pd from Tanaka Kinzoku "as is," with no special processing. They specify that it is pure cold-

worked Pd. We took the usual precautions (wearing surgical gloves to remove Pd from plastic wrapper,) but they did not ship it to us in any special container (like a container filled with argon), and we did not use a glove box to open the Pd, or anything like that. We exposed the Pd to air. No special processing used. We washed the Pd off with acetone and put it into the cell.

7. Q. Does an amount of LiOD form a precipitate? A. A precipitate forms at room temperature. When the cell heats up, the LiOD goes back into solution.

8. Q. Anode size & shape?
A. It was 0.5 mm platinum wire, coiled in 7 turns 1 cm from the Pd plate. I think that any Pt wire will do, just get some locally. [It was agreed that it would be best to get the same type of Pd from the same vendor.] One tricky part is the platinum wire attached to the cathode. We covered over a couple of centimeters of that wire with teflon to keep the current from going from anode into the Pt lead, instead of into the Pd cathode.

9. Q. Electrical current description?
A. We started with "sawtooth" (not square wave) going from 0.25 to 5.0 amps every 20 minutes. We continue this for one week. We started getting heat around day 5. After day 7 we changed to 6-hour low-high operation (this is a square wave). We think that the sawtooth input "softens up" the Pd, making it more permeable to the deuterons.

10. Q. Shape of cathode?
A. The shape of the cathode is critical. I think this is a near-surface phenomena, so the more surface you have, the better. A thin, broad plate works better than compact one. The edges? I suppose the concern here is about uneven loading. I did not worry about that. The edges are square, sharp, just as they came from Tanaka Kinzoku. I did not do anything to the plate.

11. Q. Heat removal?
A. The flow rate of cooling water was 10 liters per minute at 20 C. The cooler should have a heat-removal capacity of about 400 watts.

EDITORIAL COMMENTS: WARNING! Use sufficiently large heat-removal equipment. Use safety procedures. **BE CAREFUL!**

In one of the major points made in a two-page article addition to the Japanese version of *Scientific American*, it was pointed out that the heat output density from Takahashi's palladium is ten times higher than power density of a fission reactor fuel rod. [This quote is open to question. In a visit to the University of Florida at Gainesville, Dr. Schoessow showed us a nuclear fission reactor fuel rod that put out a reported 1500 watts per linear inch of the fuel rod. Ed.]

Note: Fire From Ice refers to the "deafening silence from Japan" at the end of 1989. Jed Rothwell notes, "I think it boils down to this - Americans don't speak Japanese, so we do not know what is going on over there. They do not keep so many secrets, we just cannot understand what they are talking about." *Fusion Facts* is most grateful to Jed Rothwell who is translating and sharing so many cold fusion items, from Japan and elsewhere, with us. Ed.

LATE NEWS FROM JAPAN
From Jed Rothwell

Received March 10, 1992
Here is another news flash: The Japanese journalist Nakano, just published a two-page cold fusion update article in *Bungeishunju*. He says, among other things, **"I do not see any reason to continue hiding this fact: the Japanese company Technova has been working on cold fusion since 1989, and it has hired Pons and Fleischmann."**

LETTER FROM JAPAN
From Dr. Takaaki Matsumoto

February 28, 1992

The Spring meeting of Japanese Atomic Energy Society will be held on March 28-30 at Tokai University near Tokyo. We have four presentations about cold fusion. I expect that many more studies will be presented this time. As soon as preprints are obtained, I will fax them to you.

[For further information about this meeting, Dr. Takaaki Matsumoto is a professor in Dept of Nuclear Engr'g, Hokkaido University, Sapporo 080, Japan. Tel 011-716-2111 (ext 6682) or fax 011-736-2858.]

G. CONFERENCES, PAPERS & MISC.

2ND ANNUAL CONFERENCE PROCEEDINGS

Tullia Bressani, Emilio Del Giudice, Giuliano Preparata, Editors, VOLUME 33 - THE SCIENCE OF COLD FUSION, Conference Proceedings published by Societa Italiana di Fisica, 46 figs, 528 pages, ISBN 88-7794-045-X.

Three years after the first announcement by Martin Fleischmann and Stanley Pons, it is possible to make a balanced appraisal of the discovery of cold fusion. This book contains the *Proceedings of the Como Conference.* Through the language of science, hints are presented of the subtle and fascinating mechanism by which an enormous amount of energy is stored inside matter and the difficulties met in trying to unlock this treasure.

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THIRD ANNUAL COLD FUSION CONFERENCE

We have included in this mailing of *Fusion Facts* a separate sheet telling about the Nagoya conference and providing our readers with a form to use for papers and/or attendance.

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New from the Fusion Information Center is *Fusion Briefings,* a 3.5 page newsletter, that is a monthly digest of cold fusion developments. Written with the lay person in mind, it is an overview of what is happening in the areas of research, business, patents, and the companies involved with cold fusion. Designed for the manager who needs to be aware of cold fusion development, but does not require all of the technical details, *Fusion Briefings* lets him track the developments that will have the most impact on his business.

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