

# FUSIONfacts

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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5th International Conference on Cold Fusion  
2nd Russian Conference on Cold Fusion and Nuclear Transmutation

Science seldom proceeds in the straightforward logical manner imagined by outsiders. Instead, its steps forward (and sometimes backward) are often very human events in which personalities and cultural traditions play major roles.

*James D. Watson*

## **A. FIRST PATENT ISSUED**

During 1992, *Fusion Facts* tried very hard to determine why the patent office was treating cold fusion in such a peculiar manner: Applications were returned with citations of the infamous MIT paper (Alagli, and 15 other Ph.Ds), New York Times article, Washington Post article all stating that cold fusion doesn't work. In a phone conversation with the supervisor of the section that handles cold fusion patent applications, he was asked why the patent examiners did not use the numerous positive articles from *Fusion Technology*, *Nuovo Cimento*, *Journal of Electroanalytical Chemistry*. His answer was, "I guess our people don't have access to these publications." So we telephoned the library at the patent office and asked the head librarian if these publications were available. They were!

The conclusion, here at *Fusion Facts*, was that someone or some group in Washington has a great deal of influence. It appeared that this influence was so remarkable that it could be used to usurp the constitution of the United States that guarantees its citizens the right to protect their inventions and to copyright other intellectual property. We knew that we did not have that kind of influence over the patent office. Someday, perhaps, there may be an investigation of this kind of influence. Would it be called **PatentGate?**

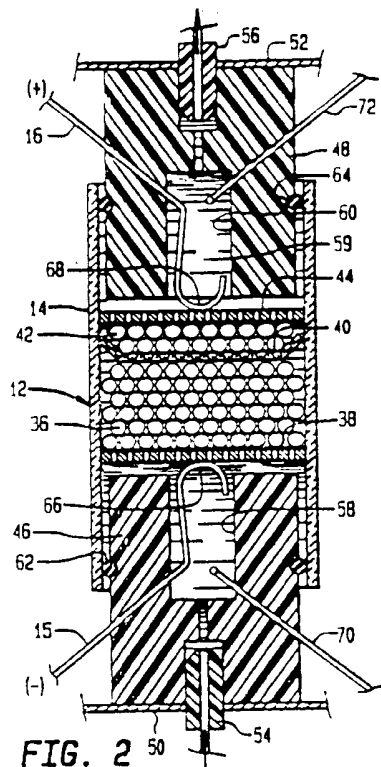
One should consider the accuracy of the three papers most often quoted by cold fusion "skeptics." Although the MIT paper reported negative results, it was shown in an article by Dr. Mitchell Swartz (*FF*, Aug. 92, pp 27-40) that the data had not been correctly evaluated. In additional analysis of both the Harwell and the Cal Tech data, it was also shown (by Noninski) that excess heat in their experiments had been produced but not recognized (or perhaps ignored).

Regardless of past problems, we are pleased to report that "An electrolytic cell and method of electrolyzing and heating water..." has been patented. See the following:

James A. Patterson (Sarasota, FL), "Method for Electrolysis of Water to Form Metal Hydride," U.S. Patent No. 5,318,675, appl. 20 July 1993, issued 7 June 1994. 13 pages, 14 figs.

#### AUTHOR'S ABSTRACT

An electrolytic cell and method of electrolyzing and heating water containing a conductive salt in solution. The electrolytic cell includes a non-conductive housing having an inlet and an outlet and spaced apart first and second conductive forminous grids connected within the housing. A plurality of non-conductive microspheres each having a uniformly thick outer conductive palladium layer thereon are positioned within the housing in electrical contact with the first grid adjacent the inlet. An electric power source is operably connected across the first and second grids whereby electrical current flows between the grids within the water solution.



Also of interest are Mr. Patterson's earlier patents:

James A. Patterson, "Improved Process for Producing Uniformly Plated Microspheres," US 4,943,355, 16 May 1989, 24 July 1990, 6 pp; and "Metal Plated Microsphere Catalyst," US 5,036,031, 28 Sept. 1989, 30 July 1991, 6 pages, have the same abstract and only vary in their claims.

#### AUTHOR'S ABSTRACTS

Cross-linked polymer microspheres are carefully separated into fractions of equal size and density by first using sieves and then using hydraulic separation in a cone. Each fraction is separately plated with copper. The copper plated microspheres are again separated into fractions of equal size and density. Each fraction is then given an additional metal plating. The thus plated microspheres have uniformly thick plating and have a maximized surface area for the amount of metal plated making them particularly useful as catalysis or in electrical products or processes. Microspheres having a plating of palladium exhibit a marked improvement in the adsorption of hydrogen both quantitatively and in rapidity.

### B. CALIFORNIA - DEMONSTRATION PROTOCOL

Courtesy of the author

Robert W. Bass (Metamatter Corp., Thousand Oaks, CA), "Five-Needles' Definitive Cold Fusion Demonstration Protocol," pre-print.

Step 1. Prepare a cathode of pure multiply-annealed (crack-free) palladium, dimensions 10 cm long, 0.5 cm wide, and 0.1 cm thick. Hint: Recall the first successful experiments of Prof. Robert Huggins of Stanford University, in which he repeatedly annealed and manually reworked a palladium sample *in vacuo*, using a glove-box, in order to expel all gaseous impurities and remove cracks.

Step 2. Gently load said cathode with deuterium in a Fleischmann-Pons electrolytic-cell manner, until beta phase is attained and cathode becomes  $PdD_1$  or at least  $PdD_{0.95}$ . Hint: Recall M. McKubre's resistivity test for assurance of at least 95% of full loading, as well as F. Will's volumetric-swelling test; also note the many

published warnings of D. Cravens *re* fatal mistakes to avoid.

Step 3. Quick-freeze said cathode by sudden pouring of liquid nitrogen upon it (*in situ* to inhibit de-loading), and thereafter maintain the  $PdD_{0.95}$  frozen. Hint: See 1992 paper by J. Bockris et al., who pioneered this freezing technique.

Step 4. Saw frozen  $PdD_{0.95}$  slab into 5 parallel "needles," 0.1 cm wide.

Step 5. Attach electrodes to bottom and top of  $k^{\text{th}}$  needle ( $k=0, 1, 2, 3, 4$ ) and pulse for times  $t_k = k\tau$  (where  $\tau = 1 \mu\text{sec}$ ), with a preselected fixed current of  $I$  amperes, at a preselected potential difference  $E_{112} = 17.0$  volts. Note: According to the Turner-Bush-Bass Resonant Transparency Spectrum, this provides the energy-level 112, above ZPF ground-state, of Coulomb Barrier transparency.

Step 6. Saw each needle in half and send all 10 pieces, in a double-blind protocol, to INDEPENDENT test labs for physical, chemical assays of  $^4\text{He}$  content.

Step 7. Evaluate results by assigning  $^4\text{He}$  amounts of  $A_k$  for  $k^{\text{th}}$  needle.

Step 8. Define\*  
 $(\langle A_0 \rangle, \langle \Delta A \rangle, \sigma)$  by  $\langle A_0 \rangle = (3A_0 + 2A_1 + A_2 - A_4) / 5$ ,  
 $\langle \Delta A \rangle = (-2A_0 - A_1 + A_3 + 2A_4) / 10$ ,

$$\sigma = \left( (1/3) \cdot \sum_{k=0}^4 (A_k - \langle A_0 \rangle - k \cdot \langle \Delta A \rangle)^2 \right)^{1/2}$$

Step 9. Judge experiment successful if  $\langle A_0 \rangle \ll \langle \Delta A \rangle$  and  $3\sigma \ll \langle \Delta A \rangle$ , in which case one CONCLUDES that with greater than 95% confidence  $A_k / \langle \Delta A \rangle \cong k$ ,  $0 \leq k \leq 4$ , so the amount of helium-4 freshly created in  $PdD_{0.95}$  is proportional to the number of deuterons in the deuterium-lattice raised to the energy-level  $E_{112}$ .

\* Derivation: Define  $\Sigma_0 = A_0 + A_1 + A_2 + A_3 + A_4$ ,  $\Sigma_1 = A_1 + 2A_2 + 3A_3 + 4A_4$ , and differentiate  $\sigma$  with respect to  $\langle A_0 \rangle$  &  $\langle \Delta A \rangle$  and set both expressions to zero to obtain  $\langle A_0 \rangle + 2\langle \Delta A \rangle = \Sigma_0 / 5$  &  $\langle A_0 \rangle + 3\langle \Delta A \rangle = \Sigma_1 / 10$ , which are trivial to solve in the form  $\langle \Delta A \rangle = (\Sigma_1 - 2 \cdot \Sigma_0) / 10$  &  $\langle A_0 \rangle = (3 \cdot \Sigma_0 - \Sigma_1) / 5$  as claimed.

## C. EDITORIAL: POLLUTION SOLUTION

World Harmony International (P.O. Box 361, Applecross, 6153, Western Australia) is planning an October, 1995 **POLLUTION SOLUTION SUMMIT CONFERENCE** to be held in Port Douglas, Queensland, Australia. *Fusion Facts* and our readers have been asked to participate.

You have heard it said that the world is facing a **paradigm shift** (a model shift). This means that the generally-accepted view of the physical universe (a composite of many models) will change **and be improved**. There is some evidence that this change will modify some of the following:

1. The constancy of the speed of light.
2. The concept of an ether (accepted in late 1800s, rejected in early 1900s, gradually reinstated.)
3. The concept of the atomic nucleus and its changes.
4. The concepts of gravity, mass, and inertia.
5. Many concepts relating to condensed matter, especially the metal lattice.
6. A redefinition of the "Coulomb barrier" (a static concept) into a penetrable charge field (a dynamic concept.)
7. The concepts of "proton capture," "nuclear catalysis," and "isotopic shifts."

Along with the **paradigm shift**, (accelerating it) will be a procession of new devices and systems that are now threatening to emerge from the laboratory into the engineering design rooms. Among these new devices and systems will be such new items as room temperature superconductivity, super batteries, sonic levitation, solid-state energy-producing devices, and "new hydrogen energy" (cold fusion) systems. Designers of new devices and systems may not wait until the theory has matured or until there is general scientific acceptance of these devices. Profit-seeking entrepreneurs are not noted for waiting for academic approval before fabricating new products. "If it works, use it," is a more characteristic attitude.

Currently, there are several groups that have displayed demonstration devices in technical conferences or in their own laboratories. By the fall of 1995, it is expected that there will be some or all of the following to demonstrate:

- a. Heavy water electrochemical heaters.

- b. Light water electrochemical devices performing "proton capture."
- c. Heat from sonoluminescence and from "cavitation."
- d. Efficient new permanent-magnet motors/generators.
- e. Space energy devices (both rotating and solid-state.)
- f. Electromagnetic systems that affect gravity.
- g. New sonic and magnetic levitation.

It will not be new nuclear powerplants, hot fusioners, oil-burning engines, solar engines, nor the whirling propellers of wind mills that will clean up this polluted world. It will be a new breed of young engineers, building on the developments of a few renegades, that will change this world. However, the process needs your help.

**We invite our readers to write to *Fusion Facts* about any devices or systems that you will have ready to demonstrate by the fall of 1995. You, our readers, are some of the most likely people in the world to solve the energy problems, produce new energy systems, and have demonstration devices or systems ready to show.**

Our goal is to provide rapid exchange of information so that you can do your job better, faster, and cheaper. Your goal, hopefully, will be the development of new energy systems and more reasonable methods of producing, storing, distributing, and using that energy. Let us know if you plan to have a working demonstration by the time of the **Pollution Solution Summit Conference** in late 1995. In turn, we will keep you informed about the latest publishable events in cold fusion.

Another aspect of this conference is a full-day's session on the impact of new technology (or the paradigm shift) on the world, its people, its industries, and its environment. We at *Fusion Facts* are pleased to note that early in our publishing history we published a series of "impact articles." These articles began the book Cold Fusion Impact in the Enhanced Energy Age which has been translated into Russian, Spanish, and now German. (The Russian edition sold out.) We are pleased to note that this book is one of the first serious discussions of the impact that new energy systems will have on many aspects of our world and its industries. Hal Fox, the author, has been invited to participate in the "Pollution Solution" conference. The bibliographic information that accompanies the Impact Book (compiled mainly from the

pages of *Fusion Facts*) now numbers over 2,000 references. By the time of the conference another 500 references will probably have been added to this collection. It is planned to have the entire contents of *Fusion Facts* for the six-years of publishing (by July 1995) available on computer media as a research tool for the attendees and sponsors of this conference.

Please write and tell us how you can help.

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## D. NEWS FROM THE U.S.

### SOMEWHERE - WHISPERS FROM THE GRAPEVINE

We have heard from several sources that a U.S. laboratory has replicated the work of Japanese scientists and have obtained significant amounts of excess heat from proton conducting materials. As reported in *Fusion Facts* in February, 1994, a report given by Mizuno et. al, during the ICCF-4, showed that certain combination of materials could be processed and provide amounts of excess heat that were hundreds of times larger than input electrical power. If the rumors are correct, then this replication is another significant achievement in the continuing development of cold nuclear fusion. Apparently, the replication is combined with new discoveries that should be properly protected by appropriate patent applications before a public disclosure is made.

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### DEEP DIRAC DISAGREEMENT

R.A. Rice and Y.E. Kim (Purdue) and Mario Rabinowitz (EPRI), "Comments on 'Electron Transitions on Deep Dirac Levels I'" by J.A. Maly and J. Vavra, *Fusion Tech*, vol 26, no 1, Aug. 1994, pp 110-112.

### COMMENTS

In a recent paper, the authors claim the existence of deeply bound electron energy levels in hydrogen-like atoms resulting from previously neglected solutions of both the relativistic Schrödinger and Dirac equations. In this letter, we show that these solutions are unphysical, and thus, these deeply bound energy levels cannot exist.

...In Summary, we have shown that the deep Dirac orbits do not exist. They are an artifact due to the incorrect use of the irregular solution of the relativistic Dirac equation and the total neglect of the regular solution. Furthermore, even if such orbits existed, this does not keep the problem in the domain of exotic chemistry with the avoidance of nuclear effects and the nuclear ash problem. Such tight orbits would be expected to produce considerably high fusion rates.

#### RESPONSE BY MALY AND VAVRA

...In summary, [the Comment above] was completely in error because based on formulas provided in it, one cannot determine any ratio between the constants C and B. [One certain equation] is simply wrong.

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#### CALIFORNIA - ANALYSIS OF PSI EXPERIMENT

*Chemical Abstracts*, vol 120, 1994

T. Case, K.M. Crowe, K. Lou, C. Petitjean, W.H. Breunlich, M. Jeitler, P. Kammel, B. Lauss, and J. Marton, et al. (Lawrence Berkeley Lab., Berkeley), "Systematic Analysis of the PSI Experiment to Directly Measure the Sticking Probability  $\omega_s$  in dt Fusion," *Hyperfine Interact.*, 1993, vol 82, no 1-2, pp 295-302.

#### AUTHORS' ABSTRACT

Starting in 1989 an experiment was run at PSI to directly measure the final sticking probability in muon catalyzed dt fusion. This experiment was based on an "active-target" ionization chamber (IC) built at Gatchina, Russia, and an array of plastic neutron counters. In three runs approximately  $5 \times 10^6$  isolated alpha signals were recorded with around one half of these occurring in the inner chamber region where the authors have more complete understanding of the systematic errors. Particularly from a long run in 1992 the authors were able to obtain a very clean sticking peak of some 5000  $\mu\alpha$  events. However, to reach an accurate value of sticking, all systematic effects and several major backgrounds had to be understood in detail. To this end a Monte Carlo code was written to simulate the full electrostatic environment of the IC and to recreate completely each signal type including the actual tritium decay noise from the live experiment. A slightly model dependent value of approximately  $0.56 \pm 0.04\%$  is obtained for final sticking.

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#### CALIFORNIA - BRACKISH WATER ELECTROLYSIS

Courtesy of Dr. Samuel Faile

David L. Spines, "Hydro-Energy via Water Reclamation Proposal," unpublished manuscript, 4 pages.

#### EDITOR'S COMMENTS

David L. Spines of Sacramento, California suggested in 1969 that the 5% of the then waterways that were unfit for swimming, fishing, or drinking be converted to H and O by electrolysis and that the H be burned to create energy. Today, says Spines, the matter is worse and the unfit waterways have increased to 30%. Electrolysis of water requires the use of high-cost electricity. If the hydrogen and oxygen were reused in a fuel cell about 70% of the electricity could be returned to the grid (at times convenient for the production of electricity). The storage costs of the hydrogen would have to be included in the costs of cleaning up the water. Spines cites the use by Tewari of India of an N-machine that reportedly gets twice as much electricity out as input to the N-machine. Spines suggests that the use of this or similar technology would make sense in providing the electricity for cleaning up the contaminated waterways.

Many times we engineers provide good engineering solutions but ignore the economics. Even when we work out the economics, we sometimes forget to include the cost of capital. It is suggested that with some of the new energy technologies now being developed (cold fusion or tapping space energy) it will become feasible to treat water by either making steam or by electrolysis. When you make your calculations for the cost of water treatment, it is wise to include 10% per annum of the total cost of the project as the cost of capital. The concept is that a project must return some degree of profits to those who will finance the project. Another suggestion is to place the burden of cleaning up the waterways on those who are dumping pollutants into the waterways. With the coming commercialization of either cold fusion and/or space energy devices, the cost of energy will be much lower, **but never free**. Our best estimates are that the cost of non-polluting energy will be about one-fourth to one-third the present energy costs or about 3 to 4 cents per kilowatt-hour. It requires about 0.7 kilowatt-hours of electricity to raise 1 liter of water from 40° C to boiling and convert to steam. (Roughly 3

kW per gallon). At the low price of new energy, the cost of boiling water is roughly 10 cents per gallon. That is fairly expensive water, but legislation could promote the use of less water in industry if they were required to only provide steam. The cost of electrolysis would be about seven times larger than the cost of boiling water, however, the use of the hydrogen as fuel could recover perhaps 50 or 60 percent of that cost.

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## INDIANA - WATER-FUEL TECHNOLOGY

Courtesy of Stan Meyer

The latest "International News Release" about the Water Fuel Cell technology (dated May, 1994) suggests that "Military funding is anticipated." This eight-page news sheet reports that Meyer has moved cautiously and quote Meyer as saying, "If any part was blocked by a foreign entity or patent-filing irregularity, the entire process could be blocked." The news sheet cites 13 U.S. patents ranging from number 3,970,070 (Solar heating system) to 5,293,857 (Hydrogen Gas Fuel Management System).

A picture of the Water Powered Car has the caption, "The water-powered dune buggy is now being retrofitted with an up-graded Water Fuel Injection System™ utilizing the latest **E-Prom** electronics computer technology to match the acceleration performance of gasoline-drive cars. Funding is being sought for the Water Fuel Cell International Product Development Center and Trade Center."

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## NEW YORK - LATEST ON GUNNERMAN

Otis Port, "Engines That Run on Water?" *Business Week*, 8 Aug. 1994, p 47.

### SUMMARY

Rudolf W. Gunnerman and his A-55 fuel are the subject of this one-page article in a major business magazine. Gunnerman has spent over \$6 million in researching a fuel that is 55% water, but apparently makes internal combustion engines run more efficiently than ever. Caterpillar, Inc. has recently formed a joint-venture with Gunnerman's Reno company, A-55, to further research the fuel.

The water and gas are mixed using 5% of a secret emulsifier, and burned in a system with specifically adjusted fuel-injection and a small piece of nickel affixed in each cylinder. It's all a patented process, and if tests done by Reno city busses, Minnesota Transportation Department and Caterpillar are to be accepted fully, that patent is worth a bundle. "If this proves out, it could reduce the U.S. trade deficit by almost half, by eliminating the need to import oil," says John D. Peters, from the Minnesota Transportation Department.

In Reno, one city bus began using Gunnerman's fuel on October 5, 1993, until February 22, 1994: over 11 thousand miles. The engine was then removed and sent to Caterpillar for study. Records show a 29% mpg increase with no unusual engine problems. In Minnesota, Gunnerman's team mixed up a fresh batch of fuel with local tap water and used it to run a model 453 engine from Detroit Diesel. Skeptic Gregory Felt, chief operations engineer for the state Transportation Dept., said, "it had the cleanest exhaust I've ever seen coming out of a diesel. If it really does what it seem to, this is big."

Converting an existing engine to use A-55 fuel would cost less than \$500, including a computer-chip controlled fuel injection system that would allow you to still use regular gasoline if A-55 was not available.

Gunnerman hasn't stopped with the A-55 fuel. His next project is a fuel that would eliminate gasoline itself, and run an engine on naphtha and water. Naphtha costs about 50% of gasoline to produce. The major oil companies won't like this one, either.

Summary by D. Torres

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## NEW YORK - PROTON INSIGHT WITH HERA

Faye Flam (science writer), "The Inner Sanctum of the Proton," *Science*, vol 264, no 5167, pp 1843-1844.

### SUMMARY

The interior of atomic particles has been a mystery, and only now is beginning to be somewhat understood. A tool that is making this possible is the Hadron-Electron Ring Accelerator (HERA) at DESY, the German particle physics laboratory near Hamburg.

Scientists had already known about the proton's main constituents, the three objects known as quarks in each proton. Being so much smaller than the proton, the quarks are like grains of sand in a sea of space, with lots of room to have other activity going on. But until now scientists haven't had the tools to enable them to see what is there. The only theory to help explain it all was the "messy and poorly understood" theory of quantum chromodynamics (QCD). So, it was still a mystery.

HERA's international team of researchers have found a surprisingly active inner life for the proton (and, by inference, the neutron). They have recorded mysterious collisions in which electrons ricochet off an unidentified object within the proton's inner space. The three familiar quarks (known as "valence" quarks) exist in a surprisingly dense space filled with short-lived "virtual" quarks that wink in and out of existence. Yet most of the electrons traveled through the protons as if they weren't there. As far as figuring out how many "virtual" particles there are in a proton, the math is just too complicated to have been solved as yet.

So HERA surprised physicists with the bustling crowd of virtual quarks and their attendant gluons (force carrying particles which bind quarks together) that they believe to be in the proton. Because HERA accelerates both the protons and electrons and collides them head-on, it can achieve about 100 times the collision energy of the former fixed-target experiments, therefore enabling the size-scale to be 100 times smaller than ever before.

From all the new evidence, and the records of the outcomes of thousands of collisions, researchers can get an impression of a "sea" of virtual quarks and gluons that is extremely active. One physicist commented on evidence for about 30 gluons and three or four virtual quarks at any given time. Since this could not have been predicted by current theory, the research will have a profound effect on the understanding of protons and neutrons.

There's also an unidentified object whose presence is inferred by a strange set of collision tracks. In these collisions, the electron seems to bounce off something within the proton, and a very sparse particle jet suggests that something has been knocked out of the proton. But the proton does not disintegrate. This was totally unexpected. Theorists have guessed that the cause may be a "pomeron," a particle theorized in the early 60's but

set aside when quarks were identified as the proton's internal components. Nobody has really known what the pomeron might be. It is thought possible, though completely unexpected, that it might be a temporary clump of gluons. Nothing in established theory predicts it.

Particle physics is treading new areas that theory has not covered before. Continued experimentation with HERA will revolutionize some of the currently established research techniques, in addition to the old theories.

Summary by D. Torres

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## TEXAS - JOHNSON SPACE CENTER

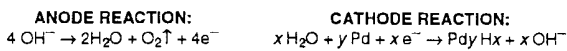
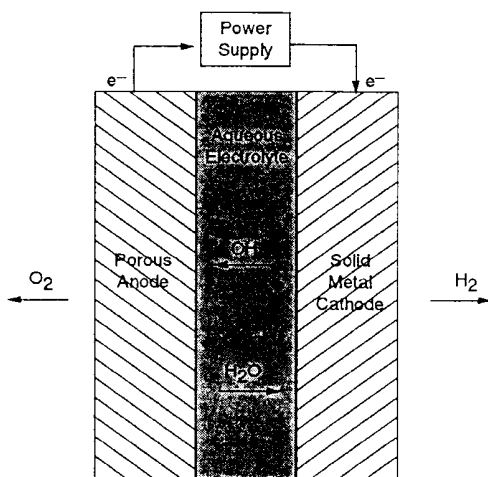
Courtesy of R.W. Lowrie, 19001 Lowrie Lane  
Dade City, FL 33525

### Generating High-Pressure Oxygen Electrolytically

*The cathode is also a barrier that lets gases be collected at widely differing pressures.*

An electrolytic cell generates oxygen directly at high pressure at the point of use. The system makes it unnecessary to use a heavy, bulky air compressor or to ship compressed oxygen in heavy tanks. It produces hydrogen as a byproduct, at a pressure that may be different from that of the oxygen, if desired. The cell has been demonstrated in a 4.5-hour endurance test, in which it stably produced oxygen at a pressure 6,000 lb/in<sup>2</sup> (40 MPa) higher than that of the hydrogen at a potential of 1.865 V, a temperature of 186°F (359 K), and a current density of 47.8 mA/cm<sup>2</sup>.

The cell dissociates water into component elements by supplying electrons through a solid palladium cathode and removing electrons through a porous anode (see figure). An aqueous alkaline electrolyte carries current, in the form of hydroxide ions (OH<sup>-</sup>), from cathode to anode. O<sub>2</sub> is generated at the anode, passes through the porous anode material, and is collected. Hydrogen is generated at the cathode, depositing on its surface as ions (H<sup>+</sup>), which combine with palladium atoms to form a palladium hydride (PdH) transition complex. The hydrogen ions diffuse through the solid metal cathode by repeatedly associating with, and dissociating from, Pd atoms in the crystal lattice. When the hydrogen ions reach the outside edge of the cathode, they combine to form gaseous H<sub>2</sub> which is collected. The cathode



Anode and Cathode Reactions Produce gaseous oxygen and hydrogen, respectively. A power supply removes electrons from the porous anode and supplies them to the solid-metal cathode. The aqueous electrolyte between the electrodes completes the circuit by carrying ( $\text{OH}^-$ ) to the anode.

transmits hydrogen efficiently. In the endurance test, the amount of  $\text{H}_2$  produced was 93.7 percent of the theoretical value based on the amount of electrical charge transferred.

Because there is a solid metal barrier -- the palladium cathode -- between the  $\text{O}_2$  and  $\text{H}_2$  collection compartments, the collection compartments can be operated at different pressures. The differential pressure is limited only by the mechanical strength of the barrier.

This work was done by F.H. Schubert and D.J. Grigger of Life Systems, Inc., for **Johnson Space Center**.

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non exclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Johnson Space Center, Edward K. Fein, MC-HA, Houston, TX 77058. Refer to MCS-21577.

NASA Tech Briefs, August 1994

## E. NEWS FROM ABROAD

### AUSTRIA - KINETICS OF $\mu\text{CF}$

*Chemical Abstracts*, vol 120, 1994

P. Ackerbauer, J. Werner, W.H. Breunlich, M. Cargnelli, M. Jeitler, P. Kammel, J. Marton, N. Nagele, A. Scrinzi et al., "The Kinetics of Muon-Catalyzed dt Fusion," *Hyperfine Interact.*, 1993, vol 82, no 1-4, pp 357-372.

#### AUTHORS' ABSTRACT

A main source of information about the muon-catalyzed fusion cycle in D-T mixtures are the cycling rates  $\lambda_c$ , which are characteristic for the kinetic equilibrium of states attained rapidly in dense targets. The measurement, analysis and interpretation of these rates will be discussed, concentrating on the extensive set of rates observed at PSI over the last decade in gaseous, liquid and solid targets.

### AUSTRIA - EPITHERMAL EFFECTS COMPARISON

*Chemical Abstracts*, vol 120, 1994

J. Jeitler, W.H. Breunlich, M. Cargnelli, P. Kammel, J. Marton, N. Nagele, P. Pawlek, A. Scrinzi, J. Werner et al., (IMEP, Aust. Acad. Sci, Austria), "Epithermal Effects in Muon-Catalyzed dt Fusion: Comparison of Experimental Data with Theoretical Predictions," *Hyperfine Interact.*, 1993, vol 82, no 1-4, pp 391-406.

#### AUTHORS' ABSTRACT

Very high  $\text{dt}\mu$  molecular formation rates for epithermal (i.e., not thermalized) muonic tritium atoms have been observed in experiments and are predicted by theory. The present detailed analysis shows qualitative agreement although further calculations will be needed to reach a complete understanding of all processes involved. The importance of epithermal effects for a correct description of muon-catalyzed fusion phenomena has been confirmed.

### AUSTRIA - $\mu\text{CF}$ & HYPERFINE EFFECTS

P. Ackerbauer, W.H. Breunlich, M. Fuchs, et al., (Inst. Mittelenergiephys., Oesterr. Akad. Wiss., Vienna,



Austria), "Survey of Experimental Results on  $\mu$ CF Including Hyperfine Effects", *Hyperfine Interact.* 1993, vol 82, nos 1-4, pp 243-258, 48 refs.

#### AUTHOR'S ABSTRACT

Complementary to the investigations of the most efficient dt cycle, the other muon-induced fusion cycles in mixtures of hydrogen isotopes have also studied. The results of these dedicated experiments provide rich information about muon-induced few-body reactions and contribute significantly to a better overall understanding of  $\mu$ CF. A summary of the recent progress will be presented. special emphasis will be put on two characteristic examples, namely a new experimental approach to study the muonic cascade in H-D mixtures and the systematic study of hyperfine effects in muon-induced reactions.

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#### CHINA - COLD FUSION STUDY

Shengyun Zhu, Xijiao Xiaoan, Tinghai Lu et al., (China Inst. At. Energy, Beijing), "Study of Cold Fusion," *Hejishu* 1993, 16(8), 475-478, p 4.

#### AUTHOR'S ABSTRACT

Cold fusion was studied by the electrolytic method and the deuterium absorption method. In one of five runs of the electrolytic experiments, a neutron burst was observed at the 90th hour after starting the electrolysis. The detected neutron burst lasted approximately 4 hours with an intensity of 400 fusions per second. Counting rates of the BF<sub>3</sub> long neutron counter and the liquid scintillation detector were simultaneously increased by a factor of 15 compared to the background. A recoil proton energy of 2.45 MeV neutrons was also measured by the liquid scintillation detector with n- $\gamma$  discrimination.

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#### CHINA - DENEUTRON MODEL

Xiaomei Chen, Jiefu Yang, (Ed. Dep. J., Hunan Norm. Univ., Changsha), "Studies on the Dineutron Model of Cold Fusion", *Hunan Shifan Daxue Ziran Kexue Xuebao* 1993, vol 16, no 1, pp 42-45, in Chinese.

#### AUTHOR'S ABSTRACT

This paper reviews the present condition and new development of nuclear phenomena, discusses in depth the physical foundation of the deneutron model of cold fusion, and gives a formula to calculate the fusion rate and formation rate of dineutrons, and then explain x-ray with 20 keV energy and the blue light phenomenon.

#### EDITOR'S COMMENTARY

This new theory explaining cold nuclear fusion was previously developed by Russian scientists Y. Istomin, K. Kaliev, and V. Istomin (Inst. of High Temp. Electrochem., Ekaterinburg, Russia) and presented at the International Symposium on Cold Fusion and Advanced Energy Sources in Minsk, Belarus, 24-26 May 1994. As the authors of the Theory indicated the Deneutron Theory explains all the strangenesses of cold fusion. The Deneutron theory of CF understands this phenomenon as being nothing but the result of nuclear interaction between deneutrons (which are "exotic" nuclei with mass equal to 2.01398105, a zero charge and with a spin equal to 1) and nuclei of chemical elements. The theory seems to be a very productive one for the further development of cold fusion investigations.

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#### CROATIA - HEAVY WATER FUSION

S. Blagus, M. Bogovac, A. Drašner, and M. Vuković (Ruder Boskovic Inst., Zagreb, Croatia), "Evidence for Neutron Production during Heavy Water Electrolysis on Palladium Electrode," *Fusion Tech.*, vol 26, no 1, Aug. 1994, pp 105-109, 18 refs, 5 figs, 1 table.

#### AUTHORS' ABSTRACT

Neutron burstlike emissions were detected during galvanostatic electrolysis of heavy water. A sintered palladium cathode of cylinder shape was used. After 166 hour of electrolysis at 100 mA/cm<sup>2</sup>, two bursts of neutrons with durations of ~200 and ~100 s were observed. The cathode temperature did not show any change.

**GERMANY - REEXAMINING THE MASS LAW**

Klaus Volkamer, Christoph Striecher, Kenneth G. Walton, John Fagan, Harmut Schenkluhn, and Harry Marlot (Deutsche MERU Gesellschaft, Bissendorf, Germany), "Experimental Re-Examination of the Law of Conservation of Mass in Chemical Reactions," *J. Sci. Explor.*, vol 8, no 2, 1994, pp 217-250, 27 refs, 13 figs.

**AUTHORS' ABSTRACT**

At the beginning of the century, the law of conservation of mass in chemical reactions was checked experimentally by Landolt and various other experimenters. Even though in 8 out of 10 chemical reactions studied by Landolt the validity of conservation of mass was confirmed within the margin of experimental errors, in 2 reactions the pre vs. the post comparison of the determined weights indicated mass differences that exceeded the experimental error by up to a factor of 6, indicating apparent violations of the law of conservation of mass. However, by averaging between such results and subjective assessments Landolt discarded these deviations.

We report on careful and systematic repetitions of one of Landolt's chemical experiments. Using modern sensitive and, in one case, automatic weighing techniques, the results obtained reveal time-dependent and long-range gravitational irregularities which are many orders of magnitude larger than expected relativistic mass effects, indicating an apparent violation of the law of conservation of mass in this special chemical reaction. Similar effects could be found in biological and purely physical systems, as well as synergistic effects between these systems. The observed spontaneous mass fluctuations suggest the existence of a form of cold, dark matter which is detected in the described systems.

**ITALY - ANOMALOUS EFFECTS**

C. Manduchi, G. Zannoni, E. Milli, L. Riccardi (Dip. Fisica, "G. Galilei", Padua), G. Mengoli, M. Fabrizio (IPEL CNR, Padua), and A. Buffa (IGI CNR, Padua), "Anomalous Effects During the Interaction of Subatmospheric D<sub>2</sub> (H<sub>2</sub>) with Pd from 900°C to Room Temperature," *Il Nuovo Cimento*, vol 107 A, no 2, Feb. 1994, pp 171-183, 16 refs, 6 figs, 3 tables.

**AUTHORS' ABSTRACT**

The interaction of subatmospheric (900 mbar) D<sub>2</sub> or H<sub>2</sub> with Pd sheet samples has been investigated isochorically, while the temperature was slowly decreasing from 900 to 20°C. As predicted, maximum gas absorption has been observed below 100°C, however the average D/Pd and H/Pd atomic ratios here achieved, 0.8-0.9, exceed literature provisions; furthermore anomalous metastable absorption (D/Pd  $\approx$  0.35) was tested in the range 500-200 °C. CR-39 charged-particle detectors, after exposure to D-loaded sheets, always revealed a large number of tracks, whereas no emission was monitored from H-loaded samples: if the tracks have been due to D-D fusion fragments, the estimated average fusion rate is about 10<sup>19</sup> fusion per couple of deuterons per second. Significant neutron count increase over background matching with D absorption was systematically observed, which fits with an average fusion rate  $\approx$  10<sup>-21</sup> fusion per couple deuterons per second; such datum however is made intriguing by a similar n-excess measured during H absorption.

**AUTHORS' COMMENTS**

The data obtained outlined some remarkable anomalies with respect to the well-established physical-chemical behavior of the hydrogen/palladium system.

Thus a r.t. D/Pd and H/Pd atomic ratios were measured unpredictably high under subatmospheric gas pressure. Maximum loading is generally achieved when both the metal lattice is free from absorbed impurities and the metal surface is clean, which conditions were surely met by the adopted pre-treatment of the samples. However, we think that mainly the surface features were the clue to our achievements, not only for the large surface/mass ratio of the used samples but more for the reactivity of atom surface layers enhanced by the drastic chemical reduction at 900°C. Furthermore, in the loading runs, D<sub>2</sub> or H<sub>2</sub> interacted with Pd from high temperatures whereby the highest mutual gas-metal reactivity was expected. This reasoning is supported by the anomalous large absorption observed in the high-temperature range, which was featured as a purely chemical reaction more than physical-chemical absorption. Especially for D<sub>2</sub>/Pd systems, the extent of high-temperature absorption fluctuates strongly, sometimes reaching between 450 and 350°C, 0.30-0.35 stoichiometric ratios and then sharply dropping at lower temperatures. Such fluctuations were

probably due to metastable D-Pd states involving strong thermal effects: the soldering phenomenon might relate with such states.

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### ITALY - CRACK-FUSION EXPLANATION

L.H. Bagnulo, (Ecoline Anticorrosion Ltd. Co., Muggio), "Crack-Fusion: a Plausible Explanation of Cold Fusion," Conf. Proc.-Ital.Phys.Soc. 1991, vol 33 (Science of Cold Fusion), pp 267-270.

#### AUTHOR'S ABSTRACT

Plausible dynamics are hypothesized on "cold fusion" in readily absorptive metals, such as palladium or titanium, for hydrogen and its isotopes. The absorption at a high density level, by these metals, of mixtures of said isotopes (especially D and T) and their successive liberation within internal cracks of the metal mass where pressures exceeding  $10^{12}$  atm are expected to be created such that they generate fusion phenomena in accordance with the probable explosive sequence as follows: the formation of molecules, the increase in pressure, the formation of plasma, nuclear fusion.

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### ISRAEL - MUON-CATALYZED FUSION

Shalom Eliezer and Zohar Henis (Soreq Nuclear Res. Ctr., Plasma Phys. Dept., Yavne), "Muon-Catalyzed Fusion -- An Energy Production Perspective," *Fusion Tech*, vol 26, no 1, Aug. 1994, pp 46-73, 95 refs, 6 figs, 4 tables.

#### AUTHORS' ABSTRACT

The nuclear fusion reaction can be catalyzed in a suitable fusion fuel by muons (heavy electrons), which can temporarily form very tightly bound mu-molecules. Muons can be produced by the decay of negative pions, which, in turn, have been produced by an accelerated beam of light ions impinging on a target. Muon-catalyzed fusion is appropriately called "cold fusion" because the nuclear fusion also occurs at room temperature. For practical fusion energy generation, it appears to be necessary to have a fuel mixture of deuterium and tritium at about liquid density and at a temperature of the order of 1000K.

The current status of muon-catalyzed fusion is limited to demonstrations of scientific breakeven by showing that it is possible to sustain an energy balance between muon production (input) and catalyzed fusion (output). Conceptually, a muon-catalyzed fusion reactor is seen to be an energy amplifier that increases by fusion reactions the energy invested in nuclear pion-muon beams. The physical quantity that determines this balance is  $X_{\mu}$ , the number of fusion reactions each muon can catalyze before it is lost.

Showing the feasibility of useful power production is equivalent to showing that  $X_{\mu}$  can exceed a sufficiently large number, which is estimated to be  $\sim 10^4$  if standard technology is used, or  $\sim 10^3$  if more advanced physics and technology can be developed. Since a muon can be produced with current technology for an expenditure of  $\sim 5000$  MeV and 17.6 MeV is produced per fusion event, it follows that  $X_{\mu} \approx 250$  would be a significant demonstration of scientific breakeven. Current experiments have measured  $X_{\mu} \approx 150$ . Therefore, the energy cost of producing muons must be reduced substantially before muon-catalyzed fusion reactors could be seriously be considered.

The physics of muon-catalyzed fusion is summarized and discussed. Muon catalysis is surveyed for the following systems: proton-deuteron, deuteron-deuteron, deuteron-triton, and non-hydrogen elements.

The idea of muon catalysis in a plasma medium is also presented. The formation of mu-atoms and mu-molecules and their disintegration in a condensed plasma are calculated. It seems that in a homogeneous plasma, there are no values of temperature and density appropriate for achieving the desired  $X_{\mu} \approx 1000$ .

New ideas that might lead to the goal of 1000 fusions per muon by the use of laser beams or selective electromagnetic radiation are suggested.

#### AUTHORS' SUMMARY

In summary, in a plasma with a temperature  $> 1000$  eV, the sticking problem disappears. In this case, muon catalysis is limited by the  $dt\mu$  (or  $dd\mu$ ) fusion probability during molecular stability. It seems that in a homogeneous plasma, there are appropriate values of temperature and density for which the sticking is small and the molecule formation rate is large.

## JAPAN - EXOELECTRON MEASUREMENT

Satoshi Fukada, Shunsuke Furuya, Takeji Sakae, and Nobuo Mitsuishi (Dept. Nuc. Eng., Kyushu Univ., Fukuoka), "Measurement of Exoelectrons from Palladium and Palladium-Deuteride with Gas Proportional Counter," *J. Alloys & Cmpds.*, vol 204, 1993, pp 223-229, 10 refs, 11 figs.

### AUTHORS' ABSTRACT

Intensities of exoelectron emission from strained rods of pure palladium, Pd hydride, and Pd deuteride were measured. The detector was an in-line type of gas proportional counter which was specially designed for the study. Emission rates for exoelectrons from strained hydride and deuteride were partly higher than those from strained Pd. However, those from a fractured Pd were much lower than those from strained Pd. Thus, the enhancement of the emission rate was related to the desorption of hydrogen or deuterium from Pd under a strain in the range of elastic deformation. There was no difference between the counting rates and the energy spectra of exoelectrons emitted from the hydride and deuteride. No trace of fracto-fusion was observed in this experiment.

### AUTHORS' CONCLUSIONS

Systematic work was carried out to examine the effects of hydrogenating, dehydrogenating and elongation on exoelectron emission from Pd rods. The differences in counting rates, frequency distribution and energy spectrum of exoelectron from the rods of pure Pd, Pd hydride and Pd deuteride were elucidated. The following results were obtained.

1. Exoelectron emission from the Pd rod was enhanced by desorption of hydrogen or deuterium with a time delay.
2. In large deformation of Pd over the elastic limit, the exoelectron emission was not observed.
3. The frequency for very high counting rates could not be expressed by a Gaussian type of distribution function.
4. Rates of absorption and desorption of hydrogen or deuterium from Pd were limited by the surface reaction or diffusion in the impurity layer.

5. The energy of the exoelectrons emitted from rods of pure Pd and its hydride and deuterium was lower than 0.5 keV. The pulse height distribution in high energy regions from 2 MeV to 40 MeV was not different from that of the background.

6. There were hardly any differences between the counting rates and the energy spectrum of exoelectrons from the hydride and the deuteride.

Thus, the presence of impurities on the surfaces of the Pd rod was related to the enhancement of the exoelectron emission. There was no experimental evidence for fracto-fusion exclusive of exoelectron emission from the Pd rods.

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## JAPAN - TRAPPED NEUTRON CATALYZED MODEL

Hideo Kozima and Seiji Watanabe (Dept. Phys., Facul. Sci., Shizuoka Univ.), "T-D and D-D Collision Probability in the Trapped Neutron Catalyzed Model of Cold Fusion," to be published in Cold Fusion Source Book, 6 mms pages, 12 refs, 1 fig.

### AUTHOR'S ABSTRACT

Elastic scattering and fusion cross sections of a triton, a neutron and a deuteron generated by the trapped neutron catalyzed mechanism of the Cold Fusion against deuterons in a lattice of metal hydrides are estimated to explain the anomalous phenomena observed in those samples. In an optimum situation where the high energy bombarding particle propagates along a line through occluded deuterons, the effective fusion reactions will occur to generate a plenty of reaction products to explain the neutron bursts and the extraordinary excess heat generations observed sometimes in the experiments.

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## JAPAN - CF AT LOW TEMPERATURE RANGE

Y. Nakamitsu, M. Chiba, K. Fukushima, T. Hirose, K. Kubo, M. Fujii, H. Nakahara, T. Seimiya, K. Sueki, M. Katada, N. Baba, S. Kamasaki, S. Ikuta (Tokyo Metro. Univ.), K. Endo (Showa Col. Pharmaceutical Sci., Tokyo), and T. Shirakawa (Otsuma Womens' Univ., Tokyo), "Study of Cold Nuclear Fusion with Electrolysis

at Low-Temperature Range," *Il Nuovo Cimento*, vol 107 A, no 1, June 1994, pp 117-127, 6 refs, 7 figs, 3 tables.

#### AUTHORS' ABSTRACT

The authors carried out an electrolysis by changing the temperature from  $-80^{\circ}\text{C}$  to room temperature in order to create a dynamic condition in the electrode. No neutron emission was observed from the palladium and the titanium electrodes in counting intervals from 28.6 ms to 267 h. The upper limit on neutron emission obtained in palladium was  $3.1 \times 10^{-24}$  counts/d-d pairs/s for the counting interval of 124 h at 99.7% confidence level.

#### AUTHORS' CONCLUSIONS

The authors searched for neutrons being emitted from electrolytic loading of deuterium into palladium and titanium by changing the temperature between  $-80^{\circ}\text{C}$  and room temperature in order to create the dynamic condition in the cathode materials. In the case of titanium, they could compare the result with the neutron emission in the gas phase experiment (listed in references) although they could not find the signal. In their analysis, the authors inspected neutron emission with respect to the counting interval. They analyzed the neutron counts at various time intervals and made frequency distributions. The excess counts over the Poisson distribution, if any, were considered to be real neutron emission events. The reason for changing the time interval was to follow any time sequence of the neutron emission that might result from the unknown mechanism of CNF. In this work they obtained, for the first time, the upper limit of the neutron emission rated for different time intervals. The best upper limit of neutron emission was  $3.1 \times 10^{-24}$  counts/d-d pair/s in 99.7% confidence level which was obtained using 124 h as counting interval and was comparable with the results of Jones et al.

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#### JAPAN - HIGH MAGNETIC FIELDS

Masuhiko Yamaguchi, Isao Yamamoto (Fac. Eng., Yokohama Nat. Univ., Yokohama), Tsuneaki Goto (Inst. Solid St. Phys., Univ. Tokyo), and Shigeto Miura (Inst. Mat. Research, Tohoku Univ., Sendai), "High Magnetic Field Effects on Metal-Hydrogen Chemical Systems," *Sci. Rpts. of the Research Inst. Tohoku Univ., Series A*,

*Research in High Magnetic Fields*, vol 38, no 2, report #1943, pp 390-397, 15 refs, 11 figs.

#### AUTHORS' ABSTRACT

The studies of effects of high magnetic fields on the equilibrium for metal (intermetallic compound)-hydrogen systems have been reviewed. The equilibrium hydrogen pressures for the systems of  $\text{LaCo}_5\text{-H}$ ,  $\text{GdCo}_5\text{-H}$  and  $\text{Y}_2\text{Co}_7\text{-H}$  were measured in magnetic fields up to 15T with a water-cooled magnet (WM-5) and up to 26T with a hybrid magnet (HM-1). The application of magnetic fields causes the hydrogen pressure to increase in  $\text{LaCo}_5\text{H}_4$  (50% increase in 26T), whereas it causes the pressure to decrease in  $\text{GdCo}_5\text{H}_{2.53}$  (1.7% decrease in 14T) and the single  $\beta$  phase of  $\text{Y}_2\text{Co}_7\text{H}_x$  (15% decrease in 14T). These observed changes in the hydrogen pressure agree well qualitatively and quantitatively with the value derived from a thermodynamic theory and magnetic data. It is the first found that the potential of the electrochemical system was shifted 1.0mV by a magnetic field of 10T for the  $\text{LaCo}_5\text{-H}$  cell.

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#### JAPAN - X-RAY MEASUREMENT

*Chemical Abstracts*, vol 120, 1994

K. Nagamine, K. Ishida, S. Sakamoto, Y. Watanabe, T. Matsuzaki (Fac. Sci., Univ. Tokyo), "X-Ray Measurement on Muon to Alpha Sticking in Muon Catalyzed d-t Fusion; Present and Future," *Hyperfine Interact.*, 1993, vol 82, no 1-4, pp 343-353.

#### AUTHORS' ABSTRACT

Among a series of X-ray experiments on the muon catalyzed fusion ( $\mu\text{CF}$ ) carried out by using pulsed muons at UTMSL-KEK, a direct knowledge of  $\alpha$ -sticking probability ( $\omega_s$ ) in  $\mu\text{CF}$  of high density D-T mixture with high T concentration has been obtained by measuring a characteristic muonic x-ray from the ( $\alpha\mu$ ) atoms (central energy of 8.2 keV with a correct Doppler broadening). Combining with the recent x-ray measurements in ( $d\mu$ ) to  $^3\text{He}$  and  $^4\text{He}$  impurities, new insight is now obtained for the detailed background structure in the x-ray spectrum, suggesting the future direction for the x-ray measurements.

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**RUSSIA - C.F. DURING CAVITATION**

A.G. Lipson, B.V. Deryagin, V.A. Klyuev et al. (Inst.Fiz. Khim., Moscow), "Initiation of Nuclear Fusion Reactions During Cavitation on Deuterium-Containing Media", *Zh. Tekn. Fiz.* 1992, vol 62, no 12, pp 121-130.

**AUTHOR'S ABSTRACT**

The feasibility was studied of initiating cold fusion in the process of ultrasonic cavitation in heavy water. A nonsteady-state emission of neutrons during the cavitation in D<sub>2</sub>O in a Ti vibrator was observed, showing traces of cavitation erosion (pretreated in D<sub>2</sub>O for 20h). The maximum excess above the level of the natural background (12  $\sigma$ ) was recorded during cavitation action on a suspension of dispersed La Ni<sub>5</sub>D<sub>x</sub> particles in D<sub>2</sub>O.

**RUSSIA - EPITHERMAL EFFECTS**

*Chemical Abstracts*, vol 120, 1994

V.E. Markushin, E.I. Afanasieva, T. Case, K. Lou, C. Petitjean (Kurchatov At. Energy Inst., Moscow), "Epithermal Effects in Muon Catalyzed Fusion in H/D/T Mixtures at Low Deuterium and Tritium Concentrations," *Hyperfine Interact.*, 1993, vol 82, no 1-4, pp 373-389.

**AUTHORS' ABSTRACT**

The results of a Monte Carlo simulation of muon catalyzed fusion in H/D/T mixtures at low deuterium and tritium concentrations are presented, and the kinetics of the dt branch of the  $\mu$ CF cycle is discussed. The epithermal effects in the dt $\mu$  cycle produce a multicomponent structure in the time spectra of dt fusion, in agreement with the recent experimental results obtained by the  $\mu$ CF collaboration at PSI. The importance of further studies of the  $\mu$ CF reactions in triple mixtures is emphasized.

**RUSSIA - SOLID ELECTROLYTES**

A.L. Samgin, V.S. Andreev, S.A. Tsvetkov, A.V. Cherepanov, "Electrolysis of Solid Deuteron Conducting Electrolytes in a Deuterium Atmosphere: Microsecond Structure Analysis of Neutron Pulses by Means of a Two-Ring Detector," to be published in Cold Fusion Source Book, 13 mms pages, 2 refs, 8 figs, 2 charts.

**AUTHORS' ABSTRACT**

This paper presents new results of the investigation on Solid Electrolytes which were initially reported at the 4th International Conference on Cold Fusion. The major objective of this investigation is to establish a correlation between ceramic sample properties, physical conditions of the experiment and neutron emission as the significant evidence of nuclear events. Basically experiments were performed with ceramic sandwich-like samples of strontium cerate which have a specially synthesized composition. Monitoring of the neutron emissions was performed by a modern neutron measurement installation which is one of the best in the Russian Federation at this time and is adequate for obtaining reliable scientific data. This installation is designed to utilize an advanced method of neutron measurement developed at the Joint Institute of Nuclear Research (Dubna).

**RUSSIA - HIGH LOADING BY DEUTERIUM**

A.L. Samgin, V.I. Tsidilkovski, A.N. Baraboshkin, (High-Temp. Electrochem. Inst., Russ. Acad. Sci., Ekaterinburg). "On the Possibility of High Loading by Deuterium in Palladium Under Strong Nonequilibrium Conditions," to be published in Cold Fusion Source Book, 4 mms pages, 2 refs, 1 fig.

**AUTHORS' ABSTRACT**

It is shown that nonlinear diffusion of hydrogen isotopes under strongly nonequilibrium boundary regimes (so-called peaking regimes) can result in the formation of inhomogeneous space structures localized near the surface of metals.

In connection with the cold fusion problem we would like to draw attention to the possibility of creating strongly inhomogeneous regions with elevated concentration of hydrogen isotopes (e.g. deuterium) near the surface of solids. This can be made possible by imposing some special strong nonequilibrium boundary regimes which determine the rate of hydrogen isotope permeation through the interface. Such inhomogeneous states, typical of synergetic, are of great interest in view of available experimental evidence of the essential role of different nonequilibrium and boundary processes in cold fusion reactions.

## SWITZERLAND - STICKING PROBLEM IN $\mu$ CF

C. Petitjean, D.V. Balin, V.N. Baturin, P. Baumann et al., (Paul Scherrer Inst., Villigen, Switz.), "Experimental Survey of the Sticking Problem in Muon Catalyzed dt Fusion," *Hyperfine Interact.* 1993, vol 82, no 1-4, pp 273-293, 71 refs.

### AUTHOR'S ABSTRACT

The "sticking" process  $dt\mu \rightarrow \alpha\mu + n$ , which constitutes the most severe limit to the fusion reactions which a muon can catalyze, is reviewed. Many attempts were made to determine by calculations and measurements the probability for initial sticking  $w_s^0$  (immediately after  $dt\mu$  fusion) and for final sticking  $w_s$  (after the  $\alpha\mu$  came to rest). Previous results based on neutron disappearance rates and on the observation of  $\alpha\mu$ -x-rays were controversial and also in some disagreement with theory. New data are reported from PSI on direct observation of final sticking, using a setup with the St. Petersburg ionization chamber. These data mark a significant improvement in reliability and may clarify questions concerning previous discrepancies. The new result is  $w_s \approx (0.56 \pm 0.04)\%$ , lower than the theory prediction  $w_s = (0.65 \pm 0.03)\%$ , at medium density.

not due to ion wind is born out in claims that the effect exists under insulating oil and high vacuum.

Brown succeeded in developing and patenting numerous embodiments of the effect. This writer is indebted to Ed Pangman of Bountiful, Utah, for providing an extensive compilation of articles and patents relating to the Biefield-Brown effect. Brown's patents include proposals not only for propulsion systems (see for example pat. 3,022,430, Feb. 20 1962) but also for over-unity electrostatic motors (see pat. 1,974,483, Sept. 25, 1934).

The fundamental embodiment of the Biefield-Brown discovery consists of a simple condenser, that is, a two plate dielectric sandwich. Use a dielectric with a high puncture voltage (high dielectric strength). Apply a potential of 50,000 volts or more across the plates. The whole capacitor should tend to swing in the direction of the positive plate, if tethered. If placed on a balance beam with positive side up, the capacitor, when charged, should exhibit a loss of weight. The enigmatic force acting on the capacitor is reported to act in the direction of the positive electrode regardless of the orientation of the capacitor.

If you are fascinated by these claims and wish to conduct your own experiments the following notes are helpful:

## F. SHORT ARTICLES

### BOOK REVIEW

by Vincent Coon

Thomas Valone, Editor, "Electrogravitics Systems, Reports on a New Propulsion Methodology," April, 1994, \$15, published by Integrity Research Institute, 1377 K Street NW, Suite 204, Washington, D.C. 20005, Phone 202/452-7674.

### ELECTROGRAVITICS FOR POWER, LIFT AND PROPULSION

In the early 1920s Dr. Paul Alfred Biefield, a physicist and acquaintance of Albert Einstein, working at the California Institute for Advanced Studies, discovered that a highly charged capacitor has an anomalous tendency to move in the direction of its positive pole. Biefield assigned Thomas Townsend Brown, his prodigy, to study the phenomena as a research project. That the effect is

1) All factors which increase capacitance increase the force: The greater the area of the plates, the nearer the plates are to each other, the higher the K or dielectric constant.

2) The effect is reported to increase with voltage. A Van de Graaff electrostatic generator is recommended as a voltage source. Care must be taken to avoid leakage.

3) Brown claimed that the greater the mass of the capacitor the greater the enigmatic force. This relationship alone suggests an electrogravitational connection.

4) Shaped capacitors augment the effect. Brown patented a condenser consisting of an accurate anode and small cathode fixed at the end of a dielectric shaft (like a parasol).

5) This writer has been unable to witness the Biefeld-Brown effect in open air and recommends using a vacuum chamber.

6) Some means should be devised to demonstrate that the effect is not due to electron emissions from the cathode. Covering the cathode should suffice.

7) The effect may be transient and not sustained.

T.T. Brown devoted considerable effort, time and means to researching this effect. Although his work has been sensationalized, it has also attracted professional attention. "Electrogravitics Systems: Reports On A New Propulsion Methodology" edited by physicist Thomas Valone, M.A., P.E., is a current and cogent anthology of reports on the electrogravitic research of T.T. Brown [1].

Apparently, Brown was engaged in secret, post W.W.II research. The first report in Valone's anthology, "Electrogravitics Systems," had been classified up until recently. According to the reports, there has been a multinational effort to develop antigravity technology and to implement the Biefeld-Brown effect. The anthology contains works which speculate on the existence of negative mass. The tendency for certain charge carriers to exhibit antigravity is also theorized.

To date there are no known gravity shields but if T.T. Brown's work is valid, it is possible to create electrogravitational fields in the vicinity of a vehicle, causing lift or propulsion or both.

General relativity offers no apparent explanation for the Biefeld-Brown effect. It was T.T. Brown's hope that a unified field theory would be forthcoming which would corroborate his work. With no hard evidence for the existence of negative mass, reconciling the Biefeld-Brown effect with the third law of motion may bespeak the presence of an aether - a hard pill for orthodoxy.

Whether or not the effect is intrinsically understood it may already be put to use in the propulsion systems of advanced aircraft. Included in Valone's anthology is a research paper by Dr. Paul La Violette entitled "The U.S. Antigravity Squadron." The abstract reads as follows:

Electrogravitic (antigravity) technology, under development in U.S. Air Force black R&D programs since 1954, may now have been put to practical use in

the B-2 Advanced Technology Bomber to provide an exotic auxiliary mode of propulsion. This inference is based on the recent disclosure that the B-2 charges both its wing leading edge and jet exhaust stream to a high voltage. Positive ions emitted from its wing leading edge would produce a positively charged parabolic ion sheath ahead of the craft while negative ions injected into its exhaust stream would set up a trailing negative space charge with a potential difference in excess of 15 million volts. According to electrogravitic research carried out by physicist T. Townsend Brown, such a differential space charge would set up an artificial gravity field that would induce a reactionless force on the aircraft in the direction of the positive pole.

An electrogravitic drive of this sort could allow the B-2 to function with over-unity propulsion efficiency when cruising at supersonic velocities.

In the forward to Valone's anthology, Elizabeth Rauscher, professor of nuclear and astrophysics at the University of Nevada, ends with this remark, "Let us re-examine Brown's work and rethink some of the issues which he has suggested to us. Science is an ongoing process, not a fixed set of facts, ever changing and developing."

Reference:

[1] Valone, Thomas (editor) "Electrogravitics Systems Reports on A New Propulsion Methodology" published by Integrity Research Institute, 1377 K street NW, Suite 204, Washington, DC 20005, (1994); 202-452-7674.

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## C.F. PATENTS UPDATE

Courtesy of Peter Glück

1. JP 05 107,376, "Energy generation by cold nuclear fusion"; Takaaki Matsumoto, Kurorin Engineers K.K.; 27 Apr 1993; 14 Oct 1991. In the process, H<sub>2</sub>O containing an electrolyte decomposed through electrolysis, using Pd (or its alloy) heated at > 800C in vacuum as a cathode and Pd as an anode, to cover the surface of the cathode material with H atoms so that nuclear fusion, with the H atoms as a catalyst, is caused on the surface of and/or inside the cathode.

2. JP 05 134,098; "Creation of elements from water by nuclear fusion," Takaaki Matsumoto; Hiroyuki Hiroda



(Kurorin Engineers KK, Mitsui Busan); 28 May 1993; 15 Nov 1991. In the process, D<sub>2</sub>O is electrolytically dissolved using a Pd cathode heated in >800 C vacuum, and the a Pt anode. The cathode is surrounded by D atoms to induce cold nuclear fusion on and/or inside the cathode with D atoms as a catalyst, and the nuclear fusion creates useful elements.

3. JP 05 203,775; "Apparatus for cold nuclear fusion;" Matsushita Electric Co.; 10 Aug 1993, 24 Jan 1992. In the apparatus, in which an anode and a cathode from an H adsorbing metal are immersed in a D<sub>2</sub>O containing electrolyte, and nuclear fusion is caused by current flow, the anode consists of > 2 parallel plates with a constant interval between them, and then cathodes are plated in between. In carrying out nuclear fusion by the apparatus, D is expelled from the cathode during electrolysis.

4. JP 05 281,379; "Nuclear fusion device using hydrogen-adsorbing metals," Hiroshi Kubota; 29 Oct 1993; 05 Apr 1992. In a nuclear device using an H-adsorbing metal (e.g. Pd), a ultrasound source and an ellipsoidal ultrasound reflector are located such that the H-adsorbing metal and the ultrasound source are positioned at respective focal points. The device has increased probability of nuclear fusion at normal temperature.

5. JP 05 302,988; "Energy generators based on cold fusion;" Ainsin Co.; 16 Nov 1993; 31 Oct 1990. In a cold fusion-based energy generator, which applies voltage between an anode and a cathode from an H-adsorbing metal (e.g. Pd.) or its alloy in D<sub>2</sub>O containing an electrolyte, and O gas is supplied to the anode to cause the reaction  $D_2 \rightarrow 2D^+ + 2e^-$ . The applied voltage can be substantially low.

6. Span. ES 2,037,628; "Electrochemical nuclear reactors based on hybrid (H,D) cold fusion in a solid matrix;" Barcelona University; 16 June 1993; 03 Aug 1990. The cathode of the reactors is charged with H formed by the electrolysis of the water, and contains a cavity into which pressurized D, obtained by electrolysis of heavy water and stored in a receiver, is injected. The tube, connecting the receiver for D with the cavity in the cathode serves also as electrical conduit. The metal of the cathode consists of Ti, Th, V, Zr, Pd, Nb, Ta, or of alloys with each other or other metals. Preferably the cathode consists of Ti, Pd, or Pd alloyed with Ag, and may be coated with a material that is impervious to H. The H is

used as the combustible material, and the D as combustion-inducing agent.

7. EP. 576,293, "Energy production from the control of probabilities through quantum level induced interactions;" Quantum Nucleonics Corp; 29 Dec 1993; 26 June 1992. A cold fusion reaction is initiated on demand in a cell containing D<sub>2</sub>O in which electrolysis occurs between a Pt and a Pd electrode. The Pd electrode collects D ions which are then caused to fuse by incident radiation from gamma and alpha radiation sources.

8. DE (Ger. Offen.) 4,203,094; "Cold fusion of hydrogen nuclei;" Earl Philbert; Bernhard Philbert; 05 Aug 1993, 04 Feb 1992. The title process comprises formation of microclusters or materials in the presence of D, and carrying out fusion under strong charge where the strong charge also allows measurement for fusion products. The microclusters are produced by evaporating, e.g. in the presence of D and cooling where in microclusters contain 3-100,000 atoms of the component.

9. DE (Ger. Offen) 4,307,693; "Methods for cold fusion of hydrogen nuclei in a self-excited process;" Heinrich Rautenhaus; 02 Sept 1993; 11 Mar 1993. Methods for fusion of hydrogen nuclei in metal lattices entail carrying out the fusion as a self-excited potential hydrogen fusion (PHF) process to generate charged highly energetic end products which, in turn, produce electron cascades in the host lattice of electrons having high kinetic energies which can initiate further PHF reactions. The host metal may have a large negative charge applied to it while the PHF reaction proceeds.

10. WO 93 17,975; "Control system for occlusion power in hydrogen absorbing metals and neutron emission capacitor for cold nuclear fusion;" Sutabiraiza Co.; 16 Sept 1993; 10 Mar 1992. In the system, electrolysis is conducted in a pressurized liquid phase on a cathodic pole containing artificial microgaps, where applied pressure ratio (applied pressure/saturated vapor pressure) is set  $\gg 1$ , so that H<sup>+</sup> is substantially increased. The surface H<sub>2</sub>O pressure of the cathode adsorbing D is periodically increased and decreased, while negative pulse high is applied to drastically increase the plasma oscillation frequency occurring in the microgaps. As D thermonuclear reaction burst is thus initiated, neutron emission capacity is enhanced and controlled.

11. WO 94 03,902; "Cold fusion method and apparatus for producing energy, tritium, helium and free neutrons;" Vitaly Alexeevich Kirkinski; 17 Feb 1994; 03 Aug 1992. A method for producing energy based on the phenomenon of cold nuclear fusion, with sorption-desorption of D in metals, is characterized by the use, as the metals, of elements or alloys forming 2 crystalline phases with different content of D existing in equilibrium within a certain temperature and pressure range and mutually isostructural, e.g. Pd, Nb, V, rare earth elements, and the intermetallic compounds TiFe and TiCr<sub>2</sub>. The metals prepared as powder (with particle size <0.1 mm), thin foil, a film on a substrate, a wire, or compact mass with pores and microcracks with the largest possible total surface. The techniques for preparation of the metal and for carrying out the method are elaborated. Sorption is carried out at a D pressure exceeding that of 3-phase equilibrium of the isostructural phases with the gas at a given temperature which is below the critical temperature, whereas desorption is carried out under conditions of 2-phase equilibrium of the crystalline phase with the gas at a pressure which is below the critical pressure of the equilibrium of the isostructural phases. The cycle is continuously repeated. The method makes it possible to accelerate the process of nuclear cold fusion by several orders of magnitude.

12. WO 94 06,122; "Enhanced d-d overlap for fusion and neutron generation;" (Keith H. Johnson) Arthur D. Little; 17 Mar 1994, 28 Aug 1992. A metal deuteride and process for its formation are described, in which the D atoms are loaded or stored in Pd to a level which induces a Jahn-Teller degeneracy effect, resulting in a symmetry of the lattice structure that places selected D atoms in sufficiently close approximation to create usable levels of fusion as an energy and/or neutron source. The Pd is placed in an environment in which D atoms are loaded into the Pd cell by electrolysis, implantation or diffusion technologies to a loading ratio of 1 or slightly above, at which point a symmetry breakage occurs from the degeneracy resulting from the existence of matched electron orbital energies in a D-D bonding relationship, which the orbitals assume different energy levels. This shift is coupled to the D nuclei, forcing them into closer association of part of the symmetry breaking effect.

13. WO 94 06,123; "Material symmetry breaking for reversible energy storage," (Keith H. Johnson) Arthur D. Little; 17 Mar 1994; 28 Aug 1992. An energy storage system and process and apparatus for its utilization are

described, in which stored energy is released in an induced symmetry break in a material lattice structure. An absorbable atom such as H or its isotopes is loaded into a material such as Pd or Ti or alloys thereof to a high degree, to the point where an electron orbital degeneracy is induced, placing the crystal in an elevated but stable potential state. The system is triggered out of the elevated, stable state with the resulting release of energy in the form of heat which is captured, through a heat exchanger, by a heat engine where it is turned to work, electricity, or some other energy medium.

14. CANON's patent described in English journal: "Cold fusion rides again," *New Scientist*, 25 June 1994, p 23.

"Canon's patent (EP 568118) claims new ways to absorb large volumes of deuterium in a metal carrier, by putting it close to a pair of electrodes to create a gas discharge in a hydrogen filled chamber. Cold fusion is promoted by cycling the power supply through low and high voltages.

The carrier can be a block of magnesium alloy or palladium alloy. For safety, the hydrogen gas is at atmospheric pressure. The pulsed power comes from large capacitors; and the electrodes are shaped to concentrate the electric field.

After storing deuterium in a palladium alloy for 60 minutes, says Canon, the deuterium content had increased, with a tenfold increase in gamma ray emission after 120 hours. Applying five-minute cycles of 5 and 500 volts DC for 50 hours produced a twenty-fold increase in emission. More heat was generated at the negative electrode than the electric energy consumed at the two electrodes. All this, says Canon, proves that cold fusion works. "Nuclear fusion can be occasioned relatively easily...' and thus a method for multiplying heat energy capable of generating a sufficiently large quantity of heat energy for a practical application," it claims.

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#### BRITANNICA LISTS COLD FUSION

George B. Kauffman, "Applied Chemistry; Cold Fusion," 1995 Yearbook of Science and the Future, Encyclopedia Britannica, Inc., pp 307-308.

## SUMMARY

In an very short article, the Britannica Yearbook expressed little interest and little research of their own in giving a bleak outline of some of the history of cold fusion. Beginning with Pons and Fleischmann in 1989, they cited the difficulty for scientists everywhere in reproducing the positive results, which were only equated with heat and neutrons and tritium. A point was made that, in spite of dismissive and derisive media and scientific reaction, the issue refused to die. Gary Taubes book, Bad Science, was mentioned as "well-received" and "definitive." [What happened to Fire and Ice?]

Japan's early acceptance of cold fusion research was talked about, along with the Nagoya conference. The article cited more than 50 U.S. attendees from research and corporate backgrounds. Dr. John O'M. Bockris of Texas A&M was quoted on the amount of overseas research and the need for more theoretical work. He, like the Japanese, prefers the phrase *chemically stimulated nuclear reactions* to the term cold fusion.

In May 1993, *Physics Letters A* published Pons & Fleischmann's paper on a new calorimeter study. Advocates hailed it as further proof, skeptics replied that it was the same old stuff. The last things mentioned were the Maui ICCF4 convention and the licensing of cold fusion patent rights by University of Utah to ENECO, for development. It is a shame that Mr. Kauffman did not take the time to check out for himself what is really happening in cold fusion research, so he could pass on a more thorough picture.

Summary by D. Torres

## VACUUM ENERGY

(also known as "zero-point energy," "inertial frame," and "space energy"), Published by the Planetary Association for Clean Energy, Inc. (PACE), of Ottawa, Ontario, Canada, May 1994)

A synopsis of knowledge from the Denver International Symposium on New Energy, May 14-16, 1994.

Empty space is not truly empty, but contains an enormous amount of untapped electromagnetic energy known as zero-point energy ("zero" referring to the fact that this energy exists even at a temperature of absolute zero where no thermal effects remain).

Vacuum energy is traced to the radiation from fluctuating quantum motion of charged particles distributed throughout the universe. These charged particles produce such well-known physical consequences as the perturbation of atomic spectral lines known as the **Lamb Shift**, the **van der Waals forces** of chemical attraction and the **Casimir Effect** related to the attractive quantum force found between closely-spaced geometries. It is also the inertial frame experienced in acceleration and deceleration. It is likely that gravity is an effect of vacuum energy.

*Nobel Laureate Prof. John Archibald Wheeler determined that the zero-point energy continuum of the vacuum has an energy density ranging from  $10^{49}$  and  $10^{127}$  watt-seconds per cubic centimeter, while 1 cubic centimeter of pure vacuum continuum contains enough energy to condense to  $10^{80}$  to  $10^{20}$  grams of matter.*

The very premise of **Michael Faraday's** pioneer work on electrical induction is contingent on movement through "a volume of space in which a magnetic field is present" (and not "magnetic lines of force"). This is the basis of current electrical engineering.

An early utilization of vacuum energy power generation was a carelectric engine developed by Nobel Laureate **Dr. Nikola Tesla** for his own personal use, based on his 1901 patent, "Method of utilizing radiant energy" which described a gating procedure for tapping background radiation of the ambient medium: vacuum or space itself. Another stand-alone "radiant energy" system generating 50kW was developed by **Dr. T. Henry Moray** between the 1900s and 1930s using "off the shelf" parts; it was positively reviewed by top electrical industry experts.

Today a number of systems have been presented: large to micro scale vacuum tubes, cermet (ceramic-metallic) semiconductors, magnetic material configurations, and special capacitors. In general they are easy to manipulate, and should be low-cost. Most of these systems are protected by patent applications or by letters of patent.

## What We Know About Vacuum Energy

**Electrical Induction:** When a conductor is moved through a volume of space in which a magnetic field is present, current flow is induced in the conductor. (Michael Faraday, 1831)

**Magnetic Field:** When a direct current flows in a coil, in a volume of space containing vacuum energy, a magnetic field appears in the center of the coil and the orientation of the magnetic polarity can be determined if the direction of the current is known. (Michael Faraday, 1831)

**Magnetic materials:** Some atomic and/or molecular structures in a volume of space containing vacuum energy can sustain temporarily, or exhibit permanently, strong magnetic fields, especially when such a magnetic material is placed within an electric coil in which current is flowing. (Michael Faraday)

**Levitation with conduction sphere:** When a conducting spherical electrode is rotated and high-voltage electricity is applied, small metal balls, cork, wood can be supported against gravity in a volume of space. (George S. Piggot, William F. Hamilton, 1904)

**Gravity and high voltage:** When a mass is connected to high voltage, gravitational attraction is affected. (Francis Nipher, 1916-17)

**Gravity and gyroscope:** When a spinning gyroscope falls along its axis of rotation, the rate of fall in the Earth's gravity field is slowed. (Bruce DePalma, 1972)

**Gravity and magnets/coils:** When non-inductive coils are wound around magnets and these coils are energized, the rate of fall in the Earth's gravity field is slowed. (Donald A. Kelly, 1993-94)

**N-machines:** When layers of magnets and conductors are rotated, electricity is produced. When an N-machine is operated in a no-load condition, input torque measured is the same as when the unit is operated at a full-load condition, distinguishing performance in variance with classical electric motors and generators. (Bruce DePalma, Paramahansa Tewari and Shiuji Inomata, 1977-1994)

**Force by high-voltage:** When high-voltage is applied to an air foil, mechanical forces are produced. (T. Townsend Brown, 1951-1955, William Hooper, 1968-1974)

**Energy stored in magnetic field:** Under certain conditions, magnets may store energy in space which can be recaptured for use. This phenomenon may be related

to such experimental devices as the Adams magnetic motor developed in New Zealand. (Harold Aspden, 1993)

**Electron charge clusters:** When a high-density electron charge cluster is produced, it travels at about 0.1 of the speed of light in the electric fields between cathode and anode. Under certain conditions, more energy may be extracted from the high-density charge cluster than is required to produce the charge cluster. (Kenneth R. Shoulders, 1985)

**Electric generation and levitation:** When magnetic forces are produced at right angles in the presence of rotary motion, high voltage electricity is generated, temperature is reduced and gravity is reduced. (John R.R. Searle, 1957-1994)

**Space energy is not isotropic:** When cylindrical magnets revolve about their axes, slowing time varies according to direction of rotation, indicating effect of rotation with Earth's magnetic field. (Christian Monstein, 1993-1994). A magnetically responsive test specimen located inside a superconducting electromagnetic solenoid detects forces which vary with time and rotation about the Sun, suggesting that the vacuum has an intrinsic direction property connected with magnetism - and suggests that vacuum energy devices could perform with efficiencies varying with the time of day. (Baurov, Klimenko and Novikov, 1991)

**Electric and magnetic fields occur simultaneously as charges move:** Time variable electric current (accelerating electron) creates an electric field parallel to that current, inducing electrical currents which last as long as current is charging. This electric force is a dragging force causing charges to move parallel (or anti-parallel) relative to the direction of current and may be known as the electrokinetic field. (Prof. Oleg D. Jefimenko, 1979-1992). Magnets conditioned to produce a motional field permitting gating to vacuum energy once triggered (9V battery allows production of up to 50kW of useful energy, but resulting in weight loss of generating system.) (Floyd A. Sweet, 1988). These parallel and anti-parallel charges may be separated and engineered for energy production. (Tom E. Bearden and William Jay Fogal, 1993-1994)

**Acceleration of electron flow results in excess energy:** Acceleration of plasma electrons in physical vacuum results in excess energy. (Prof. Alexandr Chernetskil and

J.A. Galkin, 1971-1989; Harold E. Puthoff and Kenneth R. Shoulders, 1991-1994). When electric current flows in an accelerated fashion in a ceramic-metallic semiconductor "cermet," the circulating current provides excess energy to a tank circuit. (Wingate A. Lambertson, 1980-1994)

## G. LETTERS FROM READERS

### LETTER FROM CARLOS SANCHEZ

As you remember, one Ph.D. Thesis was presented in 1991 by Dr. J. Sevilla dealing with cold fusion. We have now presented in our University the second Ph.D. Thesis dealing with Cold Fusion. The title of the thesis is "Influence of the Preparation Method in Structural Properties of Titanium Hydrides and Deuterides. Application to Cold Fusion Experiments," the author is F.J. Fernandez, now Dr. Fernandez. The qualification received was the highest one: "Cum Laude." The jury was integrated by Prof. F. Agullo (U.A.M.), Prof. J. Tornero (U.A.M.), Prof. J. Bartolome (U. Zaragoza), Prof. M.A. Alario (U.A.M.), and Dr. J. Blazquez (CIEMAT). They are experts in Solid State Physics, Micrometallurgy, Phase Transitions, Physical Chemistry, and Experimental Nuclear Physics. It is a pleasure and a great satisfaction for me, as Director of the Thesis and of the research work of Dr. Fernandez, to inform all of the Cold Fusion community on this relevant event.

### LETTER TO A REPRESENTATIVE

From Dana Rotegard

To Rep. Karen Clark  
Minnesota

Dear Rep. Clark,

In our conversation of 6-24-94 you expressed some enthusiasm for the possibility of using cold fusion technology to process nuclear waste into benign isotopes. I attended the recent DFL convention in St. Paul and staffed a table for the Minnesota Cold Fusion Alliance, a group I and several technological futurists started February, 1993. We had a small demonstration project going on our table on the ramp. It was a rare-earth magnet, cold fusion experiment that had produced significant excess heat in experiments run privately from

February to April of this year. My principal agenda for being at the convention was to promote a platform plank in support of cold fusion research that had passed the 61st district and the fifth, but needed 125 signatures to be placed back on the ballot for the state platform. I was on the floor with a press pass for Future Trends and Futurics. With a little hard floor work, from Tim Laughinghouse and myself, the cold fusion plank passed by voice acclamation on Saturday night between ballots in the governor's race. A story about this has already come out under my byline in *Fusion Facts* of Utah and I have submitted stories to *Cold Fusion Times* in Massachusetts, and *Cold Fusion Magazine* in New Hampshire; all publications with a global scientific readership.

The principal thrust of applied cold fusion research is to come up with a commercially viable, simple ~20Hp fusion reactor for alternate energy application, (probably first in Toyota or Fiat electric cars). Replacing fission power with this technology is the alternate energy goal. However, this new science directly impacts on the nuclear waste issue that should have been a factor in the debate. Due to the decrepit state of science reporting in the mass media, it wasn't.

There is solid experimental and theoretical scientific work that one can access through the Fusion Information Center of Salt Lake City, and EPRI's Fourth International Conference on Cold Fusion, Dec. 6-10, 1993, that suggests that there may be a direct solution to the nuclear waste problem.

On May 5, 1993, Dr. Edmund Storms of Los Alamos testified before the U.S House of Representatives Space, Science, and Technology Committee:

"... some speculate there is a **possibility** of converting harmful radioactive isotopes into nonradioactive elements at room temperature using properly constructed electron environments. Consequently, one of the troublesome aspects of fission energy might be **eliminated.**"

Since 1991 several experimenters have reported excess heat from cold fusion on nickel using ordinary water with alkali chemicals in the electrolyte for conductivity. Some researchers, such as Dr. Randell Mills of Thermocore of Pennsylvania and Dr. Jean Pierre Vigier of the University of Paris, felt this was non-nuclear excess heat.

Drs. Bush and Eagleton of California Polytechnic at Pomona, along with Drs. Mizuno from the Japanese National University of Hokkaido in Sapporo, and Dr. Srinivasan of the Indian Bhabha Atomic Research Center outside of Bombay, found that excess energy experiments using ordinary Potassium-89 in the electrolyte were yielding Calcium 40 as an end product, a reaction which accounted for the excess heat in these light water cold fusion experiments. Dr. Bush published a theoretical model showing how this process could be systematized. This model predicts the possibility of adding a proton to dissolved chemicals to change their nuclear composition. The documented transmutations from Rubidium 85 and 87 to Strontium 86 and 88 was predicted by this theory.

I and other interested parties had dinner with Dr. Bass, the patent counsel for ENECO at the EPRI cold fusion conference. He and Dr. Bush felt that the experimental procedure may directly lead to the electrochemical processing of a wide variety of noxious isotopes that could be stabilized. Because of the general cold fusion blacklisting that took place in President Bush's Department of Energy, very few teams of American scientists are working on this type of research. Interest and support in Japan, India, China, and Italy is very mainstream, with new work being reported in their respective mass media.

Simply put, it may be possible, a few years from now, to dissolve wastes from fission nuclear reactors and, using cathodes saturated with hydrogen, add a proton to radioactive isotopes changing, say Cesium 137 to Barium 138. Most of my last day at the EPRI conference was spent brainstorming on this topic with Dr. Carol Talcott-Storms of Los Alamos, along with the Bush-Eagleton team.

For the Minnesota legislature to take advantage of this new science is one of my hopes and the reason several prominent Minnesotans formed the Minnesota Cold Fusion Alliance in 1993. The DFL is now the first large political party to have cold fusion research for a platform plank.

When Kurt Laughinghouse and I introduced several officials of the Carlson administration to some of the hands-on research at the University, the response was underwhelming. Hearings on this area of science could produce some star witnesses both from the local community and some impressive technical

demonstrations from the groups who have been working with the University of Minnesota Department of Materials Science. This line of research is controversial (as is all cutting-edge science), but the possible benefits are staggering.

Professor Earl Joseph of Walden University in Minneapolis, the editor of *Futurics* along with faculty of the University of Minnesota or MCFA could be called to make any hearings credible. Dr. Hal Fox of the Fusion Information Center in Salt Lake City just got back from coordinating a major conference in Minsk in the shadow of Chernobyl. Alternate energy is rightly one of the major planks in the DFL's 1994 campaign. I hope you find time in your 1994 campaign schedule to help this new science get a hearing in the Minnesota legislature.

Sincerely,  
Dana Rotegard

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## H. MEETINGS & MISCELLANEOUS

### PRELIMINARY ANNOUNCEMENT

#### FIFTH INTERNATIONAL CONFERENCE ON COLD FUSION (ICCF-5) 9-13 APRIL 1995 MONTE-CARLO CONVENTION CENTRE MONTE-CARLO, MONACO

Further progress has been made in many laboratories during the last few months in experiment design, reliability and reproducibility of results both for the generation of excess energy and the observation of nuclear products in "cold fusion" systems.

The development of various experimental devices has progressed to a point where they may be considered to be demonstration of the effect.

Theoretical treatments continue to be developed and several of these are at the point where quantitative predictions can be made.

It is therefore opportune to convene a further scientific conference to consider the significance of these new results, demonstrations, and developments in theory.

**PRELIMINARY REGISTRATION**

If you are interested in attending this conference, contact one of the organizations below for a Preliminary Registration Form and return it before August 15, 1994. We expect a large attendance and we encourage you to reply as soon as possible. Please note that in view of the widespread interest, we may be required to limit registration numbers.

**LOCAL ORGANIZING COMMITTEE OFFICE**

Mr. Jacques Payet, ICCF-5  
c/o IMRA EUROPE S.A., Centre Scientifique  
B.P. 213 - 220, rue Albert Caquot  
06904 Sophia Antipolis Cedex, France  
Tel: (33) 93 95 73 37  
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OR

**FUSION INFORMATION CENTER**

P.O. BOX 58639  
Salt Lake City, Utah 84158  
Tel: (801) 583-6232  
Fax: (801) 583-2963

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**RUSSIAN CONFERENCE**

Second Russian Conference on Cold Fusion and Nuclear Transmutation (RCCFNT-2) will take place in Moscow State University retreat center on the shore of the Black Sea near Sochi, during September 18-24, 1994. The program of the conference includes the subjects: 1. Experimental researches of Cold Fusion and Nuclear Transmutation with the different scientific methods and instruments, 2. Cold Fusion theoretical models, and 3. Cold Fusion applied technologies and devices. The conference will be in Russian with English translation available. Registration fee of \$550 covers Conference proceedings, accommodation, meals, and transportation from Moscow to Sochi and back.

For information write: Russian Conference on Cold Fusion and Nuclear Transmutation, Ap. 184.8 Verknija Maslovka St., "Erzion" Center, 125083 Moscow, Russia. Contact by Fax at (095) 292-65-11 box 6935 Erzion.

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**NEXUS SYMPOSIUM REPORT**

"Report on the International Symposium on New Energy," *Nexus*, vol 2, no 21, Aug.-Sept. 1994, p 56.

*Nexus* magazine gave a short report on the Denver Symposium sponsored by the Institute for New Energy, a branch of the International Association for New Science (IANS), mentioning some of the speakers, but mainly concentrating on the demonstration by Bill McMurtry and comments they have received about the Adams Motor. The report was accompanied by the short article referenced below.

Jeane Manning, "Living Legends of New Energy Science," *Nexus*, vol 2, no 21, Aug.-Sept. 1994, p 56-57.

The diversity of people and research were the prime thrust of this article. It mentions Christine Ferguson, a film-maker who is doing a documentary on new energy, interviewing John Searl and other speakers at the symposium. "The excitement and expressions of optimism at their symposium surpassed even their first gathering in Denver last year," she said. Researchers from around the world met, spoke and networked during the three day gathering.

Shiuji Inomata of Japan spoke of plans for a superconducting-magnet version of the N-machine. Don Kelly performed successful drop experiments with his charged discs. Bill McMurtry demonstrated the Adams Motor, without over-unity success, but the research still is viewed as possibly viable for further investigations. Adams himself, Bruce DePalma and Bruce Cathie, all of New Zealand, had been invited to speak at the conference, but cancelled at the last minute.

Also highlighted was an original Keely motor, brought by Victor Hansen and explained by Dale Pond. The politics of energy was the topic of Andrew Michrowski, director of PACE (Planetary Association for Clean Energy) and Brian O'Leary, energy critic, advisor, and co-founder of IANS. A tribute was read to Rolf Schaffranke, former NASA space program consultant and pioneer in new energy research, who passed away in April 1994.

Proceedings of the New Energy Conference are in a 650 page book, soon to be available from the Institute for

New Energy, P.O. Box 58639, Salt Lake City, UT  
84158-8639, USA.

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