FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

ISSN 1051-8738 Offices located in the University of Utah Research Park

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

VOLUME 5 NUMBER 1 FUSION FACTS JULY 1993

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A. CHANGING THE ENERGY WORLD

This edition of *Fusion Facts* marks the beginning of a fifth year of publishing information about the new science of cold fusion. What has changed and what could have been changed if the truth about cold fusion had been recognized by scientists, the media, and the opponents?

THE DISCOVERY

When Pons and Fleischmann first discussed some anomalies they had observed in previous electrochemical experiments and then suggested that perhaps nuclear reactions could be sustained in an electrochemical cell, they recognized how bizarre this idea would be in the eyes of their peers. To **some** scientists, the progress of science is most exciting when dramatic new discoveries are made. To **most** scientists, their seven or more years investment in learning the fundamentals of science has left them with the concept that the foundation of science is firm or even inviolable. Pons and Fleischmann decided to begin their experiments in Pons' garage rather than under the eyes of their University of Utah peers, many of whom have problems with bold new ideas. When some successes had been observed, they moved their experiments into basement facilities at the U/U but attempted to keep the project confidential.

THE ANNOUNCEMENT

When the peer-review process failed and the initial Pons-Fleischmann paper was improperly distributed to several others and around the world by subsequent recipients, it became necessary for the University of Utah to control the storm of inquiries by holding a press conference. It was a historic occurrence that the palladium used by Pons and Fleischmann had sufficient impurities **of the right kind** to make some of their experiments successful. Having improved the processing of palladium, the next batch delivered by Johnson-Matthey

was very difficult to "load" and easy replication became more difficult. A less experienced scientist might have panicked, but Pons and Fleischmann knew what was possible and they continued their experimental efforts with, apparently, only a fraction of the success they had previously observed. In retrospect, they would have improved their initial report of their work by stressing that the experiment was not easily replicated.

THE RESULTS

To those who were heavily involved and had considerable expertise in and understanding of nuclear fusion, the announcement came as an astonishing surprise. One nuclear physicist complained to a reporter, "How would you feel if you were working on the development of an airplane and someone announced their spaceship?" Although a full disclosure by Pons and Fleischmann was prevented by patent-pending restrictions properly imposed by U/U legal staff, there was sufficient experimental disclosure to encourage dozens of laboratories to become involved in the replication of the cold fusion electrochemical cells. Most failed. However, by May 1989, about twenty successful replications had been achieved.

THE ROLE OF THE MEDIA

The achievement of nuclear reactions using relatively simple equipment which, in theory, **could be replicated using the equipment found in many high-school laboratories,** was properly hailed by the media as a possible answer to clean, inexpensive energy. Soon, the reports of non-reproducibility began. Scientists using laboratories at prestigious institutions (Harwell, MIT, Cal Tech, Lawrence Livermore, etc.) began to announce their failures to replicate the P-F results. The media responded. Much of today's media welcomes (and even contrives) controversy. Those whose work could be considered threatened by **cold fusion**, particularly the supporters of hot fusion, were willing to be quoted as being expert, knowledgeable, and experienced in nuclear physics and could assure the media that P-F were either mislead, deluded, or fraudulent.

THE IMPACT

The growing controversy was sufficient to discourage many scientists and their students from becoming involved in further experimentation. Some who had achieved a degree of success became less willing to discuss their work. "I've had success but I can't tell anyone for fear of being dismissed!" one scientist confided to Dr. John Bockris. Except for scientists such as Robert Huggins at Stanford, there were soon almost no cold fusion experiments being performed at any U.S. prestigious (such as Ivy League) universities. However, some determined scientists, such as Peter Hagelstein at MIT, refused to be intimidated by unbelieving peers nor by the media reports. This group of stouthearted scientists continued theoretical or experimental work in cold fusion. Chief among these were the much maligned Pons and Fleischmann who continued their search for means to increase the ease of replication, first at the National Cold Fusion Institute and then (after 1990) at Valbonne, France. During this time, an unknown editor began a newsletter designed to provide rapid reports of cold fusion news. Thus *Fusion Facts* became a means by which successes (and failures) in cold fusion experiments and theories were circulated among many of the scientists who continued their work. A *Fusion Facts* report of a success often caused some scientists to make direct phone calls or faxes to those reporting successes. This process invigorated research.

THE CURRENT STATUS

On June 24, 1993, viewers in Canada were shown a new video, "The Secret Life of Cold Fusion." This production by the Canadian Broadcasting Company, with Robin Christmas as the producer, is the first major unbiased video production. The previous major video productions by Nova in the U.S. and by NHK in Japan were blatantly anti-cold fusion. Because "The Secret Life of Cold Fusion" is essentially unbiased, the impact on the viewer is highly positive. The current status of cold fusion is described by examples (videos of P-F cells vigorously boiling and producing over one kilowatt of energy per cubic centimeter of palladium) and by interviewed reports (for example, with Edmund Storms in Los Alamos and Yan Kucherov in Podolsk).

The P-F heavy-water, palladium-lithium, electrochemical system has been replicated, modified, extended, and reported in peer-reviewed literature by scientists working in laboratories in over 20 countries. The concept that nuclear reactions can be produced in a bench-top laboratory experiment is a scientific fact. But more astonishing, the following methods have also been found by which excess-power-producing nuclear reactions can be initiated and in some cases sustained for long periods:

1. Light-water, alkali-metal carbonate electrolyte, nickel cathode electrochemical cells. (Mills, Bush & Eagleton, Notoya, Srinivasan, etc.)
2. Glow-discharge, deuterium-gas, palladium cathode reactors. (Karabut, Kucherov, and Savvatimova.)
3. Molten-salt, palladium/aluminum electrode, electrochemical cells. (Liaw & Liebert, replicated in Taiwan.)
4. Capillary cold fusion using bronze crystals. (Kaliev, Baraboshkin, Samgin.)
5. Gold-plated palladium electrode using deuterium gas produces nuclear reactions and heat. (Yamaguchi.)

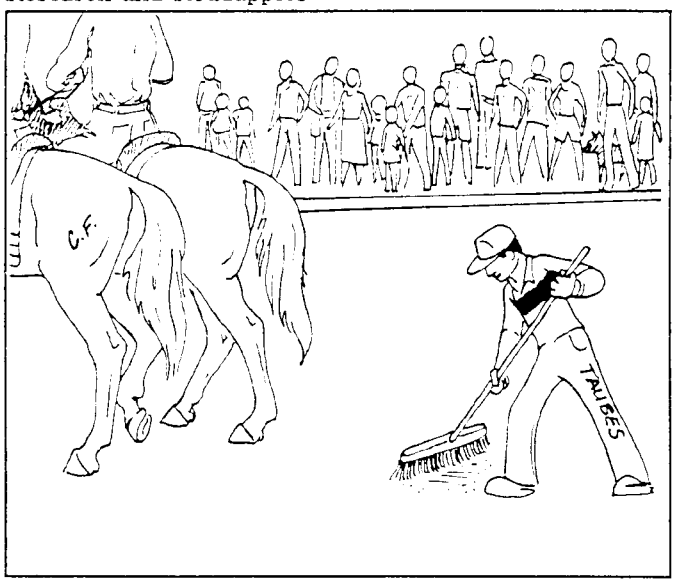
Note: Item 4 & 5 are more burst-like phenomena, the others are reasonably continuous.

It is strange that the newest book attacking cold fusion [1] fails to mention these alternative methods of achieving nuclear reactions.

THE HEROES AND THE ADVERSARIES

Among the media writers the **heroes** are Eugene Mallove, Jed Rothwell, Jerry Bishop, Otis Port, Robin Christmas, and the *FF* staff. Among the **adversaries** are Gary Taubes, Frank Close, John R. Huizenga, Maddox (Editor of *Nature)*, and John Horgan (*Scientific American*). But these are mainly reporters, the important heroes and adversaries are scientists.

Research and Roadapples



How you enjoy the parade depends on your view. (or your selection of evidence)

Stanley Pons and Martin Fleischmann are **heroes**. Also numbered among the **heroes** are John O'M. Bockris; Robert Huggins; Liaw & Liebert; Peter Hagelstein; Randell Mills; Bush & Eagleton; Edmund Storms; Karabut, Kucherov, & Savvatimova; Takahashi; Ikegami; Yamaguchi; Matsumoto; Srinivasan; Peter Graneau, Peter Glück, and many, many others. Among the most vocal **adversaries** are Petrasso (MIT), Lewis & Koonin (Cal Tech), Gai (Yale), Robert Park (American Physical Society), Douglas R.O. Morrison (CERN), John R. Huizenga (U/Rochester), and many other studiously under-informed scientists.

THE OUTCOME

Cold fusion is now advancing (although not flourishing) as evidenced by allocated funds (an estimated total value of $50 million in Japan, $12 million budgeted by EPRI, smaller budgets in many other countries such as Spain, Italy, Russia, Belarus, China, Taiwan, India, etc.) In addition, there is an increased interest by corporations in Japan, America, Canada, France, and Italy. The book that was commissioned to destroy cold fusion [1] could not have been released at a better time to become a humorous collector's item and may be withdrawn & pulped by the publisher.

It could be an entertaining evening to speculate among the "What Ifs..." What if P-F had claimed that cold fusion was very difficult to replicate? What if the American Physical Society had been professionally supportive rather than dramatically antagonistic? What if the Japanese had given up (they had little positive results by the time of the May 1989 Santa Fe Workshop)? What if Maddox (editor of *Nature*) had been a close friend of Martin Fleischmann? What if the U.S. DOE had listened to the positive reports from four DOE-funded laboratories? What if various U.S. universities had not received calls from Washington, D.C. stating that "if even a graduate student is working on cold fusion there will be no grants from Washington."?

THE "COULD HAVE BEEN"

Fusion Facts could have reported: DOE (or some other government agency) would have funded the National Cold Fusion Institute at the University of Utah Research Park with several millions of dollars. Pons and Fleischmann would be working in Utah. The United States would be **the world leader** in ridding the earth of its pollution from fossil fuels. The hot fusioneers would be energetically and proudly involved in the development of new energy systems that would benefit the entire world and especially third-world countries. The American Physical Society would be benefitting from enormous growth and prestige. New departments at MIT, Cal Tech, and at most Ivy League universities

would be teaching engineers and scientists to become cold-fusion energy experts. American corporations would be vying to hire engineers and scientists to work on various cold fusion projects. NASA would be working on new systems to power satellites. The military would be funding contracts to replace outmoded energy systems with the newer cold fusion energy systems. The Japanese would be working closely with many of the U.S. researchers and corporations to be involved in this exciting new development. And, we wouldn't be laughing at Gary Taubes' new book.

Oh well, that won't happen now until next year or later. Meanwhile, we will have the advantage of having the commercial cold fusion systems manufactured in Japan -- a country that has specialized in quality production.

Sayonara, Hal Fox, Editor-in-Chief

[1] Gary Taubes, Bad Science, the Short Life and Weird Times of Cold Fusion, Random House, June 1993, 503 pages, no peer-reviewed references.

B. HOUSE HEARING ON FUSION

U.S. CONGRESSIONAL HEARING:
FUSION ENERGY HEARING, MAY 5, 1993
From article by Eugene Mallove

During the 'Alternative Programs' part of the hearing, Congressman Harris Falwell of Illinois diplomatically showed his impatience with the hot fusion program. He read the following statement into the record: "Madam Chairman, I share with you the view that the fusion program may be entering a state of reassessment. And, in fact, this reassessment may be long overdue. I was particularly struck by the recent remarks of Dr. Robert L. Hirsch at the March 5, 1993 meeting of DOE's Fusion Energy Advisory Committee. Dr. Hirsch, who was once head of DOE's magnetic fusion energy program and is now a Vice President of the Electric Power Research Institute (EPRI) made the following observations:

"DT tokamak and laser-fusion reactors as currently envisioned will be extremely complex, highly radioactive, likely to be highly regulated and costly.

"Even if DT or laser-fusion reactors had the same capital costs -- an enormous challenge -- fusion reactors would lose out to advanced fission reactors, which are a reliable, known quantity.

"None of the very few fusion-knowledgeable utility people he had spoken with believes that tokamak or laser fusion reactors, as currently envisioned, would be acceptable to the electric utilities.

"There are some enormous materials problems related to DT fusion. There are no qualified materials today for DT fusion reactors. In the absence of development of a low activity material -- a very costly and time consuming undertaking -- you will have to effectively rebuild your fusion reactor every 5-10 years and dispose of many times the amount of radioactivity that would come from a fission reactor of the same power level.

"And then there's ITER (International Thermonuclear Experimental Reactor). If tokamak reactors, as currently envisioned, aren't acceptable, can ITER possibly be justified? If you build ITER, it will become the flagship of fusion and will likely eliminate the chance of serious funding for alternate concepts.

"If what ITER represents is seriously considered in public debate, there is a high probability that ITER will not be supported and the fusion program could collapse.

Dr. Hirsch closed his remarks with several recommendations, including: Scale-up of alternate R & D concepts as fast as possible. Don't stop tokamak or laser fusion, but cut them back and reorient them in more acceptable directions. And get off the DT fuel cycle to avoid frequent reactor reconstruction, large quantity radwaste disposal, and expensive materials development.

"I am also concerned about other aspects of the planned fusion energy program, including: (1) the role of, and the need for, a new proposed tokamak device, TPX, for which the DOE budget documents provide neither a cost estimate, a time schedule, nor an understandable rationale of why it is so important; (2) the introduction of tritium into the TFTR later this year -- not only will this be done in a heavily populated area, raising safety and other environmental concerns -- but it will also require expensive decontamination and decommissioning of the machine. Is the science we will get worth this

cost, or would it be more cost-effective to rely on JET (Joint European Tokamak), which has already used tritium?; (3) Finally, the continued operation of other tokamaks, including Alcator C-Mod and the DIII-D tokamaks, in this budget climate means that we cannot afford to pursue promising alternate concepts. Are we really getting our money's worth from them?"

To summarize the significance of the May 5, 1993, Fusion Energy Hearing:

1. The hearing was the first time since the late April 1989 House Science, Space and Technology Committee hearing that cold fusion had received an extensive public review before Congress. It was noteworthy that cold fusion and hot fusion were discussed at the same forum -- a landmark event.

2. We now have **at least** three Congressmen who are solidly open-minded about cold fusion, as demonstrated by the May 5 lines of questioning: Congressmen Swett of New Hampshire, Walker of Pennsylvania, and Falwell of Illinois. Dick Swett, as his post-hearing press release indicates, has become decidedly pro-active toward cold fusion.

3. The top aides of the HSST Committee appeared to be very interested in doing what they could in the future to help investigate cold fusion. This from conversations directly after the four-hour hearings. There is considerable interest in helping Mills, in particular, get a working device evaluated at a national laboratory. There is further interest in having an eventual demonstration, perhaps even in the Congressional offices!

4. The hot fusion people were not very well received. This was the same old stale stuff: promises, promises, promises, with not much new concrete concepts to report -- except that Princeton has 200 Curies of tritium on site and they are just dying to contaminate the hell out of the TFTR tokamak when they start their D-T testing in September. Congressmen Falwell and Walker gave the HF boys (and gal!) a hard time. Falwell challenged them with the recent public words of Robert Hirsch. Hirsch thinks the D-T program is going nowhere. In these tight budget times, I think Congress is going to scrutinize HF much more closely. If CF works out the way many expect it to in the coming year, I think there is a serious chance that Congress will reduce HF funding, and may completely kill it for FY '95.

5. The HF people acted as though CF did not exist. They made no acknowledgement of it as an issue, nor were they asked about cold fusion. One wonders what they could or would have said. They have not been following the experiments, so presumably they would have had nothing to say other than "beware, it's pathological science."

6. There may be extremely promising fallout from these hearings, there may even be a shot at getting come cold fusion funding approved for FY '94. I think there will be a symbiotic effect between (A) the accepting atmosphere in Congress, (B) new experiments and scientific papers being and soon to be reported -- particularly all the light water work, and (C) increased media attention. The whole situation is unstable.

C. NEWS FROM THE U.S.

CORRECTION -- in our May 1993 issue there was an error in our Chem. Abstracts source. On page 17, the news from GABON, wasn't. John L. Russell, Jr. is from Alpharetta, Georgia, he is one of the most important authors in the field of neutral particles. Thanks to Peter Glück for correcting the error.

CALIFORNIA - TOP TEN EXPERIMENTS

The Top Ten Cold Fusion Experiments
as selected by Russ George,
in *The Cold Fusion Newsletter*

Fleischmann and Pons original palladium cathode platinum anode in heavy water, first announced March 1989.

Variations on #1 with vigorous boiling as performed by F&P and demonstrated via television and video broadcast beginning in the fall of 1992.

Takahashi -- Cold fusion using palladium foils in electrochemical cells at the University of Osaka 1991 to present.

Palladium electrochemistry as performed by the Electric Power Research Institute (EPRI) and the Stanford Research Institute (SRI) 1989 to present.

The replication of the Takahashi experiment with variations as performed by Dr. Edmund Storms at Los Alamos National Laboratory in 1992.

The light ('ordinary') water, nickel, and potassium carbonate experiment of Dr. Randell Mills of Lancaster, Pennsylvania.

The light water, nickel, potassium experiments of Bush and Eagleton at California Polytech at Pomona.

The NTT gas loading experiments of Dr. E. Yamaguchi in Japan.

The ion implantation experiments of Takahashi at the University of Osaka.

The gas plasma experiments of Kucherov et al., at the Lutch Podolsk Institute in Moscow.

[We would include the Liaw-Liebert (U. of Hawaii) molten-salt electrochemical cell experiments to the top ten list. And we would also include the Kaliev, Baraboshkin, and Samgin work with 'bronze' crystal capillary fusion. --Ed.]

The *Cold Fusion Newsletter* can be contacted at P.O. Box 60642, Palo Alto, CA, 94306.

HAWAII - 183rd ELECTROCHEMICAL SOCIETY MEETING REPORT

By Bor Yann Liaw

This was the Spring 1993 Electrochemical Society meeting, held in Honolulu, Hawaii, May 16-21, 1993. It was also a joint society meeting with the Electrochemical Society of Japan and the Japan Society of Applied Physics. The attendance total was over 2,500, about 900 from Japan. The five-day program listed 50 symposia ranging from batteries and fuel cells to diamond film deposition and semiconductor processing.

There were several symposia that may be of interest to many of your readers. Many of them published proceedings that can be purchased directly from the Society. Here is my tentative list: "Batteries and fuel cells for Stationary and Electric Vehicle Applications," "New Sealed Rechargeable Batteries and Supercapacitors," "Corrosion, Electrochemistry and Catalysis of Metastable Metals and Intermetallics," "Second International Symposium on Electrochemical Technology Applications in Electronics," "Solar Energy Conversion Using Solid/solid and Solid/liquid Interfaces," "Third International Symposium on Carbonate Fuel Cell Technology," "Third International Symposium on Solid Oxide Fuel Cells," "Second International Symposium on Electrochemical Processing of Tailored Materials," "International Symposium on Molten Salt Chemistry and Technology - 1993," "Conductive Polymers and Surface Modified Electrodes," "Electrocatalysis," "Intercalation Chemistry and Intercalation Electrodes," and "Chemical Sensors."

Regarding the papers and representations of cold fusion work, the number was few. There were two cold fusion presentations by Professor M. Enyo and his colleagues from Hokkaido University, which were reported in the symposium of Electrocatalysis. The topics were "How High is Equivalent Hydrogen Pressure Attainable at Palladium Cathode?" and "Excess Heat Evolution During Electrolysis of H_2O with Several Metal Cathodes." Many who attended the second talk felt that the evidence of the excess heat was questionable or at least not convincing. The session was not well attended, anyway.

On May 18, a get-together occasion was organized for the cold fusionists who attended the meeting. The party was dubbed "Cold Fusion, Hot Pizza," held in a private room at the California Pizza Kitchen. Twenty members attended the party, including Dr. Debra Rolison, Dr. Robert Nowak, Prof. Enyo, Dr. Stuart Smedley, Dr. Martha Schreiber, Prof. Richard Oriani, Prof. Robert Huggins, Prof. Robert Gale, Dr. Mike McKubre, Prof. Ken-Ichiro Ota, Prof. Bruce Liebert, Prof. Fritz Will, and many others who were interested in the topic. The party was casual and informative. Many were interested in exchanging information and discussing experimental results that were not reported in open literature. There were rumors about Prof. Kevin Wolf's recent gamma-spectra results, although no written proof was available. The meeting lasted over four hours, longer than originally planned.

The meeting was overall quite successful. The weather was disappointing at the beginning of the week but improved, of course. Also, everyone is looking forward to the upcoming ICCF-4 in Maui in December.

[See abstracts under Japan - Enyo, and Japan - Ohmori]

NEW YORK - IT AIN'T OVER YET

Jerry E. Bishop (Science Writer for *WSJ* & free-lance), "It ain't over till it's over...COLD FUSION," Popular Science, August 1993, pp 47-51 & 82, illustrated.

FF EDITOR'S SUMMARY

The lead-in, "The controversial dream of cheap, abundant energy from room-temperature fusion refuses to die." sets the tone of the article. After a review of the original announcement by Pons and Fleischmann (March 23, 1989), Bishop quotes them, "our indications are that the discovery will be relatively easy to make into a usable technology for generating heat and power." Not stated by Bishop, but more than four years later, Stanley Pons states in the video "The Secret Life of Cold Fusion," (shown in Canada on CBC Prime Time News) that within a year they expect to have a prototype of a 10,000 Watt output (or higher) working cold fusion cell.

Bishop lists some of the scientific assertions that are being made by cold fusion scientists such as 1. The secrets of reproducibility; 2. The measurement of radiation and nuclear byproducts in addition to heat; and 3. The generation of excess power from light-water. These are the kind of claims that the skeptics label as "pathological science". One of the perennial skeptics is John R. Huizenga, author of Cold Fusion, The Scientific Fiasco of the Century. Edmund Storms, recently retired from the Los Alamos National Lab, is quoted as saying that **pathological skepticism** can be as damaging as pathological science.

Bishop provides a quick review of the progress of hot fusion and end with the quote that controlled thermonuclear fusion is just 25 years away and has been for 40 years. In his review of the research work at the University of Utah, there is a typo that gives the U/U credit for spending $25 rather than $5 million for cold fusion research and lawyers. Bishop properly reviews how the continuing, if tantalizing, successes have kept the researchers working and improving the cold fusion results, "despite the dismissal by the scientific establishment."

Side panels in the articles provide dark photographs of both Eugene Mallove (author of Fire From Ice, Searching for the Truth Behind the Cold Fusion Furor.) and John R. Huizenga together with appropriately contrary quotes. Mallove says that cold fusion will end the Oil Age. Huizenga says cold fusion qualifies as pathological science.

Bishop, with great fairness, cites the research efforts in which some of the nuclear byproducts have been measured and states that **the other side** do not accept such claims. Bishop reviews the work of Yamaguchi (NTT, Japan) and of Randell Mills (Lancaster, PA), Bush (Cal Poly, Pomona), and at India's Bhabha Atomic Research Centre, all of whom have had dramatic successes in producing excess power from electrochemical cells using light water. With all of this, Richard Petrasso (MIT), "I just haven't bought into the excess heat claims yet. ... I guess I'll believe it when someone drives a car up here from New Jersey powered by cold fusion."

We wish to thank Jerry Bishop for his fair treatment of the cold fusion subject and for mentioning *Fusion Facts* (which he receives monthly) in his article.

NEW YORK - A GALA EVENT

Courtesy of Eugene Mallove

June 24th, New York City, N.Y.

The World Needs Cold Fusion to Grow and Cold Fusion Needs Women and Men of Courage, Vision, and Good Spirit.

Dear Friends,

We are delighted to have met you at "The Manhattan Project, Part II: Peace" conference on June 24, 1993, which we were proud to sponsor. We hope that you will leave this gathering with new knowledge, ideas, and enthusiasm for the future of this remarkable science and technology.

We would like to leave you with several points to help crystalize your thinking about the future of cold fusion. Our field is young and fragile, particularly in the United States, where it has suffered intense scorn and obstruction from various "establishments." Let us work together to make a new path to a prosperous, peaceful, and environmentally healthy world by helping to fulfill these needs:

• Supporting cold fusion research at universities small and large throughout the land and at research laboratories where seekers of truth work on the frontiers.

• Working to enhance technical and other communication in the field by helping to support and fund cold fusion journals, newsletters, and books.

• Organizing a cold fusion information office and interest group in Washington, D.C. (*and* other offices in the several states) to help smooth the transition toward acceptance and reasonable government policies for this emerging field.

• Acting to promote international cooperation in cold fusion research and development.

• Taking *personal actions* to make sure that our friends, political leaders, businesses, civic organizations and societies are aware of the implications and needs of cold fusion.

Sincerely,

Dr. David Deak and Dr. Eugene F. Mallove
Deak Sonotech, Inc.

--Also--

Excerpts from Arthur C. Clarke's prepared remarks for "The Manhattan Project, Part II: Peace"

Three months ago, here in Colombo, I addressed the Pacific Area Senior Officers Logistics Seminar. My audience included the Commander-in-Chief, US Pacific Fleet, and over 100 staff officers from 30 countries -- including, for the first time, Russia. I feel that today I can't do better than to summarize the points I made to them, in my talk, "The Coming Age of Hydrogen Power."

• • •

What's really going on, in this 'cold fusion' business? Well, I've evolved several theories...

1. It's a mass delusion, like that which prompted dozens of French scientists at the beginning of the century to publish papers on the imaginary N-rays. But only the French could detect N-rays, and a global hallucination on the scale we're now witnessing seems a little unlikely, to say the least.

2. It's a superbly organized conspiracy, out to make a killing in oil and coal shares, and probably financed by the Mafia. (Hi there, Al!) More seriously .....

3. The phenomenon is real, but it's a laboratory curiosity, of great theoretical interest but no practical importance.

Frankly, I doubt this. Anything which so challenges accepted wisdom indicates a breakthrough of some kind. The energy produced by the first uranium fission experiments was trivial -- but everyone with any imagination knew exactly what it would lead to.

4. The next scenario: CF can be scaled up to moderate levels -- say 100 kilowatts. Even that could be revolutionary, if cheap and safe units can be manufactured. It would make possible the completely self-contained homes that Bucky Fuller envisaged: see my new novel, The Hammer of God for details. (I never miss a chance for a commercial.)

Above all, it would be the end of the gas-fueled car -- none too soon.... Automobiles could, quite literally, run on water!

5. The most optimistic scenario of all. There are no upper limits: in that case, the Age of Fossil Fuels has indeed ended. So has the Age of CO_2 buildup, acid rain, and air pollution.

Twenty years ago, when OPEC quadrupled oil prices, I remarked "The age of cheap power is over -- the age of free power is still fifty years ahead." I may have been too pessimistic.....

However, coal and oil will always be essential raw materials for an unlimited range of products: chemicals, plastics, synthetic foods. Oil is much too valuable to burn: we should eat it.

Now please fasten your seat-belts: after these modest daydreams, I want to really stretch your imaginations....

The term 'cold fusion,' even if correct, is rather misleading. Last year three Russian scientists [Karabut, Kucherov, and Savatimova] reported in *Physics Letters* that they were getting power generated in plasmas at 1800 degrees....ice-cold, of course, compared with the tens of millions the hot fusioneers require.

Now this is very interesting indeed from the point of view of rocket propulsion. If a plasma fusion rocket could be developed, it would open up the solar system, just as the airplane opened up this planet. It's not generally realized that the energy cost of taking a man to the moon is less than a hundred dollars. The fact that the Apollo round trip tickets cost about two billion each is a measure of the chemical rocket's inefficiency.

Well, back to Earth. I'd like to read from a letter which I sent to Vice-President Gore on March 18, pointing out that if the phenomenon can be scaled up for industrial and perhaps even domestic use, the consequences are immeasurable:

"It would mean essentially the end of the 'Fossil Fuel Age," and an era of cheap, clean power. The environmental benefits would be overwhelming; at the very least, concern with CO_2 build-up and acid rain would vanish.

"Clearly, no effort should be spared to resolve this matter speedily, by supporting scientists who are obtaining results (and, perhaps, discouraging those who have been obstructing them.) One expert you might consult is Dr. George Keyworth, President Reagan's Science Advisor and an authority on fusion physics. In a recent letter to me he made this striking analogy: 'the conventional path we've been pursuing is trying to build a bridge across the seas, instead of inventing boats.' Perhaps 'Cold Fusion' may give us the lifeboats Spaceship Earth so badly needs!"

I regret to say that I have not so far received even an acknowledgement from the Vice President's office.

One final thought: All through the ages, with monotonous regularity, religious crackpots have predicted the imminent end of the world. I am now predicting, at about the 90% confidence level, the end of the world as we know it.

And this time, it's very good news -- even for sinners.

Thank you, and goodbye from Sri Lanka.

Arthur C. Clarke

PENNSYLVANIA - SCIENCE AT THE FRONTIER
Karen F. Schmidt, "Liquid Gem," *Science News*, Vol 144, No. 1, July 1993, page 9.

EDITOR'S SUMMARY & COMMENTS

While working to develop new compounds for micro-electronic devices, chemists Patricia A. Bianconi and Glenn T. Visscher substituted carbon instead of silicon or germanium in an experiment to study special polymers. They reported, "Chemically, this is a unique carbon polymer and in fact, **one that chemists thought could not exist.**" They found that the carbon formed a polymer with tetrahedral linkages. Upon grinding this new material, it was found to be much harder than predicted. Upon examination, they found it has an X-Ray diffraction pattern similar to crystalline diamond. Upon heating to about 1,000° C some of the material converted to clear crystalline diamond and the rest to graphite. This article was chosen for review to illustrate that in materials technology the unexpected can occur. As this discovery could threaten vested interests (as does cold fusion), we wonder if there will be personal vilification of Bianconi and Visscher such as was heaped upon Pons and Fleischmann. The article ends with, "Polymer chemists and materials scientists alike now have exciting new vistas to explore. Says Frèchet [a Cornell polymer chemist], "This is an example of science at the frontier."

RHODE ISLAND - PHOTOEMISSION SPECTROSCOPY

X. Shi, D. Tang, D. Heskett (Dept. Phys., U. of Rhode Island, USA), K.D. Tsuei (Dept. Phys., Brookhaven Nat. Lab., N.Y., USA), H. Ishida and Y. Morikawa (Inst. Solid St. Phys., U. of Tokyo, Japan), "Coverage-dependent Core Level Photoemission Investigations of

Na/Cu(111) and Na/Ni(111)," *Surface Science*, vol 290, no 1-2, 10 June 1993, pp 69-79, 26 refs, 9 figs, 1 table.

AUTHORS' ABSTRACT

Coverage-dependent core level binding energies of Na absorbed on both Cu(111) and Ni(111) surfaces have been measured by angle-integrated photoemission spectroscopy. For increasing Na coverage, the core level binding energies of the Na 2p and 2s levels decreased by 0.93 and 0.81 eV for Cu(111) and 1.1 and 0.95 eV for Ni(111), respectively, up to completion of the first monolayer. The qualitative behavior of the 2p and 2s level was similar for both systems. A local density functional (LDF) calculation of the electrostatic potential energy change as a function of alkali coverage allows us to separate out the contributions of initial and final state effects in the coverage dependence of these alkali core level binding energy shifts. Our results are more consistent with a covalent model of alkali-metal bonding.

AUTHORS' CONCLUSIONS

In summary, we have measured the core level binding energy shifts as a function of Na coverage on Cu(111) and Ni(111). The results are very similar for the two systems, demonstrating that the substrate d-band structure is not important in determining the magnitude of the shifts. By comparing with a first principles calculation of Na on jellium we attribute the total magnitude of the core level shifts primarily to initial state effects due to the coverage-dependent change in the charge distribution around the Na nucleus. The discrepancy between the experimental and theoretical results in the intermediate coverage range is most likely due to final state effects.

WASHINGTON D.C. - NATIONAL PUBLIC RADIO
By Chris P. Tinsley

NPR 'Science Friday' cold fusion radio debate, broadcast June 25, 1993

This one-hour program was a discussion on electrolytic deuterium-palladium cold fusion, between Drs. M. McKubre of SRI International, J. Huizenga of Rochester University, P. Haglestein of MIT and M. Miles of the Naval Air Warfare Center. There was also comment from science historian Dr. B. Lowenstein of Cornell University, and the debate was chaired by Ira Flatow.

Dr. McKubre described his findings of excess heat energy. Dr. Huizenga said that Dr. McKubre was inferring a nuclear process without commensurate radiation. Dr. McKubre, stressing the importance and difficulty of loading the palladium with enough deuterium, said that his claim was limited to observations of excess energy "exceeding that of known chemistry," and that he made no claims for any nuclear process being involved. Dr. Huizenga, while declining to make any technical criticism of the experimental work of McKubre or Miles, stated that several groups had attempted to replicate the work at SRI. When pressed strongly by Dr. McKubre he refused to name any such group, but insisted, despite denials from Dr. McKubre, that McKubre knew who they were.

Dr. Hagelstein explained that if the reports are correct the energy is so great as to require a nuclear explanation, and that in his theoretical work he had discarded fusion of the kind seen in plasmas in favor of a quite different and previously unknown kind. Dr. Huizenga said that any such model would require high levels of gamma radiation, whose absence was conclusive disproof. He twice stated that cold fusion proponents were claiming that the gammas were being hidden in the metal. Dr. Hagelstein replied that nobody was claiming that.

Dr. Miles reported his findings of Helium-4, found only in heavy water experiments which gave excess heat. Dr. Huizenga insisted that, since such reports were contrary to known fusion mechanisms, they must be dismissed as being due to contamination: "If the Helium-4's there, the gamma rays have to be there." He also stated, twice, that if the energy from fusion was released as heat instead of gammas, then that would violate the law of conservation of energy. I do not follow this argument, it sounds as though Dr. Huizenga were saying that the absence of flames proves that animals do not oxidize carbohydrates.

The others present happily agreed with Dr. Huizenga that there is no mapping of plasma fusion onto these experiments. He insisted that without such mapping all contrary experimental evidence could be dismissed -- a statement which is in conflict with comment that cold fusion should be considered according to the

experimental results obtained. He also stated that the whole field is discredited by the "preposterous " reports of light water excess heat.

On a more relevant note, he insisted that nobody had provided full details of a procedure which guaranteed replication of the heat effect. This seemed to be partially accepted by the others, who, however, said that the growth in understanding over four years had made replication much easier even if it still required diligence and determination before good results were obtained.

The impression I obtained was that even the chairman became increasingly impatient with Dr. Huizenga's position. Essentially Dr. Huizenga was attacking new findings which appear to conflict with current theory on the basis that they do so conflict. Since he was unwilling to deny categorically the excess heat findings or criticize the technical work, I can only imagine that he is capable of Orwellian double-think. Certainly it is now quite clear that his role in 1989 was hardly that of a dispassionate reviewer.

In contrast, the other members of the panel gave clear, straightforward and convincing testimony.

WASHINGTON D.C. - NEGATIVE ON C.F.

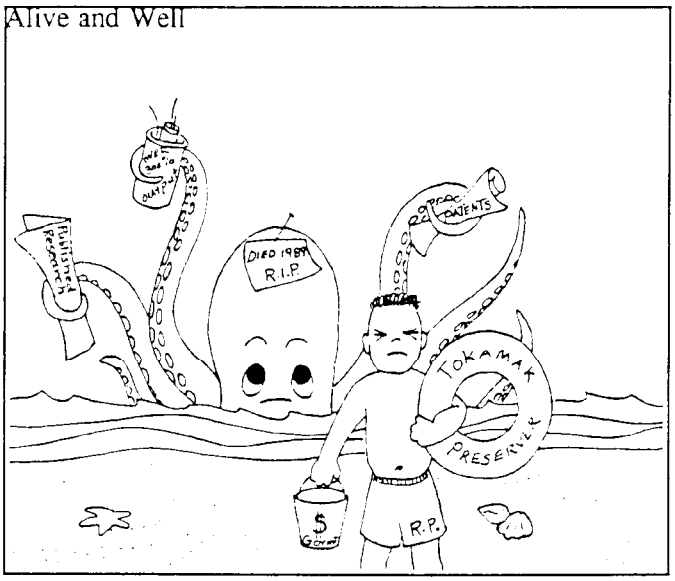
Ivan Amato, "Pons and Fleischmann Redux?," *Science*, vol 260, no 5110, 14 May 1993, p 895.

EDITOR'S SUMMARY

This is an essentially negative article which only just manages not to say Pons and Fleischmann are complete frauds, again. Commenting on the paper published in *Physics Letters A*, this article rehashes the many excuses that have been used over the last 4 years for not accepting cold fusion as a legitimate new science. *Science* claims, in this article, that "Physicists and chemists who have seen the paper, which reports surges of heat in the familiar cold fusion setup--palladium electrodes immersed in heavy water--say it's old news. Like the work that sparked the furor in 1989, they say, the new work contains baffling assumptions and complicated arguments, fails to document key controls, and leaves the field where it has been since the beginning: in a state of confusion..." but then admits, "...albeit hovering around the remote possibility of an intriguing new phenomenon in solid state science."

Cold fusion is made to look like an experiment whose usefulness is negligible, at best, although possibly of novelty interest (if you don't have anything worthwhile to do). One skeptic, Dr. Richard Petrasso, a physicist at MIT, when asked about the paper, stated, "I'm neither interested enough, nor do I have the time, to look at it." Too bad they haven't been interested enough or open-minded enough to find out what the rest of the world's cold fusion researchers have been doing. "They never say how reproducible [the claimed phenomena] is, they lack controls, it's the same old stuff," is a blatant statement of ignorance of the current state of world research.

Alive and Well



Petrasso quote: "I'm neither interested enough, nor do I have the time, to look at it."

WASHINGTON D.C. - SCIENCE NEWS

Ivars Peterson, "Strings and Mirrors," *Science News*, vol 143, no 9, 27 Feb. 1993, pp 136-139, 1 fig.

AUTHOR'S INTRODUCTION

In the 1920's, two powerful ideas took hold in physics. Quantum theory held that electrons in atoms could have only certain energies. The special theory of relativity

insisted that no particles could travel faster than the speed of light.

But there was no equation that combined the two theories to describe the behavior of rapidly moving electrons in atoms.

Paul A.M. Dirac finally found the link in 1929, when he formulated an equation that encompassed both special relativity and quantum mechanics -- and created relativistic quantum mechanics. Solutions to the equation not only provided a description of the motion of atomic electrons, but also unexpectedly gave an explanation of their spin and magnetic properties.

Moreover, some technical difficulties in handling the equation led Dirac to postulate the existence of antimatter: For each type of ordinary particle, such as an electron or proton, there exists an anti-particle of opposite charge. The discovery of positively charged electrons (positrons) a few years later vindicated Dirac's daring, controversial prediction.

AUTHOR'S CONCLUSION

Although the latest results suggest some intriguing possibilities, string theory itself remains mired in seemingly intractable mathematical difficulties.

"The main barrier is the fact that we don't have the full equations in hand," says physicist Brian R. Green of Cornell University. It is often hard to tell whether a given result depends on the approximate solution chosen for study or corresponds to real physics.

The discovery of a large number of different solutions to the equations of string theory presents theorists with another disturbing problem. Within the major assumptions of string theory, there appears to be a tremendous number of paths from the mathematics to the real world.

... "I think that over the last decade it has become apparent that we mathematicians can actually learn a lot in interacting with physicists if we suspend disbelief for a while," mathematician David R. Morrison of Duke University says. He describes some of the mathematical surprises emerging from recent developments in string theory in the January '93 *Journal of the American Mathematical Society*.

In 1989, John H. Schwarz, of the California Institute of Technology, remarked, "It is very satisfying to witness the growth of interaction between mathematicians and physicists after a long period of separation. I think it is fair to say that the study of string theory holds great promise for the unification of particles and forces, but it has already done a great deal to unify disciplines."

[Those remarks are still valid. Perhaps, even nuclear physicists and cold fusion chemists can work together. -- Ed.]

D. NEWS FROM ABROAD

BRITAIN - SUNDAY TIMES ARTICLE

Neville Hodgkinson, "Nuclear Confusion," *Sunday Times*, London, 27 June 1993, sec. 9.

SUMMARY

Following cold fusion since the March 1989, this article points out the tribulations of the cold fusion scientists and the biased and self-serving side of the hot fusion advocates. The science community of England has been highly hostile to cold fusion also. Even though Martin Fleischmann is a Fellow of the Royal Society (Britain's premier scientific society), was chosen Faraday Professor of Electrochemistry at Southampton University in 1967, and was awarded the Palladium Medal of the U.S. Electrochemical Society in 1985, the acceptance of his cold fusion work in England was worse than in the U.S., after the March 1989 press conference.

Since they were 'driven' out of the U.S. scientific community, Pons and Fleischmann have settled into their research lab in France, and Fleischmann says, "We are developing a new research organization. Its objective is to look at the science and engineering of the next century. The pattern of research funding by existing organizations makes them look for 'safe' research. They can't afford to have failures. So a large proportion of their work is concerned with improving existing knowledge, rather than searching for new knowledge. We want to see whether we can break this mold. Some of the labs [at their new center in Nice, France] will be dedicated to external researchers, the criterion is that they should work on innovative projects."

Meanwhile, the hot fusionists have been consistently antagonistic to all forms of cold fusion research, regardless of peer-review and publication of new research. Because these non-physicists (Pons & Fleischmann) claimed a major discovery outside what was construed to be their territory, they were threatening the multi-billion dollar industry that hot fusion research has become for the physicists, in Europe as well as the U.S. The fact that Fleischmann had looked for help from his colleagues at Harwell to discover more about the possible causes of this phenomenon enabled them to be the first to try to reproduce it. But with no successes, the British scientists became some of the first detractors, too.

Pons states, "The good scientists are starting to say, okay, we'll give you the benefit of the doubt and check it again. We have had about 60 scientists visit us here in recent weeks. These people also come here with good ideas, and make important observations which accelerate the whole process." He feels that the next goal is a 10-kilowatt generator that may be ready within a year.

Dr. Eugene Mallove, now with Deak Sonotech, Inc. and author of Fire From Ice, considers cold fusion "not a scientific curiosity. It is a technological revolution in the making. Texas A&M Professor John O'M. Bockris, one of the first to duplicate the P-F effect, says "Solid-state nuclear physics has been born. A great law we all used to believe in, that nuclear reactions can only take place at huge temperatures, is not true. That is the shibboleth we have only just got over."

In Japan, despite some controversy over the reality of cold fusion, research has gone ahead with hundreds of scientists. Their work is funded by both government and private commercial interests, and they have a lot of money to work with. This has enabled them to get ahead of most other countries in investigating the "new hydrogen energy."

More progress is being made toward figuring out a theory which will explain the c.f. reaction, but as yet no completely conclusive answer has even been attempted. This research is new ground, in more ways than one, and it will take trial and error to narrow down the parameters that make c.f. work every time. But, all the pieces are being identified for the puzzle to be solved.

The *Sunday Times* says that the c.f. story raises some major questions about the scientific establishment's openness to new ideas, and industry's willingness to fund new research. Dr. Yamaguchi of NTT in Japan sees this negative reaction as an "easy way out" to avoid the confusion of so few successes opposed to many failures, that typified the early c.f. research. Dr. Fleischmann agrees. "Of the new technological developments since the second world war, 70% have been discovered in the UK. But [the British] have not been able to engineer any of it. Now [they] are saying that if they do less science they will do more engineering, but there is no evidence of that. [That policy] will just reduce the flow of ideas."

CANADA - SECRETS EXPOSED

Robin Christmas & Jerry Thompson (Producer & Reporter), "The Secret Life of Cold Fusion," Canadian Broadcasting Company's *PRIME TIME NEWS*, 27:55 minute video.

EDITOR'S SUMMARY

This video presentation provides a balanced view of the past and near future of cold fusion. The net impact is highly positive because both sides of the controversy were presented without editorial propaganda. After a review of the March 23, 1989 press conference in which Pons and Fleischmann announced the cold fusion discovery, the reporter reviews how several laboratories rushed into experiments and reported negative results. For example, Steve Koonin appears and says, "When wine goes sour, you throw it out." The reporter states that when the media went from adulation to doubt to ridicule, Fleischmann returned to England, Pons vanished and everyone believed that cold fusion was dead. Now, four years later, Pons and Fleischmann are shown in their new laboratory near Nice, France, working on cold fusion with Japanese funds from the Toyota corporation.

Asked if they believe that cold fusion was an error, Pons says, "No!" Pons says that 95% of the criticism leveled against cold fusion was unwarranted but that 5% had merit and they have ensured that those points have been considered. The current cells are reproducible. The video showed four cells that were producing significant (140 to 150 watts) excess power from a small cathode.

Laboratory shots showed work going on with considerably larger reactors (about the size of a two-quart bottle) that will be developed into commercial prototypes to supply the power needed to run a home (about 20,000 watts). They expect these reactors to last several years.

With the comment that the "Mystery won't go away," the next presentation is an interview with John Maddox (editor of *Nature* who refuses to publish any positive reports about cold fusion). Maddox thinks cold fusion is equivalent to making water run uphill. Next is shown the lab work of Dr. Yamaguchi (NTT, Japan) who has shown heat, neutrons, and helium as the nuclear ash from fusion reactions. McKubre, Reiko Notoya, Akito Takahashi, and Ikegami are interviewed in their labs. The next is an interview with Frank Close who claims that not a single experiment has shown the nuclear ash. "Where's the radiation?", asks Close (who apparently has not attended cold fusion conferences nor read the literature.)

Dr. Vigier (editor of Physics Letters A, Paris) discloses his initial disbelief and now his acceptance that excess heat is being generated. Dr. Vigier is involved with experimental work in Belgrade that produces a "huge flock of neutrons". He thinks that there is some unknown deep, not understood, phenomena that can be triggered into producing nuclear reactions. "Definite nuclear reactions," he states emphatically.

The reporter next interviews Yan Kucherov in his Podolsk (near Moscow) lab. "Before, theory says it is impossible. But Pons and Fleischmann show that it is possible." Kucherov and associates have produced up to 500% excess heat plus a variety of nuclear ash. Edmund Storms is interviewed in Los Alamos, New Mexico. Asked why he has kept doing cold fusion experiments, he stated, "When you make tritium it is spectacular. ... When you hold the holy grail in your hands, it is hard to let go."

Michael McKubre is interviewed and the video shows the precautions they are now taking to ensure that no further fatal accidents occur in their experimental work. McKubre reports, "We have an energy source such that you must account for [energy production] between 10 and 100 times as large as known chemistry and that [amount of energy produced] is not consistent with the known laws of chemistry."

The multi-quote finale of the video is Vigier saying, "That's why the Indians are doing it [light-water cold fusion]. Could put it in the Indian villages and that would change the conditions in the third world." Edmund Storms says that we have a paradigm shift, a new way that we must look at matter. And Pons & Fleishchmann say, "We now have cells that are running and producing eight to ten times the input." When asked how many years away from commercial potential, Dr. Stanley Pons states, "I would say probably by the end of the year." Then the final commentary by Thompson, "I would say that the jury is still out. ... But if there is not something to cold fusion, why are reputable labs willing to spend millions of dollars on an idea that was supposed to be dead?" [Summary by Hal Fox, Ed.]

ITALY - NEW NEUTRON ABSORBER

Gian Franco Cerofolini, Guilio Boara (Istituto Guido Donegani, EniChem, Functional Materials Dept., San Donato, Italy), Stefano Agosteo and Armando Foglio Para (Politecnico di Milano, Dip. di Ingegneria Nucleare, Milan, Italy), "Giant Neutron Trapping by a Molecular Species Produced During the Reaction of D^+ with H^- in a Condensed Phase," *Fusion Technology*, vol 23, no 4, pp 465-469, 8 refs, 2 figs, 1 table.

AUTHORS' ABSTRACT

In an attempt to study the claim of deuterium-deuterium fusions resulting from redox reactions involving deuterium, it has been discovered that in the control reaction $D^+ + H^- \rightarrow HD$ (where the reaction takes place in a condensed phase, either homogeneously or heterogeneously), a compound is formed that can reduce the neutron background count rate by an amount higher than that produced by the most efficient neutron absorbers.

The results presented in this technical note concern a new phenomenon, giant neutron trapping (completely unexplainable in terms of the absorption cross section of the materials employed in our experiments), which has been observed in a variety of situations in which negatively charged hydrogen reacts with positively charged hydrogen to form a hydrogen molecule. Since the hydrogen molecule by itself is unable to trap neutrons, we ascribe the giant trapping to some molecular configuration of the hydrogen molecule

formed during the elementary $H^+ + H^-$ reaction, which is exothermic by 17.6 Ev with respect to the H_2 molecule.

ITALY - HYDROGEN EXTRACTION

G. Mengoli, M. Fabrizio (IPELP CNR, Padova, Italy), C. Manduchi, and G. Zannoni (Dip. di Fisica, Univ. of G. Galilei, Padova, Italy), "Surface and Bulk Effects in the Extraction of Hydrogen from Highly Loaded Pd Sheet Electrodes," *J. Electroanalytical Chem.*, vol 350, nos 1-2, 1993, pp 57-72, 15 refs, 8 figs, 1 table.

AUTHORS' ABSTRACT

It has been shown that hydrogen extraction from highly-loaded Pd sheet electrodes takes place under the mixed control of hydrogen diffusion within the solid and kinetic steps at the boundaries. Analysis of the transients of the potentiostatic extraction currents revealed the relevant kinetic and diffusion parameters. The kinetic parameter, which is probably related to the transition $H_{abs} \rightarrow H_{ads}$, thus depends on both the history of the Pd sample electrode and the electrolytic environment, whereas the diffusion parameter may depend on the degree of hydrogen loading in the metal.

JAPAN - HYDROGEN PRESSURE

M. Enyo and P.C. Biswas (Catalysis Research Center, Hokkaido, Univ., Sapporo, Japan), "How High is Equivalent Hydrogen Pressure Attainable at Palladium Cathode?" presented at 183rd Electrochemical Society meeting, Hawaii, May 16-21, 1993.

AUTHORS' ABSTRACT

Concentration of hydrogen dissolved in Pd Cathode, or the equivalent hydrogen pressure, during hydrogen evolution reaction (HER) in aqueous solution is determined by the hydrogen overpotential and mechanism of the HER. The equivalent pressure may be quantitatively measured through observation of the part of the overpotential that is responsible for the Tafel step ($2H \rightarrow H_2$). The use of a surfactant which retards this elementary reaction is effective in increasing the pressure. Experiments indicated that the highest pressure may reach 10^8 atm at 0.25 A per sq. cm., 30°C.

JAPAN - VARIOUS CATHODES

T. Ohmori and M. Enyo (Catalysis Research Center, Hokkaido Univ., Sapporo, Japan), "Excess Heat Evolution During Electrolysis of H_2O with Several Metal Cathodes," presented at 183rd Electrochemical Society Meeting, Hawaii, May 16-21, 1993.

AUTHOR'S ABSTRACT

Excess Heat evolution was measured on Ni, Au, Ag, and Sn in aqueous K_2CO_3, Na_2CO_3, Na_2SO_4, and Li_2SO_4 solutions under galvanostatic electrolysis conditions. Steady evolution of excess heat in various electrode/electrolyte systems, but not in Ni/Na_2CO_3, Ni/Na_2SO_4, and Ni/Li_2SO_4, was observed for at least several days. The largest excess heat observed was 907 mW on Sn in K_2SO_4 solution.

JAPAN - MUON-CATALYSED FUSION

Courtesy of S.P. Faile

K. Nagamine (Fac. Sci., Univ. Tokyo, Japan), "Experiments on Muon-catalyzed Fusion," *Perspect. Meson Sci.*, 1992, 32 refs, pp 383-397.

AUTHOR'S ABSTRACT

Recent topics in experimental studies on negative muon catalyzed nuclear fusion are reviewed with an emphasis placed on kinetics in muon transfer phenomena and on the muon-to-alpha sticking probability. Some future perspectives are also given for the energy production studies as well as application to low energy microsource.

JAPAN - RESEARCH REVIEW

Chemical Abstracts, 17 May 1993

E. Tachikawa, T. Hirabayashi, Z. Yoshida, Y. Arantono, T. Kimura, H. Aoyagi, R. Sato, K. Obara, Y. Yamanuti, et al. (JAE Res. Inst., Japan), "In Search of Cold Deuteron-deuteron Nuclear Fusion," *Nippon Genshiryoku Kenkyusho*, [Rep.], 1992, JAERI-M 92-036, pp 344-346, 4 refs.

AUTHORS' ABSTRACT

A review of the cold fusion research at JAE Research Institute.

RUSSIA - NEW THEORY "E-CELL"

Gennady V. Fedorovich (Russian Acad. of Sci., Theoretical Problems Dept., Moscow, Russia), "Nuclear Fusion in Crystal Hydrides of Light Elements," *Fusion Technology*, vol 23, no 4, pp 442-464, 44 refs, 14 figs, 7 tables.

AUTHOR'S ABSTRACT

A new physical object called the E-cell can be used as an appropriate catalyst to facilitate nuclear fusion reactions in solids. The E-cell is a radiation defect in a crystalline lattice of A_xH_y hydride (ordering number Z and mass number N of element A must be equal to one of the following pairs: (2,3), (3,6), (4,7), or (5,10)) formed by the capture of a thermal neutron in a crystal. Two features of hydrogen nuclear dynamics are of interest:

1. suppression on the Coulomb barrier between hydrogen nuclei due to many-body screening effects,
2. sufficient acceleration of hydrogen nuclei up to a few hundred electron-volts.

Experimental research in this area may lead to the creation of equipment for the effective enhancement of the fusion rate to values that are of practical interest.

AUTHOR'S CONCLUSION

The conclusions resulting from the consideration of separate E-cell phenomena are listed in the corresponding sections of this technical note. It is expedient to discuss the conclusions as a whole.

The main result is the exposure of the existence of a new physical object called the E-cell. In the E-cell, there are physical phenomena, each of which contributes to an increase in the nuclear fusion reaction rate. The combination of these phenomena makes it possible to obtain a detectable yield of neutrons as a result of cold nuclear fusion in a solid.

These conclusions are the result of a theoretical consideration of the possible phenomena in the E-cell, and for this reason, they have a rather speculative character. We may develop more exact models and improve the corresponding methods. However, the results would not be more reliable than those described herein. The only way to confirm or to disprove our conclusions is to execute special-propose experiments. We may say that the potentialities of the theory are exhausted now. The theoretical approach has given us the leading considerations. The rest is a matter of experimental physics.

RUSSIA - PRE-1989 COLD FUSION
Courtesy of Dr. Veniamin Filimonov

Andrey Grigoryevich Lipson wrote his Ph.D. thesis in 1986, one chapter of which was connected with cold fusion. Presentation of the thesis was made in November 1986, and its confirmation by VAK (Higher Attestation Commission) was in September 1987, with support of academician A. L. Buchachenko. (Academician is a title awarded to highly ranked scientists and administrators of a university department or research facility.)

The thesis was entitled "Electrophysical Processes on Fresh-formed Surface of Solids," the scientific chief was academician B.V. Derjaquin. The chapter of interest was entitled "Nuclear Reactions During Destruction of Solids," and concerned description of experimental results of the author on the neutron emission under fracture of lithium deuteride (LiD). Single crystals and also polycrystals of heavy ice D_2O. Two papers of the author were published at the same time: one in *Kolloidnyi Zhurnal* (Colloidal Journal, USSR) and the other in *Pisma v ZTF* (Letters to Journal of Technical Physics, USSR).

RUSSIA - ENERGY PRICES TO RAISE

Elizabeth Bubindien (Staff reporter), "Russia's Economy Shows Signs of Turnaround as Inflation Eases," *Wall Street Journal*, June 28, 1993, p A12.

Export quotas for energy and certain other commodities are due to be raised in September, which should drive up the price of oil closer to world levels and bring in more

hard currency. (Energy prices have risen considerably in Russia already, but they are still far below world levels; for example, industrial gas sells for 5% of the world price and coal 4%.

E. SHORT ARTICLES FROM READERS

A HOT FUSION EXPERIMENT THAT HELPS COLD FUSION

By Dr. Harold Aspden

When a heavy ion moves in a forward direction, the quantum electrodynamic action of the field background, as excited electrodynamically by interaction with an associated electron motion, can result in an energy transfer as between the ion and the background field. In a sense there are thermodynamic actions involved which can result in cooling or heating of that environmental field.

The governing condition is the physical requirement that the action does not develop a reaction force couple on that background field. The reason for this is that the field is unable to assert coherent forces which would have reaction counterparts as eddies in what is really a structured and organized vacuum medium, inasmuch as that medium is the seat of the action we associate with Planck's constant and the photon, and photons travel in straight lines.

That fact is something that has eluded researchers investigating electrodynamic principles. Ampère, who was the first to develop a law of electrodynamics which had account of such reaction effects, opted for a form of law which denied the reaction couple but it also denied the possibility of a linear reaction force. The Ampère law found no use in practical electromagnetism because it is too complex. Also, it does not cater to the kind of energy transfer which allows magnetic induction energy to be stored in the vacuum field, even where all the circuit action is between electrons.

As a result, our electrical science has developed from empirical foundations, which rely on a much simpler law, the Lorentz force law, but which needs separate empirical rules to extend to magnetic induction, but yet these still do not cater to electrodynamic interaction between heavy ions and electrons.

It is in this latter heavy ion situation that we see energy and force anomalies. They have been creeping into the science literature now for several decades. The early evidence came from the very high anomalous cathode reaction forces found with the cold-cathode arc discharge, as in a mercury pool rectifier used to produce d.c. power in our laboratories in the early half of the 20th century.

This author was the first to draw attention to the need to revise electrodynamic law on the basis that the field reaction could not assert a turning couple but that it could assert a linear force. Early thinkers were mistaken when they regarded an out-of-balance force as unacceptable because it conflicts with Newton's law of action and reaction. In fact, the field background is a partner to the total system in which two discrete charges in motion interact electrodynamically. That field background medium can provide the seat of the force balance and as it is the storehouse for magnetic induction energy it seems rather foolish to pretend that it cannot assert or absorb force.

This concept was explained on pages 15 and 16 of the author's first printed disclosure on this subject, entitled: "The Theory of Gravitation" and dated November 22, 1959. The author deduced, on this basis, the form of law applicable between two charges of equal mass and found it had a form which could give the long sought connection with gravitation. For charges of the same polarity having the same velocity, then regardless of their relative spacing and motion direction relative to the separation vector, one obtained an inverse square of distance law of force that was mutually attractive and directed along the line joining the charges.

In the second theory of "The Theory of Gravitation," in 1966, the author extended the formulation of the law to include interactions between charges of different mass. Attention was then drawn to the recognized reaction force anomalies in cold cathode discharge tubes and the findings were formally published in the *Journal of the Franklin Institute* (vol 287, p. 179, 1969).

After referring to such anomalies, the last words of the last chapter of the author's 1966 book were: "The law of electrodynamics presented probably has the most immediate practical implications and these are as important to mankind as our understanding of the nature of the gravitational force we know so well."

Yet, here we are 27 years later and still the world of science keeps faith with the wrong force law, even, as is now explained, when they have photographic proof that something is clearly wrong and that proof is provided by their own experiments on hot fusion research!

The author's mass-dependent formulation of the law of electrodynamics was developed at about the time the author noticed a 'hot fusion' report in 1965 that a falling column of mercury carrying current in an axial magnetic field exhibited anomalous behavior. The photograph reproduced in *Electronics and Power* (vol 11, p 12, 1965) in an article entitled "The Quest for Controlled Thermonuclear Power" showed how helical convolutions developed over the second half of the downward fall. Their radius increased progressively until with the final convolution the helical radius diminished sharply as the mercury filamentary flow was somehow drawn back to the central axis.

This clearly implied that some very unusual forces effective along the lower part of the current filament were at work and that this was a compressive action directed along the current flow axis. This is contrary to the Lorentz force law and, though the author wrote a letter to the Editor of *Electronics and Power* to urge attention to this anomaly (vol 11, p 202, 1965), it attracted no comment.

The author did not, at the time, stress one other point, which can be seen so clearly by scrutiny of that same photograph. The filament had, towards the end of its fall, also reduced to about one third of the diameter it had over its first half of the fall. This means that its cross-sectional area was reduced by about one-ninth and so the flow velocity had increased ninefold, which means that the kinetic energy had increased by about 80 times of the value it had after falling half way.

Now, by what stretch of one's physics imagination can such a phenomenon be explained? It is not a gravitational effect and so it must be an effect induced electro-dynamically **as a d.c. effect** by the 300 amp current. If so, this is something beyond the realm of accepted physics.

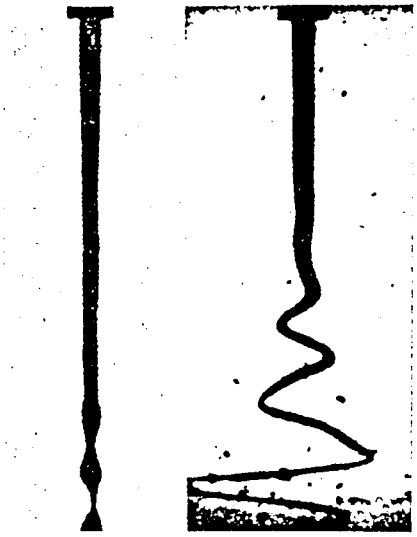
There is, however, an answer and the author eventually put this on record in *IEEE Transactions of Plasma Science* (vol PS-5, p 159, 1977). A further, less theoretical and more comprehensive account, in which the author discusses also the very substantial water discharge force anomalies found by Peter Graneau, is found in *IEEE Transactions of Plasma Science* (vol PS-14, p 282, 1986). This is all relevant background to those who currently research excess energy in plasma discharge experiments.

The true law of electrodynamics with the mass ratio factor that allows for electron action on heavy ions, requires a discharge between anode and cathode to involve electrodynamic deceleration forces to the midpoint, leaving the anode-cathode voltage (or gravity in the falling mercury experiment) to keep ions moving through that midpoint. Then, over the second half of the discharge, there are electrodynamic acceleration forces. However, as these forces are proportional to ion velocity and enhanced by the ion-electron mass ratio, the action is one involving an exponentially-increasing escalation. There are, therefore, very high forces set up which draw power from the background field environment and this action taps that background in a thermodynamic sense, leaving it in a cooler state.

Here then is an unexpected source of energy, which should be heeded by 'free energy' enthusiasts, but, admittedly, it needs some astuteness and a deep insight into electrodynamics in order to perceive this as evidenced in that 1965 reproduction of the photograph of the column of falling mercury. Yet, surely those researching the stabilization of plasma discharges in hot fusion reactors are sufficiently versed in electrodynamics to see what is there to be seen from one simple photograph.

It is, indeed, a curious turn of events, when those specialists in hot fusion deny the results emerging from 'cold fusion' experiments, and yet this author can point to something as important as a 'free energy' source revealed by their own 'cold' experiments on discharge stabilization!

It would seem, therefore, that the spin-off from 'hot fusion' research, which was why that falling mercury work was undertaken in the first place, has something useful to offer us in our quest to understand what Professor Peter Graneau now calls 'capillary fusion' (*Fusion Facts*, June 1993, p 19).



The 'sausage' and 'kink' instabilities in a column of mercury carrying a current of 300 A. Because the mercury is falling, the instabilities are further developed at the bottom of each picture. (Left) no axial magnetic field; (right) the 'kink' instability is encouraged by an axial magnetic field of 300 G.

Those who doubt should take a close look at the photographic evidence provided by that falling mercury column. It is submitted that it really does provide a picture of an action that defies accepted physical principles and does this by revealing that 'excess energy' appears as if from nowhere over the second half of the mercury free fall.

It is tempting to suggest that a deuteron is a heavy ion moving through a conductor that is fed by current and, though the current is small, an exponentially increasing acceleration rate can soon cause an individual deuteron to hog most of the current and develop an enormous impact velocity, which could well be a fusion trigger. The above-referenced 1986 IEEE paper refers to evidence of arc discharges in liquid hydrocarbons involving measured arc speeds of 100 km/s and argues that the forces measured by Graneau for discharges in water correspond to a 5 km/s speed by only 1 part in 100,000 of the solution. A heavy ion colliding to rest from a speed of 100 km/s sheds the energy equivalent to it having a temperature measured in millions of degrees. One may wonder whether one can extend this electrodynamic escalating acceleration theme to solid host metal palladium in which deuterons have some initial mobility.

However, it seems more likely that 'cold fusion' is just that, a fusion reaction which involves deuterons, and at best the electrodynamic action is a catalyst which helped to trigger fusion.

Peter Graneau, in his *Fusion Facts* June 1993 letter, combined in one paragraph three statements: (a) that Fleischmann and Pons had measured "more that 1 kw/cm^3," (b) that theoreticians are prone to misread experimental data when they defend dogma, and (c) a comment about Thomas Harriot carrying out 'free fall' experiments before Galileo did them in Pisa. It seems appropriate therefore, by this letter, to draw Peter Graneau's attention to the 'hot fusion' mercury 'free fall' experiments which now defy Galileo and which do have some bearing on the 'capillary fusion' theme, given that discharge currents occur through fusible material occupying the capillary channel. Hopefully, I will not be judged as having 'misread' that photograph in upholding my own 'dogma.'

Harold Aspden
Southampton, England
25 June 1933

F. LETTERS TO THE EDITOR

FROM ARTHUR C. CLARKE

to the Editor of The Sunday Times (London), from a copy Dr. Clarke sent *Fusion Facts*.

Dear Sir,

My congratulations on the excellent article 'Nuclear Confusion' in your 27 June issue.

Initial extreme skepticism over the Fleischmann and Pons claims was fully justified, but since 1992 no one who has studied the extensive literature can have any doubts about the existence of some energy-producing phenomenon (not necessarily fusion).

I hope that the brilliant Canadian Broadcasting Corporation's report 'The Secret Life of Cold Fusion,' aired in prime time on 24 June will be repeated in the UK. It puts the case beyond serious dispute, and those who still disagree are guilty of at least stupidity -- and at worst, criminal negligence, for the end of the Fossil Fuel Age may be in sight.

You might be interested in this summary of the address I made to a symposium in the Hotel Plaza, New York, on 24 June. I think it created communications history, as it was sent from my desk via the new AT&T Videophone. Although the picture was very small, it

blew up quite well, and of course, the transmission cost no more than an ordinary phone call!

Yours faithfully,

Dr. Arthur C. Clarke, CBE

Chancellor: International Space University
Chancellor: University of Moratuwa
Fellow: King's College, London

[See summary of Dr. Clarke's speech on page 8.]

LETTER FROM DR. GLÜCK IN ROMANIA

Dear Hal,

Everything was excellent at Minsk ("Possibilities of Ecologically-Clean Energy Production and Energy Conservation," May 25-27, 1993) and I am very grateful to you. I hope that we shall now have better access to the cold fusion literature of the former Soviet Union--this seemed to be a gap in our information. At Minsk we had another good opportunity to see that the contribution of *Fusion Facts* to the development of the field is simply invaluable and will be more and more important in the future --and your (our) work will be more and more important.

The most interesting event in my post-Minsk activity was that I have learned from the Yamaguchi-Nishioka Provo paper --which I missed!-- that they are adepts of a type of SURFDYN concept. It is applied to an extreme case-explosive outgassing of D_2, it is not connected to catalysis, however it is based on the same thinking. I shall cite from this paper:

"It should be much more probable that the event occurs at the surface of the solids than in the bulk," and (final sentence) "Although more sophisticated calculations are needed to check the validity of the proposed 'musical chairs' model, we claim that the origin of the nuclear fusion is the rapid vibration movement of host atoms." (host=Pd)

I was rather shocked: it is not a problem of priority, however if I had had all the Provo papers, the progress of SURFDYN/nuclear catalysis could have been much faster due to the encouragement by a similar idea.

In Nature **363**,6425, 13 May 1993, p 107, there is a note re. cold fusion but this has nothing to do with the scientific aspects: "Italian court wrestles with cold fusion suit." I think you were informed about it.

I may call to your attention, and to the analysis of our theorists, a paper in Nature **363**,6427, 27 May 1993, p 320, as well as its presentation by the famous enemy of cold fusion, John Maddox: "Visualization of coherent nuclear motion in a membrane protein by femtosecond spectroscopy." This paper reveals a surprising correlation of the nuclear and the molecular worlds --the same is true for cold fusion. (My guru, Arthur Kostler, has shown that creativity works by synergism, that is by correlating remote, seemingly very different ideas.) Please ask Robert Bush, too.

A lot of interesting papers have been presented at the 183rd meeting of the Electrochemical Society in Hawaii, see *Interface*, spring '93, supplement of the *Journal of the Electrochemical Society*. Abstracts no. 1715, 1731, 1764, 1766, 1772, 1899, 1907, 1911, 1917, and 1924 are of interest for cold fusion/SURFDYN --I have to write to all these authors.

In *Current Contents*, the following paper was announced, "Recent measurements of nuclear reactions cross sections with ion beams at very low energies," F.E Cecil, H. Liu, J.S. Yan, *Vacuum*, vol 44, no 3-4, Mar-Apr 1993, pp 181-184. The first author, Ed Cecil (Colorado School of Mines, Golden, Colorado) is a nice gentleman, we met with him at Como.

Peter Glück

Absence of knowledge encourages myth, or the comfortable illusion that there is nothing new to know.

E.G. Mesthene

LETTER TO ALL U.S. CONGRESS MEMBERS

Cold Fusion Research Advocates
Chamblee, Georgia
July 14, 1993

Dear Senator (Representative),

We would like to bring to your attention some recent developments in a controversial field -- a field which could be critically important to our nation's energy future.

As you may recall, cold fusion first became news back in 1989 when the University of Utah researchers Pons and Fleischmann announced to a startled world that they had created a fusion reaction at room temperature. In 1989, the experiment could not be readily replicated. The U.S. Department of Energy issued a negative report on cold fusion, and the field received little attention in the U.S. since then.

In the four years since 1989 however, considerable advances have been made in cold fusion. Successful experiments have been conducted in many laboratories around the world, including SRI International, Los Alamos, the Naval Air Weapons Center, Naval Research Laboratory, and many other U.S. laboratories, but most notably in Japan. MITI has organized a cold fusion research and development consortium which includes 15 of Japan's largest corporations. The leading consortium member, Toyota, demonstrated a 144 watt boiling cell last year.

Attached are articles on cold fusion from *Popular Science* and the London *Sunday Times*. **We would like to invite you and your staff to attend a showing of a half-hour documentary on cold fusion recently aired by the Canadian Broadcasting Corporation.** The film includes footage from laboratories all around the world, including SRI in California, the Toyota laboratory in France, and one of the Russian laboratories.

Two Showings: Friday, July 23, 1993 at 9:30 a.m. and 10:30 a.m. in 2318 RHOB.

We hope to see you on July 23rd.

Sincerely,

Jed Rothwell
Director

Dr. Eugene F. Mallove
Associate Director

LETTER FROM DAVID MOON

A reference to the notes, "An Elementary Model of Deuteron Behavior...": June issue, page 13, col. 1, bottom of second paragraph, after the phrase "...which carries away the 23.85 MeV." please add an asterisk. The footnote will read:

* This possible relation between excess power (from d + d → ^{4}He) and the level of input power was hinted at in Dr. A. Takahashi's alternating high-low electrolysis in which the output/input ratio was greater during the low-current input -- see *Fusion Facts*, vol 3, no 9, March 1992, p 12.

Thank you, David Moon

TALKING TO P.M. KOLOC

In a conversation with Paul M. Koloc (President, Prometheus II, Ltd., College Park, MD, Phone (301) 445-1075) he asked about the progress that has been made in understanding the role of lithium in cold fusion electrochemical cells.

Specifically, has anyone tried using pure ^{6}Li as contrasted with the natural isotopic combination of ^{6}Li and ^{7}Li? Paul suggests that the lithium + deuterium → helium nuclear reaction would be favored by the use of ^{6}Li. The rationale is that ^{6}Li has different magnetic properties that would cause a higher diffusion rate in Pd than would be the case with ^{7}Li. The time that it takes an experimental Li\Pd cell to "turn on" may be due to the slower diffusion of ^{6}Li compared to deuterium. Paul suggest that the ^{7}Li may "clog up" the Pd lattice and prevent the proper diffusion, loading levels, and reaction of ^{6}Li with deuterium.

We would greatly appreciate hearing from any reader who has comments or experimental data that would bear on this concept. It is noted that Jerome Drexler, Steve Gregory, and Robert Bush & Robert Eagleton (and others) have all suggested that the predominant nuclear reaction in a Pd\Li\heavy water cell could be the aneutronic ^{6}Li + d → 2 ^{4}He + energy. Refer to the R.T. Bush paper.

Hal Fox, Ed.

LETTER FROM IAN HACON

In a letter to Sam Faile, Ian Hacon states:

..."I was talking to one of my reps about things and he said he knew a chap who could run a diesel on water. He used a flash boiler to generate dry steam and also passed it through a high voltage field. Got about 98 mpg. He sold the rights to someone who sold them to an oil company and there it rests until today. However, he only sold part of the rights for a specific application. Maybe diesel, maybe petrol engines? I am certainly following this one up, ASAP.

"As an experiment to prove a point, he fitted a heater in the fuel tank or somewhere, to heat the diesel fuel. On a normal run that takes a tank of fuel, he reduced consumption dramatically and only used ¼ of a tank. Simply by preheating....

Yours Sincerely,

Ian C. Hacon
P.O. Box 2020, Bendigo Mail Centre 3554
Australia
Phone (054) 41 2747
Fax (054) 41 2707

LETTER FROM DR. MELVIN MILES

of the U.S. Department of the Navy, Naval Air Warfare Center, Weapons Division, China Lake, CA, posted on Internet to Professor Steven E. Jones of Brigham Young University, with a copy to *Fusion Facts*, and a request to publish.

... My problems with Professor Jones began on July 23, 1991 when I presented an invited seminar on my research at Brigham Young University. I soon learned that this event was more of an inquisition rather than a normal scientific seminar. Professor Jones and his group interrupted with so many pointed questions that it took me nearly three hours to complete my seminar. Although I was upset with this situation, I tried my best to be patient and to answer all their questions. It was obvious that the real intent of this group was to find possible errors with my experiments. This was verified a few weeks later when Professor Jones mailed out a critique of my work to other scientists involved with this research field throughout the world. This eventually lead to my published response to questions raised by Professor Jones regarding my work. This entire episode was clearly outside the bounds of professional decency towards an invited seminar speaker.

Professor Jones has recently made false allegations regarding my work by his statements of "rejected data points," "shifts the window," "fudging or worse," etc. Although Professor Jones tries to use some unknown author for several negative statements, the implications regarding my experiments are very clear. These statements by Professor Jones are damaging since there are absolutely no rejected helium measurements in my recent publication. Every data point involving heat/helium measurements is reported. This can be readily verified by Dr. Ben Bush who did the helium analysis at the University of Texas, as well as by my detailed laboratory notebook for these experiments. Furthermore, there is no fudging of any measurements.

LETTER FROM THE EDITOR

June 15, 1993

Stephen B. Shepherd, Editor-in-Chief
BusinessWeek
McGraw-Hill Building
1221 Avenue of the Americas
New York, N.Y. 10020

Dear Mr. Shepherd,

Being an editor myself, although many times smaller, I can appreciate that you are not responsible for the content of all of the articles that pass muster for inclusion in *BusinessWeek*.

We who have made it our business to follow closely the enormous progress of the new science of **Cold Fusion** wish to thank you for being one of the few publications that have provided reasonably honest news about cold fusion. This service has been provided by *Business Week* in spite of the fact that nearly all of the large, important, eastern universities (with whom your writers would be most likely to confer) have been plagued with negative results from the few cold fusion experiments that they tried.

The author of a recent review of Bad Science: The Short Life and Weird Times of Cold Fusion, by Gary Taubes,

which appeared on page 13 of your June 21, 1993 issue has been studiously misled. We would like to correct some of the unfortunate implications of Taubes writing. His book reminds me of the story of all the birds getting together to learn to build nests. As soon as they saw how to build a base of mud, the swallows flew off convinced they knew how to build nests.

Taubes book doesn't report past the mud stage. Here at the Fusion Information Center we have collected over 1,000 technical papers on cold fusion from over a hundred different laboratories in over thirty countries. The Fusion Information Center is the world's leading center for cold fusion information. The strange part is that we have never been approached by either Gary Taubes nor by John Carey, your "Washington Correspondent Carey [who] covered cold fusion from the start."

I personally have just returned from an energy conference in Minsk, Republic of Belarus, where several new developments in cold fusion were reported. I am a consultant to a growing company that is purchasing cold fusion technology rights from various scientists and building a strong technology base. These are sophisticated industrialists who have thoroughly evaluated the cold fusion technology over the past 18 months and are building a new energy business based on cold fusion developments.

For your information, I am enclosing a copy of my book on cold fusion, Cold Fusion Impact in the Enhanced Energy Age. This book contains the "over 1,000" references on a diskette included with the book. This accumulation of information has taken my full-time attention for the past four years. I have attended almost every major cold fusion conference and I have never met Gary Taubes. To preserve your image of accurate reporting of business news, I would suggest that a follow-up to all of the misinformation provided by the Carey-Taubes combination would be in order.

Thank you for your excellent publication. Keep up the good work for American business. But please be advised that in support of the new, expanding science of cold fusion the American Electrical Power Research Institute has budgeted $12 million for cold fusion over the next three or four years. A stronger commitment has been made by a combination of the Japanese MITI organization and Japanese industry who have budgeted or pledged an estimated $50 million for the next four years. Please do not allow *BusinessWeek* correspondents (especially when they have failed to do their homework) to lead American business astray in this important new energy technology.

Best personal regards,

Hal Fox, Editor-in-Chief
Fusion Facts

Encl: Impact book with Diskette.

P.S. As penance, you might ask John Carey to review my book, especially the list of international patents, and the "over 1,000" bibliography. By the way, cold fusion and other new enhanced energy developments may soon be one of the hottest investments in the market.

G. MEETINGS AND MISCELLANEOUS

4th INTERNATIONAL CONFERENCE ON COLD FUSION
December 6-9, 1993
Hyatt Regency Maui, Hawaii

Participation is open to all interested scientists and technologists. In particular, the following are encouraged to attend: nuclear and solid-state theoreticians, advanced energy technologists and long range utility planners. There will also be an exhibit of scientific instruments and supplies by various manufacturers.

The proposed agenda is as follows: Morning sessions will be devoted to one keynote presentation and a number of shorter, invited presentations. Afternoon presentations will be divided into a number of subject-organized parallel sessions. Papers reporting the results of simultaneous measurement of different kinds are particularly encouraged. Subject areas to be covered include: Materials and Fundamentals, Calorimetry, Nuclear Measurements, Solid-state Theory, Electrochemical Studies, and Safety Issues.

CALL FOR PAPERS

Those wishing to present papers should submit two copies of an abstract containing the title of the

presentation, contact author, affiliation(s), etc. to S.Crouch-Baker, SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025. Mark these submissions "ICCF-4 Abstract." Two-page abstracts are due by Sept. 10, 1993. Author notification by Oct. 10, 1993.

Abstracts should be no more than two pages including figures and tables; 10-point type, single-spaced. A bound volume of abstracts will be produced for distribution to attendees at the conference, so abstract submittal in magnetic form is encouraged. (Mac users: Word 4.0 +, sys. 7; PC users: Word 4.0+ is preferred, but will accept other w.p. programs or ASCII.) Be SURE to include two hard copies.

Poster sessions will be used to supplement presentations and discussions. Presenters are encouraged to prepare a poster of 3' x 6' maximum size.

The co-chairs are Dr. T.O. Passell (EPRI) and Dr. M.C.H. McKubre (SRI) who can be reached at (415) 855-2070 and (415) 326-6200 respectively, for technical information.

The registration fee of $300 covers conference proceedings, continental breakfasts, three luncheons, and an evening reception. To register, contact Linda Nelson, Conference Coordinator (EPRI) at (415) 855-2127 or Fax (415) 855-2041. Hotel reservations can be made with the Hyatt Regency Maui (mention ICCF-4 conference to obtain the special group rate), call for information: (808) 661-1234 or Fax (808) 667-4499. Reservation deadline Nov. 6, 1993.

INTERNATIONAL FORUM ON NEW SCIENCE
October 13-17, 1993
CALL FOR PAPERS

The International Association for New Science, the sponsors of the conference, purpose to bring together scientists, professionals and lay people to promote research in the areas of New Science as well as education. New Science includes topics and phenomena which cannot be explained by traditional science and yet may have the potential for significant benefit to the health and conditions for humanity and the planet Earth.

Scholarly papers are invited on any topic related to New Science. These papers should include one or more of the following: theories, hypotheses, research designs, research results and analyses. Abstracts of not more than four thousand words must be sent as soon as possible to the address below. Consideration of abstracts cannot be assured if received after September 1. Authors will be notified as soon as possible if the paper is accepted for presentation.

Please send for registration information to the International Forum on New Science, 1304 S. College Avenue, Fort Collins, CO 80524.

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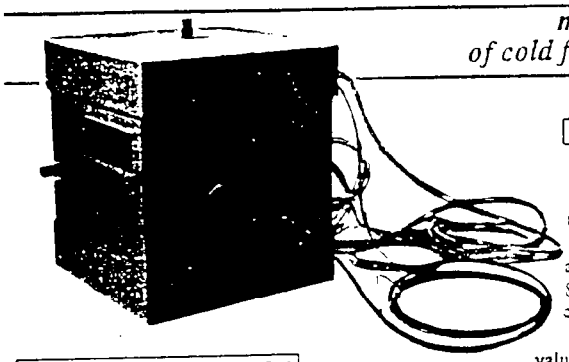

INTRODUCTION

Thermonetics has been designing and building accurate calorimeters based on a unique, well-tested principle for twenty years. Applications include physics, chemistry, engineering, biology and medicine. Sizes range from 1-1/8 inch cube to 8 x 9 x 10 feet. Temperature levels range from cryogenic to 1500° F. Open literature papers by many research teams have described the use and value of the Thermonetics SEC Calorimeters in their research programs.

PRINCIPLE OF OPERATION

The Seebeck Envelope Calorimeter (SEC) is based on an elementary principle:

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The calorimeter envelope is quite thin so time constants are low. The tranducers are thermopiles which generate a DC millivoltage directly proportional to the heat flow. In a properly designed calorimeter, the millivolt output signal is affected only by the rate of heat flow. These desirable properties markedly simplify operating procedures compared with classical calorimetry methods and make possible a whole spectrum of experimental investigations.

DESCRIPTION OF THE SEC CALORIMETER

Heat flows from the reaction vessel through air or water layers in the calorimeter, through the Seebeck Envelope to an aluminum jacket incorporating water cooling coils. The millivolt output signal from the SEC, which is related to the heat release via an accurate calibration process, can be read out by a millivoltmeter, recorded continuously by any millivolt recorder or fed to a computer. Each calorimeter is supplied with a calibration heater that allows the researcher to verify the calorimeter at any time.

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SEC-1201	12x12x12	5.0	1.46	$8000
SEC-2403	24x24x24	10.0	2.93	$16000

(These models can also be leased with an option to buy)

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