

FUSIONfacts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

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

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NEXT ISSUE BEGINS OUR 4TH YEAR

The July, 1992 issue will be Volume 4, Number 1. It is our plan to present a special review of the major scientific findings in cold fusion for this next issue. During the next few months *Fusion Facts* predicts some dramatic new findings in the field of enhanced energy devices and systems.

DON'T MISS AN ISSUE

LATE NEWS FLASH!

Replication of the Takahashi experiment is being performed by several U.S. and Japanese scientists. At press time, three scientists had been successful but were not ready to release their results. *Fusion Facts* will try to obtain brief reports for the July, 1992 issue.

A. NUCLEAR CATALYSIS & COLD FUSION By Dr. Peter Glück and Hal Fox

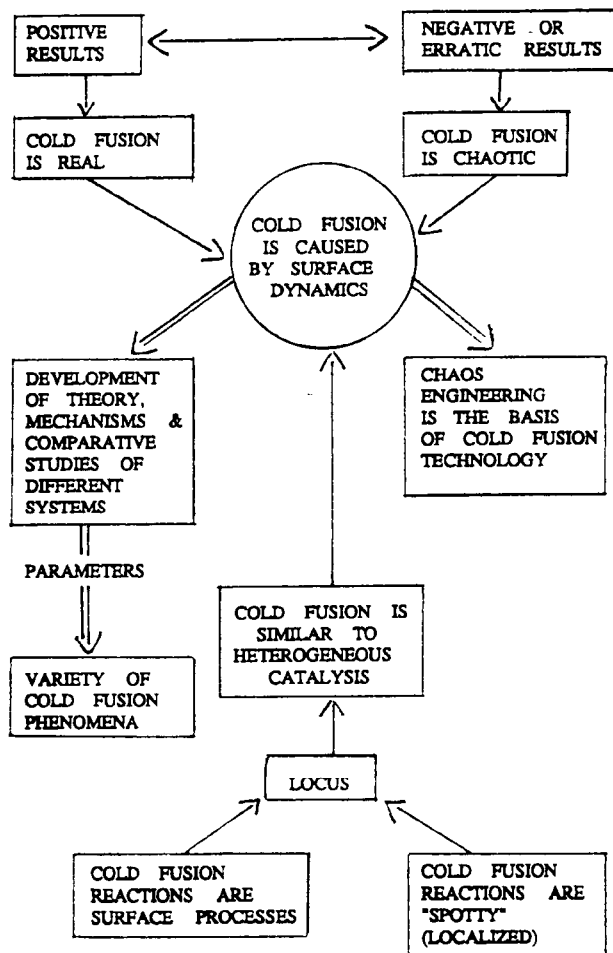
Dr. Peter Glück, of Romania, has had considerable professional experience with chemical catalysis. Recently Glück provided us with an excellent discussion on cold fusion reproducibility (*Fusion Facts*, May, 1992, pp 19-23.) In this article Dr. Glück develops a model which he dubs SURFDYN (from SURFace DYNamics.)

Shown on page 2 is a graphical outline of the SURFDYN model for cold fusion. As Dr. Glück stated in his article, "This concept is only a part of the theory. It has to be combined with reactions, mechanisms for two and multi-body functions, quantum and electric field effects, etc., in order to solve the other puzzle of the field: variety."

Glück states that "SURFDYN is fusion on the lattice and not in the lattice." In view of the variety of cold fusion experiments that have been reported and replicated (Pd-D₂O-Lithium; Ni-H₂O-Ni; gas-loading; etc.), it is appropriate to consider nuclear catalysis as being a new process to explain some of the experimental findings.

There is, as yet, no complete theory on **chemical catalysis**. We all know that many of the noble metals (and other substances) promote certain chemical reactions without taking part in the reactions. The experimental findings that "cold fusion" nuclear reactions appear to take place on or in a metal lattice without the production of large gamma-rays could be considered a form of **nuclear catalysis**. The following diagram presents a logical scheme for considering the various results of cold fusion research.

THE SURFDYN CONCEPT
LOGICAL SCHEME OF DEDUCTION



increase with the quenching of metal from the temperature of two dimensional vapor existence. The results of membrane catalysts studies are incorporated for hydrogen permeable palladium alloys and oxygen permeable silver. The phenomenon of reaction coupling on the membrane catalyst has been discussed.

This book will be of prime interest to researchers in physical chemistry, surface science, and catalysis.

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EXCELLENT BOOK ON CHEMICAL CATALYSIS

Dr. Glück has translated the chapter headings from an excellent Russian text on chemical catalysis. We believe that this book provides some useful insights into chemical catalysis. Some of the concepts presented by Dr. Gryaznov et al. may be of considerable help in understanding nuclear catalysis.

Catalysis by Noble Metals: DYNAMIC FEATURES (in Russian) by V. M. Gryaznov, N.V. Orekhova - Moscow: Nauka, 1989 - 224 pages, 7 tables, 39 illustrations, bibliography with 620 references.

Catalytic and adsorption properties of platinum metals and silver are treated in this book **taking into account the surface mobility of metal atoms**. The changes in number of single atoms on metal crystal planes with temperature rise are correlated with catalytic activity as well as its

Second Part: The transfer of reactants through membrane catalysts on basis of noble metals.

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B. MALLOVE'S UTAH LECTURE

COLD FUSION: REAL AND REVOLUTIONARY

By Dr. Eugene F. Mallove. Presented at the University of Utah, May 21, 1992

The University of Utah's Marriott Library invited Dr. Eugene F. Mallove to speak at the First Annual Distinguished Lecture on May 21, 1992. Dr. Mallove holds advanced degrees in astronomical engineering and environmental science, was the Chief Science Writer for the MIT News Office and is the author of *Fire from Ice - Searching for the Truth Behind the Cold Fusion Furor*. The following excerpts are taken from his remarks.

I believe this conflict [regarding cold fusion] is about to be resolved to the satisfaction of the wider scientific community, and the new science will give birth to one of the greatest technological revolutions in history and even pre-history. Because, my friends, since cold fusion is real, what we are talking about is infinite, cheap, and clean energy from the abundant water of this planet. Cold fusion is like fire, only millions of times more potent. It's as simple as that..

In the beginning I was definitely not a "true believer"... In 1989 and even into 1990, I was very skeptical about the claims coming from Utah, but throughout I kept an open mind. I am now firmly convinced that cold fusion is a real new form of nuclear energy, indeed, beyond any reasonable question. It is likely to have staggering scientific and technological implications...

What is cold fusion? First you need to know what hot fusion is. Hot fusion is a very tough engineering problem -- mimicking the stars with plasmas at hundreds of millions of degrees held in high magnetic fields, or by imploding tiny pellets of fusion fuel with gargantuan lasers. Even the hot fusion proponents say that the soonest we might have commercial hot fusion might be 30 to 50 years. No experimental hot fusion reactor has ever generated a single watt of excess power... Yet, Uncle Sam continues to pour \$500 million a year down the hot fusion black hole, but not for long...

Cold fusion seems to be a way *not* to directly mimic nature -- the multimillion degree temperatures deep inside the cores of stars. But cold fusion, whatever its detailed reaction mechanism turns out to be, accomplishes the same end: vast energy release from hydrogen -- the hydrogen in water. Something very wonderful, very unusual happens when hydrogen isotopes, such as deuterium -- ordinary hydrogen with one additional neutron, enter the metals palladium, nickel, or titanium. Energy comes out at levels that are impossible to explain as mere chemistry, and evident nuclear products are found in trace amounts that do not correspond directly to the energy... Because these are powerful nuclear reactions, it doesn't take a high percentage of atomic transformation to create large energy release.

One might say that the spectacular heat is the "fire," and the trace, non-hazardous nuclear products are the "smoke" of cold fusion. We don't fully understand this yet, but there are some excellent theories and clearly defined possible nuclear reactions that purport to explain it. But because something is unexplained, does not mean that it does not exist! The miracle is this: the energy in cold fusion -- whatever the nuclear or other process it may be -- comes out without significant radiation! ...The skeptics, negativists and scientific bigots who have attacked cold

fusion say -- "Nonsense, this is impossible! We know everything there is to know about nuclear reactions..."

I am convinced that our world is about to be revolutionized by a spectacular technology that may well abolish concerns about energy forever! We will have an infinite fuel supply from the isotopes of hydrogen in the seas. Fuel essentially free. If deuterium is the main fuel, a mere one cubic kilometer of the ocean contains fusion energy in at least one easily extractable isotope - deuterium - is equal to the energy of all the world's known oil reserves. [Ed. emphasis.]

In the emerging Cold Fusion Age, our homes may be heated by self-contained units that will be recharged once energy several years at minimal cost. We may have cold fusion-powered electric generators in our homes, thus abolishing the electric power grid; or central station electricity generation may continue -- cold fusion fired. Automobiles will be steam powered -heated by compact cold fusion reactors. Their exhaust: beautiful, clean water vapor. Good-bye air pollution! Or they may be electric vehicles whose batteries are recharged continuously by cold fusion power generation. Our dependence on Middle East oil -- oil anywhere -- will end, except for chemical industries. Ditto for natural gas and coal. Questions about global warming from fossil fuel combustion will become moot. With cheap energy everywhere, desalination and water pumping will make the deserts of the world bloom. Poor countries will gain easy access to this technology. People now at the edge of survival will have a chance at life...

All the largest newspapers in Japan recently heralded the spectacular energy-producing cold fusion experiment of Professor Akito Takahashi of the Department of Nuclear Engineering at the University of Osaka -- a Pons-Fleischmann type cell that produced excess heat and low level neutrons for three months continuously. Hardly a peep about this in the American press...

The Japanese have been infinitely more co-operative with the underground cold fusion research community here in the U.S. than the U.S. Department of Energy... I have my own Takahashi-type experiment running, which seems to be coming to life... The Japanese have provided precise element analyses of the original palladium samples. They have told us every detail of their experiments. Top Japanese scientists have offered to come to the U.S. to testify before Congress, but they have been rebuffed... If we can't even get hearings on cold fusion, let alone funding, the federal situation is hopeless, except for private industrial efforts, which are now far ahead of the government.

The Department of Energy is officially doing nothing about cold fusion. Nothing! In fact, it continues to attack

cold fusion even in the face of massively mounting evidence... The worst happening was the DOE panel that came up with an untenable report in November of 1989, which, in effect, killed official cold fusion funding in the U.S... DOE's hatchet man, Professor John Huizenga of the University of Rochester, outrageously biased from the start, wanted cold fusion killed. And he still does. He has a book out now called Cold Fusion: Scientific Fiasco of the Century.

Dr. Mallove continued to relate the impressive heat results from Dr. Michael McKubre's group at SRI, International (formerly Stanford Research Institute), Dr. Robert T. Bush and his colleagues at California Polytechnical University, and the continuing research of Drs. Fleischmann and Pons at the Japanese-funded laboratory in France. Mallove criticized Huizenga's new book and the fraudulent report of scientific reports from MIT with which he had negative experience.

Dr. Mallove concluded his address on cold fusion with this quote from Michael Faraday, "Nothing is too wonderful to believe."

C. PUBLIC DOMAIN LETTER - OTIS PORT Courtesy of Jed Rothwell

The following is a letter from Otis Port (Business Week writer) to Tom LeCompte on the CompuServe SCIENCE forum:

In Re: Reproducibility... In early Feb, I had a chance to talk briefly with Fleischmann -- about Takahashi's work and reproducibility, among other things. I doubt that any of this will be terribly illuminating for you or the other working scientists here, but it might help some others understand just how touchy this phenomenon is.

First, F says that his claims about reproducibility are often quoted out of context. He is **NOT** able, always to get heat from 10 of 10 cells. that level of reproducibility only occurs when all 10 (or however many) cathodes are made from the **SAME BATCH OF ALLOY**. But the next batch of supposedly identical metal from the same supplier may yield dud after dud (perhaps only 10% or 20% "good" cathodes). Why? He is not sure. But on occasion, after a few duds, he has sent the palladium back to the producer, and they do something -- he doesn't know what (or at least wouldn't tell me) -- and it **may** come back hungry for deuterons and itching to generate heat. Getting a handle on the reasons for these anomalies, F says, will require "a very large program" in materials science.

I tried to pin him down on some details. Not too successfully, I fear. He did admit that shape is important, and surface texture seems to be, also. But he surprised me by saying that, with respect to surface-to-volume ratio, "it's not so clear that that's as important."

P&F are still working exclusively with open cells, and energy output is now close to 1,000 W/cc. The big question, he allows, is "can those levels be sustained?" As of Feb, "we're up to 30 to 40 minutes ... so there's a long road ahead."

In Re: Takahashi: ... Fleischmann is impressed by T's work: "What Takahashi has got is a way of defining the conditions required to make the various observations. At first, people thought they should observe all the same signatures under identical conditions, but it's become gradually clear that that's unlikely." Basically, said F, Takahashi's work shows that heat comes only after the lattice is fully loaded; before then is when you get "other signatures." Other researchers have noted this previously, he acknowledged, "but he (Takahashi) has got the whole thing a little more systematic."

In the beginning, he said, it seemed obvious that the different signatures should be uniquely related to each other. But in the final analysis, they may be related only insofar as the processes are taking place in the same lattice. "We ourselves have said that might be the case - that it's unreasonable to say that when you have a lot of heat, you must also have a lot of neutrons and a lot of tritium." To F, it seems more likely that high heat is related to the formation of helium-4, as was indicated by experiments last year at the Naval Weapons Research Lab.

In Re: Multibody Fusion: ... F is reserving judgment on this. But he did say: "I think that some of the signatures cannot be accounted for by two-body fusion."

Might the heat be chemical -- at least in part? "Oh no, no, no. It's all nuclear. There's no chance that any of this is chemistry. Out of the question. You cannot get tritium and you cannot get neutrons from a chemical process, and the very high levels of heat you certainly cannot get from a chemical process. It cannot involve chemistry. It's quite impossible, in my view."

In Re: Correlation: ... I related some of the things that you, DB, Norm Ritzel, and others have said would be convincing, such as correlation between heat and nuclear events.

Fleischmann's response: "The physicists are exactly right in wanting correlation. But it's a catch-22: You can't get the correlation without the money, and you can't get the money without the correlation." P&F detected helium-4

in 1989, he said, but had to discontinue that line of study for want of funds. "Unless you have a half-million dollars to spare, you better not get into that." He mentioned how much it costs to run a thorough ⁴He analysis on a single palladium rod, and as I recall, it was \$35,000 or thereabouts. [\$13,000, see page 23. Ed.]

In Re: X-rays and k-alpha lines: ... You won't see those, said F, because if the reaction goes to helium-4 and thermalization in the lattice, "you'll get low-energy radiation lines -- and won't excite the k-alpha and k-beta lines." He explains that palladium has too big a charge on the nucleus to expect K-a and K-b lines. Researchers in India, he added have used titanium, which is much more likely to yield these x-ray energies -- and, in fact, they did observe k-a and k-b lines. But they attributed them to the decay of the tritium.

In Re: Takahashi: ... Most of what follows is in his own words, and there's a lot that's way beyond my grasp of physics -- so I'll be waiting impatiently to hear your reactions. Here goes ...

"There are two points where deuterium will position itself in the palladium lattice. One is the octahedral (8 plane faces) sites, the other is the tetrahedral (4-faced) site. If we load deuterium into palladium, the deuterium-over-palladium atomic ratio increases. First, deuterium will occupy mostly the octahedral sites. If all those are filled, then tetrahedral sites start to be filled. This is already an anomaly in physics. It's unusual in hydrogen-absorption metals. It's anomalous, but it happens, and I'm convinced it's a necessary condition for cold fusion. It's the starting place."

"If we look at the lattice conditions under these circumstances, there is one tetrahedral site, and right in the same neighborhood, we have three octahedral sites or **atomic potential wells**. The wells for the octahedral sites are much shallower than those of the tetrahedral.

"If we excite deuterons, they go up and become somewhat free. They can fall into the tetrahedral site, which has a deeper well than the three neighboring octahedral sites." Under ideal conditions, Takahashi believes, three excited deuterons from the shallow holes fall into the deeper hole simultaneously, "where one deuteron is already waiting. It's not always that way. Maybe only one deuteron will fall in. Or maybe two. But in the best case, you end up with four [deuterons] in the same well."

Next point: This cluster or pair formation is a transient phase. "If we have two or three deuterons in one hole, it won't last. It will be destroyed. But in that moment of cluster or pair formation, we have a change to have nuclear fusion."

Phrased perhaps more accurately, he says, we have a quantum-mechanical uncertainty. "The deuteron wavelength is comparable to the size of the hole. We need quantum mechanical uncertainty to have nuclear fusion in the site. Usually, we have no possibility for this multibody event in hot plasma fusion. The reason is, every particle moves freely, at random. But if deuterons are fixed to three shallow holes and one deep hole, we have a microscopic structure to restrict freedom. That's why we can have an opportunity for multibody meeting."

"At the moment of cluster formation, because of quantum mechanical uncertainty, we get simultaneous multibody fusion with a certain probability. So our task is to estimate how much probability."

"To estimate, we must know the nuclear cross-section for the multibody reaction process. The cluster formation by itself doesn't mean fusion. It's still at the atomic level, not nuclear. To estimate the inter-nuclear cross-section, I made estimates using existing data for two-body reactions of hydrogen isotopes. That is to say: proton-deuteron fusion, deuteron-deuteron, and deuteron-triton fusion."

"We can extrapolate from those existing, or known cross-sections to 3-body and 4-body deuteron fusion. I have found that the inter-nuclear cross-section of 3-body and 4-body are much larger than the deuteron-triton cross sections. The deuteron-triton cross-section is the highest, or largest, that we know of. But I estimate that the 3-body and 4-body cross-sections are much larger. I'd say four orders of magnitude, or even eight orders of magnitude."

The upshot is: "I can estimate much larger inter-nuclear cross sections. The probability to make nuclear fusion becomes much greater with 3-body and 4-body (clusters)." Takahashi admits that he doesn't have "data sufficient to call all of this a 'record' of fusion. This is an extrapolation. An empirical extrapolation. But I would say that the likelihood is very high. When a cluster occurs as the tetrahedral site, the possibility is very high that nuclear fusion occurred. Because the cross-sections are much larger. If the cross-section was the same as deuteron-deuteron reaction, or deuteron-triton, you will not get this kind of heat generation."

Finally, Takahashi stressed that any explanation of this theory must include the two steps: (1) cluster formation at deeper, tetrahedral sites, and (2) inter-nuclear "probability." One is the idea that CF might be a combined nuclear-chemical reaction.

In Re: NTT research: ... "I can't answer the question of what this reaction is, if it is either chemical or nuclear. I'd say it is mostly chemical, partly nuclear, and maybe

multibody. (NTT's) Yamaguchi claims he's found heat from hydrogen. I say maybe the same deuterons mixed with hydrogen. That would make is multibody." Perhaps the same goes for the experiments of Mills. "Maybe it's a mix of light and heavy hydrogen in a multibody formation. It could be that one or two deuterons are replaced by hydrogen protons."

Takahashi spent a day at the Nagoya conference, Jan 29, 1992, discussing these issues with Yamaguchi. "We didn't agree. Yamaguchi-san still insists on the usual fusion system, not multibody. We still have a gap."

D. NEWS FROM THE U.S.

CALIFORNIA - NAVAL RESEARCH RESULTS

From Chem Abstracts, May 18, 1992

M.H. Miles, G.S. Ostrom, B.F. Bush & J.J. Lagowski (Chem. Div. Navy Weapons Center, China Lake), "Experimental evidence for correlated heat and helium production in cold fusion experiments," *Proc. - Electrochemical Society*, 1992, pp 287-297, in English.

AUTHORS' ABSTRACT

Calorimetric measurements during electrolysis of the Pd-D system were combined with the analysis by mass spectrometry of the effluent gas samples. Episodes of excess heat production showed the concurrent presence of ⁴He in the effluent gas. Larger excess enthalpy events produced larger amounts of He. Furthermore, the amount of ⁴He detected was within experimental error of the theoretical estimate of He production. No ³He was detected in any experiment. Control experiments using H₂O + LiOH gave no evidence for He. These correlated measurements of excess heat and He support the concept that nuclear fusion can occur within a metal lattice at normal temperatures.

CALIFORNIA - SQUEEZED LIGHT

Courtesy of Dr. Samuel Faile

I. Peterson, "Squeezing Light for Precision, Speed," *Science News*, Vol 141, no 22, pg 356.

EDITOR'S COMMENTS

In a May 18, 1992 *Phys Rev Letters* article, Drs. Kimble, Carri, and Polzik describe the application of squeezed light for making measurements heretofore not done. The concept of squeezed light is related to zero-point energy. The energetic fluctuations of space have a discernable effect on light. In squeezed light, the experimenter can

exchange information about amplitude and phase without conflicting with the Heisenberg uncertainty principle. The end result, for example, is enhanced optics. The article states that Haus et al. at MIT are working on an improved solid-state device to more accurately measure velocity and changes in velocity.

COLORADO - PROTON CAPTURE

From Chem. Abstracts, May 4, 1992

F.E. Cecil, D. Ferg, H. Liu, J.C. Scorby, J.A. McNeil, P.D. Kunz, (Dept. Physics, Colorado Sch. Mines), "Radiative capture of protons by light nuclei at low energies", *Nuclear Physics A*, A539(1), 1992, pp 75-96.

AUTHORS' ABSTRACT

Gamma-Ray-to-charged-particle branching ratios, and gamma-ray angular distributions were measured for the radiative capture of protons by ${}^6\text{Li}$, ${}^7\text{Li}$, ${}^9\text{Be}$, and ${}^{11}\text{B}$ for proton bombarding energies 40-180 keV. Except for the 163 KeV resonance in the reaction ${}^{11}\text{B}(p,\gamma){}^{12}\text{C}$, the branching ratios are roughly independent of energy and the angular distributions are isotropic. These measurements were used to deduce reaction S-factors and infer thermonuclear reactivities. The measurements were compared to distorted-wave-Born-approximation direct-capture cross section calculations.

GEORGIA - MONOPOLE TRANSITIONS

From Chem. Abstracts, May 4, 1992

J. Schwarzenberg, J.L. Wood, E.F. Zganjar (Sch. Chem., Georgia Inst. Technol.), "Pure electric monopole transitions in an odd-mass nucleus," *Phys. Rev. C: Nucl. Phys.*, 45(3), R896-R899, 1992.

AUTHORS' ABSTRACT

Six electric monopole (EO) transitions have been observed at low energy in ${}^{185}\text{Pt}$. These transitions have no observed gamma rays. The observations of pure EO transitions and of **such a large number of EO transitions in an odd-mass nucleus is unprecedented**. The phenomenon is consistent with the mixing of shape isomeric configurations.

HAWAII - MOLTEN SALT REPORT

From Chem. Abstracts, May 4, 1992

Bor Yann Liaw, Peng Long Tao, Patrick Turner, Bruce E. Liebert, (Hawaii Nat. Energy Inst., Univ. Hawaii) *J. Electroanal. Chem. Interfacial Electrochem.*, 319(1-2), 1991, pp 161-175.

AUTHORS' ABSTRACT

A new approach is reported of using a Pd/eutectic LiCl + KCl molten salt saturated with excess LiD/Al electrochemical cell to generate excess heat at elevated temperatures. For future utility applications, high-grade heat and high efficiencies can be expected from this novel process when it is operating above 350 C with its faster kinetics, compared with recent room-temperature aqueous-system operations. The electrolyte provides a very reducing environment, which offers the possibility of using less expensive non-noble-metal materials. A modified isoperibol calorimeter was used for the excess heat measurements. Preliminary results show high levels of excess heat output, although the effect remains sporadic. The Pd electrode shows a significant surface microstructural transformation after electrolysis. A small number of alpha-particles were found in the deuterated Pd electrode.

MASSACHUSETTS - AMPERE FORCES

Courtesy of Dr. Samuel Faile

Peter Graneau (Northeastern Univ) & Neal Graneau (Univ of Oxford), "The role of Ampere forces in nuclear fusion," *Physics Letters A*, Vol 165, No 1, May 4, 1992, pp 1-13, 10 figs, 29 refs.

AUTHORS' ABSTRACT

Three different non-tokamak fusion mechanisms are examined, involving plasma filaments formed from gaseous, liquid or solid deuterium. Results from previous experiments, in which up to 10^{12} neutrons were produced, point to non-thermal fusion mechanisms. The role of electrodynamic forces, including those predicted by Ampere's force law, are investigated as the possible mechanism of ion acceleration.

EDITOR'S COMMENTS

Readers are referred to the article by Stefan Marinov which is reviewed in this issue. See page 12. Marinov shows that for some interaction between two current elements, Ampere's formula does not apply. We know that cold fusion readers and workers will not be surprised that science can change and will have an open mind for Marinov's arguments.

MICHIGAN - COULOMB BREAK-UP

From Chem. Abstracts, May 4, 1992

C.A. Bertulani, L.F. Canto (Natl. Supercond. Cyclotron Lab, Michigan State Univ.), "Semiclassical calculation of Coulomb break-up of weakly bound nuclei," *Nucl. Phys A.*, A539(1), 1992, pp 163-176.

AUTHORS' ABSTRACT

The authors develop a semiclassical coupled-channels calculation for the Coulomb break-up of loosely bound nuclei. The continuum wave functions are discretized by means of 2 different sets of strongly peaked functions: (1) a histogram set, and (2) a continuously derivable one. Using simple expressions for the bound and continuum wave functions, they calculate the break-up probability to 1st-order and with the coupled-channels method. The 1st-order perturbation theory fails to describe the Coulomb break-up of unstable projectiles, such as ${}^7\text{Li}$ at small impact parameters. A nonperturbative calculation may reduce the cross section by 20% in collisions at intermediate energies.

NEW JERSEY - BLACK HOLE EVAPORATION

Courtesy of Dr. Samuel Faile

T. Banks, A. Dabholkar, M.R. Douglas, & M. O'Loughlin (Rutgers Univ, Piscataway), "Are horned particles the end point of Hawking evaporation?," *Phys Rev D*, Vol 45, No 10, May 15, 1992, pp 3607-3616, 2 figs, 11 refs.

AUTHORS' ABSTRACT

We investigate the proposal by Callan, Giddings, Harvey, and Strominger (CGHS) that two-dimensional quantum fluctuations can eliminate the singularities and horizons formed by matter collapsing on the nonsingular extremal black hole of dilaton gravity. We argue that this scenario could in principle resolve all of the paradoxes connected with Hawking's evaporation of black holes. However, we show that the generic solution of the model of CGHS is singular. We propose modifications of their model which may allow the scenario to be realized in a consistent manner.

EDITOR'S COMMENTS

With Dr. Matsumoto's work in tracking various particles released from cold fusion experiments and the possible identification of miniature black holes, we thought this article might be of some interest to our multi-disciplinary readers.

NEW MEXICO - BUCKYBALL GAS TRAPS

Courtesy of Dr. Samuel Faile

M. Stroh, "Serendipity yields buckyball trap for gases," *Science News*, Vol 141, no 22, pg 356-357.

EDITOR'S COMMENTS

The article cites work by chemist Douglas A. Loy at Sandia National Laboratories in Albuquerque, N.M. The space between closely packed buckyballs (ball-shaped 60-carbon molecules of the fullerene family) can hold or not hold gas molecules depending on the size of the gas molecules. The article states, "The scientists believe that manipulating either the buckyball molecule or its crystal geometry might also allow them to vary how many and what kinds of gas molecules a crystal will hold, as well as the release rate of those gases." Dr. Faile suggests that this approach should be considered for the fabrication of alternate types of electrodes for cold fusion experiments.

NEW YORK - OMNI FRAUD

Courtesy of Dr. Samuel Faile

Linda Marsha, "Scientific Fraud," *OMNI*, Vol 14, No 9, June 1992, pg 38.

EDITOR'S COMMENTS

The table of contents page advertises the Marsha article with, "Scientific Fraud By Linda Marsa, From cold fusion to the David Baltimore debacle, scandals are tarnishing science's reputation." The article also includes a side panel labeled, "GRAND ILLUSIONS of the top ten known or suspected science frauds." The ten range from Galileo Galilei to John Darsee in 1980 but did not list cold fusion. The author writes about cold fusion in the following words, "In isolated instances, such as the cold fusion controversy, the system still appears to work." She cites the announcement of cold fusion and leads the reader to believe that "scientists could find no evidence of fusion and concluded the Utah experiment was flawed." Unfortunately, she forgot to follow up on the hundreds of scientific articles that cite positive findings in attempts to replicate the famous Pons-Fleischmann experiments.

TENNESSEE - SILVER ALLOY CATHODE

From Chem Abstracts, May 18, 1992

A. Zywockinski, Hulin Li, A.A. Tuinman, Paula Campbell, James Q. Chambers, W. A. VanHook, "Analysis for light atoms produced in the bulk phase of a tubular palladium/silver alloy cathode working electrode," *J. Electroanal. Chem. Interfacial Electrochem.*, 1991, Vol 319, No 1-2, pp 195-205.

AUTHORS' ABSTRACT

Experiments designed to detect the production of trace amounts of helium and/or tritium in the interior of a palladium/silver electrode during electrolysis of LiOD solutions are described. Electrolysis products that diffused through the evacuated tubular electrode were concentrated

by reaction of H₂, HD, and D₂ with CuO, then analyzed by mass spectroscopy and radiometry. The limit of detection for ⁴He was 1 x 10¹¹ atoms. No evidence for production of helium or tritium by "cold fusion" was detected.

[Note: *Fusion Facts* is not aware of any previous successful experiment using a cathode with a tubular shape. One such experiment was announced in 1989 but the announcement was later withdrawn when replication was not achieved. Ed.]

TENNESSEE - GRAVITY & NEGATIVE ENERGY Courtesy of Dr. Samuel P. Faile

John G. Cramer (Prof of Physics, U/Washington), "Natural Wormholes: Squeezing the Vacuum," *Analog Science Fiction & Fact*, Vol CXII, Nos. 8&9, pp 182-187.

DR. FAILE'S COMMENTS

The removal of quantum fluctuation in "squeezed light" experiments is really a squeezed vacuum of negative energy. The negative energy is what is needed for wormhole stabilization. The article distinguishes between Euclidian wormholes of Stephen Hawkins and Sidney Coleman and the normally unstable Lorentzian wormholes. Hochberg and Kephart say it is possible to violate the normal "weak energy condition" so that there could be some stabilization of the Lorentzian wormholes. Near black holes, wormholes could form. It is as if when one concentrates mass-energy, there is a compensation in energy nearby. If one has depleted energy by free-energy processes one could compensate the negative energy zones and their hard to manage wormhole activity with the deposition of positive mass-energy by the deposition of evaporating mini-black holes such as those discovered by Dr. Matsumoto. The article delves into some of the interesting aspects of zero point energy including virtual pairs, zitterbewegung, the phase in regard to the conjugate variables, the Casimir force, and the Rindler transformation.

EDITOR'S COMMENTS

This article is cited because of the interest in miniature black holes regarding some cold fusion experiments by Dr. Takaaki Matsumoto (Hokkaido Univ., Japan). As Prof. Cramer points out in the article, "A wormhole is a geometrical shortcut in curved space-time with the topology of a cup handle which, in principle, allows movement from one point in space-time to another, without the necessity of traversing the intervening space-time interval. . . . With the new work, however, there is a plausible mechanism for the formation of stable natural wormholes. We'll discuss this after a brief summary of

the status of wormhole physics." The author cites the work by David Hochberg and Thomas W. Kephart (Vanderbilt University), "Wormholes and Squeezed Vacuum," *Physics Letters B*, 268, 377, (1991).

TEXAS - FUGACITY OF HYDROGEN

From Chem Abstracts, May 18, 1992

John O'M. Bockris, D. Hodko, Z. Minevski (Dept of Chem, TAM), "Fugacity of hydrogen isotopes in metals: degradation, cracking and cold fusion," *Proc. - Electrochem. Soc.*, 1992, 92-5 (Proc. Symp. Hydrogen Storage Materials, Batteries, Electrochemistry 1991), pp 258-268, in English.

AUTHORS' ABSTRACT

Potentiometric and in-situ neutron diffraction measurements were carried out on PdD cathodes in LiOD-saturated D₂O solution. Open-circuit potentials of the PdD_x electrode after interruption of high-intensity cathodic currents (300-500 mA/sq cm) showed a more negative potential than that expected from the literature. The anomalous potentials were observed for about 10 to 20 minutes after current interruption at x > 0.7 concentration of deuterium. This phenomenon may indicate a metastable phase of the Pd-D system, which may be detected by neutron diffraction. In-situ neutron diffraction measurements, so far, have indicated only the evolution of the known alpha and beta phases of PdD_x. Successful neutron diffraction measurements in electrochemical cells suggest the viability of this technique for the in-situ investigations of metal-hydride battery electrodes in experiments when heavy-water electrolyte is used to model the MH_xH₂O electrode.

ILLINOIS - NANOPHASE MATERIALS

Courtesy of Richard A. DiSanza, Pres. & CEO of Nanophase Technologies.

Jeff Eastman & Richard W. Siegel (Argonne National Laboratory), "Nanophase Synthesis Assembles Materials From Atomic Clusters," *Research & Development*, Jan 1989, pp 56-60, 3 refs, 6 figs. [Abstract: Ultrafine powders are consolidated in situ to form materials with low sintering temperatures, improved mechanical properties, and fast diffusion characteristics.]

H. Hahn, J. Logas, H.J. Hofler, P. Kurath, R.S. Averback, "Low Temperature Sintering and Deformation of Nanocrystalline TiO₂," *Materials Res Soc Symposium Proc Volume 196, Superplasticity in Metals, Ceramics, and Intermetallics*, pp 71-76m 6 Figs, 35 Refs. [Abstract: The sintering and deformation kinetics of nanocrystalline (n-) TiO₂ were studied. It was found that pressureless sintering yields densities about 95% with modest increase

in grain size whereas pressure-assisted sintering (1 GPa) results in high density samples without grain growth. In addition compression tests were performed. Large true strains up to 0.6 and strain rates as high as 8×10^{-5} per sec were observed at 810 C without fracturing. The sintering and creep results are discussed in terms of the microstructure and diffusion coefficients in n-TiO₂.]

G. Skandan, Horst Hahn, & J.C. Parker, "Nanostructured Y₂O₃: Synthesis and Relation to Microstructure and Properties," *Scripta Metallurgica et Materialia*, Vol 25, pp 2389-2393, 1991, 3 Figs, 9 refs.

John C. Parker (Nanophase Technologies, Darien, Illinois), "Synthesis and Properties of Nanophase Ceramics for Technological Applications," Presented, P/M in Aerospace and Defense Technology Symposium, Tampa, FL (1991), 4 figs, 16 refs. [Abstract: Nanophase materials exhibit unique or enhanced properties that are not seen in their coarse-grained counterparts. For example, nanophase materials [may] be sintered to full density at low temperatures. Nanophase ceramics are ductile and nanophase metals have increased strength. In this presentation, a review of the current status of nanophase materials production will be given, focusing on the technically oriented properties. We also discuss how these materials can be used in various commercial applications.]

Alan Thomas & John C. Parker (Nanophase Technologies), "Tiny Grains Hold Large Potential," *Materials Engineering*, March 1992, 5 figs. [Lead in: When metals and ceramics are prepared at nanometer grain size, they offer fabrication and mechanical-property advantages compared to their bulk-microstructure counterparts.]

EDITOR'S COMMENTS

Fusion Facts thought there might be some interest in nanophase materials and so we contacted Richard DiSanza, Pres. of Nanophase Technologies, 8205 S. Cass Ave., Suite 105, Darien, IL 60559. DiSanza was kind enough to send the above papers. In an information leaflet the following is presented: "Whereas **ultrafine** particles are generally considered to be in the size range of 0.1 to 1 micron (100 to 1000 nm), nanophase materials result from the consolidation of nanoscale powders, with particle sizes less than 100 nm, often in the 5 to 50 nm range. A central feature of nanophase microstructure is the large volume percentage of grain boundaries within the material. Grain boundaries and interfaces are structurally and energetically different from the bulk material and contribute to a unique set of properties for nanophase materials. Nanophase powders are generally produced by the gas phase condensation of a metal or compound under highly controlled conditions. The process is analogous to creating a metal or ceramic snow

from a precursor vapor. Ceramics are often produced by subsequently oxidizing or nitriding metal powders." At present the corporation is working on the commercialization of nanophase ceramics and then they plan to provide nanophase metals.

WASHINGTON - DOE RESPONDS TO CONGRESSMAN SWETT

Courtesy of Dr. Eugene Mallove

Letter from Linda G. Stuntz, Acting Deputy Secretary, to Congressman Dick Swett:

Dear Congressman Swett:

Thank you for your letter of April 7, 1992, concerning the topic of "cold fusion." The Department of Energy (DOE) has supported research into "cold fusion" in the past, but does not presently conduct any research in this area. However, DOE has the flexibility, within our present budget and programs, to pursue the claims associated with this topic. To date, our scientists have not been able to verify the reports either of "anomalous excess energy" or of "anomalous nuclear effect," referred to in your letter.

Shortly after the announcement of the "cold fusion" observations in March 1989, Secretary Watkins directed ten DOE laboratories to intensify research efforts on "cold fusion." The Secretary was kept informed on a weekly basis. Following repeated negative results, the DOE laboratories dropped the effort, but they still examine all legitimate claims. The negative findings from our laboratories are consistent with reports from the overwhelming majority of the scientific community who pursued "cold fusion." The pertinent DOE results have been published in the open literature and presented at open technical meetings along with those of other laboratories. It should be pointed out the "cold fusion" experiments have been carried out in many laboratories in the United States and abroad, not just DOE laboratories. In fact, the original University of Utah research on the subject was not supported by DOE and the investigators subsequently refused DOE support. . . .

We are also fully aware that Dr. Takahashi's cold fusion results were presented at the Massachusetts Institute of Technology on April 15, 1992. We understand that the experiments were discussed, although the results were presented as preliminary and did not appear to be new in substance. The technical community will have to judge its soundness and reproducibility, as is the case with all science.

As stated earlier, at the present time we do not have any research underway on the topic of "cold fusion." However, it is our policy to accept and review any

technically sound proposal in this area. The program office that has the responsibility to implement this policy is located in our Energy Research/Office of Basic Energy Sciences (Dr. L.C. Ianniello, (301) 903-3081), Division of Advanced Energy Projects (Dr. W.M. Polansky, (301) 903-5995). These staff individuals would be pleased to provide you or your staff with any additional information you wish.

Your interest in our program is greatly appreciated.

/s/ Linda G. Stuntz

[It is amazing that over 250 peer-reviewed positive papers on cold fusion from over 25 different countries are outside *the overwhelming majority of the scientific community who pursued "cold fusion."* It is also of interest that the Takahashi cold fusion experiments *did not appear to be new in substance.* Perhaps someone will soon be able to deliver a working demonstration device to Linda Stuntz's desk. Ed.]

WASHINGTON, D.C. - HOT FUSION EVER?

Courtesy of Stephen A. Roen and
Courtesy of Dr. Samuel Faile

Thomas W. Lippman (Washington Post Staff Writer), "A Wet Blanket at the [hot] Fusion Party," *The Washington Post National Weekly Edition*, May 4-10, 1992, page 39.

Thomas W. Lippman, "Will [hot] fusion ever come to pass?", *The Columbus Dispatch*, Sunday, May 3, 1992.

EDITOR'S COMMENTS

Lippman cites a political scientist (W.D. Kay, Northeastern Univ., *Issues in Science & Technology*) as claiming "that the cost of developing the technology is so great, the timetable so vague and the outcome so uncertain that Congress is certain the kill the program eventually." On the other side of the issue is the following quote from Energy Secretary James D. Watkins, "We are very confident that by some time after the first decade of the next century, we will have a clear demonstration [of the technology] to give us unlimited energy. We are very excited about it." Lippman notes that the energy bill passed last year by the U.S. Senate (94 to 4) provides that one-half of future hot fusion money comes from non-federal sources. Lippman also quotes Ed Rodwell of the Electrical Power Research Institute (EPRI) as saying, "We don't invest in it [hot fusion] -- it's too far away. There could be a massive long-term benefit, but to get from here to there is going to take a lot of money." On the other hand, EPRI has been funding (and is budgeted to continue funding) cold fusion research. In the *Washington Post National Weekly*

edition, a lead-in states, "True believers are in no mood to give up hope." Perhaps the media bias against cold fusion is turning to, "A plague on both your houses."

WASHINGTON, D.C. - REJECTS SCIENCE

Courtesy of Marge Hecht

"Nat'l Academy and Royal Society Reject Science for Malthus," *21st Century Sci & Tech*, Spring 1992, pg 6.

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In an unprecedented joint statement issued Feb. 26, the National Academy of Sciences and the Royal Society of London express their concerns on "Population Growth, Resource Consumption, and a Sustainable World" and revive the spirit of Malthus. The statement is intended as a political intervention before the Earth Summit in Rio de Janeiro to ensure that Malthusianism is on the agenda; it [the statement] contains no science, just ideology. The statement acknowledges that science and technology have been able to accommodate population growth in the past. "Nevertheless," the statement says, "the present patterns of human activity accentuated by population growth should make even those most optimistic about future scientific progress pause and reconsider the wisdom of ignoring these threats to our planet. Unrestrained resources consumption for energy production and other uses, especially if the developing world strives to achieve living standards based on the same levels of consumption as the developed world, could lead to catastrophic outcomes for the global environment. Some of the environmental changes may produce irreversible damage to the earth's capacity to sustain life."

EDITOR'S COMMENTS

Inexpensive, clean, and abundant energy will be available through the development of cold fusion and/or other enhanced energy systems. The use of this energy can help in recycling scarce resources, preventing pollution, and improving the quality of life. It is remarkable that the Royal Society of London and the National Academy of Sciences are both operating in an intellectual desert without the capacity of forecasting the obvious. Their statements show a paucity of technological forecasting ability when they both fail to project the current level of new energy science into the future. It appears that both organizations could use more capable personnel.

WASHINGTON D.C. - INVENTION SECRECY

Courtesy of Dr. Samuel Faile

Edmund L. Andrews, "Cold War Secrecy Still Shrouds Inventions," *New York Times*, Saturday May 23, 1992 page Y 17.

EDITOR'S COMMENTS

Andrews states that the U.S. federal government is still classifying many inventions even though the Soviet Union, our erstwhile enemy, has collapsed. Under the 1951 Invention Secrecy Act, the Patent and Trademark Office is allowed to classify technology so that regardless of the source of development funding, the inventor is restricted from selling his technology to anyone except the government. Andrews make the following statement, "In one exception he [John Preston, head of licensing for MIT] said, the Federal Government has tried to impose a secrecy order on a patent application for producing energy through *cold fusion* technology, an area of research that generated great excitement several years ago but now appears to be ineffective."

E. NEWS FROM ABROAD

AUSTRIA - AMPERE WAS INCORRECT

Courtesy of Dr. Samuel Faile

Stefan Marinov (Institute for Fundamental Physics, Graz), "On the Newton-Lorentz Equation," *Deutsche Physik*, Vol 1, No 4, Oct-Dec 1992 [sic], pp 5-9, 5 refs, in English.

AUTHOR'S ABSTRACT

First I give further experimental evidence on the invalidity of the Ampere formula describing the interaction forces between two current elements. Then I show why the scalar magnetic intensity was not until now experimentally revealed with the magnets constructed during nearly two centuries, and why Genadi Nicolaev was successful in observing it with a toroidal coil.

EDITOR'S COMMENTS

Marinov's article, together with his previous articles on this subject, are recommended to those who are working with cold fusion electrochemical experiments. It may be possible that under some experimental conditions that the experimenter will get incorrect results because of the inadequacy of the Ampere formula. Experimenters should question whether some of the **apparent** low-level excess heat can be attributed to some lack of understanding of the fundamental equation of electromagnetism. It is suggested that Marinov's "Newton-Lorentz" equation be considered for its possible relevance. Letters to the Editor or short articles concerning this subject are solicited.

CANADA - ACTIVE NICKEL ALLOYS

Courtesy of Dr. Peter Glöck

A. Rami, A. Lasia (Dept de Chimie, Univ de Sherbrooke, Quebec, Canada), "Kinetics of hydrogen evolution on Ni-Al alloy electrodes," *J of Appl Electrochem.*, 1992, no 22, pp 376-382, 8 figs, 2 tables, 34 refs, in English.

AUTHORS' ABSTRACT

The kinetics of the hydrogen evolution reaction have been studied on Ni-Al alloy electrodes. The electrodes, after leaching aluminum in alkaline solution, are very active despite their large Tafel slopes. The SEM studies show a formation of deep pores in the electrode surface. The kinetics were studied using an a.c. impedance technique. It was found that the impedance plots may be explained assuming a fractal model. The logarithm of the charge transfer resistance is a linear function of the overpotential. Using a nonlinear least square approximation it was found that the reaction proceeds through the Volmer-Heyrovski mechanism and the kinetic parameters were estimated.

CHINA - SQUEEZED VACUUM

Courtesy of Dr. Samuel Faile

Zhongxi Zhang (Southeast Univ, Nanjing) & Hongyi Fan (World Lab, Beijing), "Properties of states generated by excitations on a squeezed vacuum state," *Physics Letters A*, Vol 165, No 1, May 4, 1992, pp 14-18, 8 refs, in English.

AUTHORS' ABSTRACT

We examine some properties of the states which are engendered by excitations on a squeezed vacuum state. Using the IWOP (integration within an ordered product of operators) technique, we find that such states are normalized in the form of Legendre polynomials of the squeezing parameter r . Based on this remarkable property, the squeezing and the statistical properties of the fields in such states are discussed.

AUTHORS' INTRODUCTION

Since the early seventies, squeezed states, which exhibit fluctuations in one quadrature component smaller than those associated with a coherent state, have attracted due attention owing to their perspective application, for instance, in optical communication, gravitational-wave detection, and so on. Nowadays, the squeezed states can be realized in several experiments, and therefore various investigations of the squeezed states display their significance more obviously.

CZECHOSLOVAKIA - GRAVITY WAVES

From Chem. Abstracts, May 4, 1992

Citrad Klimcik (Nucl. Cent., Charles Univ., Czech.), "Gravitational waves as string vacua. III.", *J. Phys.*, 42(2), 1992, pp 121-140, In English.

AUTHOR'S ABSTRACT

A review with 22 refs. is given on perturbative construction of in and out scalar vertex operators in nonlinear sigma-models corresponding to gravitational plane wave backgrounds. The calculation was performed to all loops in the weak field limit and up to 3 loops in the usual perturbation expansion. The closed expressions for the vertex operators are given. They exhibit peculiar singularities in the target space which are closely related to the focusing phenomena in such backgrounds.

DENMARK - FUSION ENHANCEMENT

From Chem. Abstracts, May 4, 1992

C.H. Dasso & R. Donangelo, (Niels Bohr Inst., Univ. Copenhagen), "Fusion enhancement via the soft dipole mode in neutron-rich nuclei," *Phys. Lett. B*, 276(1-2), 1992, pp 1-3.

AUTHORS' ABSTRACT

Neutron-rich nuclei exhibit a soft dipole mode which we show may lead to an important dynamical enhancement of the fusion cross section at subbarrier energies. This effect could ease the formation of heavy systems through fusion reactions induced by radioactive beams.

GERMANY - NEUTRON EMISSION

From Chem. Abstracts, May 4, 1992

D.J. Hinde, D. Hilscher, H. Rossner, B. Gebauer, M. Lehmann, M. Wilpert (Hahn-Meitner-Inst., Berlin) "Neutron emission as a probe of fusion-fission and quasifission dynamics," *Phys. Rev. C: Nucl. Phys.*, 45(3), 1992, pp 1229-1259.

AUTHORS' ABSTRACT

Pre-scission and post-scission neutron yields have been measured as a function of projectile mass, compound nucleus fissility and fission mass split and total kinetic energy (TKE) for 27 fusion-fission and quasifission reactions induced by beams of $^{16,18}\text{O}$, ^{40}Ar , and ^{64}Ni . A new method of interpretation of experimental pre-scission neutron multiplicities ν_{PRE} and mean kinetic energies, allows the extension of fission time scales with much less uncertainty than previously, all fusion-fission

results being consistent with a dynamical time scale of $(35 \pm 15) \times 10^{-21}$ sec for sympathetic fission. All reactions show that ν_{PRE} falls quite rapidly with increasing mass asymmetry; evidence is presented that for fusion-fission reactions this is partly due to a reduction of the dynamical fission time scale with mass asymmetry. For quasifission, the pre-scission multiplicity and mean neutron kinetic energy are very sensitive to the final mass asymmetry, but that the time scale is virtually independent of mass asymmetry. For fusion-fission there is no dependence of ν_{PRE} on TKE, while for ^{64}Ni -induced quasifission reactions, a strong increase of ν_{PRE} with decreasing TKE is observed. This is probably largely caused by neutron emission during the acceleration time of the fission fragments in these fast reactions. Interpretation of post-scission multiplicities in terms of fragment excitation energies leads to deduced time scales consistent with those detected from the pre-scission data.

GERMANY - WHAT TO DO?

Courtesy of Dr. John Bockris

Heinz Gerischer (Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin), "Memorandum on the Present State of Knowledge on Cold Fusion," a circulated memo. See similar material in "Is Cold Fusion a Reality? The Impressions of a Critical Observer," The Science of Cold Fusion, Proceedings of the II Annual Conference on Cold Fusion, edited by T. Bressani, E. Del Giudice, & G. Preparata. Como, 29 June - 4 July 1991, c 1991 by Societa Italiana di Fisica, Bologna, Italy, pages 465-474.

AUTHOR'S CONCLUSIONS

WHAT SHALL BE DONE? The works which have so far been reported [in the body of this paper] are works which concern individual questions. Attempts are being made to reproduce experiments and to modify the technique. A systematic characterization of the electrochemical and experimental conditions has not yet been carried out. As the largest effects are being observed under these electrochemical conditions it is necessary to concentrate upon the electrochemical experiments.

Fleischmann and Pons reported in the meeting in Como concerning their experiments with palladium alloys (probably with silver) and maintain that they had been able reproducibly to observe large excess heats. No details of the experimental arrangements were given because of their wish to maintain patent conditions.

There is also evidence that the composition of the electrolyte plays a considerable part in the occurrence of the anomalous effects. It is absolutely essential to research the connection between overpotential, hydrogen

content, and surface characteristics of palladium or palladium alloys in a systematic way. This could be probably carried out with light hydrogen. Beginning with the hypothesis that a very high loading of D in metals is necessary for fusion because in this respect to loading, H and D hardly differ from each other. One could then come back later to the experiments with D₂O and with the knowledge of what has given rise to the high loading with hydrogen. In this respect it is necessary to have a method which allows a rapid measurement of the amount of hydrogen in the palladium. Here resistance methods are probably the best. Parallel to the information obtained in these measurements it would be necessary to build calorimeters which have requisite controls and work in an enclosed manner so that heat production and nuclear products can also be observed with a minimum amount of ambiguity. The decisive proof of the rising of excess heat by nuclear reactions will, of course, be the occurrence of the corresponding amount of ⁴He. If this can be confirmed, further steps for the optimization of the energy yield can be carried out.

These goals require the cooperation of scientists from various fields. One needs electrochemists, metal scientists, particularly those with knowledge of metal hydrides, engineers for the building of cells and the computerization of data, persons with experience in calorimetry, mass spectroscopy, and one needs nuclear physicists for the radiation measurements. A team of this kind should be in position to clear up the basic situation fairly quickly. Of course, the first thing is to confirm the facts. The fact that, in the Republic of Germany this work has been inhibited is no longer justified. It could later on be regarded as a very unfortunate gap in German research when compared with the present activity in other countries and particularly in Japan.

[This summary from a prominent German scientist is worth sharing with all of our readers, many of whom were not at the Como Conference. From *Fusion Facts*' vantage point, we are pleased to assure Dr. Gerischer that the new science of cold fusion is real and concur in his suggestion for the use of a multi-disciplinary group of scientists. However, dedicated scientists such as Takahashi, Bush & Eagleton, John Bockris, Edmund Storms, Melvin H. Miles, and many others, have produced important results without large amounts of funding, with modest equipment, and without a team of multi-disciplinary experts. As the attacks on cold fusion lessen, there will be more funding for teams of researchers. We are indebted to those valiant scientific pioneers who have laid the ground work for the rest of us. Ed.]

GERMANY - ELECTRON SCREENING
Courtesy of Dr. Samuel Faile

S. Engstler, G. Raimann, C. Angulo, U. Greife, C. Rolfs, U. Schröder, E. Somorjai, B. Kirch and K. Langanke "Test for isotopic dependence of electron screening in fusion reactions," *Physics Letters B*, 279, 1992, pp 20-24, 24 refs., 1 Fig, 2 Tables.

AUTHORS' ABSTRACT

The fusion reactions ⁶Li(p,α)³He, ⁶Li(d,α)⁴He and ⁷Li(p,α)⁴He have been studied over the CM energy range $E = 10-1004$ KeV. The effects of electron screening have been observed in all three reactions exhibiting the same enhancements for a given experimental technique. The deduced values for the screening potential energy are significantly larger compared to values calculated via the united atom test. **This difference between observation and expectation is not understood at present.**

AUTHORS' CONCLUSIONS

The data for all three fusion reactions exhibit an enhancement at low energies due to the effects of electron screening. For the approximations used here (in particular the assumed $S_b(E)$ form at $E < 100$ keV), several conclusions may be drawn:

1. For each set of experimental techniques (gas and solid targets) the deduced values of the screening potential energy U_E for all three reactions are identical within experimental error; thus, there appears to be no evidence for isotopic effects on electron screening, as expected from the simple model.
 2. The U_E values for LiF solid targets (weighted averages is 420 ± 120 eV) are somewhat higher compared to those for molecular hydrogen targets (weighted 350 ± 80 eV). This observation is similar to the report for the ³He(d,p)⁴He reaction, where the observed difference of ΔU_E is approx = 60 eV between atomic and molecular targets was explained to a large extent by the effects of Coulomb explosion. In the present case the situation is more complicated due to solid state effects (such as chemical shifts and formation of image charges) and thus no attempt was made to explain the difference in the above U_E values.
 3. The U_E values derived from both experimental techniques are significantly larger than the estimated value of U_E approx = 240 eV for the simple Coulomb model; considerations of electron binding energies (i.e., united atom test with $U_{atom} = 15.7 Z^{7/3}$ eV) result in U_E approx = 200 eV. The difference between the observed and expected U_E values is not understood at present.
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ITALY - NO NEUTRONS

Courtesy of Dr. Samuel Faile

P. Pratie, G. Ricco, M. Taiuti, C. Boragno, R. Eggenhoffner, and U. Valbusa (INFN, Genova), "Search for Neutron Emission from Titanium-Deuterium Systems," *Il Nuovo Cimento*, Vol. 105 A, No. 2, February 1992, pp 293-299, 8 refs, 6 figs, in English.

AUTHORS' ABSTRACT

We present the results of recent measurements, performed in Genoa with a novel neutron detector, on some titanium-deuterium systems. In spite of the good detector sensitivity, better than the one claimed by Jones and co-workers, no neutron emission was found.

AUTHORS' INTRODUCTION

After the first claims about the so-called "cold fusion" phenomenon and several different experiments, it has soon become clear that reliable detectors were necessary for research in this new and particular field, to avoid measurement errors. A new, multiparameter, high-efficiency neutron detector was specifically designed in Genoa for cold-fusion measurements and used in some typical experiments on titanium-deuterium gas systems. Our aim was to verify, with an improved neutron sensitivity, the results reported by Scaramuzzi and co-workers and to investigate neutron emission during high deuterium adsorption in the titanium lattice. In both cases no neutron emission was observed in our experiments. Actually, in the first case, our experimental conditions, as described in the following, were not completely equivalent to the Scaramuzzi ones.

AUTHOR'S CONCLUSIONS

Some measurements on two deuterium-titanium systems were performed without observing any neutron signal above the background level, also with a high deuterium adsorption inside the titanium lattice. With the first sample, the experimental conditions were very similar, but not completely equivalent, to those of Scaramuzzi and coworkers. In particular, the thermal transient induced in the cell was slower and the multiparameter analysis, performed on the detector signals, had a dead time of 200 microseconds. The second point could make impossible the detection of "neutron burst" shorter than the detector dead time; nevertheless we must note that the scintillator count rates, for which the dead time is negligible, was fully compatible with the background level in all the measurements performed. The same considerations can be applied to the second set of measurements. As a conclusion, we think that the "Scaramuzzi-like" method, that we have followed, is not reliable because deuterium is not adsorbed in the titanium lattice. Experimental

configurations with high deuterium adsorption could be still investigated, in particular in high stress conditions.

[It is suggested that the titanium chips used be selected from numerous chips exposed to high-pressure deuterium gas and tested for tritium output by auto-radiography. The scientists at BARC found only 4 out of 1,000 Ti chips were providing nuclear byproducts. Ed.]

ITALY - THE SHADOW MODEL

Courtesy of Dr. Samuel Faile

A. Scalia "The "Shadow" Model for the Sub-Barrier Fusion", *Il Nuovo Cimento*, Vol. 105 A, N.2, February 1992, pp 233-244, 14 figs, 3 tables, 22 refs, in English.

AUTHORS' ABSTRACT

By assuming that the fusion process is the "shadow" of the elastic scattering the analytical expression of fusion cross-section is obtained in a straight forward way. A systematic analysis is performed by using experimental values of fusion cross-section for several systems.

INTRODUCTION: During the past few years there has been a great amount of interest in studying the details of fusion below and near the Coulomb barrier. The study of the heavy-ion fusion reactions at energy well below the barrier started with the observation that the fusion measured cross-sections were significantly larger than predicted by a tunnelling process through one-dimensional barrier. This has stimulated a more precise understanding of the processes going on this energy range where not too many nuclear degrees of freedom are involved. The precise mechanism leading to sub-barrier fusion cross-section enhancement is still to be understood in detail. Heavy-ion fusion near the barrier provides, also, an opportunity to study the interaction potential between two nuclei in a situation where only few degrees of freedom seem of importance.

Moreover the detailed understanding of our cosmic heritage combines astrophysics and nuclear physics and forms what is called nuclear astrophysics.

The nuclear fusion has played a key role in nuclear astrophysics, in fact for most purposes, such as the energy production rate in stars, or the general course of nucleosynthesis, it is the fusion reaction cross-section that is needed. The nuclear evolution of the stars is thus largely a question of charged-particle-induced nuclear reaction. The determination of nuclear fusion cross-section for big-bang or stellar nucleosynthesis usually required determining fusion cross-section at as low an energy as feasible, and then extrapolating the cross-sections to still lower energies. These astrophysical

energies are so low with respect to the Coulomb barrier that direct measurements are, in general, impossible. This extrapolating procedure is a crucial point for the determination of the reaction rate in nuclear astrophysics. In order to give a classical approach of what two nuclei do when they come together, we suggested, in a previous paper, the elastic model (EM) for the sub-barrier fusion. After this model was generalized in the extended elastic model, a new procedure to obtain the cross-section factor was suggested, this procedure was obtained in the framework of the elastic approach to sub-barrier fusion. An investigation about the validity of the EM, EEM I, II, III [models] and about the validity of the new procedure to determine the cross-section factor was performed. In ref. [6] we suggested a simple connection between the fusion process and the elastic scattering in such a way that the fusion process can be considered the shadow of the elastic scattering.

In the present paper, by assuming this point of view, the analytical expression of fusion cross-section, given in EM, is obtained in a straightforward way. This physical point of view and the analytical expressions obtained in EM or in its generalizations, EEM I, II III, are defined as the "shadow" model. Experimental values of fusion cross-section for several systems are considered in our analysis.

ITALY - TRITIUM PRODUCTION

From Chem Abstracts, May 18, 1992

Giuliano Mengoli, Monica Fabrizio, Claudio Manduchi, Giorgio Zannoni, Lucia Riccardi, Antonio Buffa (Padua), "Tritium and neutron emission in heavy water electrolysis at palladium and titanium cathodes," *J. Electroanal. Chem. Interfacial Electrochem.*, 1919, Vol 322, no 1-2, pp 107-17, in English.

AUTHORS' ABSTRACT

The possible emission of nuclear particles during the electrochemical loading/discharging of deuterium in/at suitable metals has been investigated by analyzing in succession 4 cells equipped with Ti rod, Pd tube, and Ti plat cathodes. The tritium enrichment in the electrolyte purely due to electrolytic T/D separation is related to the characteristics of D₂O used; notwithstanding the possible occurrence of this effect, 3 cells out of 4 showed (at least during the first week of the run) tritium excess above the statistical error. A quantity evaluation of neutrons from the cells was not tried owing to the high fluctuating background. However, from the statistical analysis of pulse frequency recorded during either long electrolytic or blank experiments, in the former case the background is overlapped by a phenomenon of higher frequency.

ITALY - H & D IN THIN Pd

From Chem Abstracts, May 18, 1992

Andrzej Czerwinski, Roberto Marassi (Dip. Sci. Chim., Univ. of Camerino), "The absorption of hydrogen and deuterium in thin palladium electrodes. Part II. Basic solutions, *Journal Electroanal. Chemistry Interfacial Electrochem.*, 322(1-2) 1991, pp 373-381, in English.

AUTHORS' ABSTRACT

A comparative study of hydrogen and deuterium sorption in palladium from basic solutions (0.1M NaOH, NaOD, LiOH, and LiOD) was performed, using electrodes by electrodeposition of Pd on gold. The amount of absorbed H or D depends on the electrode potential. The shape of H(D)/Pd vs E plots and the rate of H (or D) absorption are strongly influenced by the composition of the solution. Lithium has a marked influence on the alpha to beta phase transition. The maximum H(d)/Pd ratios were about 0.8 for all studied solutions. The greater isotopic effect was found during absorption and desorption in Li solutions.

JAPAN - DEUTERIUM ABSORPTION

Courtesy of Dr. Samuel Faile

G.Maizza, K. Nakamura, M. Fujitsuka and M. Kitajima "Study on Deuterium Absorption of Pd at High-Pressure D₂ Gas and Low Temperatures," *Il Nuovo Cimento*, Vol 14 D, N.1, pp 27-32, 15 refs, 1 table, 3 figs.

AUTHORS' ABSTRACT

This paper presents studies on the absorption and desorption behavior of deuterium in Pd and Ti subjected to high pressure D₂ (6 to 90 atm) by measuring the resistivity in cyclic conditions of temperature ranging from 77 K up to room temperature. Numerical calculations have also been performed for the deuterium absorption behavior based on the diffusion equation. The results show that: a) deuterium starts to be absorbed into the bulk of Pd metal within 240 to 270 K depending on the pressure; b) the absorption is dominated by a surface process.

INTRODUCTION

Recently, Hemmes et al. have studied the electrical resistance change of palladium in highly pressurized hydrogen (40,000 atm.) and have found that hydrogen is abruptly absorbed around 110 K. Eberhardt et al. have observed that hydrogen is adsorbed on the surface of Pd (111) above 270 K under conditions of low pressure (less than 10⁻⁵ Pa). The temperature at which hydrogen

starts to be adsorbed depends on the surrounding hydrogen pressure.

However, there are little data on hydrogen absorption to palladium in the intermediate pressure range (10 to 100 atm.) Hydrogen absorption behavior on Pd and Ti in this pressure range has recently received much attention since several groups have reported neutron emission in thermal and/or pressure cycling of high-pressure D_2 gas (7 to 80 atm.) loaded Pd and Ti at low temperatures. Therefore, we have studied the electrical resistivity change of the high-pressure loaded Pd under cyclic conditions of temperature (77K to about room temperature) and pressure (5 to 90 atm.) We have performed model calculations on the basis of the diffusion equation under transient conditions. Herein, the results of this study on the temperature dependence of deuterium absorption behavior in Pd thin wires under pressurized D_2 gas at low temperatures will be described. For the sake of comparison, the case of Ti was also examined.

AUTHORS' CONCLUSIONS

The absorption behavior of deuterium in the high pressure D_2 gas-loaded Pd and Ti has been studied by measuring resistivity under cyclic conditions of temperature ranging from 77K to room temperature. The calculation model based on the diffusion equation explains the incubation behavior of the temperature dependence on deuterium absorption and the pressure dependence on the change in absorption for Pd. The calculation results show that the dominant process in the deuterium absorption could be a surface process for Pd.

POLAND - DEWAR CALORIMETERS

From Chem Abstracts, May 18, 1992

R.E. Sioda, T.Z. Fahidy (Inst. Indus. Organic Chem, Warsaw), "A simplified approach to the thermal behavior of electrolytic Dewar cell calorimeters," *J. Applied Electrochem.*, 1992, Vol 22, no 4, pp 347-50, in English.

AUTHORS' ABSTRACT

A simplified approach, based on the concept of an overall heat loss coefficient, is described for the estimation of time-variant temperature profiles. The computation of the loss coefficient from experimental temperature maximum under programmed power input is also discussed. D_2O electrolysis is discussed.

V. I. Sannikov, V.G. Gorodetskii, E.M. Sulimov, B.G. Polosukhin, V. Ya Kudyakov (Inst. Elektrokhim, Sverdlovsk, USSR), "Emission of Neutrons and gamma-quanta from a titanium electrode polarized by current in a vapor-gas phase over lithium deuteride," *Rasplavy*, (4), 1991, 86-89.

AUTHORS' ABSTRACT

To further study the emission of high-energy gamma-quanta and neutrons during the electrolysis of heavy water in cells with Pd and Ti electrodes, as reported earlier by S. Pons and M. Fleischmann (1989) and by S.E. Jones (1989), studies were made in which a Ti wire (diam. 2mm, working surface 3-5 mm²) of VT1 grade used as 1 of the electrodes in a gas phase. The other electrode was represented by a beaker of steel 12Kh18N10T (diam. 25 mm) on the bottom of which was placed LiD. The obtained results attest to the effect of temperature and voltage on the emission of gamma-quanta spectra obtained in this work. On the basis of the different mechanisms of nuclear transformations, esp. with the participation of Li, Be, B and alpha-particles, further studies are needed.

RUSSIA - GEOLOGIC NUCLEAR FUSION

From Chem Abstracts, May 18, 1992

V.A. Tsarev & P.I. Golubnichii, "Geological manifestations of low-temperature nuclear fusion", *Kratk. Soobshch. Fiz.*, 1991, No. 3, pp 24-26, in Russian.

AUTHORS' ABSTRACT

The considerations of possible geological manifestations of the low-temperature nuclear fusion (S.E. Jones, 1989) are discussed. The estimations in the above mentioned work are considered to be unrealistic. In this work the energy yield of the reaction $p + d \rightarrow {}^3\text{He}$ between p and d present in the water of oceans is considered. The supply of this natural reactor with the reacting components is assumed to determine the rate of the cold fusion λ_{p-d} at about 10^{-17} per sec per p-d pair. The currently available experimental facts suggest that the actual value is about 10^{-5} per sec per p-d pair. The considerations presented can help to answer a question concerning the distribution of products of the nuclear synthesis, T & ${}^3\text{He}$, on the earth.

SRI LANKA - DISSOCIATION OF WATER

Courtesy of Dr. Samuel Faile

Dale D.A. Danforth, "Molecular Dissociation of Water," *Tuning In* (published by E.P.M. Power Systems, Ivanhoe, Victoria, 3079, Aust., p 18-19, 1 diagram.

RUSSIA - NEUTRONS FROM TITANIUM

From Chem. Abstracts, May 4, 1992

EDITOR'S COMMENTS

Danforth comments on the Stan Meyer patents and the production of excess energy from a complex equipment which essentially disassociates water. Danforth describes an experiment and provides the circuit diagram which produces high frequency voltages which dissociates water with an efficiency greater than that normally achieved with the use of standard electrolysis. Danforth states that, "There are two primary frequencies that produce the best results. They are 14372 Hz and 43430 Hz. The former is about 50% more efficient, but it seems that just about any frequency between 9 KHz and 143.762 KHz works quite well." Unless I have made a mistake in understanding, there is an error in the accompanying circuit diagram (The connection shown immediately above diode D1 should not be a connection.)

Dr. Sam Faile sent *Fusion Facts* a copy of Stan Meyer's **Water Fuel Cell International News Release**, Issue No. 8, Winter/Spring 91/92. The lead article is by Marcia Thompson, *Grove City Record*, July 31, 1991, and is titled, "World wakes up to water fuel invention." The news release also lists over 25 U.S. and foreign patents that have been obtained by Meyer and his group.

SWITZERLAND - BLACK HOLES

From Chem. Abstracts, May 4, 1992

John Ellis, N.E. Mavromatos, D.V. Nanopoulos, (Theory Div., CERN, Switz.), "On the evaporation of black holes in string theory," *Phys. Lett. B*, 276(1-2), pp 56-66.

AUTHORS' ABSTRACT

We show that, in string theory, the quantum evaporation and decay of black holes in two-dimensional target space is related to imaginary parts in higher-genus string amplitudes. These arise from the regularization of modular infinities due to the sum over world-sheet configurations, that are known to express the instabilities of massive string states in general, and are not thermal in character. The absence of such imaginary parts in the matrix-model limit confirms that the latter constitutes the final stage of the evaporation process, at least in perturbation theory. Our arguments appear to be quite generic, related only to the summation over world-sheet surfaces, and hence should also apply to higher-dimensional target spaces.

F. SHORT ARTICLES FROM READERS

IR DETECTORS FOR COLD FUSION

"Experiments with Non-Inductive Coils While Observing Hot Spots with IR Detectors," by Dr. Samuel P. Faile, April 18, 1992.

Dr. Dennis Cravens has shown that an Infra-Red viewer can be used to observe the changes in hot spots on the cathode of a cold fusion electrochemical cell. If one can establish that much of the excess heat comes from hot spots or from microexplosions as determined by the use of IR detection, it would be of interest to see what effect the non-inductive coils would have on the pattern and timing of the hotspots on the cathode surface. The non-inductive coil could produce static or dynamic magnetic potentials. Complex square waves such as those produced by Rein could be produced. Under some conditions it is expected that the hotspots would brighten together. [Cravens reports that an observed hot spot changed its intensity as a function of the pulsed nature of the input current to a cell.] The excess heat might be increased if more hotspots could be stimulated, if they became larger, or if the lifetime of the hot spot were increased. Under some conditions produced by the non-inductive coil, many hotspots might be caused to occur simultaneously and this effect could result in an explosion. The use of the non-inductive coils may be helpful in leading to insights on macroscopic phenomena especially if the proper safeguards are taken.

In a separate note Dr. Faile sent us the following information and telephone number for IR sources:

Edmund Scientific (609/573-6250) also details from Product Information Dept. at 600/573-6890. Edmund offers a variety of near-IR viewers. They are night vision viewers and scopes (about \$3600). Camera Adaptable Night View Vision System (about \$4400). An IR hand-held viewer for about \$1100 and IR Goggles for about \$1300. A Finder Scope Infrared Viewer for \$1400. For Far-IR heat imaging Micron Instrument Corp (800/631-0176) offers a high resolution \$50,000 systems. Other companies in the IR business are Minarad Scientific Corp. (203/366-7666); Olympus (516/488-3880); Pyrometer Instrument Co. (201/768-2000); Egema IR Systems (201/286-5390); and Spectronics Corp (800/274-8888).

[A similar set of experiments, while using IR-viewing techniques, could involve the use of magnetic fields and various electrostatic fields in the vicinity of the electrochemical cell. Ed.]

LATEST INFORMATION ON FREE ENERGY

Written for *Fusion Facts* by Dr. S.P. Faile
April 28, 1992

Today I received another letter from a free energy inventor, Dr. Shiuj Inomata, from Electrotechnical

Laboratory, 1-1-4 Umezono, Tsukuba-shi, Ibaraki, 305 Japan (TELEX No. 365270 AIST J). At last it appears there is an inventor in the free energy field who is available and readily reports results that are reproducible. Having persisted for ten years in the field, positive results were finally achieved by Dr. Inomata in the last few months. Dr. Inomata has achieved effects attributed to a gravitational vortex and also gravitational induction where it is shown that a torque on [a] wood [toothpick] can be produced by a dense coil even though the coil is wrapped in aluminum foil that is grounded to the laboratory earth. The coil involves 0.06 mm wire with 250,000 turns. It is possible to obtain a deflection of a toothpick suspended from a silk thread with no electrical load on the coil. All that is needed is a connection between the terminals so that there is no gap in the circuit. He believes his device is tapping zero-point energy.

A video of the effects was shown on March 28th at the Japan Psychotronics Institute meeting in Tokyo. Recently I received a copy of his ETH, Zurich, 1988 paper, "Paradigm of New Science," where Dr. Inomata develops a complexified EM theory by having the gravitational constant a product of two terms where Newton's formula of gravity $f = -G M_1 M_2 r^0/r^2$ is rewritten as $f = (iG^{1/2} M_1)(iG^{1/2} M_2) r^0/r^2$ where $i = \sqrt{-1}$. By putting $Q_1 = iG^{1/2} M_1$, $Q_2 = iG^{1/2} M_2$ one obtains the "shadow charges" and the expression of Coulomb's formula in a vacuum shown in ESCG units as $f = Q_1 Q_2 r^0/r^2$. He then derives the expression "ijm," the glow of shadow current, which should produce a gravitational vortex. In the paper, Dr. Inomata mentions another effect where a 10 mg. change in gravitational mass was obtained for a condenser weighing 75 grams.

Much more powerful effects have been obtained by John Hutchison of Canada but the effects have been very sporadic. Articles of interest are "The Hutchison Effect" by George D. Hathaway, pp 6-12, and "Rainbow in the Lab: The John Hutchison Story," by Jeane Manning, pp 13-22, which are from Issue No. 4 (Oct/Nov/Dec 1991) of Electric Spacecraft Journal which has a publication date of April 16, 1992. It is not surprising that when unsophisticated experiments produce powerful gravitational effects, there could be a problem with the time factor (sporadic effects) since the linkage of time and gravity by general relativity suggests an effect on gravity could impact on time.

In fact, the main problems that plague the free energy field are interruptions in excess energy production that appear in a chaotic manner. During the 26th Intersociety Energy Conversion Conference in Boston, Massachusetts, August 4-9, 1991, one of the most highly touted free energy systems, the solid state "Pod Mod" of Richard L. "Scott" McKie and Michael A.P. Kendrick has reportedly suffered unexplained power interruptions delaying a test

that was planned to demonstrate the invention before a California Utility testing group.

One of the best known free energy inventors is Stanley Meyer of Grove City, Ohio who has many patents on a "Water Fuel Cell" process. Even though a number of independent studies indicate Stanley Meyer has something of importance, for many years now "Murphy's Law" and new bugs have prevented commercialization.

People have been working on free energy machines for about 100 years. Mr. Joseph Pinkerton, a free energy machine inventor (US patent 4,945,273), believes there are now about 200 approaches to free energy techniques worldwide. To bring about commercialization a major organization may have to devote a major project to solving the problems. Over the years some of the information held by individual inventors has been lost. To provide exchange of information and a greater continuity of technical development, in recent years, many networks or newsletters have been started typically having about 100 subscribers each.

An example of the usefulness of these newsletters is the attempt to duplicate the invention of Mr. William W. Hyde (US Patent 4,897,592). There was a lot of interest since reportedly a stand-alone machine had been built which produced about 18 Kilowatts excess power in the form of electricity. As often happens when news like this is brought out, the inventor may no longer be available to talk to the public. Early attempts to duplicate the results failed. However, since then, a network (that had been organized by Moray King) has been providing tips as various groups experimented with components of the invention. At last a ray of hope has appeared in the Issue 4 article of Electric Spacecraft Journal, titled "Update on the Hyde Invention," by Dr. Moray B. King, (Paraclete Publishing, P.O. Box 859, Provo, UT 84603) which was in the Network Notes section. Many new tips were given in the article on pp 40-41.

It is worthwhile to list some of the newsletters that cover the Free Energy Field. Of interest are:

* Electric Spacecraft Journal, Editor Charles Yost, P.O. Box 18387, Asheville, NC 28814.

* Tuning In, Editor Ian C. Hacom, Free Energy Connection, Box 255, Ivanhoe, Vic. 3079, Australia.

* Space Energy Newsletter, Editor Donald A. Kelly, Space Energy Association, P.O. Box 11422, Clearwater, FL 34616. (March 1992 issue gave a summary of a IECEC-92 Submission, "Progress Report on the Win Process," by Dr. Lambertson.) (Also note "The Non-Inductive Coil, the Key to Both Free Energy and Anti-Gravity Effects," and the Hooper patent 3,610,971.)

* Planetary Association for Clean Energy, 100 Bronson Avenue, Suite 1001, Ottawa, Ontario K1R 6G8 Canada.

* Extraordinary Science of the International Tesla Society, 330-A Uintah Street, Suite 215, Colorado Springs, CO 80905.

For those interested in audio/video tapes e.g. "Hutchison Effect," Tesla Symposium, write to E. Briggs for information at P.O. Box 187, Lone Mountain, TN 37773.

An encouraging trend is that the newsletters are taking a closer look at microscopic effects, a field that could provide valuable clues. The Electric Spacecraft Journal showed micrographs from metals used in Hutchison's experiments. The journal plans to cover the electron bead patent of Dr. Ken Shoulders (US Patent 5,018,180). These electron clusters of 10^9 - 10^{11} electrons per bead produced by electric arcs, could be involved in many processes that produce excess energy. It has been suggested that fireballs could be "seeded" using electron beads. Tuning In wants to survey cold fusion.

In addition to newsletters, patents are a source of information. The inventor with the lion's share of patents is Stanley Meyer. He has avoided claims of energy efficiency (over-unity results) or much mention of energy sources in his "hydrogen fracturing" process. Thus he has prevented examiners from labeling his invention a perpetual motion machine. Some of his US Patents are: 4,613,779; 4,613,304; 4,275,950; 3,970,070; 4,265,224; 4,465,455; 4,798,661; and 4,826,581. Others involving his process from CDA are: 1,231,872; 1,233,379; 1,228,833; 1,227,094; 1,235,669; 1,234,774; 1,234,773; and 1,213,671. Stanley Meyer is obtaining many more including a number of international patents. A recent US Patent is 4,936,961. Three international patents being issued are PCT US 90065B, PCT US 9103476 and PCT US 8902622. One of his goals, which is a year or more away from realization, is to fly a jet plane twice around the world without refueling.

Another strategy for obtaining patents is to bring a working model into the Appeals Office. This worked years ago for Mr. Howard R. Johnson (US Patent 4,151,431) who demonstrated a working magnetic system. A much more practical device having stand-alone capability has been built by Troy G. Reed of Tulsa, Oklahoma who is now building a portable device at Reed Technologies.

Other sources of information on various inventions:

* IECEC '91 - 26th Intersociety Energy Conversion Engineering Conference - Volume 4, "Innovative and Advanced Systems," available from the American Nuclear Society.

* AIDS, The Last Great Plague by Hans Neiper, MD. Half of this book is devoted to energy machines and a theory involving the tachyon (faster than light particles) field where it is believed the machines draw their power.

* Gravitobiology, by Lt. Col T.E. Bearden, Tesla Book Company, P.O. Box 121873, Chula Vista, CA 91912 on scalar technology.

* An extensive catalog is available from Bob Nelson at Rex Research, P.O. Box 19250, Jean, NV 89019.

After studying the free energy information that is available, I believe one will conclude that it is an active, fascinating field with many challenges to overcome so that the world will benefit from "free-energy" technologies.

COLD FUSION EXPLOSIONS

"Organizing Forces During Cold Fusion Explosions?" By Dr. Samuel P. Faile, April 15, 1992.

Artifacts of cold fusion explosions seem to show the effects of a force that organizes on a large scale. In one instance the explosion of a rod of deuterated palladium left two filaments that ran in the axial direction. Despite the disintegration of most of the rod these strands were left intact. In another explosion involving a high voltage applied to a deuterated palladium wire, a cylinder was formed that looked like a straw. This effect could not be produced using non-deuterated wire. At Oak Ridge there were indications that an explosion of a deuterated palladium electrode involved the simultaneous effect of many microexplosions that organized themselves into a lattice-like array. Regularly-space micron-wide craters were found in the crystallites.

Dr. Preparata speaks of coherent effects and macroscopic quantum behavior. Mr. Peacock believes new forces arise in surfaces due to anyon statistics. These effects could apply to internal surfaces as well as external surfaces. There could be standing quantum potential waves that operate between grain boundaries that go across crystallites. At regular nodal points along the waves, speeded-up crater-producing cold-fusion reactions could occur. Gravity decay reactions could unleash organized macroscopic effects.

[We have been taught by Shoulders in his patents that electron beads can drill holes in dielectrics but that the electron beads disintegrate when encountering the surface of a typical metal conductor. It would be most interesting if the effects described by Dr. Faile were explainable by electron beads in a palladium hydride (which is less of a conductor than palladium). Ed.]

NUCLEAR MAGNETIC RESONANCE

By Hal Fox

At the meeting of scientists invited to meet with Dr. Akito Takahashi at Texas A&M (See *Fusion Facts*, May 1992, page 8) Dr. Bockris introduced Joe Champion, "new man on campus." Champion briefly described his 9 liter cell using d.c. current plus 2 r.f. frequencies. In running the electrochemical cell with the two r.f. sources, Champion finds that some type of a "radioactive gas" is produced. Champion reported that the cell used 20% heavy water and 80% light water. An "alpha-emitter" is produced in over 100 tests. Blank tests with no r.f. produce no alpha-emitter.

This interesting report led *Fusion Facts* staff to compile the following information on **nuclear magnetic resonance** for our multi-disciplinary readers from Physical Chemistry, by Walter J. Moore, 2nd Ed., Prentice-Hall, pgs 324 ff.

An atom exhibits magnetism due to the electrons in the atom and also contributions from the nuclei. Nucleons have spin and therefore act as elementary magnets. In many atoms the spins add to zero. Early predictions of the magnetic moment of a proton was 1 **nuclear magnetron**, or equal to $eh/(4\pi M)$, where M is the mass of the proton. Measurements show that the proton magnetic moment = 2.79245 nuclear magnetons. The value for a neutron is -1.9135 where the negative sign indicates that the moment is like that of a negatively charged particle. Due to the mass difference the nuclear magnetic moments for the neutron are about 1,000 times smaller than for the proton.

Prof. Moore states, "The existence of nuclear magnetism was first revealed in the *hyperfine structure* of spectral lines. As an example, consider the hydrogen atom, a proton with one orbital electron. The nucleus can have a spin $I = \pm 1/2$, and the electron can have a spin $S = \pm 1/2$. The nuclear and the electron spins can be either parallel or antiparallel to each other, and these two different alignments will differ slightly in energy, the parallel state being higher. Thus the ground state of the hydrogen atom will in fact be a closely spaced doublet, and this splitting is observed in the atomic spectra of hydrogen, if a spectrograph of high resolving power is employed. The spacing between the two levels, $\Delta E = h\nu$, corresponds to a frequency ν of 1420 megacycles."

[My notes from Champion's brief presentation list only one frequency of 60 megaHz.]

Prof. Moore discusses the simplified apparatus used for basic nuclear magnetic resonance. Moore also discusses the phenomenon of *space quantization*. The frequency ν of the transitions between two quantized levels ($\nu = \Delta E/h$) lie in the microwave range of r.f. Moore cites,

"For example, at a field of 7050 gauss, the frequency for protons is 30 megacycles."

When a sample chemical, such as ethyl alcohol is placed in a strong magnetic field and then perturbed with a smaller r.f. signal the NMR transitions can be picked up by a sensitive receiver coil and amplifier. When the strength of the received signal is amplified and displayed over a range of magnetic values, there will be displayed three separate peaks. These peaks relate to the chemical binding energies of the CH₃, the CH₂, and the OH parts of the CH₃ . CH₂ . OH molecule. As Moore explains, "The reason for this splitting [of the waveform] is that the different protons in the molecule have a slightly difference magnetic environment [due to the position in the molecule], and hence a slightly different resonant frequency. The fine structure that can be obtained by charting these resonances can give a strongly detailed insight into the nature of the chemical bond.

Prof. Moore (page 267) discusses the emission spectra of the alkali metals. In addition to the principal spectra there are three other series: the **sharp** series, the **diffuse** series, and the **fundamental** series. These fine details are seen mainly when the alkali metals are at elevated temperatures. Prof. Moore also notes in a discussion of **Space quantization**, "So far in the discussion of allowed Bohr orbits, we have not considered the question of how the orbits can be oriented in space. This is because in the absence of an external electric or magnetic field there is no way of distinguishing between different orientations, since there is no physically established axis of reference. If an atom is placed in a magnetic field, however, one can ask how the orbits will be oriented relative to the field direction. The answer is given by the Bohr theory is that only certain orientations are allowed. These [orientations] are determined by the condition that the component of angular momentum in the direction of the magnetic field, e.g., in the Z direction, must be an integral multiple of $h/(2\pi)$.

Thus $p_z = mh/(2\pi)$, where m is the magnetic quantum number. This behavior is called **space quantization**. The allowed values for m are plus and minus 1,2,3,4, etc. up to k where k is the azimuthal quantum number, which gives the magnitude of the total angular momentum. In the presence of an electric or magnetic field these various energy levels will give rise to a fine structure of the spectral lines. In a magnetic field, this is called the *Zeeman effect*. In an electric field, this fine structure is called the *Stark effect*. This experimental observation is the basis for the introduction into the Bohr theory of **space quantization**, and of the **quantum number m**.

G. LETTERS TO THE EDITOR

LETTER FROM CHUKANOV

[Refer to May 1992 issue of *Fusion Facts*, page 4, "An Outline of Chukanov's Theory".]

Dr. Kiril Chukanov writes:

I think your explanation of my Theory is very good and clear. But one correction is needed:

Quantum Boundaries $R_{\mathbf{K}\mathbf{P}} = 2 \times 10^{16}/E$ and

$R_{\mathbf{D}} = \sqrt{E} / 0.91 \times 10^8$ are both in force **ONLY** for nuclear components of matter.

Particles of a metal lattice are ions (their space state is determined by the surrounding electron cloud), so, for these ions the quantum boundary $R_{\mathbf{K}\mathbf{R}} = 1.45 \times 10^{18} / E$ is in force not the $R_{\mathbf{K}\mathbf{P}}$ boundary curve.

The lattice is not getting hot because the particles (*ions*) of the lattice are not being compressed below $R_{\mathbf{K}\mathbf{R}}$. During the same time period hydrogen ions (protons) are being compressed (during saturation) from point B to point C (below the quantum boundary for the nuclear components ($R_{\mathbf{K}\mathbf{P}}$), therefore the protons pick up an excess energy (one part from the lattice, and another part from **Nothing**.) Because of the action of quantum limitations behavior of the assembly of hydrogen nuclei and of metal ions is collective, not individual, whole assembly of metal ions give some energy to the assembly of hydrogen nuclei, whole assembly of hydrogen nuclei picks up the rest excess energy from **Nothing**. Because of excess energy from **Nothing** the lattice become hotter.

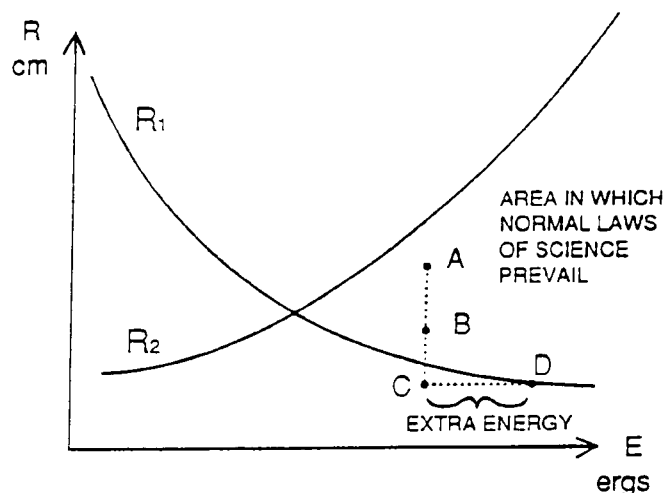


Figure 1. A Portion of the Chukanov Map of the Bounded Universe of Science.

$$\begin{aligned} \text{Equations: } R_1 &= R_{\mathbf{K}\mathbf{P}} = (2 \times 10^{16}) / E \\ R_2 &= R_{\mathbf{D}} = (\text{Sq Rt } E) / 0.91 \times 10^8 \\ R_{\mathbf{K}\mathbf{R}} &= (1.45 \times 10^{18}) / E \text{ (not shown)} \end{aligned}$$

[*Fusion Facts* will publish more on Chukanov's model and his experimental work. Ed.]

LETTER FROM RUMANIA

Dr. Peter Glück writes the following:

Now I am preparing for the great battle with the skeptics at Debrecen [for a forthcoming technical conference]. Yesterday I gave a routine lecture to the chemistry department here at the University. The conclusion was that the students are more prone to understand new facts than some of the professors. . . .

Professor Gryaznov, whose book has inspired me to develop the SURFDYN model has written an interesting paper in a journal easily accessible to your readers: *Platinum Metals Review*, vol 36, no 2, April 1992, pp 70-79, "Platinum Metals as Components of Catalyst Membrane Systems." It is not directly linked to cold fusion but it shows convincingly the high degree of expertise in the field of Pd and its alloys by Prof. Gryaznov. Actually, V.M. Gryaznov is a cold fusion believer and author. Refer to *Fusion Facts*, Sept, 1990, p 22, the B.V. Govotov, et al. paper. (Gryaznov is the first of these et al.). This paper is an important contribution proving that fragility, fracturing, and neutron emission, are not correlated. . . .

I have stated that **the theorists are the mental prisoners of the lattice**. For our wise man, Robert Bush, this is not true. I read in his new *Fusion Technology* paper [to be published] regarding hydrogen-alkaline fusion: "Note that there is no problem of a surface reaction in the author's new TRM since the deBroglie wavelength of the ions are no longer involved in the transmission resonance aspect of the model." So I dare to hope that Dr. Bush will be cooperative in providing the SURFDYN model with adequate mechanisms and theory - we have to explain the great variety of the results! (wandering clusters? surface vortices? other phenomena?)"

[Dr. Glück promises to report on the Debrecen conference, hopefully in time for our July issue. Ed.]

LETTER FROM ONTARIO HYDRO

Dr. W. T. Shmayda writes the following:

Dear Mr. Fox,

I have heard indirectly from Dr. Srinivasan that you are under the impression that we have measured excess heats using a Randy Mills type cell.

We have carried out a series of measurements using his cell and his input to determine if excess heat can be produced. The cells have been placed into a calorimeter with a 50 mW detection sensitivity and tested under a variety of conditions. We did not stir the electrolyte but did measure the electrolyte temperature in three locations. We used two salts: sodium and potassium carbonate. We did not detect any excess heat, although given the temperature differences we measured, I can see how these results could be misconstrued. The conclusion of our study is: for the cell configurations we studied we did **NOT** observe any excess heat. A report will be issued shortly. I intend to send a duplicate message to Dr. Bush.

Regards, /s/ W.T. Shmayda
Ontario Hydro, Research Division,
Corrosion and Tritium Technology Section,
800 Kipling Avenue, Toronto, Ontario, Canada, M8Z 5S4.

[Some time ago, I was informed that a major Canadian laboratory had replicated the Mills-type electrochemical cell and had obtained excess heat. I made the comment that it was likely Ontario Hydro of Toronto, Ontario, Canada. I was mistaken and greatly appreciate Dr. Shmayda's letter. Hal Fox, Ed.]

LETTER TO EDITOR OF *SCIENTIFIC AMERICAN*

Over the years, I have always found comfort in the objective, non-political, and purely scientific reporting in your magazine [*Scientific American*]. I was surprised and disgusted, therefore, to find your article, "Japan, Cold Fusion, and Lyndon LaRouche," to be little more than a half-page smear job-- and a fairly amateurish one at that. It was full of snide comments, factoids, and evasive arguments, all carefully organized to shove the unsuspecting reader towards your particular conclusion. The closing paragraph, in which Mr. Horgan tries to link "cold fusion" research with Lyndon LaRouche, is particularly bad. It reads like something from my Propaganda 101 class in college--- "How to Smear, Lesson 1: Imply a connection, no matter how vague or spurious, between your target and a well known criminal or scandalous situation. See also: Mudslinging."

I don't know if "cold fusion" results are valid. However, I do know that it is beneath the dignity of your magazine to publish sophomoric, spin-doctored, yellow-journalism crap like that article.

Clean up your act, please.

Yours truly, /s/ Thomas B. Benson

[See *Fusion Facts*, May 1992, page 13 for review of the *Scientific American* article. Benson is a successful California computer executive. Ed.]

NOTE FROM CHIP RANSFORD

Chip sent a bumper sticker with white letters on a blue background:

COLD FUSION

It Could Happen

Chip writes: "Bumper sticker is from a Jazz band out of Orlando, Florida. -- good name.

COST OF ELECTRODE ANALYSIS

Courtesy of Dr. Nate Hoffman

A five-position analysis of three blanks and two specimens using 20 mgm of material can be made for \$1300. The samples to be analyzed must include both "as received" and "after electrolysis." It is good procedure to have about 1% of the electrode analyzed. The samples should be carefully marked but not to indicate which of the samples is the "as received," so that the tests will be essentially a "double-blind" test.

Results can be kept confidential. For more information, call Dr. Bryant Oliver at (818) 700-4361.

READERS INPUTS REQUESTED

THE BEST OF THREE YEARS OF *FUSION FACTS*., NOMINATIONS REQUESTED!

During the past three years, the staff and correspondents of *Fusion Facts* have brought to it readers, cold fusion information from hundreds of papers and information from over 25 countries. **We ask you to select the 10 best cold fusion articles or presentations or events over the past ten years.**

Send your nominations to *Fusion Facts*, P.O.Box 58639, Salt Lake City, Utah 84158. We will have a drawing and three of you will receive free copies of the 2nd Edition of Cold Fusion Impact, written by Hal Fox.

H. MEETINGS AND MISCELLANEOUS

ITALIAN COLD FUSION CONFERENCE PLANNED

We failed to receive details of the planned cold fusion conference. For those interested, please write or Fax:

Dr. A. Gaspari
21st Secolo Via Toito Labieno #24
00174 ROMA, ITALY

Fax: Italy, 6-74-80393.

Fusion Facts will publish further details as soon as we receive more information.

2ND ANNUAL CONFERENCE PROCEEDINGS

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

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

Orders should be sent to:
Societa Italiana di Fisica
Redazione
Via L. Degli Andalò, 2
40124 Bologna, BO, ITALY

Price is 110,000 Lira. Send U.S. \$90 for surface mail or U.S. \$110 for expedite by air mail. Make checks payable to the Societa Italiana di Fisica or directly to the bank account No. 3916594/01/54 Banca Commerciale Italiana Bologna. The price of the book includes packing and mailing.

Phone: (051) 58.15.69; Telex 512688 SIF I;
Fax: (051) 58.13.40.

THIRD ANNUAL COLD FUSION CONFERENCE

Fusion Facts has received no further details about the forthcoming (October 21 to 25, 1992) Third International Conference on Cold Fusion.

NEW FROM FUSION FACTS - *Fusion Briefings*

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

Fusion Briefings is airmailed to you for only \$49.00 for twelve issues. Single issues are \$5.00 per issue. Mention to us that you saw this notice and we will send you a free complimentary copy.

For *Fusion Briefings*, write or phone us at the address or phone number below:

P.O. Box 58639, Salt Lake City, UT 84158
Telephone: (801) 583-6232

NEW BOOK AVAILABLE - *Impact Studies*

"Fusion Impact Studies" (Second Edition) is now being published. Available to FF subscribers for \$15.00. Updated with new statistical information and graphs to illustrate and support the information, "Fusion Impact Studies" is a timely resource book detailing the impact that enhanced energy systems will have on eight industries and the government. This latest edition includes comments on commercial strategy based on the new light water electrochemical cells, one of which is now producing 1 kW of power.

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Fusion Facts DOES ACCEPT SHORT ARTICLES

The goal of *Fusion Facts* is to present the latest information on enhanced energy devices in **the shortest possible time**. Therefore, we use only our local staff, correspondents, and scientist friends in making acceptance decisions on submitted articles.

We are especially interested in any new discoveries that improve the replication of cold fusion electrochemical cells or of other devices that provide excess energy. We are also interested in simply-stated summaries of your theories or models, especially as they pertain to improvements of devices that produce excess energy.

Brief **Letters to the Editor** are also welcome. Topics of interest include latest business developments related to cold fusion, patent information, and your constructive criticism of any cold fusion concepts. We especially welcome news of any **enhanced energy devices** that have been reduced to practice.

Remember to keep your written material simple but precise. A large fraction of our subscribers do not have English as their primary language.

Send your contributions to Hal Fox at:

P.O. Box 58639
Salt Lake City, UT 84158

Or FAX to: (801) 272-3344

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PRELIMINARY ANNOUNCEMENT

THIRD INTERNATIONAL CONFERENCE
on
COLD FUSION

will take place in Nagoya, Japan
from October 21 to 25, 1992
at the Nagoya Congress Center

The conference will cover the broadest topics relevant to cold fusion phenomena in the research fields including nuclear physics, electrochemistry, and solid state physics. We believe that the conference will give us excellent opportunities to exchange ideas for further advance in cold fusion researches.

DEADLINES FOR REGISTRATION

Preliminary Registration: 15 March 1992

One Page Abstract and Final Registration: 15 July 1992

LOCAL ORGANIZING COMMITTEE OFFICE

H. Ikegami (Chairman) or C. Namba (Chief Secretary)
National Institute for Fusion Science, Nagoya, Japan 464-01
Tel: 052-781-5134 (office) Fax: 052-781-9564

E-mail: ikegami@nifs.ac.jp

PRELIMINARY REGISTRATION

If you are interested in attending this conference, please fill in the enclosed preliminary registration form and return it to the Local Organizing Committee Office before 15 March 1992 in order to be included in further mailings for the conference. Final forms and hotel reservation cards will be sent out in May and August, respectively.

PRELIMINARY REGISTRATION FORM

for
The Third International Conference on Cold Fusion
October 21-25, 1992, Nagoya, Japan

Preliminary Registration to the Conference

- Plan to attend
- Plan to submit a contribution
- Do not plan to attend now, but wish to be kept on the mailing list

Name _____ Title _____
 Affiliation _____
 Address _____
 Country _____
 Tel: _____
 Fax: _____
 E-Mail: _____

Research Field of Interest:

- Physics
 - Particle detection
 - Materials
 - Electrochemistry
 - Heat and calorimetry
 - Others (please specify) _____
- neutron
 - helium
 - proton
 - x-ray
 - tritium

Any Comments:

The following colleague might be interested in receiving information on this conference.

Name _____ Title _____
 Affiliation _____
 Address _____
 Country _____
 Tel: _____
 Fax: _____