FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

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

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MINSK

International Cold Fusion and Energy Conference
May 1994

PAPERS must be received by 15 April 1994

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A. FIVE YEAR ANNIVERSARY OF COLD FUSION

By Hal Fox

The University of Utah officials called a press conference on March 23, 1989 where Drs. Stanley Pons and Martin Fleischmann presented their experimental results which became labeled as **cold fusion**. One year later at the time of the First Annual Conference of Cold Fusion (University Park Hotel, Salt Lake City, Utah, March, 1990) officers of the American Physical Society labelled the conference as a wake held by faithful believers around a twitching corpse. **It is March, 1994, and the initial discovery by Pons and Fleischmann has progressed to where the 2 kilowatts per cubic centimeter heat output from a palladium cathode rivals the heat output from a similar volume of any other power source.**

Although the heat-producing processes are not fully understood, the devices that produce excess heat have proliferated. The **hot fusioneers** who have been crying "pathological science" are now challenged by at least seven different methods by which the production of excess heat has been discovered. Many other experimental devices have been designed and developed that are greatly expanding our knowledge of heat-producing reactions in/on a metal lattice. Those who read the numerous papers on cold fusion (over 1500 articles) are now either convinced that there is an important new science to be investigated **or have become pathological skeptics.**

These past five years are characterized by a mixture of scientific acceptance and scientific dismissal; by new discoveries and by disappointing results; by a proliferation of theories and a smattering of ridicule; and by numerous continued successes and occasional setbacks. What has been the cause of this unusual mix of discoveries and disappointments? The answer is that the basic palladium metal used for the cold fusion cathodes requires special treatment, as yet not fully understood. The best precious metal fabricators in the world are still trying to resolve the special handling in

the processing of palladium that gives mixed experimental results.

Prior to the discovery of cold fusion the apparent steady progress of science and technology led most people to believe in the accuracy, integrity, and intellectual honesty (with a few exceptions) of scientific progress and of scientists. We had forgotten how many great new inventions or discoveries were ridiculed by some of the most famous scientists and only gradually accepted. It was not expected that the first rush of enthusiasm following the announcement of cold fusion would be followed by an emotional outpouring ranging from skepticism to personal condemnation of two famous scientists. It was not expected that the august 400-year old publication, *Nature* would stoop to ridicule rather than to promote careful scientific inquiry. It has been disturbing to find that many of the world's peer-reviewed publications established a policy of not accepting papers on cold fusion. Even more astonishing were the actions of a few intelligent and respected scientists who have since dedicated their efforts to **correcting the errors of all successful cold fusion researchers.**

Regardless of the dedicated attempts to discredit cold fusion, many skilled scientists from many laboratories in over thirty countries found sufficient evidence for a new science that they have continued their research and have advanced knowledge. In May, 1989, at a cold fusion workshop held in Santa Fe, New Mexico, it had been learned that one of the key parameters to excess heat in a cold fusion cell was sufficiently high loading of deuterium into the palladium cathode. While some scientists were dismissing cold fusion as non-science due to the difficulty found in replication, other scientists were harkening to the findings of successful scientists. For example, several Japanese scientists attended the workshop, listened to successful scientists, returned home with new knowledge and dedication and by August 1, 1989 held a workshop in Japan. By this time ten Japanese scientific groups had achieved successful replication of the Pons-Fleischmann experiment.

As of March, 1994 (five years later) the new science of cold fusion is characterized by the following:

1. Replication of the nuclear reactions found in the original cold fusion experiment is relatively easy to achieve by those who will follow the procedures.

2. Strong evidence for anomolous nuclear reactions have been discovered using light water with nickel cathodes; using molten salts; using deuterium gas in glow discharge conditions; using crystals with deuterium-filled cappillaries; using electric arcs in deuterium gas; and even in proton conductors.

3. Many new theories have been presented. Some theories have been highly predictive of new results but none have been universally accepted.

4. Continued discoveries of new experimental results to show that the "cold fusion" phenomena is rich in anomolies.

5. A beginning attraction for the financial involvement of commercial entities. Examples are (in the United States) **HydroCatalysis Power Corp.** in Pennsylvania to commercialize the discoveries of Dr. Randell Mills and **ENECO, Inc.** in Utah who have acquired many of the most promising cold fusion intellectual property. Most of the corporate activity in cold fusion, as determined by the number of patent applications filed, has come from Japanese companies.

6. The burgeoning threat to the hot fusioneers. After the expenditure of an estimated $40 billion, this group of hot fusion researchers have not, as yet, achieved 50% of input as output power. It has been suggested that this group is primarily responsible for the attacks on cold fusion.

7. A continued expansion of our understanding of the complexities of anomolous activity, especially on or within a metal lattice. These disoveries and the diligent attempts to further scientific understanding is contributing strongly to the basic understanding of matter.

8. Continual examples of the dedication of true scientists who continue the pursuit of knowledge in spite of vigorous and unwarranted criticism. To this group we express our fond congratulations.

9. Finally, by the gradual depletion from the ranks of the vociferous skeptics, most of whom now recognize that the pursuit of scientific truth is not attained by dedicated ridicule nor by vigorous denial. All that are left are those who refuse to read or believe the extensive literature of cold fusion or those vanishing few pathological skeptics.

It is now appropriate that next month a new Wayne Green monthly publication will be delivered to newstands and bookstores across America. This publication simply named **"Cold Fusion"** is being edited by Dr. Eugene Mallove, formerly the head of the information office at MIT. Dr. Edmund Storms, a retired Los Alamos National Laboratory scientist is the cover personality for the premier issue, May, 1994. It is suggested that this publication will cause many people to ask where cold fusion has been for the past five years.

In the first burst of enthusiasm for the new discovery of cold fusion, I predicted that there would be commercial applications within two years. I am now more restrained in my

enthusiasm. Even if there had been vigorous support from the Department of Energy, it would probably have taken until now to have commercial prototypes. However, the years 1994 and 1995 are suggested as the years in which some commercial applications can be expected to be announced. We await these developments with great pleasure. The new sources for creating clean energy are now only a few million dollars away.

B. FUSION SCIENTISTS FOR 1994

Among those who have persevered in developing this new science of cold fusion and who have made many new discoveries are the **"Fusion Scientists of the Year"**, an annual award from ***Fusion Facts***. These scientist are:

1990: B. Stanley Pons and Martin Fleischmann (Jan., 1990)

1991: Bruce E. Liebert and Bor Yann Liaw, Univ. of Hawaii (Jan., 1991)

1992: Robert T. Bush and Robert E. Eagleton, Cal Poly-Pomona, and Randell L. Mills (Jan., 1992)

1993: Yan R. Kucherov, Alexander B. Karabut, and Irina B. Savvatimova, LUCH, Russia (Jan., 1993)

SCIENTISTS OF THE YEAR 1994

Our tributes to **1994 - Fusion Scientists of the Year** appear in this **FIFTH ANNIVERSARY ISSUE.** Those to whom we express our appreciation for their noble efforts are the following:

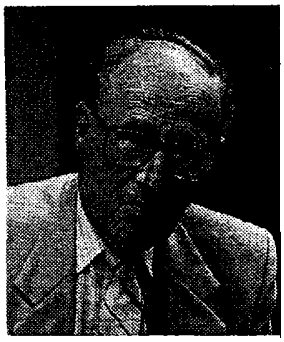
Dr. John O'Malley Bockris, Texas A&M for being one of the earliest replicators of the Pons-Fleischmann Effect and for his production of large amounts of both tritium and helium in a palladium cathode taken from a heavy-water experiment.

Dr. Dennis Cravens, Vernon College, Vernon, Texas for his replication of both heavy-water and light-water work and for his development and sharing of several practical methods for making successful working experiments on a low budget.

Dennis Letts, Austin, Texas for his discovery of the "Letts Effect" wherein selected electromagnetic radiation directed onto a Pons-Fleischmann cell causes a considerable increase in the production of excess heat.

Dr. Alexander Livovich Samgin and **Academician Alexey Nikolaevich Baraboshkin** of the High-Temperature Electrochemical Institute of the Russian Academy of Sciences in Ekaterinburg, Russia for their pioneering work with a new generation of solid-state materials.

Drs. Tadahiko Mizuno, Michio Enyo, Tadashi Akimoto, and **Kazuhisa Azumi** (Hokkaido University, Sapporo, Japan) for their extraordinary development of experiments using proton conductors and achieving a new high value of excess heat (over 5,000 times as much thermal power out compared to electrical power input.)



Dr. John O'M. Bockris

Dr. John Bockris is a Distinguished Professor of Chemistry at the Texas A&M University. His research interests are in the areas of quantum electrochemistry, photoelectrochemistry, electrocatalysis, bioelectrochemistry, corrosion, and the splitting of water. Bockris was born in Johannesburg, South Africa; received his B.S. and D. Sc. from the University of London. He was a founder of the International Society for Electrochemistry in 1949. He has had academic appointments at Imperial College in London, University of Pennsylvania, Flinders University in South Australia and since 1982 at Texas A&M University. Among his many honors Professor Bockris received the "Faraday Medal" from the Faraday Division of the Chemical Society, Chemical Lecture Award of the Swedish Academy, and the Medaille d'Honneur from the University of Louvain. Bockris has published 22 papers about cold fusion.

Dennis Letts

Dr. Dennis Cravens' information did not reach us in time for this month's issue, so we will publish his picture and biographical data next month.

Dennis Letts received his B.A. from Texas Tech University in 1972 where he studied physics under Dr. K. Das Gupta. His later

physics education has been continued through his own intense interest. He first heard of the Pons-Fleischmann discovery during a weekly ham-radio telephone conversation while managing a gold mining operation in Northwestern Bolivia. He made an early connection between Nuclear Magnetic Resonance and cold fusion that led to the development of three possible stimulation frequencies and later the discovery and proof of the **Letts' Effect.**


Dr. Alexander Samgin

Dr. Alexander Livovich Samgin was born in Sverdlovsk, Russia and obtained his physics diploma from the People's Friendship University in Moscow in 1983 and his Ph.D. in 1988. When the High-Temperature Electrochemistry Institute of the Russian Academy of Sciences organized a nuclei-electronic processes group, Samgin became its chief scientist. This Institute has carried out work on nonlinear transport of hydrogen isotopes in solids under non equilibrium conditions and studied nuclei-electronic interactions in proton conducting solid electrolytes. Among his honors is to be the scientific secretary of the Coordination Council for Anomalous Nuclei Phenomena in Condensed Matter of the Russian Academy of Sciences.


Dr. Alexy N. Baraboshkin

Academician Alexey N. Baraboshkin was born in Sverdlovsk, Russia and graduated from the Ural Polytechnical Institute in 1952. Since 1958 he has worked in the High-Temperature Electrochemistry Institute of the Russian Academy of Science and is currently its director. His research has included the electrocrystallization of metals and alloys from molten salts. He has published more than 300 papers and monographs. He is a member of the Russian Academy of Science and an associate Editor of "Melts".

Baraboshkin is the Head of the Coordination Council of the Russian Academy of Science's committee on Anomalous Nuclei Phenomenon in Condensed Matter. Samgin and Baraboshkin have authored or co-authored six important papers concerning their important development work in cold fusion that has led to the development of demonstrated fusion reactions in proton conductors. It is believed that the results of their work presented at the International Conference on Cold Fusion in Nagoya, Japan in 1992 led to the important confirming work by Dr. Mizuno et al.

Dr. Tadahiko Mizuno received his degrees from Hokkaido University in Applied Physics with the Ph.D. being awarded in 1976. During 1983-1985 Mizuno worked with Dr. John Bockris at the Texas A&M University. His special research studies have included hydrogen permeation into metals, study of hydrogen storage alloys, localized corrosion and since 1989 the study of cold fusion. [Pictures of the Japanese scientists will be published next month.]

Dr. Michio Enyo received his bachelor and master degrees from Hokkaido University and his Ph.D. from the University of Pennsylvania in 1960 where his supervisor was Dr. John O'M. Bockris. From 1983 to 1994 Enyo has been a professor at Hokkaido University in the Research Institute for Catalysis. He is now an Emeritus Professor of Hokkaido University and President of the Hakodate National College of Technology. In 1992 Enyo won the Takei Prize from the Japan Electrochemical Society.

Dr. Tadashi Akimoto received his degrees from Hokkaido University in Electrical Engineering with his Ph.D. in March, 1992. From 1966 to 1994 he has been a Research Associate in the Dept. of Nuclear Energy at Hokkaido University. His studies have included radiation measurements in nuclear reactors and since 1989, Cold Fusion.

Dr. Kazuhisa Azumi received his degrees from Hokkaido University with a Ph.D. in Applied Chemistry in 1990. During 1992-1994 he was a visiting scholar at Stanford University. His studies have included the semiconductive properties of various films, the use of tunneling spectroscopy, photo-acoustic emission and since 1989 the electrochemical study of palladium/hydrogen (deuterium) systems (cold fusion).

Fusion Facts is pleased to welcome all of these scientists to the rolls of those whom we have honored with the title of **FUSION SCIENTISTS OF THE YEAR.** It is the dedication, study, and the sharing of important experimental results that have helped advance the cause of cold fusion

throughout the world. These scientific efforts have been performed within a background of studied unbelief. Even in Japan a confirmed skeptic assured his colleagues that if cold fusion were true he would give up physics, shave his head, and become a monk.

Now after five years, these and many other scientists have added over 1500 papers to the new science of cold fusion, have demonstrated that nuclear reactions can take place in/on a metal lattice, have developed the technology from a single experiment to more than seven methods of obtaining and controlling nuclear reactions, have expanded the excess heat from a few percent to over 5,000 times input power and have laid the scientific groundwork for the ongoing engineering efforts that will commercialize many of the new inventions in the new science of cold fusion. We applaud the efforts and achievements of especially these scientists and of all dedicated scientists and engineers who are the cold fusion pioneers.

TRUISM

"Cynics Do Not Contribute,
Skeptics Do Not Create,
Doubters Do Not Achieve."

by LDS President Gordon B. Hinkley, quoting his father.

C. NEWS FROM THE U.S.

ERRATA

Last month in Dr. Bass's paper, "A Closed Form Expression for a Generic Madelung Series," on page 5 of the February issue , the Editor's comment contained an error. This is the **corrected** version:

EDITOR'S SUMMARY

If charged particles, such as deuterons, are distributed uniformly throughout a metal lattice, a combined electrostatic force is produced that can strongly affect the Coulomb force (see Dick, "Madelung Constant", in *McGraw-Hill Encyclopedia of Physics, 2nd Ed.,* page 723.) In this paper, Bass develops a one-dimensional model of a PdD lattice where the Pd/D ratio = 1. Bass then discusses the difficulty of computing the results of the slowly-converging Madelung constant. However, he presents a simplification and then carries out the calculations for 44 steps (**truncation of infinite series after 44 terms plus rigorous bound on remainder**). This calculation, as described, attains an accuracy of 17 decimal points in 44 steps. This expression is used by Bass in other papers to show that using the concept of resonance, the probability of fusion of deuterons in a "loaded" metal lattice can approach 1.

CALIFORNIA - FATAL EXPLOSION: OIL

Patrick M. Grant, Richard E. Whipple, Armando Alcaraz, Jeffrey S. Haas, and Brian D. Andresen (Lawrence Livermore Nat. Lab., Forensic Sci. Ctr., Livermore, CA), "Hydrocarbon Oil Found in the Interior of a 'Cold Fusion' Electrolysis Cell After Fatal Explosion," *Fusion Technology*, March 1994, vol 25, no 2, pp 207-208, 3 refs.

AUTHORS' ABSTRACT

Forensic analyses of debris from the fatal explosion of an electrochemical "cold fusion" cell revealed the presence of unanticipated organic residues that could be very important in the future design and performance of these experiments. A hydrocarbon oil, likely a lubricant from machining the metal components of the electrolysis cell, was detected on the interior cell walls. Reactions of oil with electrolytic oxygen have a potential for significant energy generation and could have contributed to the initiation and total energy inventory of the subject explosion.

CALIFORNIA - CALORIMETRIC MEASUREMENTS

Melvin H. Miles (Dept. of Navy, Naval Air Warfare Ctr., China Lake, CA), Benjamin F. Bush (SRI International, Menlo Park, CA), and David E. Stilwell (Conn. Ag. Expt. Station, New Haven, CT), "Calorimetric Principles and Problems in Measurements of Excess Power during Pd-D_2O Electrolysis," *J. Phys. Chem.*, vol 98, no 7, 1994, pp1948-1952, 13 refs, 5 figs, 2 tables.

AUTHORS' ABSTRACT

A major experimental problem in many isoperibolic calorimetric studies is the fact that the decrease in the electrolyte level due to electrolysis produces a significant decrease in the apparent calorimetric cell constant if the temperature is measured in the electrolyte of the electrochemical cell. Furthermore, heat transport pathways out of the top of the cell can produce large errors, especially at low power levels. There is no steady state in electrochemical calorimetry, so accurate results require the evaluation of all terms in the differential equation governing

the calorimeter. These factors have contributed to the controversy involving measurements of excess power during Pd-D_2O + LiOD electrolysis experiments. A critical analysis is presented for several key publications that have impacted this scientific topic.

AUTHORS' CONCLUSIONS

The calorimetric measurements involving Pd-D_2O electrolysis reported by several laboratories in 1989-1990 contain serious errors that undermine their reports of no excess power. These publications by Lewis, Williams, Albagli, and others, however, serve to illustrate important calorimetric principles, problems, and sources of error relating to attempts to measure excess power in the Pd-D_2O system. Electrochemical calorimetric measurements accurate to within ±1 mW require the application of all terms in the differential equation governing the calorimeter as well as careful control of external experimental conditions such as the ambient laboratory temperature and all liquid levels.

CALIFORNIA - CASIMIR EFFECT

Julian Schwinger (U.C.L.A., Los Angeles), "Casimir Light: the Source," *Proc. Natl. Acad. Sci. USA*, vol 90, March 1993, pp 2105-2106.

AUTHOR'S ABSTRACT

The release of Casimir energy in filling a dielectric hole is identified as the source of coherent sonoluminescence. Qualitative agreement with recently acquired data is found for the magnitude and shape of the spectrum.

CALIFORNIA - UNIFYING MODEL

Robert T. Bush (Phys. Dept., Cal. St. Polytech. Univ., Pomona, CA; ENECO, Inc., Salt Lake City, UT; Proteus Processes & Tech., Inc., Denver, CO), "A Unifying Model for Cold Fusion," manuscript from author, 21 pages, 37 refs, 9 figs, 3 tables.

AUTHOR'S ABSTRACT

A theoretical model has been devised that accounts for the heavy water excess heat effect (Fleischmann and Pons) and light excess heat effect (Mills and Kneizys, Noninski, Bush and Eagleton) as resulting from genuine cold fusion. Among the features of interest are the following: The model:

1. provides a unique and highly novel mechanism to sufficiently enhance tunneling through the Coulomb barrier to account for empirically-observed cold fusion rates.

2. accounts for the role of lithium in electrolytic experiments.

3. accounts for the depletion of Li^6 relative to Li^7 observed by Thompson et al. in post-run palladium cathodes and shows that it is associated with a difference in reduced masses rather than quantum symmetry.

4. predicts excess power density (W/cm^3) as a function of loading, S, and temperature, T, to be as follows for the D-D case for the heavy water-Pd system:
$P(S,T) = 26.07 \cdot \{[(2 - S)/(1-S)]^3 S\} \cdot (e^{\theta/T}-1)^{-1} \cdot 10^{[23.6-(24.774)S^{-1/12}]}$ in (W/cm^3)
(θ is the Debye temperature for the deuterided Pd.)

5. excess power expression P(S,T) gives a good fit to the data of McKubre et al. (SRI International/EPRI) and to the data of Kunimatsu et al. (IMRA).

6. can account for the excess power density of about $4kW/cm^3$ achieved by Fleischmann and Pons in their "boil-off experiments" and by Bush and Eagleton in their thin film experiments (cathode: 5 micron thin film of Pd on a silver substrate).

7. accounts for the Fleischmann and Pons "heat after death" phenomenon.

8. yields a positive temperature coefficient reaching a limiting value of about $1W/cm^3 \bullet C$ at 600C.

9. predicts tritium and neutron production: For tritium:
$N(S,T) = 6.789 \times 10^{12} \bullet \{S(1-S)[1-(1-S)S^2]^{-3}\} \bullet (e^{\theta/T}-1)^{-1} \bullet 10^{[23.6-(24.774)S^{-1/12}]}$
in (Tritons/cm^3/s)
In particular, it can account for the result of Bockris' curve for which tritium production mirrors excess heat production, but only at about one-thousandth of the level to account for the latter; and shows that tritium production is ordinarily not observed when excess heat is being observed.

10. shows that tritium production peaks at around S = 0.83 (loading fraction) for all temperatures.

11. suggests a relatively "radiationless" de-excitation mechanism.

AUTHOR'S CONCLUSIONS

The ECFM (Electron-Catalyzed Fusion Model) gives a good fit to the independent data of McKubre et al. and of Kunimatsu et al. on excess power versus loading fraction (S), and generally appears to explain much of cold fusion. The ECFM provides a unified approach to the heavy and light water excess heat effects as nuclear effects both arising from genuine cold fusion. The mechanism accelerating quantum tunneling through the Coulomb barrier is, however, very novel with the most questionable aspect being that of the validity of the Casimir reflection mechanism. Nevertheless, many of the model's predictions appear to depend more upon the statistical mechanical aspects of the fractional loading of the deuterons and the temperature, rather than upon the explicit tunneling mechanism. Thus, these latter aspects appear to be testable even in the absence of any consensus concerning the exact mechanism for enhancing tunneling.

Finally, it will be ironic if, after much conceptualization over employing the vacuum as an alternate energy source, an energy source is revealed that depends crucially upon the existence of regions of diminished energy density in the vacuum.

EDITOR'S COMMENTS

We applaud Dr. Bush's work on modeling cold fusion phenomena. Over the past few years it appears that Bush's models have been some of the more predictive models. As our knowledge increases as to the possible effects of zero-point energy, the role of this energy to modify conditions within a metal lattice deserves to be considered as Bush has done. More consideration to possible zero-point energy effects is recommended.

GEORGIA - VISIT TO HYDRO DYNAMICS
by Jed Rothwell

AUTHOR'S ABSTRACT

A Hydrosonic Pump, an excess energy device, was observed during three test runs. The first test was a control run to verify the calorimetry, which yielded a coefficient of production (C.O.P.) of 59% compared to apparent electric power, or 98% after adjusting for known electrical and mechanical inefficiencies. The second two tests both yielded massive amounts of excess heat at levels very easy to detect. Test 2 gave a C.O.P. of 110% compared to apparent electric power, or 168% adjusted; and Test 3 yielded 109% or 157% adjusted.

EDITOR'S COMMENTS

Jim Griggs of Hydro Dynamics presented information on his excess heat pump at the Maui ICCF-4 conference and asked for help to understand the phenomena. Two concepts have been suggested to explain the excess heat: 1. There is some type of nuclear reaction caused by the highly agitated (shock waves) water perhaps in combination with metal of the pump, or 2. The device somehow taps zero-point energy. A paper by Julian Schwinger was discovered that explains sonoluminescence (See ???). This concept illustrates how a bubble of vapor in a liquid medium can produce illumination due to the Casimir forces as the vapor reduces in size due to condensation of the vapor. It has been suggested that the Griggs pump could be providing numerous cavitation bubbles which would produce heat from the Casimir force as they are absorbed, thus tapping zero-point energy. Any suggestions readers?

INDIANA - CONDENSED MATTER EFFECTS
Courtesy of the author

Y.E. Kim, J.-H. Yoon (Dept. Phys., Purdue Univ., West Lafayette, IN) and M. Rabinowitz (EPRI, Palo Alto, California), "Condensed Matter Effects on Nuclear Fusion Rates in Laboratory and Astrophysical Environments," *Int'l. J. Theoret. Phys.*, July 1993, vol 32, no 7, pp 1197-1223, 33 refs, 7 figs.

AUTHORS' ABSTRACT

Previously overlooked condensed matter effects (CME) can significantly influence nuclear fusion rates in both laboratory and astrophysical environments. In dense plasmas, the ensemble of fusing particles has a significant exchange of kinetic and potential energies. Thus, there are diminished effective flux velocities resulting in a significant selective reduction of fusion rates. Our CME predictions are testable in laboratory experiments and have broad-ranging implications on the fusion rates for stellar media in general. By calculating reaction rates for $p(p,e^+\nu_e)$D and ^{7}Be$(p,\gamma)^8$B in the sun, we show that CME help to solve the solar neutrino problem.

AUTHORS' SUMMARY & CONCLUSIONS

We have investigated previously neglected condensed matter effects (CME) on nuclear fusion rates in laboratory and astrophysical environments. We have shown that CME is negligible for nuclear fusion rates at higher energies and/or in a low-density plasma, but is significant at lower energies (E<20keV) in condensed matter. These CME together with our previously proposed corrections to fusion cross sections (Kim et al., 1992a, 1993) can help solve the solar neutrino problem.

Our calculations with CME show substantially larger fusion rate reductions for ^{7}Be$(p,\gamma)^8$B than for $p(p,e^+\nu)$D. Our results are in good agreement with experiment, compared with conventional fusion rate estimates.

Our conclusion has profound implications in astrophysics, since previous stellar and solar (structure and evolution) model calculations have to be redone with revised nuclear fusion rates including CME. The new results are expected to be significantly different from previous results of the conventional stellar and solar model calculations. It will also change conventional estimates for the solar neutrino flux. There are also implications for magnetic and inertial confinement fusion, since decreased nuclear fusion rates due to CME will require higher values of kT than conventional estimates for achieving ignition and breakeven. Additional CME are related to reduced volume effects which have

analogs in liquids and inside nuclei and which may also be operative in unexpected ways.

CME predictions of nuclear fusion rates can more easily be tested in laboratory beam experiments using intense ion beams to large-size cluster beams (in which there are no light-ion contamination problems), which can increase the low-energy incident flux substantially as demonstrated in previous heavy-water molecular cluster beam experiments for D(D,*p*)T reaction with both ion beams and small cluster beams (in which there were no light-ion contaminant problems) that may be consistent with CME. However, additional D(D,*p*)T experiments are needed using high-flux beams and different deuterated target compositions in order to test CME on nuclear fusion rates quantitatively. Because of the profound and important implications of CME in stellar and solar fusion and in magnetic and inertial confinement fusion, it is very important to carry out such experimental tests of CME on nuclear fusion rates using high-flux ion beams on a variety of targets containing different nuclear species.

EDITOR'S COMMENTS

The authors have shown that there can be a significant difference in reaction rates as compared to the current accepted rates. It is also important to read about the modifications to the Coulomb barrier as presented in this paper. *Fusion Facts* would like to have readers' comments on the possible effect(s) that the zero-point energy may have on the Coulomb barrier within a metal lattice. Some comments have already been made by Schwinger, Robert Bass, and Robert Bush. This is an area that deserves thoughtful consideration. (See Haisch, Reuda, & Puthoff, *Phys Rev*, Feb 94.)

MASSACHUSETTS - AMPÈRE TENSION (2 Papers)

[The following two papers by the Graneau(s) are important contributions to our understanding of the forces that can occur within large currents. Similar conditions may occur within cold fusion reactors. Ed.]

Peter Graneau (MIT, Francis Bitter Nat. Magnet Lab., Cambridge, MA), "First Indication of Ampère Tension in Solid Electric Conductors," *Physics Letters*, vol 97A, no 6, 5 Sept. 1983, pp 253-255, 6 refs, 1 fig.

AUTHOR'S ABSTRACT

An empirical law for the mechanical force between two current-elements, originally deduced by Ampère from a series of classical experiments, asserts that an electric current flowing along a straight wire should place the wire in tension. The existence of longitudinal Ampère forces at solid-liquid conductor interfaces has been demonstrated by various investigators during the past 160 years. This letter contains the first report of pulse currents creating sufficient tension to cause fracture in hot copper and aluminum wires.

MASSACHUSETTS - EXPLOSIONS IN LIQUIDS

Peter Graneau (Ctr. Electromag. Res., N.E. Univ., Boston, MA) and P. Neal Graneau (Phys. Dept., King's College London, The Strand, London, UK), "Electrodynamic Explosions in Liquids," Appl. Phys Lett., vol 46, no 5, 1 March 1985, pp 468-470, 6 refs, 4 figs.

AUTHORS' ABSTRACT

This letter reports experimental results which show that electric arc currents through salt water produce explosions by electrodynamic forces rather than by the thermal expansion of gases generated in the arc column. The explosive phenomena can be explained with the aid of longitudinal Ampére forces but not with traditional Lorentz forces. This represents the first experimental evidence indicating that Ampére's force law may be valid for dense plasmas.

EDITOR'S COMMENTS

There has been considerable reliance on classical interpretation of the Lorentz equations that do not treat longitudinal forces in electrical current flow. This paper is important to show that the earlier Ampére relationships, which do allow for longitudinal forces in an electrical current, explain certain experimental observations. Cold fusion experimenters should pay careful attention to Graneau's work, especially where large current flows can be encountered either as steady-state or as transient currents.

NEW YORK - ZERO-POINT RADIATION

Timothy H. Boyer (Dept. Phys., City College of City Univ. of N.Y., N.Y.), "Random Electrodynamics: The Theory of Classical Electrodynamics with Classical Electromagnetic Zero-point Radiation," *Physical Rev. D*, vol 11, no 4, 15 Feb. 1975, pp 790-808, 36 refs.

AUTHOR'S ABSTRACT

The theory of classical electrodynamics with classical electromagnetic zero-point radiation is outlined here under the title random electrodynamics. The work represents a re-analysis of the bounds of validity of classical electron theory

which should sharpen the understanding of the connections and distinctions between classical and quantum theories. The new theory of random electrodynamics is a classical electron theory involving Newton's equations for particle motion due to the Lorentz force, and Maxwell's equations for the electromagnetic fields with point particles as sources.

However, the theory departs from the classical electron theory of Lorentz in that it adopts a new boundary condition on Maxwell's equations. It is assumed that the homogeneous boundary condition involves random classical electromagnetic radiation with a Lorentz-invariant spectrum, classical electromagnetic zero-point radiation. The scale of the spectrum of random radiation is set by Planck's constant $\hbar$. In the limit $\hbar \to 0$, the theory of random electrodynamics becomes Lorentz's theory of electrons. Thus, random electrodynamics stands between two well-known theories -- traditional classical electron theory with $\hbar \to 0$ on the one hand and quantum electrodynamics with its noncommuting operators on the other. The paper discusses the role of boundary conditions in classical electrodynamics, the motivation for choosing a new boundary condition involving classical zero-point radiation, and the assumed random character of the radiation. Also, the implications of the theory of random electrodynamics are summarized, including the detection of zero-point radiation, the calculation of van der Waals forces, and the change of ideas in statistical thermodynamics. In these cases the summary accounts refer to published calculations which yield results in agreement with experiment. The implications of random electrodynamics for atomic structure, atomic spectra, and particle-interference effects are discussed on an order-of-magnitude or heuristic level. Some detailed mathematical connections and some merely heuristic connections are noted between random electrodynamics and quantum theory.

AUTHOR'S CLOSING SUMMARY

The classical electron theory of Lorentz was regarded as a successful theory of atomic phenomena in the earliest years of the twentieth century. Subsequent developments in theoretical physics led to the introduction of quantum theory and the collapse of classical electron theory as a serious description of nature. It survives merely as a qualitative description of some phenomena such as optical dispersion and the Zeeman effect.

In this article we have pointed out that classical electron theory can be modified by the change of the homogeneous boundary condition on Maxwell's equations. If the homogeneous boundary condition is chosen to correspond to random classical electromagnetic radiation with a Lorentz-invariant spectrum, then we obtain a theory which in the past we have termed classical electrodynamics with a classical electromagnetic zero-point radiation and which in the future we propose to call random electrodynamics. The theory involves classical ideas of particle position, force, and measurement. It is an extension of Lorentz's theory. The new theory makes possible a classical understanding of a number of phenomena which are usually regarded as requiring quantum explanations. The predictions of random electrodynamics have close connections with those of quantum electrodynamics for free-field systems and harmonic-oscillator systems. However, a general understanding of the areas of agreement and disagreement for quantum and random electrodynamics awaits further mathematical analysis of the new theory.

[With the concept of zero-point energy entering into cold fusion literature, it was deemed appropriate for us to call our reader's attention to this 1975 article by Boyer. Ed.]

NEW YORK - SCANNING TUNNELING MICROSCOPY

G. Nunes, Jr., and M.R. Freeman (IBM Thomas J. Watson Research Ctr., Yorktown Heights, NY), "Picosecond Resolution in Scanning Tunneling Microscopy," *Science*, vol 262, 12 Nov. 1993, pp 1029-1032, 16 refs, 4 figs.

AUTHORS' ABSTRACT

A method has been developed for performing fast time-resolved experiments with a scanning tunneling microscope. The method uses the intrinsic nonlinearity in the microscope's current versus voltage characteristics to resolve optically generated transient signals on picosecond time scales. The ability to combine the spatial resolution of tunneling microscopy with the time resolution of ultrafast optics yields a powerful tool for the investigation of dynamic phenomena on the atomic scale.

EDITOR'S COMMENTS

Ingenious use of quantum dynamic effects between probe and sample allows these authors to measure molecular events in the picosecond region. It is suggested that similar experiments may be used to explore the nature of the metal lattice surfaces that appear responsible for catalyzing cold fusion reactions.

TEXAS - COLD FUSION SUCCESS FACTORS

Dennis Cravens (ENECO, Inc., scientific advisor), "Factors Affecting the Success Rate of Heat Generation in CF Cells,"

manuscript from author, 21 pages, 18 figs., from ICCF4 paper.

AUTHOR'S ABSTRACT

A series of low cost, low precision experiments were conducted to screen for factors which may affect the successful observation of heat from palladium/heavy water electrolytic cells. Critical factors include the selection of the palladium and the experimental protocol during the initial loading to the beta phase. It was found that bubble patterns, volume expansion, and surface appearance can be used as early predictors of ultimate success. Since large scale defects are detrimental, methods of avoiding cracking are discussed. These include alloying, preparing a uniform surface loading at a slow rate at low temperatures, delaying use of additives to the electrolyte, and uniform loading techniques. Methods of achieving the latter and larger heat releases were found to include: rapid increase in the current density above a threshold value and raising the temperature. A reflux calorimeter design is presented that allows for continuous studies at boiling temperatures of the electrolyte. Unexpected and unexplained occurrences of heat bursts by magnetic fields and radio frequency fields are reported.

AUTHOR'S CONCLUSIONS

Experimental protocol is especially important for successful observation of the anomalous heat. Due to the subtle and complex interactions going on, special care must be taken during the initial loading of the metal lattice. Unfortunately, the multi-disciplinary skills required for proper exercise of the effect is not always available to the new or specialized experimenter. It is hoped that this crude empirical investigation may help others who do not have the time or range of background to fully characterize the experimental parameters and that they may avoid undue experimentation.

For the greatest likelihood of observation of anomalous heat effect:
1. Select Pd or alloys free from visual cracks, voids, etc.
2. Prepare surfaces by finely polishing or other consistent methods.
3. Select samples for extensive studies only from those most likely to give the effect.
4. Use bubble pattern observations to narrow selections.
5. Load uniformly.
6. Wait until initially loaded to use any additives.
7. Quickly raise current, but only after the initial loading.
8. Work at elevated temperatures for greater efficiencies.

Flow calorimetry used on reflux condensers is especially recommended for those seeking extended studies on boiling systems. In brief: load cool and slow, then run hot and fast.

WASHINGTON D.C. - ATTENTION ON INERTIA

Robert Matthews (writer for *The Sunday Telegraph* in London), "Inertia: Does Empty Space Put Up the Resistance?" *Science*, vol 263, 4 Feb. 1994, pp 612-613.

EDITOR'S SUMMARY

Since Galileo first named the concept of inertia in the 17th century, some scientists have wondered if inertia may be an acquired trait of matter, and not intrinsic. Other scientists were satisfied to build on the concept that inertia "was," simply an attribute of matter. Mach, Feynman and Einstein have tried to explain inertia with respect to the other forces in the universe, or to the arrangement of the matter in the universe. None of these explanations has been completely successful. Now Haisch, Rueda and Puthoff are mathematically hitching inertia to space energy, and to a older concept used by Andrei Sakharov to explain gravity. In this article in *Science* magazine, a good look is taken at the background and underpinnings of the trio's new paper, as well as the way it is being received.

The authors set aside conventional quantum theory, using instead an approach called stochastic electrodynamics (SED), which accepts the concept of space energy as a basic fact, in an approach based on particle physics and electromagnetism. Using SED, the trio sets forth a theory that inertia results from a Lorentz force field.

Peer reaction to this theory is predictably mixed, but the general feeling is good that inertia is again drawing theoretical curiousity. Haisch and his colleagues agree that more work is needed in refining, and experiments need to be done to further back up the theory. Other researchers will be attracted by the implications of the theory: that by altering the properties of vacuum energy, inertia may be controllable. This is an attractive possibility, that research is not likely to stagnate in the near future, and forseeably large strides could be taken in understanding and manipulating both inertia and gravity.

[Submitted by Dan Davies]

D. NEWS FROM ABROAD

BRAZIL - HYDROGEN NEUTRON EMISSION?
Chemical Abstracts, 7 Feb. 1994

C. Borghi, C. Giori, A. Dall'olio (Cent. Energ. Nucl., Recife, Brazil), "Experimental Evidence on the Emission of Neutrons from Cold Hydrogen Plasma," *Yad. Fiz.*, 1993, vol 56, no 7, pp 147-156.

AUTHORS' ABSTRACT

The authors have tried to see experimentally whether there is some interaction between electrical charges, other than the Coulombic one, and whether it may produce some kind of bound states between a proton and an electron, electrically neutral but different from the hydrogen atom state. This requires that the stronger, and quicker, Coulombic interaction may be avoided to prevail, by means of a high frequency ionizing electromagnetic field. This field succeeds in maintaining a cold plasma, that is a considerable number of protons mixed and colliding with an equal number of free electrons, for a time much larger than 10^{-8}s. This limit is suggested by the known average recombination time of the ionized hydrogen atom.

ERRATA

In the January issue, no 7., on page 21, in the paper: Yi-Fang Chang, Chuan-Zan Yu (Dept. Phys., Yunnan Univ., Kunming), "Interchange of Thermonuclear and Cold Fusion," the equation 3, in the second column, should have read:

$$\exp\{-\frac{2\pi\sqrt{2m}}{h}[\frac{ke^2}{\sqrt{E}}\,arctg(\frac{ke^2}{RE}-1)^{1/2}-(\frac{ke^2}{R}-E)^{1/2}R]\}$$

We apologize for this error.

CHINA - SOLVING LATTICE PROBLEMS

Nan-xian Chen (CCAST World Laboratory, Beijing), Zhao-dou Chen, Ya-nen Shen (Dept. Math., Beijing Univ. Sci. & Tech., Beijing), Shou-jun Liu and Ming Li (Inst. Appl. Phys, Beijing Univ. Sci. & Tech., Beijing), "3D Inverse Lattice Problems and Möbius Inversion," *Phys. Let. A*, 1994, vol 184, no 4-5, pp 347-351, 20 refs, 4 tables.

AUTHORS' ABSTRACT

A general and exact solution of inverse lattice problems in physics for simple cubic (sc), fcc (face-centered cubic) and binary structures are presented based on a three-dimensional Möbius inversion formula, which is unexpectedly concise and easy. More important, it shows the potential application of the theory of numbers to the physical sciences.

AUTHORS' CONCLUSIONS

The inverse 3D lattice problems can be solved successfully based on a very simple Möbius inversion theorem on partially ordered sets, without the unique factorization as in the set of natural numbers, the ring of Gaussian integers and the ring of Einsenstein's integers. The series of our works on Möbius inversion has answered the challenge for extending the one-dimensional Möbius formula to higher dimensions. Again, it shows the potential application of number theory to the physical sciences. It has to be noticed that for a practical calculation for inverting the pair potential we need to know the values of $\mu(m)$ with m up to 64 for sc, 512 for fcc and the Cu_3Au structure, 768 for the CsCl structure. This can be obtained immediately by a small program computed in a PC.

CHINA - POSSIBLE NEW FUSION PROCESS

JieFu Yang, DeXiu Chen, GuangGhui Zhou, QiangSheng Wu, JianPing Huang, LiJun Tang, XiaoMei Cheng, GongZhu Xie, and LiMing Gu (Hunan Normal Univ., Dept. Phys., Changsha, Hunan Prov.), "Abnormal Nuclear Phenomena and Possible Nuclear Process," *Fusion Technology*, March 1994, vol 25, no 2, pp 203-206, 8 refs, 3 figs.

AUTHORS' ABSTRACT

A careful study of "abnormal" nuclear phenomena in a cold fusion experiment indicates that cold fusion is a new problem in ultra low energy, and we cannot use the traditional idea of deuteron-deuteron fusion to understand and appraise cold fusion. The contradiction between the new phenomena and traditional theory is analyzed, and a possible new nuclear process is suggested.

AUTHORS' DISCUSSION

A POSSIBLE NEW NUCLEAR PROCESS. 1. There is a weak interaction in the nuclear force. It was thought that nuclear force is only a strongly interacting force, but a series of experimental results reveal that there is a weak interaction in nuclear force. A deuteron is a two-nucleon system. This system also contains weak interaction. A deuteron has a weak force field to capture an electron if the deuteron is excited.

2. It may exist in the excited state ${}^{2}_{1}H^{*}$ in the ultralow energy range. Until now, almost all conclusions about deuterons have been based on the following: (a) non-ultralow energy range, (b) the hypothesis that nuclear force is a central force, and (c) nuclear force is a pure, strong interactive force. Some conclusions are, therefore, one-sided.

A POSSIBLE NEW FUSION. This [new] fusion does not have the potential coulomb obstacle. The fusion of dineutron and nucleus can occur at any temperature, and it can surmount many difficulties that are very hard for traditional nuclear fusion theory to overcome.

CHINA - ANOMALOUS NUCLEAR EFFECTS

Chemical Abstracts, 29 Nov. 1993

Shang-Xian Jin, Fuxiang Zhang, Dee-Heng Yao, Qi-Bang Wang, Bai-Lu Wu, Yushui Feng, Mei Chen (Grad. Sch., Univ. Sci. Tech. China, Beijing, Peo. Rep. China), "Anomalous Nuclear Effects in Palladium-deuterium System During the Gas Discharge Process," *Gaojishu Tongxun*, vol. 1, no. 5, 1991, pp 25-27.

AUTHORS' ABSTRACT

A burst of nuclear products far larger than background was reproducibly detected for the first time by using CR-39 solid-state nuclear track detector during the experiments of Pd-D systems stimulated by a high voltage discharge. No anomalous effects were found in the control experiments of Pd-H and Cu-D systems under the same experimental conditions. This indicates that anomalous nuclear effects were definitely produced in the Pd-D system under certain conditions.

ENGLAND - THERMOELECTRIC HEAT PUMPING

Chemical Abstracts, vol. 120, no. 4, 24 Jan. 1994.

R.G. Keesing, A.J. Gadd (Dept. Phys., Univ. York, UK), "Thermoelectric Heat Pumping and the `Cold Fusion' Effect," *J. Phys., Condens. Matter*, vol. 5, no. 43, 1993, pp L537-L540.

AUTHORS' ABSTRACT

This letter contains a brief description of an experiment to examine the importance of the process of thermoelectric heat pumping in the investigations of the cold fusion effect. The magnitude of the Peltier effect is measured for H- and D-loaded Pt/Pd junctions. The process of electromigration of impurities in the platinum and palladium is discussed together with its role in the formation of semiconducting junctions in the system.

GERMANY - HOT NATURE OF COLD FUSION?

Rainer W. Kühne (Braunschweig, Germany), "The Possible Hot Nature of Cold Fusion," *Fusion Technology*, vol 25, no 2, March 1994, pp 198-292, 84 refs.

AUTHOR'S ABSTRACT

Based on the model of micro hot fusion, the neutron emission rate of cold fusion is determined without the need for fine-tuning parameters. Moreover, the experimental conditions that are essential to reproduce fusion are determined.

EDITOR'S COMMENTS

The author lists seven experimental conditions that are essential to produce MHF (micro hot fusion). These conditions should be reviewed and further work done to test this theory.

INDIA - CONDENSATION OF DEUTERONS

S.N. Vaidya (Chem. Div., BARC, Bombay, India), "On Bose-Einstein Condensation of Deuterons in PdD," ICCF4.

AUTHOR'S ABSTRACT

Deuterons (deuterium ions) are Bose particles and should exhibit Bose condensation at temperature

$$T_B = (2\pi h^2/m_D k_B)\,(n_D/2.612)^{2/3} \qquad (1)$$

For deuteron density $n_D = 7.10^{22}$ cm^{-3}, eq. (1) gives T_B = 6.6K. The screened coulomb repulsion between the deuterons $(e^2/r)\exp(kr)$ approaches zero as the screening constant $k \to \infty$ at $T \leq T_B$. Hence in a Bose-Einstein condensate of mobile deuterons, large increase in d-d reaction rate is expected at temperatures below T_B. We discuss here whether such B-E condensation can be realized in the system PdD.

The requirements for such a system are the following: (i) deuterium should exist as D^+ ion, (ii) the number density should be large ($n_D > 10^{23}$ cm^{-3}), and the deuterons should be mobile at temperatures below T_B. It follows that liquid deuterium, which consists of deuterium molecules, will not be suitable for the present purposes. Vast amount of experimental data on PdD_x suggests that, to some extent, the deuterons meet the first two requirements in this material. PdH_x and PdD_x (with $x \sim 0.6$ to 0.7) show inverse isotope effect, i.e., the superconducting transition temperature of PdH_x (8K) is lower than that of PdD_x(11K). In PdD_x the coulomb repulsions between the electrons are also screened by the deuterons in the system, the screening constant for deuterons

$$k_D = (4\pi e^2 n_D/k_T)^{1/2}(Zg'_{3/2}(z)/g_{3/2}(z))^{1/2} \qquad (2)$$

increases at low temperatures and diverges as $(T-T_B)^{1/2}$ as $T \to T_B$. However, the screening produced by H^+ ions (fermions) in PdH_x is almost negligible. These contributions to screening are in addition to those due to the conduction electrons in these compounds. We suggest that the inverse isotope effect points to the significant role of deuterons in

PdD_x in screening the coulomb interactions between electrons at low temperatures.

We suggest an experiment for the observation of B-E condensation and its effect on d-d reaction rate in PdD_x. We take a single crystal of Pd in form of a cylinder and coat its external surface with gold as has been done by Yamaguchi and Nishioka. The cylinder is then charged with deuterium to high D/Pd ratio by electrolysis or by gas loading. The flat ends of the cylindrical crystal, which are normal to a crystallographic axis, are capped by similar transducers for generating longitudinal ultrasonic wave of high frequency ($> 10^9$ Hz). The assembly is placed in a helium cryostat at temperature below T_B. Both transducers are carefully aligned to direct ultrasonic waves along the cylinder axis and are operated at the same frequency. The gold coating is intended to ensure preferential migration of deuterons along the cylinder axis.

At low temperatures, all deuterons will occupy the lowest levels in the potential wells in the face-centered-cubic lattice and will have very low mobility. At these temperatures, the deuteron transport is mainly due to tunnelling. The experiment now consists in driving deuterons to the center of the cylindrical bar by inducing tunnelling by means of longitudinal ultrasonics waves from the two transducers which are operated at same amplitude and frequency. The phase difference between the transducers, and the frequency and the amplitude of the ultrasonic waves is varied to achieve optimum tunnelling. If mobile deuterons form the Bose-Einstein condensate under these conditions, then the d-d reaction rate will increase by several orders of magnitude, and the heat and neutrons will appear in bursts. The d-d reaction will stop when the heat produced increases the specimen temperature above T_B and will restart on its cooling. This experiment may help in evaluating the role of deuteron screening in the Fleischmann and Pons experiments.

INDIA - COHERENT NUCLEAR REACTIONS

S.N. Vaidya (Chem. Div., BARC, Bombay, India), "Coherent Nuclear Reactions in Crystalline Solids," ICCF4.

AUTHOR'S ABSTRACT

In-phase interactions between photons (or propagating quantum particles) and active centers in a medium can lead to coherence effects as a result of which total scattering amplitude (or interaction matrix) increases as $N^{1/2}$, where N is the number of active centres in the medium. Dicke supperradiance and laser phenomenon, are the established examples of such coherence phenomena. The state-of-art neutron interferometry experiments have not only reaffirmed the wave nature of neutrons but also established persistence of coherence over long distances. The present paper considers coherent (n,r) reactions between propagating monoenergetic neutrons and the nuclei in a crystalline solid. The coherent interactions between itinerant deuterons (deuterium ions) and lattice deuterons in crystalline PdD are also considered.

Consider nuclear interactions between neutrons having wavelength $\lambda = (h/2\sqrt{ME})$ propagating along the [100] direction in a crystal. It is shown in Ref. 1 that the rate of (n,r) reactions is

$$R = (A/V)\,|\Psi(0)|^2 .\exp - \langle k^2 u_{ik}^2 \rangle \cdot S^2, \qquad (1)$$

$$S^2 = \Sigma\Sigma \exp[ik(R_{io}-R_{jo})];\ k = 2\pi/\lambda \qquad (2)$$

R depends on the rate constant, A, nuclear overlap wavefunction U(O), Debye-Waller term and the structure term S^2. Since

$S^2 = N^2$ for $\lambda = (a_{lOO}/2m)$ (coh. interaction) (3)

and $S^2 = N$ for $\lambda = (a_{lOO}/2m)$ (incoh. interaction) (4)

where m is an integer, it follows that

$$R_{coh} = N.\ R_{incoh}. \qquad (5)$$

The number of participating nuclei N depends on the coherence of incident beam and the mosaic size of the crystal. Hence N can range from 10^3 to 10^9. Coherent interactions envisaged here are in some respects analogous to the interactions between conduction electrons and lattice ions in metals at the boundary of the Brillouin zone.

Coherent (n,r) interactions can result in isotope production at enhanced rates as well as intense burst of gamma rays. Substances suitable for such application are ^{197}Au, ^{103}Rh, ^{181}Ta, ^{59}Co, ^{115}In and others which have nearly 100% natural abundance which belong to a crystal structure of high symmetry and have a large (n,r) crosssection. Coherence mechanism can be used for creation of large population of excited nuclei $^{n+1}$A for greater action. Its large scale application will require the technology for production of high flux, tunable, monoenergic thermal neutron beams from nuclear reactor or other sources. Some possible experiments for the investigation of coherent (n,r) reactions are discussed in Ref. l.

We suggested that enhanced fusion rates in PdD system can be due to accidental coherent interactions between itinerant deuterons and lattice deuterons in polycrystal PdD. On account of large coulomb barrier, the application of coherence mechanism is more subtle. The coulomb interactions are screened by the conduction electrons in PdD, but the extent of additional screening produced by the mobile deuterons or by phonons remains unclear. The reaction rate

is enhanced when the deuterons not only fulfill coherence criterion such as eq. (3), but also the tunnelling criterion for propagation through lattice

$$(a_{100} - 2r_t) = (2m+l)\,\lambda/4. \qquad (6)$$

Since both criteria cannot be met simultaneously in systems close to equilibrium, the enhancement in the fusion rate due to coherence is limited by the deuteron propagation length in the crystal. Theoretical studies indicate that external perturbations can enhance tunnelling through a periodic array of wells. Tunnelling can occur under non-equilibrium conditions prevailing in the PdD electrolysis and gas loading experiments, even if the equilibrium criterion, eq. (5), is not fulfilled. In the Fleischmann and Pons' experiment, increased tunnelling at high current densities, together with coherence in d-d interactions, probably leads to the increase in the reaction rate.

Ref. 1. S.N. Vaidya, *Fusion Technology*, Vol 20, pg 481, (1991); Vol 24, pg 122, (1993); BARC Report I/017(1993).

ITALY - DEUTERIUM IMPROVED SUPERCONDUCTOR

F. Celani, M. Boutet, D. di Gioacchino, A. Spallone, P. Tripodi (INFN Lab. Nazionale di Frascati, Italy), S. Pace and M. Polichetti (Dept. Fisica, Univ. Salerno, Italy), "Enhancement of Critical Temperature up to 100 K of YBCO Ozone Annealed Pellets by Deuterium Absorption," *Physics Letters A*, vol. 183, no. 2-3, 6 Dec. 1993, pp 238-242, 12 refs, 5 figs.

AUTHORS' ABSTRACT

In this paper we report preliminary results about transition temperatures of $YBa_2\,Cu_3O_7$ pellets loaded with high pressure deuterium gas. After the gas loading non-superconducting phases were not detected by X-ray diffraction. The complex magnetic a.c. susceptibility has been measured as a function of the temperature. One D-YBCO pellet exhibited a magnetic critical temperature (T_c) as high as 100 K and the absence of significant weakening of the superconducting grain coupling. Another sample, with a T_c of 95.8 K in free air, showed a T_c onset as high as 102 K under 35 bar of deuterium gas pressure.

AUTHORS' CONCLUSION

In conclusion we obtained D-YBCO ozone stabilized pellets of good superconducting properties. The maximum value of the magnetic T_c was 100 K. We loaded YBCO pellets even with hydrogen: we obtained a maximum T_c of 97.5 K. We remark that all these data are preliminary and a systematic work, on the dependence of T_c on the loading conditions and the comparison between deuterium and hydrogen loading, will be published in the near future.

ITALY - NICKEL-HYDROGEN ACHIEVEMENT

Courtesy of Dr. Bruno Stella, Rome

FAX received February 23, 1994

In a seminar at Siena University, three physicists (F. Piantelli from Siena, S. Focardi from Bologna, and R. Habel from Cagliari) have announced an astonishing result from their work on cold fusion.

A nickel bar (9 cm. long, 1 cm^2 in cross-section) heated to about 350 °C was filled with hydrogen [we assume **placed** in a hydrogen gas atmosphere because hydrogen is not normally considered to enter deeply into a nickel lattice]. After some short electromagnetic stimulation (patent pending), the temperature of the bar has definitely overcome [exceeded] the temperature from the heater, giving an **excess** of some 40 Watts (compared to about 120 input Watts.) The results seem to be well reproducible.

The authors consider as an interpretation the proton-deuteron fusion reaction; accounting for [taking into account] isotopic ratios and for reactions energy, the heat excess could be roughly compatible with the energy release in vacuum [from similar reactions.] The first attempt with deuterium has given a similar result. The paper [describing the experiments] has been accepted by *Nuovo Cimento* and will be published soon.

[Comments in square brackets are mine. We commend this group for adding another new cold fusion process for the creation and control of nuclear reactions. We look forward to the complete paper. Ed.]

JAPAN - DOUBLE DEUTERATED CATHODE

Chemical Abstracts, 29 Nov. 1993

Yoshiaki Arata, Yue Chang Zhang (Res. Inst. Sci. Tech., Kinki Univ., Higashiosaka, Japan), "Excess Heat in a Double Structure Deuterated Cathode," *Purazuma, Kaku Yugo Gakkaishi*, vol. 69, no. 8, 1993, pp 963-967.

AUTHORS' ABSTRACT

A new type of cathode, the double structure cathode (which contained Pd inside a Pd rod) was developed. By using the new cathode, remarkable excess heat greater than the input

energy was observed consistently after a certain incubation period.

JAPAN - COLD FUSION REVIEW
Chemical Abstracts, Nov. 29, 1993.

Yuh Fukai (Fac. Sci. Eng., Chuo Univ., Tokyo), "Present Status on Cold Fusion," *Nippon Butsuri Gakkaishi* , vol. 48, no. 5, 1993, 29 refs, pp 354-360.

AUTHOR'S ABSTRACT

A review is given on cold fusion, describing the experimental facts about excess heat and nuclear reaction products during reactions of d+d or d-p, and then discussing the possibility of cold fusion from various points of view.

JAPAN - PRESENT STATUS OF CF
Chemical Abstracts, 20 Nov. 1993.

Masafumi Kobayashi (Imura Japan KK., Japan), "Present Status of `Cold Fusion'," *Kagaku Kogaku*, vol. 57, no. 10, 1993, pp 715-717.

AUTHOR'S ABSTRACT

A review with 11 refs. is presented on the present status of cold fusion research. Discussed are excess heat produced during cold fusion, reaction products of nuclear reaction, and cold fusion materials.

JAPAN - MECHANISMS OF COLD FUSION

Takaaki Matsumoto (Dept. Nucl. Eng., Hokkaido Univ., Sapporo), "Mechanisms of Cold Fusion: Comprehensive Explanations by the Nattoh Model," submitted to *Fusion Technology*, 35 manuscript pages, 31 refs, 1 fig.

AUTHOR'S ABSTRACT

The phenomena of cold fusion seems to be very complicated; inconsistent data between the production rates of heat, neutrons, tritium and helium. Our thoughts need to drastically change in order to appropriately understand the mechanisms of cold fusion. Here, a review is described for the Nattoh model, that has been developed extensively to provide comprehensive explanations for the mechanisms of cold fusion. Important experimental findings that support the model are described. Furthermore several subjects including safety problems are also discussed.

AUTHOR'S SUMMARY

In the preceeding sections, the mechanisms of cold fusion have been well explained by the Nattoh model. Although important things such as the productions of ^{4}H and non-baryon particles remain unproven, we have comprehensively but qualitatively understood the extraordinary phenomena associated with cold fusion. It is characteristic that cold fusion burns [sic] in various manners depending on the conditions, because the hydrogen-cluster evolves many hydrogens. The branching ratios of the hydrogen-catalyzed fusion reactions are critical factors that are determined by the conditions of the electrolysis, the microscopic structure of the metals and so on. They will be studied quantitatively. Furthermore, the study of cold fusion will be progressed towards the high voltage and current to achieve the higher efficiency of transforming mass to energy. There the gravity decays instead of the fusion reactions predominate so that new science such as black and white holes will be fully developed.

JAPAN - CURRENT STATUS OF CF
Chemical Abstracts, 29 Nov. 1993.

Reiko Notoya (Hokkaido Univ. Sapporo, Japan), "Current Status of Cold Fusion," *Genshiryoku Kogyo*, vol. 39, no. 9, 1993, pp 34-36.

AUTHOR'S ABSTRACT

A review with 8 refs. is presented on the research of hydrogen electrode reaction of cold fusion in light water using K soln. Emphasis is on the discussion of heavy water-Pd and K-light water-Ni systems.

JAPAN - HELIUM-4 PRODUCTION
Chemical Abstracts, 29 Nov. 1993

Eiichi Yamaguchi, Takashi Nishioka (NTT Basic Res. Lab., Japan), "Helium-4 Production from Deuterated Palladium," *Purazuma Kaku Yugo Gakkaishi*, vol. 69, no. 7, 1993, pp 743-751.

AUTHORS' ABSTRACT

Elementary processes of nuclear fusion in solids were studied by providing the sample in a vacuum system. The key factor of this study is heterostructures fabricated by depositing thin film oxides and Au on one and the other surface of deuteron-loaded Pd (Pd-D) plate. Using this method, the authors detected ^{4}He production by a real-time observation using high-resolution quadruple mass (Q-mass) spectroscopy. The

peak attributed to ^{4}He mass (4.0026 amu) appeared chaotically when the sample temperature increased rapidly. The system of H-loaded (Pd-H) heterostructure, on the other hand, produced no peak at 4.0026 amu. The authors also confirmed that the peak at 4.0026 amu in the Q-mass spectra is not due to the existence of contaminated ^{4}H in the air or in the D_2 cylinder used. A new class of nuclear fusion apparently occurs in condensed matter.

NETHERLANDS - REDUCED RADIOACTIVITY

Otto Reifenschweiler (Philips Res. Lab., Eindhoven, The Netherlands), "Reduced Radioactivity of Tritium in Small Titanium Particles," *Phys. Letters A*, vol. 184, 1994, 3 figs, 14 refs, pp 149-153.

AUTHOR'S ABSTRACT

By heating a $TiT_{0.0035}$ preparation consisting of extremely small monocrystalline particles ($\phi \approx 15$ nm) a decrease of the radioactivity by 40% was observed. In further experiments the concentration of tritium in such preparations was varied (TiT_x experiments) showing that the radioactivity of the tritium increased less than proportionally to its concentration. Careful analysis of the experiments seems to rule out the possibility of trivial errors. A provisional hypothetical explanation is formulated. Our experiments may point to a connection with cold DD-fusion.

AUTHOR'S CONCLUSION

The author - though well aware that the experimental evidence is rather limited and that a theoretical foundation is lacking - feels strongly attracted by this idea of nuclear pairing with reduced radioactivity and he believes that it might have other applications. The author hopes to come back to these questions in later publications.

It should be obvious that our results might also have a bearing on cold fusion. As a first step I should like to propose experiments with deuterium absorbed in preparations of finely divided hydrogen absorbers (Ti, Pd or others) as used in our tritium experiments and at temperatures between 100°C and the dissociation temperature.

NORWAY - RHODIUM AS ELECTRODE

Chemical Abstracts, 7 Feb. 1994

M.M. Jaksic, B. Johansen, R. Tunold (Norw. Inst. Technol., Univ. Trondheim), "Electrochemical Behavior of Rhodium in Alkaline and Acidic Solutions of Heavy and Regular Water," *Int. J. Hydrogen Energy*, 1994, vol 19, no 1, pp 35-51.

AUTHORS' ABSTRACT

The behavior of rhodium as an electrode for hydrogen (protium and deuterium) and oxygen evolution in both alkaline and acidic, heavy and regular water solutions was studied primarily by cyclic voltammetry. The main features, such as adsorption and underpotential deposition of hydrogen (both protium and deuterium) as well as the specific charge capacities first for chemisorbed oxygen and, subsequently, further for monolayer (α-phase) with subsequent pronounced multilayer (ß-phase) oxide growth with successive increase in oxygen content, preceding hydrogen and oxygen evolution, respectively, with characteristic desorption peaks, were more or less marked in both electrolytes. Some distinctly different behaviors, however, were observed revealing that heavy and regular water behave almost as different solvent ambients.

In contrast to some other noble metals (Pt, Pd, Au, Re) and in common with Ir, the hydrogen and oxygen evolving limits for Rh keep their potential values unaltered in alkaline media of both heavy and regular water. Hydrogen absorption, besides adsorption, of both protium and deuterium was clearly marked by the continuously growing charge capacity of the diffusional desorption peak, whose extent depends on the evolving rate and contact time of hydrogen evolution and distinctly exceeds both 1-to-one hydrogen to rhodium (H/Rh or D/Rh) atom coverage on the exposed electrode surface, and relative to the corresponding reversible adsorption wave charge area for its underpotential deposition. The hydrogen oxidation peak, immediately following its desorption (in particular from acidic heavy water) also was clearly marked on the voltammograms.

A distinct merging and melding together of 2 initial deuterium reversible desorption peaks into the diffusional desorption peak in acidic heavy water also was discernibly scanned. Oxide formation usually starts at more anodic potentials together with deuterium oxidation and specifically in acidic media, proceeds vigorously with higher and continuously growing rates and merging together with evolving molecular oxygen, while the prevailing oxygen evolution thereby becomes shifted to more positive potential values. These features reveal that due to its distinctly steric factor, heavy water, in particular in acidic media, behaves as a stronger oxidizing agent than regular water. Some discernible properties of the interplay between hydrogen and oxygen on the rhodium electrode in both electrolytes along the potential axis were clearly marked and pointed out. The Rowland or EDTA effect on potentiodynamic and electrocatalytic features of rhodium also was scanned and displayed.

ROMANIA - COLD FUSION OF ACTINIDES
Chemical Abstracts, 7 Feb. 1994

A. Florescu, A. Sandulescu, W. Greiner (Inst. At. Phys., Bucharest), "Isotopic Yields for the Cold Fission of Actinides as a Function of the Fragment Excitation Energies," *J. Phys. G: Nucl. Part. Phys.*, 1993, vol 19, no 11, pp 1947-1952.

AUTHORS' ABSTRACT

The authors estimate the isotopic yields for the production of pairs of fragments with the help of the dynamic model for cold fission. This model predicts an enhanced production of odd-odd nuclei for the lowest fragment excitation energies. A single set of realistic fragment ground-state deformations and liquid-drop mass and stiffness parameters are used for the calculations. Isotopic yields for the thermal neutron-induced cold fission of ^{233}U and ^{235}U are estimated.

RUSSIA - SPACE IS NOT ISOTROPIC

Yu.A. Barov, E.Yu. Klimenko & S.I. Novikov, "Experimental Observation of Space Magnetic Anisotropy," *Physics Letters A*, Vol 162, 1992, pp 32-34, 3 figs, 8 refs.

AUTHORS' ABSTRACT

It has been experimentally discovered that there exist certain regions in strong magnetic fields of solenoids where the substance is subjected to a force which is different from the magnetic one. The angular arrangement of this region in the solenoid aperture depends on the time of day and the season. This [observation] indicates space magnetic anisotropy.

EDITOR'S COMMENTS

For those who are assured that space is non-energetic, it will be a surprise to find that such space exhibits directional effects. For those who are designing and testing devices that **convert space energy to useful energy,** this evidence for anisotropy will be understood. Another experiment that is contrary to science's general denial of an energetic space is the "direct and inverse Rowland experiments." The theory of relativity predicts that a stationary compass needle would exhibit a torque in the presence of a moving charge and that the same compass needle would experience a torque if moved through a static electric field. Such is not the case as is shown by the inverse Rowland experiments. (See Stefan Marinov, Divine Electromagnetism, East-West International Publishers, Graz, Austria, c1993.) Those who are working with space energy are not surprised. There are other evidences that should lead today's scientific investigator to become more aware of the increasing reality of space energy (also known as zero-point energy and free energy.) It is proposed that this same energetic space energy is present within metal lattices, such as used in cold fusion, and may be, at least in part, reponsible for the seeming demise of the Coulomb barrier.

RUSSIA - THERMAL SYSTEMS

V.A. Romodanov, V.I. Savin, Ya B. Skuratnik, S. G. Korneev, A.E. Glagolev (SRI of SPA LUTCH, Podolsk, Moscow), "Ecological Aspects of Thermal Systems Using Hydrogen Isotopes," presented at ICCF4.

AUTHORS' ABSTRACT

The so-called "cold fusion" problem still has many vaguenesses and a great number of works have negative results. However, many groups of scientists have been developing power devices using nuclear reactions in condensed media (NRCM) for their application for everyday life necessities and in industry.

One of the most promising types of devices using NRCM are plasma devices (plasma generators of different types, magnetrons, plasma focus devices, glow discharge devices, etc.) because one can relatively easily change the operating plasma characteristics within a wide range. Having used a powerful glow discharge during such investigation for the first time, we reached the tritium generation rate about 1,000,000,000 atom/s when the neutron-to-tritium yield ratio was from 0.000,000,1 to 0.000,000,001 and the heat yield exceeded the applied power by up to 100%. Having used the obtained data extrapolation, we developed a conceptual design of the air heater having an output thermal power of 1-10 kW and [which can] supply living space heating. The main advantage of the developed air heater is the fact that the generated heat 2-10 times exceeds the electric power consumption. Such devices filled with deuterium every 1-3 years will be necessary in regions with sudden temperature differences and at the shortage of traditional power carriers and electric power.

We have been developing a power device with a modified Steerling engine (P~10 kW), which can be used in vehicles. Some nuclear safety and ecological problems of the proposed nuclear devices have been considered and discussed.

SERBIA - ELECTRO-DEPOSITED Ag & Pd
Courtesy of Samuel P. Faile

V.D. Jović (Ctr. Multidisciplinary Studies, Univ. Belgrade), B.M. Jović (Inst. Tech. Sci., Serbian Acad. Sci. & Arts,

Belgrade), and A.R. Despić (Fac. of Tech. & Metallurgy, Univ. Belgrade), "Identification of Phases in Ag + Pd Alloys Electrodeposited by the Electrochemical ALSV Technique," *J. Electroanalytical Chem.*, vol 357, no 1+2, 1993, pp 357-372, 28 refs, 9 figs, 2 tables.

AUTHORS' ABSTRACT

The well-established anodic linear sweep voltammetry (ALSV) technique has been used to identify the phases present in electrodeposited thin layers of Ag + Pd alloys. Alloys were deposited both potentiostatically and galvanostatically on glassy carbon and gold rotating-disc electrodes from a chloride-containing electrolyte at elevated temperatures.

It is shown that electrodeposited Ag + Pd alloys appear in two different phases (ordered structures) depending on the chemical composition and the amount (thickness) of electrodeposited alloy. It is also found that the temperature of the electrolyte for alloy deposition and/or dissolution has a slight effect on the ALSV peak potentials but has no influence on the phase composition of the alloy. The concentration of chloride ions in the electrolyte for alloy dissolution (characterization) was found to be a limiting factor in successful and complete dissolution of Ag + Pd alloys.

UKRAINE - COULOMB BARRIER SUPPRESSION

V.I. Vysotskii (Radiophysical Dept., Shevchenko Kiev Univ., Kiev), "Conditions and Mechanism of Nonbarrier Double-Particle Fusion in Potential Pit in Crystal," presented at ICCF4.

AUTHOR'S ABSTRACT

Previously we have shown that when multi-particle Fermi-condensate of $N \geq 10$-20 deuterons is formed in a microhole of optimal size $R \approx 4$-7A, there takes place stationary ($N \geq 100$) or short-term fluctuational ($N \approx 10$-20) suppression of Coulomb interaction mechanism with simultaneous initiation of fusion mechanism.

In present paper for the first time we suggest the conditions and mechanism of Coulomb barrier V(r) suppression with presence of only two deuterons in the pit of the small radius $R \approx 1$-2A. This is achieved by following:
(a) Average interaction energy V_{nn} turns itself into zero.
(b) Interlevel transition probability W_{ns} inside optimal parabolic pit $U(r) = \frac{m\omega^2 r^2}{2}$ in crystal at strictly defined temperature T is resonantly self-suppressed.

E. SHORT ARTICLES BY READERS

BRIEFEST POSSIBLE EXPOSURE OF THE FALLACY IN DENYING THAT STANDARD NUCLEAR PHYSICS & QUANTUM MECHANICS PREDICT COLD FUSION

By Robert W. Bass (registered patent agent and scientific advisor for ENECO, Inc.).

Certain theoretically-uninformed experimentalists, such as John Huizenga of Rochester U., Robert K. Adair of Yale, and Richard Garwin of IBM (backed up BY over-hasty/under-informed theoreticians like Stephen Koonin of Caltech), affect the pose of "hard-boiled empiricists" to whom theory is IRRELEVANT; only the "experimental FACTS" speak! And they are aware that high-energy physics experiments (on **collisions** between essentially **isolated** particles in a vacuum) have confirmed the validity of the *Gamow factor determining penetrability of nuclear Coulomb barriers*, which takes the form (regarding probability-flux intensity transmissivity $\mathbb{T} = \mathbb{T}(E)$ of particles of energy E):

$$\mathbb{T} \cong \tfrac{1}{4} \cdot \Theta^{-4}, \quad \Theta = \Theta(E) \gg 10^{100}.$$

(For example, at Los Alamos James Tuck verified this factor over a large range of energies, as has George Miley at U Illinois.) All three skeptical experimentalists mentioned earlier have told me personally that they "have no doubt" that theoreticians COULD explain Cold Fusion if it really occurred, but since it allegedly doesn't they don't want to hear any theoretical arguments. (Koonin has, since 7/91, promised to read the papers of L. Turner, R.T. Bush & myself, but has not YET "been able to find the time.")

What they are OVERLOOKING is that **all experiments depend on some prior theory** (accepted as "proved") for their interpretation! The FALSE ASSUMPTION in *extrapolation* from the Tuck-Miley experimental data is that the particles obey "the same law" when they are inside a **PERIODIC crystal lattice,** subject to global Madelung forces from the alternately positive & negative charges defining the lattice's rigid cohesion. The quantum-mechanical problem is then **not local** but rather becomes mathematically GLOBAL, and can be analyzed by the well-established (in both atomic and nuclear physics) theory of *Resonant Transmission*, or *Resonant Transparency of DOUBLE Coulomb Barriers* spaced apart a distance L.
Consider a *periodic* potential $V(r) \equiv V(r + L)$, and let r_n denote the nuclear radius. Then (see e.g. Bohm, Quantum Mechanics, p 286) the *resonance* between a particles' de Broglie wavelength and the length L is:

$$\mathbb{T} = [1 + \tfrac{1}{4} \cdot \{4\Theta^2 - 4^{-1}\Theta^{-2}\}^2 \cdot \sin^2(\vartheta)]^{-1}$$
$$\Theta \equiv \exp(2Q), \quad \vartheta \equiv {}_{(1/2)} \cdot (\pi - R),$$

$$Q = \int_{r_t}^{L-r_n} \sqrt{2m_D(E-V(r))}\,\frac{dr}{\hbar}, \quad R = 4.\int_0^{r_t} \sqrt{2m_D(V(r)-E)}\,\frac{dr}{\hbar},$$ where r_t denotes the classical turning point, where $V(r_t) - E = 0$. Whenever the particle's **low energy level** $E \leq 20$ eV is significantly different from a *resonant transparency* energy level E_N, at which $sin(\vartheta) = 0$, namely

$R = (2N + 1) \cdot \pi$, (N = 0, 1, 2, ...), $\Longleftrightarrow \mathbb{T} \equiv 1$,

one may reasonably replace the sine term in $\mathbb{T}$ by its expected rms *average* value of ½ with an "improved" Madelung-Coulomb potential, the conventional stance of "*negligibly small"* is confirmed. but when $sin(\vartheta) = 0$, the large size of Θ becomes *irrelevant*, and $\mathbb{T} \equiv 1$, which **predicts** tunneling through the Coulomb barrier **with 100% probability!** (Sophisticated critics, such as Jändel, will raise objections about *line breadth*, but these are overcome by noticing the *zero-point fluctuations* of the bound deuterons inside a supersaturated (beta phase) $PdD_{1.0}$ crystal.)

EXCESS HEAT (X-HEAT) AND ITS APPLICATIONS: Thinking Tools for Leaping Forward [1]
By Dr. J.L. Waisman

Progress in the field is much slower than one would like. To a large extent this is due to the effects of the currently prevalent out-of-hand rejection, by many, of the reality of the phenomenon. This type of rejection historically accompanies the early phase of a major change in a scientific paradigm. [2] But even considering these circumstances, progress is slow. Here are three thinking patterns which will accelerate it.

1. Use a Macro-Science Approach. (Alone or in parallel to Micro-Science.)

Remember that Macro-Science usually precedes Micro-Science. Frequently there is sufficient information to state macro-relationships years before the detail micro-mechanisms of a reaction are understood. An example: the electron (the micro-particle of electricity flow) was "discovered" by Thomson in 1896. But the Macro-Principles, the Maxwell equations, were published 32 years earlier, and had led to the first commercial generating plant 14 years earlier, 1882.

The writer believes that enough information is now available to state the macro-principles which relate X-heat to the state properties of a metal lattice containing deuterium.

2. Concentrate on Achieving the Goal.

It is easy to be overwhelmed by the variety of experiments and theoretical explanations being produced by many investigators with backgrounds in different specialties. Anomalies seem to abound. But many of the seeming anomalies being encountered by some specialists are normal occurrences for those skilled in other specialties. It is necessary to sort the anomalies into those that are real and those that are not. We must focus on the real anomalies. The sorting is greatly aided by the third thinking pattern (below), interdisciplinary activities.

In the X-heat investigations, the micro-organism for the heat producing events, is indeed an anomaly. New science will be needed to explain it.

From the point of view of applications, understanding the X-heat in terms of macro-properties is the goal. And micro-scientists can help themselves and the X-heat community by articulating relationships between X-heat and macro-properties in parallel with their evolving micro-theory.

3. Make Your Projects Interdisciplinary.

A strength of our communities of scientists and engineers is the detail in which the field is covered. And we are blessed by the presence of many thousands of compartmentalized specialties. The accompanying weakness is that new phenomena which overlap the established specialties can be badly misunderstood and overcomplicated. Cross-discipline projects will greatly improve the quality of the work and speed it up. This thinking pattern is closely related to the previous thinking pattern, 2.; the "sorting" requires cross-discipline.

References:
[1] These comments relate to Excess-Heat in Metal-Hydrogen Systems. We call it "X-heat" and its rate, "X-power."

[2] A good historical review can be found in Thomas S. Kuhn's The Structure of Scientific Revolutions, 2nd ed., 1970, U. of Chicago Press.

THOMAS KUHN VS. IRVING LANGMUIR: On the Topic of Pathological Science

By Veniamin Filimonov, Inst. of Physicochemical Problems, Belarus St. Univ., Minsk, Belarus

A paper by the late Nobel prize winning physical chemist I. Langmuir on pathological science [1] is very popular among those scientists who refuse to recognize Cold Fusion (CF) as a fact of science. On the other hand, the lack of acceptance of CF isn't something new: T. Kuhn (MIT), a prominent historian of science and scientist, had described such a situation in his famous book [2] and has called it scientific revolution.

It is difficult to disagree with the statement [3] that self-delusion in science takes place in all times. In particular, the

belief of the author of a noted paper, and similar people, that it is possible to distinguish true science from the false (pathological) one using two or three simple rules is self-delusion too. Of course, I approve the necessity of protecting science from heresy, but I can't agree fully with I. Langmuir's statements on pathological science.

As you may know, the point they proposed to consider is that if discovered phenomena have poor reproducibility or have results at magnitudes of the same order as the sensitivity of the available equipment, it is the first sign of pathology in science. Some questions arise on that point. Is this sign characteristic of true scientific discoveries during at least a short period of time, or does a new phenomenon always send a signal having magnitude exceeding the scales of standard devices? Or does creation of the device for displaying just the phenomenon always precedes its discovery? And so on... Indeed, if anyone claims that the lack of reproducibility is a basic property of the phenomenon under study, or attempts to make certain conclusions on the mechanism of a noted phenomenon because of its irreproducibility, he [shouldn't cease investigations. A good scientist will study the mechanism(s) to resolve the problems of reproducibility.]

Now let us turn to the next two signs. The second sign is unwillingness of pathological scientists to operate within a framework of existing theories and their willingness to propose new explanations deviating from the framework. It is undoubtedly a large fault. But one may consider it as pathology, apparently, only in a case where malicious scientists don't reckon with theories which are able to describe the discovered effects exhaustively. And if there are no suitable theories, I suppose it's a natural right and even a duty of scientists to look for some new explanations in such a situation.

Let us consider the third sign added by D. Rousseau [3] to the classification given by I.Langmuir. It is the unwillingness of pathological scientists to carry out the decisive (critical) experiment(s) or to give credibility to results of the same experiment carried out by somebody else. To find an excuse for such behavior, pathological scientists claim that some important or even decisive conditions of successive experiments haven't been revealed. Certainly, such behavior is unethical, whether advanced reason is far-fetched or not. But, can one always confirm that critics know all the necessary conditions of success?

The basis of such a view of the development of science, due to the above mentioned signs of pathological science, is more or less peculiar to certain periods of scientific progress, and is given in the book by T.Kuhn [2]. Such periods are named by the author as scientific revolutions. T. Kuhn calls the science of the scientific revolution period anomalous, to distinguish it from normal science: the science of accumulation of facts, perfection of experimental methods and completion of existing theories. Scientific revolution leads to more or less radical changes of ideas in some fields of science, and as a result known and newly-discovered results in the field become described. The difference between pathological science by Langmuir and anomalous science by Kuhn is: that the first one is apparently an incurable disease but the second one is a process of growth.

Let's concentrate on the third, Rousseau's example of pathological science, Cold Fusion. This particular subject has attracted the greatest attention of responsible scientific opinion up to the present. *Errare humanum est* - this is a reason of pathology in science, to Rousseau's mind. But making mistakes is mainly a feature of youth, while the discoverers of CF are experienced researchers. They have a great authority with responsible scientific opinion and, in my opinion, they are concerned for their reputation. Both Professor Martin Fleischmann, the outstanding electrochemist, a Fellow of the Royal Society, and Professor Stanley Pons, former Dean of the Chemistry Department of one American university and a known electrochemist too, don't appear to be notorious cranks.

Is the intervention of non-specialists - electrochemists - insulting to the nuclear-physics community? In Kuhn's opinion, such intervention, being senseless and atypical during normal periods of progress in science, is observed rather often during scientific revolutions and then turns out to be very successful. Let's recall the contribution of meteorologist John Dalton to atomic physics, and the contribution of physician Robert Mayer to physics.

Whether or not one numbers professor Steven Jones among discoverers of CF, he is a well-known nuclear physicist, a prominent specialist in the Cold Fusion field (its acknowledged branch called muon catalysis of CF). In my opinion, all above mentioned scientists and many of their followers really had observed what they claimed to observe. Sometimes their observations indicated high magnitudes of the effect, far above detection limits. Unfortunately, the majority of researchers who attempted to reproduce CF hadn't succeeded in that. That's why responsible scientific opinion can't recognize Cold Fusion (CF) as a really existing phenomenon. But, perhaps, does the "obscure" knowledge which would help to obtain reproducible results really exist? Maybe M. Fleischmann and S. Pons either don't know this secret or don't want to reveal it, intending to take out a patent for that method of CF implementation.

Therefore, one may suppose that some important conditions of CF implementation and reproducibility are unknown to the great majority of CF researchers. It means that such

conditions weren't properly understood in published papers on CF but they may have been satisfied randomly in some cases. This circumstance concerns the possible explanation of one more mystery of CF. I refer to a note of Douglas Morrison [4], a permanent skeptic of CF, on the "off-beat" geography of CF confirmation, according to which there are mostly negative results in known centers of nuclear physics, and there are both positive and negative results in equal parts in a lot of small and unspecialized laboratories and research groups. In D. Morrison's opinion, noted centers have reached the third and final stage of pathological science progress, while provinces are staying too long at the second stage of indecision. In my opinion, there are equal reports of positive and negative results in both centers and provinces, but the latter have less opportunities and less desire to publish their negative results. That's why provinces report the main part of CF confirmation - due to their majority.

Two other acknowledged scientific achievements of recent years, namely the discovery of high-temperature superconductivity and the synthesis of buckminsterfullerene, have succeeded more than CF because the objects of these discoveries were at first predicted theoretically and, only then, found out experimentally. But it is CF that is in contradiction with existing theoretical knowledge. According to the latter there is a precipice [sharp division] between chemical and nuclear forces.

If there was any hypothesis capable of explaining the existence of intense nuclear fusion at room temperatures and of pointing the path to improve its reproducibility, this CF phenomenon should transfer from the category of pathology to the category of normal science. Many scientists don't approve of the method chosen by Fleischmann and Pons for announcing their discovery first: TV, press-conference, etc. But, in my opinion, facts speak for themselves: thanks to that press conference [called by the University of Utah officials, not by Fleischmann and Pons], CF became known immediately to the whole world.

It isn't a pity that CF took a lot of effort and money: there were and there will be some other cases of attracting the attention of responsible scientific opinion to less serious problems in the history of science. It's a pity that the hypothesis that explains the implementation of intense Cold Fusion qualitatively and partly quantitatively does exist, being unknown to the majority of physicists [5]. Moreover, this hypothesis points to certain conditions for reproducible implementation of CF. However, that's the subject of our following communication.

I want to quote both Khun and Langmuir (both quotations have been translated from Russian).

"*We are forced to solve numerous and complicated problems in difficult situations. And it would be an absurdity to guess that the mind might be our guide in all cases... We aren't able to have the necessary data always or to simplify the problem for application of rational methods... We underestimate the importance of intuition.*"
Irving Langmuir [6].

"*The normal science doesn't seek to find a new **fact** or new theory... Nevertheless new phenomena exists which wasn't suspected by anybody, but are discovered by scientific researchers again and again, and radical new theories are invented by scientists again and again.*"
Thomas Kuhn [2].

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4. D. Morrison, "Review of Cold Fusion," *CERN/PRE*, 90-159, 6 Nov. 1990, pp 1-13.

5. V. Filimonov, "On the Probability of Cold Nuclear Fusion Implementation: Synergetic Hypothesis," *J. Radioanalytical and Nucl. Chem*. (Articles) 1992, vol 162, no 1, pp 99-109; Item: "On the Probability of Cold Nuclear Fusion," *Pisma v ZTF*, 1990, vol 16, no 19, pp 42-46; Item. "On the Mechanism of Cold Nuclear Fusion," Ibid., 1990, vol 16, no 20, pp 29-34; "Cold Nuclear Fusion: Possibility in Principle and the Paths of Implementation," *ZTF*, 1992, vol 62, no 6, pp 219-222; Item. "Cold Fusion - the Child of Catastrophes," *Khimiya i Zhizn* (Chemistry and Life), 1992, no 11, pp 48-51.

6. I. Langmuir, "Science, Common Sense and Decency," in: Langmuir: The Man and The Scientist, Pergammon Press, 1962. pp 333-342.

ADDENDUM TO "A COLD FUSION THEORY"
By David Moon

A recent report of 17 MeV protons observed coming out of "highly deuterated" titanium during bombardment with 150-KeV deuterons by a Japanese research team [1] suggests a possible extension of the reactions that were proposed to

produce energetic tritons and He^3 particles from deuterium-loaded titanium or palladium.

In the parent paper, "A Cold Fusion Theory," (on pp 3-7), the hypothesis was given that MeV-level tritons or H^3 can form when the collective energy of the deuteron wave pulse, in a resonating train of deuteron waves oscillating between grain boundaries, invades the volume of a metal atom near the neutron-absorption cross-section area. The deuteron serves as a neutron donor to the metal nucleus. The reactions given were:

$$d + Ti^{48} \rightarrow Ti^{49}(0.12MeV) + p(5.80MeV),$$

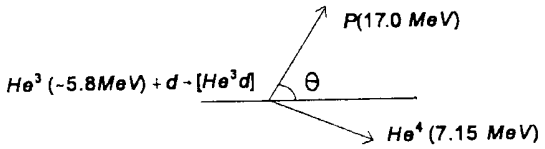
$$p(\sim 5.8MeV) + d \rightarrow t(\sim 5.8MeV) + \beta^+(\sim 5.47MeV),$$ or median energies

$$p(\sim 5.8MeV) + d \rightarrow He^3(\sim 5.8MeV) + \gamma(\sim 5.49MeV)$$

In a concentrated active volume of the metal lattice, in which trains of coherent deuterons are oscillating at a microwave frequency, sequential reactions of deuterons are conceivable. Helium-3 particles can react with another deuteron:

$$He^3 + d \rightarrow He^4(3.69MeV) + p(14.66MeV)$$

The Q-value (3.69 + 14.66 = 18.35 MeV) can be distributed in such a way as to produce a 17-MeV proton, where the total kinetic energy is ~5.8 + 18.35 ≈ 24.15 MeV. This should occur when $\theta \approx 66°$:



An earlier report of charged particles with energies up to 18 MeV [2] could also be accounted for by this reaction mechanism.

[1] Kasagi, *FF*, vol 5, no 5, Nov. 1993, pp 14-15.
[2] Kucherov, *21st Cent. Sci. & Tech*., Spg. 1993, p 73.

[David Moon's paper "A Cold Fusion Theory" may be ordered from him at No. 104, 4020 East 52nd Street, Minneapolis, MN 55417.]

COLD FUSION OR
SPACE ENERGY'S IMPACT ON THE SEAS
By Wesley Bruce

The Cold Fusion Impact book covers the obvious impact on surface shipping. They will gain nearly unlimited range with the major cost of fuel replaced by a relatively low capital cost power plant. Shipping will become both cheaper and faster.

However the impact of a cheap non-air breathing power plant on undersea transport and the activities opened up by such transport remained unexplored. Air breathing power plants can't run deep diving submarines. Both liquid oxygen and hydrogen peroxide have been tried with great expense but limited success. Subs are thus powered by batteries, large fission reactors or an umbilical link with a surface vessel. All three technologies are dangerous and the first and last limit range and mobility.

For four decades the naval vessel of greatest importance has become the nuclear submarine. With its long range and undetectablity it is now the capital ship of those navies that have them. They have replaced the battle ship as the symbol of naval power and superpower status.

On the civilian side, oceanography is a slow and expensive business. Shallow waters are sparsely explored at best. Huge areas of the deep sea bed have not yet been seen by man. A few small areas have been explored and studied intensely at great expense but they are the exception that prove the rule. We know more about the moon and Mars than we know about 70% of our ocean bed.

New energy technologies like cold fusion and space energy could revolutionize both continental shelf and deep ocean exploration, mariculture and mineral extraction. With such power plants running propulsion, life support, sensors and pumps, then small, cheap, fast and versatile vessels are possible.

They will have the following probable effects: 1. Sea bed mineral mining bases would be possible. Several prospected deposits on the sea bed contain a large percentage of the world's known reserves of a given mineral. Iron, copper, gold and silver all exist in huge sea floor deposits. Because the minerals have never been weathered or reworked by geological activity they are chemically pure or are simple metal sulphide compounds. These are easier to process into pure ingots and slab stocks than the generally impure and oxidized continental ores. The price of many mineral commodities may drop making land based deposits commercially non-viable. Countries relying on their land deposits may attempt to restrict sea based mining politically, economically, and militarily.

2. Permanent and semi-permanent submarine habitats would become possible if not at first common. The first units would be dormitories for the sea bed miners and research teams. Tourist, hotels, luxury houses "in" tropical reefs and the kelp forests of colder waters also become possible. The rarity and risk of such homes in the sea will only tend to drive up their status.

3. As the sea becomes habitable it will become ownable. The law may lag behind events resulting in conflict but ownership will prevail. Squatters rights tend to become property rights over time. Small island nations will end up with an effective 30,000-fold increase in useful "land" area since the sea bed within a 200 mile limit commercially becomes as valuable as dry land.

4. Fishing will become fish farming, mariculture. A pasture improvement approach to mariculture is already being developed. With small submersible runabouts farmers could engage in selective breeding, selective culling of inferior or sick stock, and other stock control measures.

Such sea bed farmers will slowly replace "hunters" of today. Clashes between the farmers and the fishermen over poaching may resemble the Johnson County war of the 1880's, where clashes between farmers and ranchers almost resulted in war.

5. As the sea bed becomes home and farm, the peoples of the sea will adopt a "not in my back yard" approach to pollution. The farmers will take strong legal and political action if governments are slow to protect the farmers waters. Secessionism is not out of the question in the long term. Secession at the local government level, forming new counties or shires, is probable.

6. Long endurance submarines will rapidly become available to all navies both first and third world. On average they will be smaller, faster and more lightly armed than today's military subs. The expense of antisubmarine warfare technology will force some countries to defend smaller territories while other nations may claim larger areas. Given the stealth nature of subs and the surprise nature of their attacks, the tension of surface crews could lead to a greater number of accidental attacks on subs. Captains will prefer to be safe than sorry. Engagement rules will need to be tightened.

7. There is a small but real risk that terrorists, pirates and drug smugglers may acquire and arm civilian subs. Drug smugglers are already suspected of using subs today. Careful licensing of hulls and power plants will be required to control this problem before it happens. Coast Guard and river police may need antisubmarine warfare equipment to counter the smugglers.

8. The opening frontier will provide places for the world's adventurers and refugees to go. The world has almost become too small and too well mapped for the former and too many borders have become closed for the latter.

9. Our knowledge of the sea and its biology will produce new wonders, medicines, and technology as it progresses. The consequences of these cannot be predicted. It won't be a frontier without risk. Lives will be lost. Tragedies will happen since no system is infallible.

Some of these consequences seem farfetched but dare we go into new territory without a map that shows all the possible obstacles. The implications of a new technology are not all foreseeable. It is therefore our responsibility to acknowledge those we can foresee.

BOOK REVIEW OF DIVINE ELECTROMAGNETISM

By Hal Fox

Divine Electromagnetism, By Stefan Marinov, East-West International Publishers, Morellenfeldgasse 16, 8010, Graz, Austria.

There are few books that are destined to change the world. However, there are a few books that **could change the world**, if they were read by enough educated people. Divine Electromagnetism is one of the potential world-changing books. Why? Not because it is beautifully written, not because it is elegantly printed, but simply because it has a persistent **and important message:** Science has made many mistakes in selecting some scientific facts and ignoring other equally important facts.

As an example: In 1887, A.A. Michelson and E.W. Morley joined in an experiment to measure the speed of light both in the direction of the earth's motion and perpendicular to the earth's motion. Their experiment showed that the speed of light was a constant. This **most famous of all negative experiments** has been credited for the basis upon which Einstein developed his special and general relativity work. The results have been the development of quantum dynamics and the building of a scientific edifice **based on a false interpretation of an experiment.**

Marinov describes in Article 44 "The Coupled Shutters Experiment" which easily shows that the velocity of light is affected by the motion of the earth. The experiment is simple. Marinov constructed two identical disks having a large number of precision-drilled small holes in a circle near the outer circumference of the two disks. The disks were mounted on opposite ends of a shaft about two meters long with a driving motor in the center. A laser light source is placed at one end of the system such that the laser light would travel through a hole in the disk and to a closely-aligned hole in the other disk at the opposite end of the shaft. A photo-electric cell (or equivalent) is placed at the second disk to measure the intensity of the incoming light. When

the disks are rotated at high speeds, the second disk hole has moved to a position such that the laser light beam is partially obscured, therefore, the signal from the photo-electric cell is diminished. With this relatively simple equipment, Marinov has shown that the speed of light varies throughout the day (due to rotation of the earth) in an expected sinusoidal fashion. The experiment was first done in 1979 and reported in 1980 in *Spec. Sci. Tech.* Vol 3, p 57, (1980) and again in the Proceedings of the Second Marcel Grossmann Meeting on General Relativity in Trieste in 1982, page 547. The experiment has never been replicated by any other laboratory. Why? Probably because they don't want to know the truth!

With the challenge, "Electromagnetism is a science which is to be learned by everybody who know some mathematics in ten days. Eleven days are too many.", Marinov launches into 149 pages of mathematical preparation of the student. Then in Chapter VI, Experimental Verifications, he begins the most interesting part of his (and the reader's) intellectual journey beginning with a new way to measure the speed of light (the example immediately preceding.)

Several scientific beliefs are shattered as Marinov reports on his mathematical challenge of scientific orthodoxy. Marinov does not stop with mathematics. He explores every challenging concept by designing and testing experimental equipment. He also publishes his findings. Thirty-nine of the 75 references are Marinov articles. Of special interest are his mathematical and experimental investigations of the Lenz Rule (first published by H.F.E. Lenz in 1834). The rule is that when a magnet is thrust into a coil the motion is opposed. Marinov describes a relatively simple experiment that can be conducted by children to show that there is an "anti-Lenz" effect over a part of the cycle of moving a magnet in and out of a coil. Further, Marinov investigates how this "anti-Lenz Effect" can be used to develop a **perpetual motion machine**. According to accepted scientific understanding, neither the anti-Lenz effect nor the operation of a *perpetuum mobile* is possible. Marinov informs the reader how to demonstrate the anti-Lenz effect. In addition, he spends many pages and reports on many experiments in which machines are built that (if one takes into account the friction & heat losses) are candidates for perpetual motion.

At the end of the book, Marinov describes and testifies as to the reality of the Paul Baumann "Testatika" machine(s) located in the Christian religious community Methernitha in Switzerland. Paul Baumann has solved the problem of making a machine that provides electrical power with no obvious power input. Although Marinov has seen the Merthernitha machine, he is not privy to its ultimate techniques for construction. However, Marinov is convinced of two concepts, such machines can be built and he is likely to built a similar machine.

While Marinov does not completely solve the problems of building a self-sustaining energy-producing machine, his tale of discovery is highly recommended reading. Marinov, himself, is still exploring and learning. He will admit to making and correcting experimental errors and **with equal vigor he will illustrate errors that are now being made in our generally-accepted science.** If you are a pathological skeptic, don't read this book. If you have an open mind; if you enjoy journeys of discovery; if you want to be **shown**, you will find this book of considerable interest.

To obtain a copy of Divine Electromagnetism, write or phone East-West Publishers, Morellenfeldgasse 16, 8010 Graz, Austria. Telephone (0316) 37 70 93. The price of the book is $70 and the funds go to aid Marinov in his experimental discoveries.

Note: Stefan Marinov was one of the approximate 20 engineers and scientists gathered world-wide to participate in the May, 1993 retreat at Estes Park, Colorado. Also invited were Harold Aspden and Peter Graneau. Peter Graneau's (with Neil Graneau as co-author) book, Newton versus Einstein is another book challenging some of the cherished scientific beliefs. Harold Aspden is working on a new book to update his previous Physics without Einstein book. These scientists together with other scientists and engineers are changing the world. Their work and the work of many other scientists who are challenging some vigorously-protected scientific beliefs is resulting in new ways to produce energy. These are some of the world changers of this generation.

THE NEIGHBOR'S GOAT
By Peter Glück

Here in the Balkans, a very important issue is "the neighbor's goat." The basic philosophy is: "if my goat dies, the neighbor's goat must die also, by all the possible means." This seems to be quite understandable, however, when the neighbor's goat becomes more important than your own, terrible problems can arise, see the former Yugoslavia.

Cold fusion won't die, however, it has some big problems. Therefore, let's see in a genuine Balkanic style, what happens at the neighbor's. That is, what problems have to confront the other hot or breakthrough fields, topics of science, or more precisely, solid state science.

This analysis, taking into consideration the principal of **Synchronicity**, will show if cold fusion is essentially different from the other issues, i.e. if it is pathological or not. On the other part, we can learn a lot form these neighboring fields, we can extrapolate some conclusions, etc. This action

is actually a correlational analysis based on the unicity of Science.

A. High-temperature Superconductivity
This is considered an "immensely successful" field. It really is, however, there are some problems here, as the following quotes show (the underscored parts seem to be equally valid for the case of cold fusion):

"High temperature copper oxide superconductors achieve their remarkable properties in ways that are still mysterious. Although the topic has been intensely debated since the initial discovery of the class of layered ceramics 6 years ago, no microscopic mechanism has received a full vote of confidence." (S.M. Gerwin, *Science*, 4 Sept. 1992, p 1354.)

"Since the adventure of high temperature superconductivity began 7 years ago, experimentalists have been like navigators without a map. They have managed to concoct class after class of high-temperature superconducting materials, but all that work was done largely by relying on trial, error, and lab-honed intuition rather than theory. Not to say there were no theories, on the contrary, there have been a plethora of theoretical explanations for how these ceramic materials could carry currents without resistance at temperatures higher that had ever been seen before. In the early days, a theorist always could find data that supported his theory." (Robert Dynes, U. of Calif., San Diego) cited in I. Amato, *Science*, 16 July 1993, p 294.)

B. Porous Silicone
Another apparently promising field. Everything clear? "Despite extensive research, the mechanism for the formation of porous silicon is not well understood and the effects of operating parameters such as applied potential, doping level, illumination intensity, and electrolyte concentration on the morphology of porous silicon is not well understood." (Ying Kang, Jacob Jorné, *J. Electrochem. Soc.*, vol 140, no 8, Aug. 1993, p 2258.)

"However, fundamental questions about the underlying chemistry, physics and microstructure remain unanswered. More research will be required before any definitive statements can be conclusively made regarding the luminescence mechanism." "Many major breakthroughs have been reported, many major breakthroughs will be needed." (K.H. Young et al., *J. Electrochem. Soc.*, vol 140, no 9, Oct. 1993, p 3046.)

A recent paper confirms these statements and adds some data which are very encouraging for my SURFDYN theory. Don't forget, porous silicone is a rather strange stuff: each tenth atom of it is on the very surface.

"The photoluminescence (PL) of porous silicone is commonly used for characterization of its properties, however, its mechanism has not been unambiguously characterized yet."

"The results of PL measurements after the additional treatment show a strong influence of the **surface states** on the luminescence properties of PS, that is why any theory explaining the PL of PS without taking into account the **surface states**, cannot be valid." (J. Oswald et al. *Solid State Commun.*, vol 89, no 3, Jan. 1994, p 297.)

C. Heterogeneous Catalysis
This field is at least 170 years old, however, the intimate mechanism of the catalytic processes remains unknown. The huge commercial plants based on catalysis are actually "black boxes." In other words:

"The catalytic chemist is usually better at discovering new catalysts than at explaining why old ones worked at all." (John M. Thomas, Royal Inst. of Great Britain cited in *Chem. Eng. News*, vol 71, no 42, 18 Oct. 1993.)

The situation is analogous in our field, new [effects] and new systems are discovered, however, the puzzles of the "classical" Fleischmann & Pons cell are not solved yet. In my opinion, this is more than an analogy.

This review shows that the neighbors' goats are not so much better than our goat. If we don't consider the problem of reproducibility, generated by the catalytic nature of cold fusion, it is the same goat (and for the sake of rhyme), we are in the same boat.

Someday we shall have a theory, a good one according to the wise classification: "A FIRST RATE THEORY PREDICTS, A SECOND RATE THEORY FORBIDS, A THIRD RATE THEORY EXPLAINS AFTER THE EVENT." (A.I. Kitaigorodskii)

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4 INDEPENDENT EXPERIMENTAL EVIDENCES THAT D + D → ^{4}He DOMINATES COLD FUSION

By Robert W. Bass (registered patent agent and scientific advisor for ENECO, Inc.).

Some experts in cold fusion research for whom I have the greatest respect, have doubted that the *OBVIOUS* reaction in Fleischmann-Pons cells and similar deuterium-based work is that stated. But this is not only the most elementary explanation for the observed Excess Enthalpy, it seems to me almost incontrovertibly established by the published evidence:

(1) In their paper, "Two Innocent Chemists Look at Cold Fusion," Cheves Walling & Jack Simons, two University of Utah colleagues of Fleischmann & Pons, mentioned in a footnote that F & P had told them how much Excess Enthalpy they were getting in certain experiments in which the effluent gases were searched for reaction by-products. They assumed that the excited Alpha Particle dropped into its stable ground state NOT by emission of a gamma ray but by transfer of energy to the electron cloud, which they called *Internal Conversion* (IC), leading by *IC* ultimately to phonon excitations of the *Pd* lattice observable as macroscopic heat, in a *Radiationless Reaction* (RR). A simple calculation based upon the hypothesis that all excess heat came from the 23.85 MeV shown in high-energy physics experiments upon essentially isolated particles colliding *in vacuo* to be emitted as a γ-ray but here hypothesized as some novel *IC,* produced the expected number of ^4He atoms to look for; these were found, but at the borderline of reliability of the resolution of the instruments available in Utah; consequently F&P did not pursue further publication of this early clue.

(2) The China Lake NWC double-blind experiments by Mel Miles, Ben Bush *et al.* provided with great care *perfect* correlation: either NO, or NO, or a SMALL amount, or a LARGE amount of ^4He in the effluent gases from a light water control or a heavy-water F&P cell producing either NO or a SMALL amount or a LARGE amount of excess heat.

(3) The Texas A&M experiments by John O'M. Bockris *et al.* provided massive amounts of both tritium & helium in a cathode that had been quick-frozen while producing heat.

(4) The ingenious experiment by Nippon Telegraph & Telephone (Dr. Yamaguchi) produced Alpha Particles in profusion from a D-loaded Pd-lattice (note the absence of lithium) by heat-or-electric *shocks!*

F. LETTERS FROM OUR READERS

LETTER TO A SKEPTIC

Letter from Dr. Melvin H. Miles (Physical Chemist with Dept. of Navy, Naval Air Warfare Ctr., China Lake, CA) to Dr. John R. Huizenga (Dept. Chem., Univ. Rochester, NY), well known skeptic.

Dear Dr. Huizenga,

I would like to call your attention to my manuscript (enclosure 1) that will soon be published in the *Journal of Physical Chemistry*. If my Equations 1-3 are correct, then the 1989 studies by Cal Tech, M.I.T., and Harwell contain serious errors that undermine their reports of no excess power. Reports from these three laboratories had a major impact on the cold fusion controversy in 1989 that affected U.S. funding policies (see enclosure 2). It is interesting to note that my early 1989 studies also failed to produce excess power, hence I am classified with Cal Tech, M.I.T., and Harwell in this ERAB Report (enclosure 2).

Although the cold fusion controversy may linger for many years, it should be possible for scientists to agree on the basic principles of chemistry and physics that govern the behavior of open, isoperibolic calorimetric systems during D_2O electrolysis. I hope my *Journal of Physical Chemistry* manuscript will be a major step towards that goal.

I continue to stand by our reports of excess power and helium production during D_2O electrolysis using palladium cathodes (enclosure 3) since there is no major error source that can explain these results.

Sincerely, /s/ Melvin H. Miles, Ph.D. Physical Chemistry, NAWCWPNS Fellow

Enclosure 1: see abstract page ???
Enclosure 2: partial copy of ERAB report, 1989
Enclosure 3: Dr. Miles paper "Correlation of Excess Power and Helium Production During D_2O and H_2O Electrolysis using Palladium Cathodes," *J. Electroanal. Chem*., vol 346, 1993, pp 99-117 (reported in *Fusion Facts*, May 1993).

LETTER FROM ROMANIA

Dear Hal,

I have received the ICCF4 preprints from our friend Bill Collis and have asked a lot of authors for the complete papers. It seems one of the most interesting contributions is that of Dufour et al. They have a very clear hypotheses which "goes" well with my SURFDYN and explains a lot of last hour puzzles, i.e. the tritium from the light-water experiments: this was something that transformed my dreams into nightmares, it seemed to defy logic.

My Minsk paper is now created, the basic idea is:
What we need for a good cold fusion process is: very high local concentration of mobile hydrogen isotopes; the higher the better, the more local the better, the more mobile the better. To obtain this with a high global concentration (e.g. D/Pd, H/metal) is a clever solution, however, to obtain it <u>without</u> a high global concentration is a creative solution.

Please look over the available data and you will see that I am right. The other important conclusion is that all hydrogen

isotopes are working and therefore the future belongs to light-water and hydrogen devices.

I have to confront a very violent anti-cold fusion campaign here. The main reason is that I have participated and won a contest for a higher rank as senior researcher. My qualifications are invincible, e.g. I have more patents than all my competitors together. However, it was suggested that I am working for a theme without any future!

I have to go to our Central Institute in Bucharest to defend my position and cold fusion as well, giving a lecture. The story has inspired the enclosed presentation [see page ???] of the situation of the theoretical achievements in related fields.

Thank you for this opportunity,
Best regards, /s/ Peter Glück

G. MEETINGS & MISCELLANEOUS

NOTE: The Proceedings of the Rome Workshop on the Status of Cold Fusion in Italy, with **most of the papers written in English**, is available for $35. For copies contact Professor Bruno Stella, FAX 00396-495 7697, E-mail: VAXROM::STELLA

MINSK COLD FUSION CONFERENCE - MAY 1994 AMENDED CALL FOR PAPERS

A bilingual, international conference on cold nuclear fusion and affiliated energy systems will be held in Minsk, Republic of Belarus during the last week of May, 1994. Papers accepted will be published in English and Russian editions of proceedings that will be provided to attendees at the start of the conference. Presentations of the papers can then concentrate on the latest developments and the answering of questions. The proceedings are expected to provide a tutorial overview of the new science of cold nuclear fusion for a multi-disciplinary audience and provide the latest experimental and theoretical findings.

Russian language papers should be sent to:

Dr. Filimonov V.A.
14 Leningrad St., Research Inst. of
Physical and Chemical Problems
Minsk - 80, 220080
Belarus.

Abstracts due by March 15. Papers in English may be submitted to Hal Fox, P.O. Box 58639, Salt Lake City, UT 84158. Notification of acceptance will be sent by Mar. 31, 1994. **Papers must be received by APRIL 15, 1994.**

$250 Conference attendance includes room and meals. Authors of accepted papers must include the check for the conference when submitting the paper. Page costs for pages in excess of 6 (including figures) will be $100 per page. A total of about 70 papers will be selected and published in the proceedings. Translation costs, if handled by the organizing committee staff, will be $20 per page. Authors are urged to submit their papers in both English and Russian. Words on figures may be in English.

Institute for New Energy's INTERNATIONAL SYMPOSIUM ON NEW ENERGY

A symposium for Professionals, Industry, Lay people and News Media

The Institute for New Energy will sponsor an International Symposium on New Energy to be held in the Denver Hilton South in Denver, Colorado on **Thursday, May 12, 1994 through Sunday, May 15,** 1994. Fees: Registration before April 1, $150; Registration between April 1 and May 1, $175; Registration after May 1, $200; Workshops $20 each, and Banquet $25. Checks should be made payable to the **Institute for New Energy** and sent c/o *New Energy News*, to P.O. Box 58639, Salt Lake City, UT 84158.

Expected Speakers: Robert Adams - Adams Motor/Generator; Harold Aspden - Ferromagnetics; Bruce Cathie - Harmonics; Bruce dePalma - "N" machine; Shiuji Inomata - "N" machine; Stefan Marinov - Perpetuum Mobile; Harold Puthoff - Zero Point Energy; John Thomas - Prof. Searl's Electro-Gravity experiments; Paramahamsa Tewari - Space Power Generator; Dennis Weaver - Ecology/ Economics.

Some of the speakers will present concurrent workshops on the evenings of May 12, 13 & 14, from 6:30 to 9:30 p.m. The Banquet will be held Sunday at noon.

Subjects to be presented at the conference will include all types of **New Energy** topics such as those covered in each issue of *New Energy News.* Specifically, papers are solicited covering both theory and practice of energy producing devices and systems such as **cold nuclear fusion**, rotating N-Machines, Solid-State energy systems, Magnetic over-unity machines, Tapping Space Energy (Zero-Point Energy), gravity control techniques, energetic transmutations (nuclear reactions), and other new energy research.

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