FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

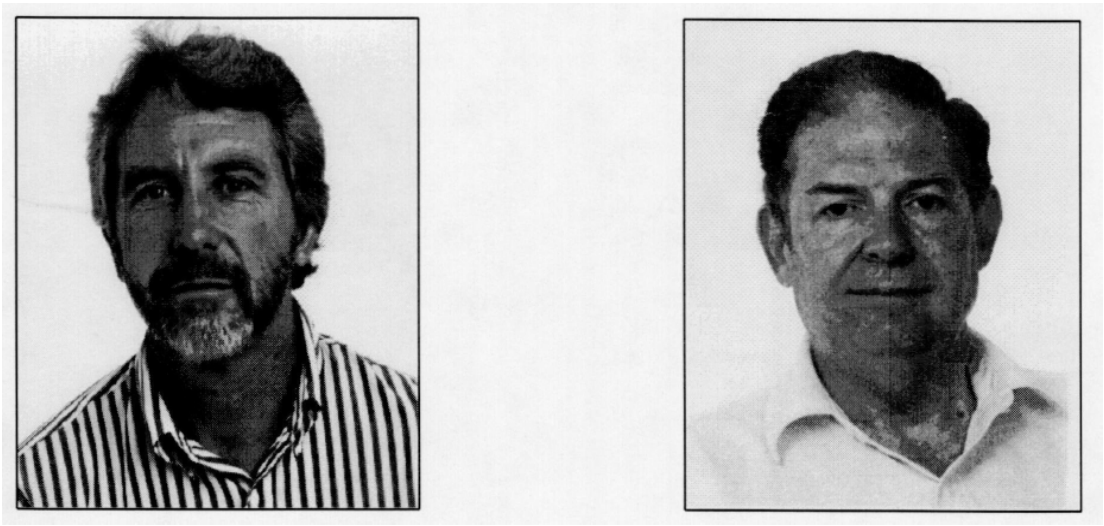
ISSN 1051-8738 • University of Utah Research Park •

ISSN 1051-8738

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

VOLUME 6 NUMBER 7 FUSION FACTS JANUARY 1995

Fusion Facts Names Fusion Scientists of the Year for 1994



DR. MICHAEL McKUBRE DR. ROBERT W. BASS

CONTENTS FOR JANUARY 1995

A. Scientists of the year 1
B. Theory of Cold Fusion Quantum Resonant Transparency (QRT) of Coulomb Barriers and Lattice-Induced Nuclear Transmutations (LINT) 2
C. A new Energy Caused by "Spillover-Deuterium" 4
D. News from the U.S. 7
E. News from Abroad 11
F. Articles from our Readers 17
Hydrogen in Cosmos, Metals & Life 17
A Paradigm too far? 19
G. Book Reviews 21
H. Meetings and Misc. 23

A. SCIENTISTS OF THE YEAR

Awards are not always made to the hero of the moment. Sometimes it is the player who is persistent, dedicated, valiant, and sometimes long-suffering. For notable achievements during the past several years, *Fusion Facts* awards its **SCIENTISTS OF THE YEAR, 1994** award to two bright, dedicated, and persevering scientist: Drs. McKubre and Bass.

DR. MICHAEL MCKUBRE (Experimental)
Dr. Michael McKubre was born, reared, and educated in New Zealand. He received his B.Sc., M.Sc., and Ph.D. (chemistry) in 1976 from the Victoria University of Wellington. Among other achievements he was a Postdoctoral Research Fellow in Southampton University, England studying porous electrodes. McKubre's special-

ties include electrochemistry, surface and membrane chemistry, AC properties of heterogeneous electrolyte systems, steady-state and transient properties of porous and flow-through electrodes, electrochemical sensors; battery systems; corrosion science; and expertise in the fields of geophysics and electronics. His expertise is reflected in his publications: two theses, five reviews, and more than ninety papers in professional and scientific journals, books, and proceedings.

Michael McKubre is currently the Director of the Energy Research Center of the Physical Sciences Division of SRI, International, where he has been since 1982. McKubre has been a meticulous researcher and has supervised the performance of hundreds of cold fusion experiments. In addition, he has been the teacher and lecturer to attest to the reality of the cold nuclear fusion excess heat. We have sat at his feet on several occasions and listened to his well-documented and well-illustrated lectures on the experimental work of his group of scientists at SRI, International. He knows the reality of the results that he has carefully measured. He makes no claims at being an outstanding theorist, but has shown great patience and care in the continuing effort to make precise measurements that must be the basis for adequate theories.

We commend Michael McKubre and his staff for their good works to further the development of one of the most exciting new sciences in this century.

DR. ROBERT W. BASS (Theory)
Dr. Robert W. Bass was born in 1930 and graduated from John Hopkins University with a bachelor degree in Physics in 1950 at age 19. He entered Oxford University as a Rhodes Scholar and received a Master's Degree from Oxford in Mathematics and a doctorate from Johns Hopkins in 1955. Bass also completed three years of post-doctoral studies at Princeton under Solomon Lefschetz before beginning his career in the aerospace industry. In 1956 Bass published, two years before Pontriagin et al., the Adjoint System Approach to Time Optimal Control for which Pontriagin et al., received the Lenin Prize in 1962. Bass is one of the world's leaders in control theory, has contributed to the advancement of mathematical analysis, became a patent agent, and has several high-tech patents. His list of achievements are extensive and impressive.

During the past few years Bass has been intensely involved in developing a theory of the cold fusion of hydrogen and its isotopes. In the following section, we present a summary statement of the results of Bass's latest theoretical work which he expects to present at the next cold fusion conference. **In our judgement, Bass has achieved the development of the first adequate theory of cold fusion based on basic physical principles**. It is for this achievement that we are pleased to name **Dr. Robert W. Bass as a *Fusion Facts*' Scientist of the Year.** Thanks, Dr. Bass, we have thoroughly enjoyed our frequent communications with you and have appreciated following your rigorous application of physics and math to develop an adequate theory of cold fusion.

A tribute to ALL cold fusion scientists: We (the citizens of earth) have been and are being well served by your dedication to discovery and development of new science. Collectively, we may never meet nor hear of your good works, but we and our children's children will live more abundantly on and off this earth because of your collective search for truth. Although some still profane your efforts, we applaud you and most graciously, thank you for your foresight, your integrity, and your scientific spirits.

B. THEORY OF COLD FUSION QUANTUM RESONANT TRANSPARENCY (QRT) OF COULOMB BARRIERS AND LATTICE-INDUCED NUCLEAR TRANSMUTATIONS (LINT)

By Robert W. Bass
Scientific Advisory Board (SAB), ENECO, Inc.
Technical Advisory Board (TAB), F.I.C., Inc.
Registered Patent Agent, P.O. Box 6337, Thousand Oaks, CA 91359-3667

Former ERAB Committee Chairman, author of CF: Scientific Fiasco of the Century, John R. Huizenga has stated that **CF** "would be contrary to all understanding gained of nuclear reactions in the last half century," and would require "invention of an entirely new nuclear process" which would require "Three Miracles," namely the "Fusion Rate (low-energy) surmounting of Coulomb Barrier," "Branching Ratio," and "Reaction Products" (alleged) Miracles. Huizenga has performed a public service, in that he stated the orthodox science establishment's case for finding **CF** *a priori* "IMPOSSIBLE" with such carefully explicit precision that it is easy to refute his case point-by-point.

In a recent issue of the *American Scholar,* Caltech Provost & Physics professor David Goodstein, while fairly reciting the impressive showing at **ICCF-4**, concludes that he "quite firmly believes the theoretical arguments that say **CF** is impossible" (citing his colleagues Koonin & Lewis, whose destructive roles he attempts to portray as benefiting **CF** `believers' because informing them of their many unrecognized mistakes, etc.). But reading between the lines of his entertaining essay (& ignoring the revisionist history attempting to whitewash the roles of K & L), it seems to me that he knows in his heart that "the jig is up" and that the twin bastions of anti-**CF** sentiment, Caltech & MIT, had better start back-tracking or face utter public scorn and permanent historical discreditation.

More constructively, in a recent 57-page review (*Int. J. Theor. Phys.*) of 173 **CF** theory papers, the quartet of Mario Rabinowitz, Yeong Kim *et al.* perform the valuable service of citing explicit flaws in all 25 identifiable categories of theories, and conclude that not a single candidate **CF** theory merits acceptance.

The theory addressed here (in concurrence with the quartet) assumes that by far the most formidable objection is Huizenga's point (1), and addresses it exclusively, in the belief that prior papers by Nobel Laureates Julian Schwinger and Willis Lamb *et al.*, taken with a recent solo preprint by Lamb's former collaborator Robert Parmenter, have brilliantly, and with exquisite Quantum Mechanics (QM) & Quantum Field Theory (QFT) & Nuclear Physics detail, exposed Huizenga's points (2) and (3) as the results of mere bad habits, such as `back of the envelope calculations using Heisenberg's Inequality with wrong-direction inequality sign,' & other cartoonishly incompetent arguments with which complacent `experts' have become used to indulging themselves.

The present theory *could* (with injustice) be called the Turner-Bush-Bass theory, if I failed to acknowledge the giants upon whose shoulders I stand (and I incorporate ideas which I first learned from F&P, and F&P jointly with Simons & Walling, as well as (early) Hagelstein, Schwinger, Parmenter & Lamb, Chubb & Chubb, Kim *et al.*, Rabinowitz & Worledge. This theory is now the ONLY viable **CF** theory:

1. It *predicts* the strictly *empirical* Schwinger ratio to within one third of one percent(!), and *demonstrates* why the Schwinger ratio is `all important' to **CF**.

2. It is the *only* theory which *predicts* that a beta-phase deuterided palladium lattice (heavy-water **FP** cell) will produce **CF**, while a similarly hydrided palladium lattice (ordinary-water **FP** cell) will *not!* ("Rabinowitz Acid Test")

3. It is the *only* theory which was submitted in a patent application and a still `in press' paper in 1991 which makes *seven* experimentally confirmed predictions, *only* two of which were known to me when I submitted the patent, yet then implicitly predicted that ordinary water or hydrogen gas *would* work in nickel.

4. In a privately circulated pre-print, when **F&P** had only suggested up to 1 kW/cm^3, it predicted 3 kW/cm *before* Bush & Eagleton observed that rate of Excess Enthalpy in a thin-film palladium anode plated on silver (closed **FP** cell).

5. It is the *only* theory which has permitted the explicit numerical computation of the low-energy *Resonant Transparency Spectrum* from first principles **QM** in *periodic* solid-state lattices, updating *Duane's Rule;* the most important resonances cannot be found without consideration of **ALL** particles in the lattice, done by *combining* methods of Madelung & Fermi-Thomas/Mott in a *periodic* potential.

6. It is the *only* theory which (via ZPF line-broadening) overcomes the formidable "Breit-Wigner Linewidth" type of objection to the Turner-Bush theory published independently by Jandel and by Rabinowitz & Worledge, the "billion-year tunneling time" which spooked Bush into retracting his own **TRM** theory at **ICCF-4**.

7. Therefore it is the *only* theory which garners additional experimental support by predicting the Bush *Fine Structure Spectrum,* or sequentially ascending hill+cusped-valley curves of Excess Enthalpy as function of either cell current or cell temperature, as first observed experimentally by Bush & Eagleton;

8. The theory early stated explicit warnings of **FP** meltdowns (& Gozzi *et al.* incipient meltdowns), and is compatible with Schwinger's independently proposed theory of *"chain* fusion reactions" dependent upon *unbroken* linear lattices of barrier-well-barrier chains; thus random imperfections in the actual as opposed to ideal metallic lattice account for the unpredictable evolution in time of many experiments; and so it predicts that *sporadicity* is a function of the *branching ratio* between phonon excitation of the host metallic lattice (**FP CF** heat) versus the embedded deuteron lattice (heat after death; microbomb fizzles; Pons meltdown).

9. It is compatible with Bush's **ICCF-4** explanation of tritium production (low loading) versus radiationless aneutronic **excess enthalpy** by helium-4 creation (high loading), as well as Bush's generalized **CAF** (Cold Alkali Fusion) and **LANT** (Lattice Assisted Nucleon Transfer) theories, which explain the Mills-type light-water and Bockris-type neo-alchemy experimental successes, plus predictions of eliminating ***all*** long-lived dangerous radioactive wastes (*without* use of neutron fluences).

10. The theory illuminates that what is really important is not the host lattice but the embedded deuteron lattice, therefore suggesting that solid, meta-stable, room-temperature-&-pressure, *crystalline* **MSD** (Meta-Stable Deuterium), manufactured via Bass's patented Plasmasphere^{tm} Process & patent-pending Metamatter Process (for putting fully ionized plasmas into the state of a liquid metal, prior to magnetic levitation in a refrigerated vacuum for cooling), will provide *micro-pellet* radiationless, aneutronic cold fusion (triggered by my patent-pending **QRT**^{tm} Process).

C. A NEW ENERGY CAUSED BY "SPILLOVER-DEUTERIUM"

Yoshiaki Arata, M.J.A., and Yue-Chang Zhang
Welding Research Inst., Osaka Univ., Japan
Published in *Proceedings of the Japanese Acadamy, Series B*, vol 70, ser B, no 7, pp 106-111. *Reprinted by permission of Y. Arata*

AUTHORS' ABSTRACT

It was verified that a new kind of energy is caused by "Spillover-Deuterium" generated in a double structure (DS)-cathode with "Pd-black." Using this cathode, the authors confirmed the sustained production of a significantly abnormal amount of energy over a period of several months that could not be ascribed to chemical reaction energy. The chemical reaction energy of 0.1 mol Pd-black used is only 4[kJ], but more than 200 MJ of excess energy was continuously produced for over 3000 hr. at an average rate of 50-100 kJ/hr using a DS-cathode with a same quantity of Pd-black. Intermittent operation over a period of two years using this structure proved the complete reproducibility of these results.

Introduction
Since Fleischmann et al. [1] first reported on a hypothesis of "unknown fusion reaction" in 1989, various experiments [2] have been carried out but without sufficient reproducibility of the results as is known well. Taking a different approach as below, the authors began to research the same subject in March 1989, and reported [the following] initial results at the end of the same year [3];

A. Surface atomic structure will play a key role in the production of a new type of energy.
B. Lattice imperfection such as lattice defects, amorphous structures, intense local stress and microcrack are very important.
C. Bottle and/or cylinder shaped (50 mm x 20 mm dia.) "Pd-electrodes" with function as the cathode in electrolysis were designed to examine the possibility of "solid-state plasma fusion" under the condition of the high pulse/high frequency current [as used] when the author conducted the first "plasma fusion" experiments in Japan in 1958 (Feb). [8]

Based on points A and B above, the authors recognized the importance of using Pd "powder." Experiments were first carried out after applying the powder to the cathode's surface by thermal spraying, and our accumulated results utilizing this method were presented in our first and subsequent reports.[3-5] Based on [the result] C, we produced large cathodes in the form of a Pd rod and bottle with the same size mentioned above.

In 1990 the authors developed a Double Structure Cathode (hereafter DS-cathode) based on points A, B and C above [9]. The DS-cathode consists of a Pd cathode with an internal vacuum zone filled with a deuterium storage-type powder. A long trial and error period of over two years was required before success was achieved in the DS-cathode experiments.

The first DS-cathode used consisted of a Pd bottle-shaped outer cathode filled with "Pd-black" powder as an inner cathode. The outer-cathode was used principally to introduce D^+ ions into the inner-cathode where the primary reaction that realizes excess energy takes place. After repeated trials lasting over a year, the authors began the main experiment using this DS-cathode in September 1992, and the experiment is still in progress. It should be noted that DS-cathode is fundamentally different from the Single Structure Cathodes (hereafter SS-cathodes) used by all other researchers which [usually] consist of a plate, foil, wire, cylinder or rod.

Experiments and discussion. The experiments were conducted under the basic guidelines described in Appendix I, where the symbols used in this report are defined. The DS-cathode used in an earlier study [6] was retested after being left idle for a period of one year to test the reproducibility of the earlier reported results. An intermittent test was conducted over 1000 hr., and a 3000 hr. continuous test was also conducted. The functional principle and characteristics of the DS-cathode are described in Appendix II.

Fig. 1 shows the excess heat characteristics in the DS-cathode for a long period over 2 years. The A-series (A_1, A_2, A_3) shows one example (600 hr. continuous) of the 1992-1993 experiments. Since new intermittent tests conducted over a period of 1000 hr. yielded similar results each time, it was decided to leave the DS-cathode idle for one year to investigate any change due to "aging." The B-series (B_1, B_2, B_3) show the retesting results for experiments conducted one year later in 1994 using the same DS-cathode employed for the A-series. Here (C) is the result obtained using "standard joule heat sources" of joule heating by standard resistors in above same cell. It is surprising that A and B-series in Fig. 1 are virtually identical, demonstrating the complete reproducibility of this system. (A_1) in A-series shows the time characteristic of the relation between the Effective Output $Q_{\bullet}$, Electric Input Q_{in} and the Cell Voltage V_{cell} (= Vo - 1.5V), (where Vo = constant current supply voltage). Here, $Q_{in} = tIV_{cell}$[J]. (A_2) shows the time dependency of the most important parameter, Cell Power $Q_{\odot}$ (= $Q_{\bullet}$ - Q_{in}). (A_3) clarifies the relationship between Q_{in}, $Q_{\bullet}$, and the Excess Rate Q* of excess heat emission. Period A-B shown in A-series is the incubation period required whenever a cathode is used for the first time, however in a cathode that has once produced excess heat, it is significantly shorter. (B_1), (B_2) and (B_3) in B-series correspond

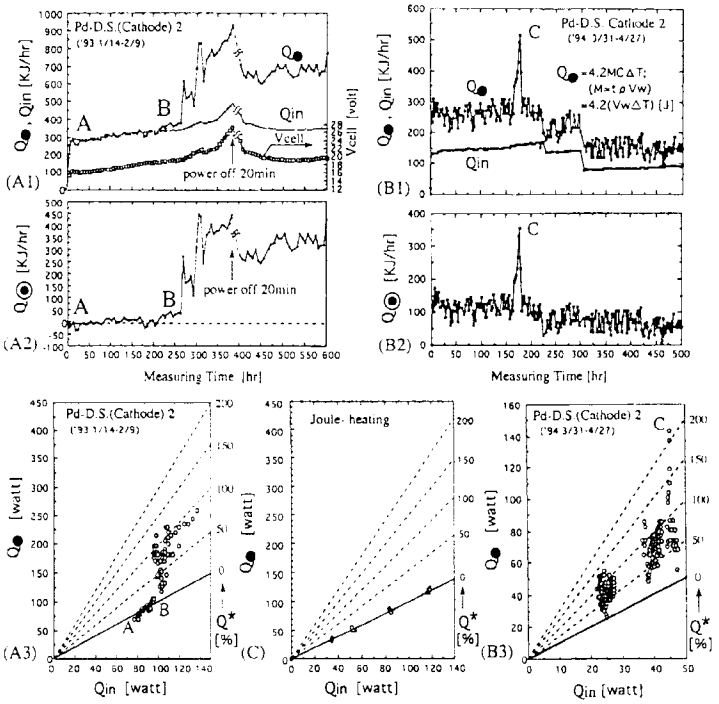


Fig. 1 Excess heat characteristics in DS-cathode for a long period over 2 years. Note: A-series (A_1, A_2, A_3); experiments in 1992-1993, B-series (B_1, B_2, B_3); re-experiments in 1994 after 1 year idling period of A-series' cathode, and (C); experiments of "standard joule heat sources."

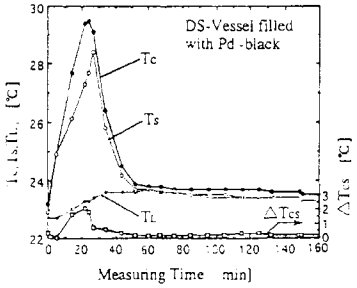


Fig. 2 Chemical reaction characteristics when the same quantity of "Pd-black" was used with that of Fig. 1 DS-cathode.

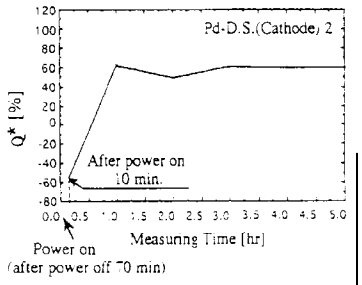


Fig. 3 Excess heat generation characteristics at the beginning of re-test using DS-cathode of Fig. 1.

to (A_1) (A_2) and (A_3) in A-series after one year elapsed, respectively. While there is absolutely no change in Q_{in} and V_w, the appearance of a C-zone which indicates the suddenly increased temperature by about two times for 17 hr. offers significant hope for future.

In a 3000 hr. continuous experiment using the DS-cathode with Pd-black (0.1 mol), an excess energy higher than 200 MJ was obtained with an average rate of 50-100 kJ/hr. It is well known that the chemical reaction energy between Pd and deuterium is almost 40 kJ/mol, and in this case only 4 kJ, which was confirmed by experiment result of Fig. 2. In other words, when the "DS-vessel" (Stainless Steel Vacuum Vessel similar to the DS-cathode) with a same amount of Pd-black is placed at same position of DS-cathode in the cell and then deuterium is introduced in this vessel. The internal temperature Tc rises immediately and the surface temperature Ts follows. The electrolyte temperature T_L rises almost 1°C which corresponds to 4 kJ. This test data shows that there is a significant difference between the characteristics of the chemical reaction energy and the excess energy of the DS-cathode, and it is obvious that this energy was produced by fundamentally different mechanisms.

Fig. 3 shows the excess heat characteristic when the DS-cathode used in Fig. 1 was retested after "off-interval" of 70 min. The Excess Rate Q* was -60% ten minutes after startup of the system, but a stable generation of excess energy was achieved within one hour with Q* stabilized at 60-70%. The same phenomena caused [was obtained] with complete reliability in the repeated tests. Fig. 4 compares the internal temperature T_c of the DS-cathode during the experiment with the temperature T_s of the electrolyte near the cathode surface, which is heated to the highest by Joule heat. T_c is constantly almost 1°C higher than T_s, demonstrating that the "heat source" is clearly internal. A surprising finding is that the temperature difference $\Delta T_{c,s} (= T_c - T_s > 0)$ was observed even after the power was turned off, and a difference of almost 0.3°C was maintained during test-off ($Q_{in} = 0$), and the same results were obtained repeatedly with complete reliability.

Appendix I. System for Measuring Cell Output Characteristics. The experiments were conducted using a closed cell [6] in which excess heat was measured by the system shown in Fig. 5. The total input (F_{in}) and the total output (E_{out}) in closed cell are equal. F_{in} is the sum of the electrical input (Q_{in}) and the excess heat (ε). E_{out} is the sum of output energy ($Q_\bullet$) delivered outside of the system by the cooling water flowing through the cooling duct in the closed cell, and loss energy flowing from the cell to the outside (cell loss: Q_{Loss}). The relationships between these parameters are given by

$E_{in} = E_{out}$ .....(a)
$Q_● - Q_{in} = \varepsilon - Q_{Loss}$ ($\equiv Q_⊙$) .....(b)
$Q^* \equiv Q_⊙/Q_{in}$ .....(c)
$Q_{in} = tIV_{cell}$[J]; $Q_● = 4.2MC\Delta T$[J] .....(d)

where

$Q_●$: the actual energy delivered from the cell, and named as "effective output"
$Q_⊙$: the effective excess energy that can be extracted from the cell, and herein named as "cell power"
Q^* : the rate of effective excess energy to Q_{in}, and named as "excess rate"
Q_{Loss} : the loss energy flowing out of the cell, indicating the heat insulation characteristic of the cell, $Q_{Loss} \neq 0$.

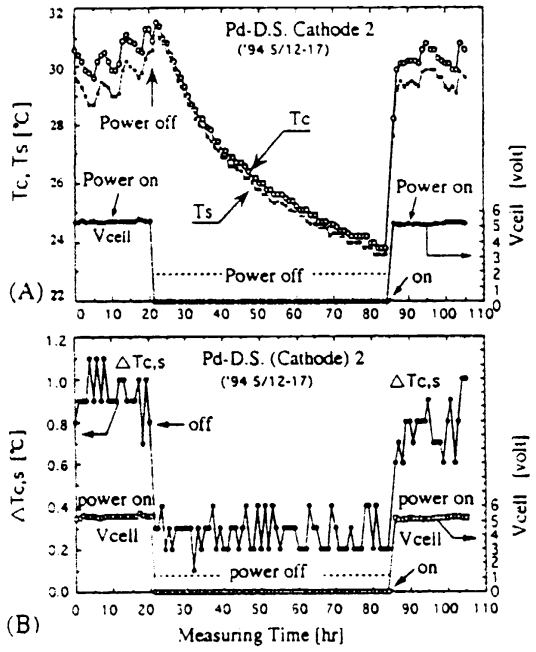


Fig.4 Internal temperature characteristic of the DS-cathode.

Appendix II. Structure and Characteristics of the DS-Cathode. The conventional SS-cathode is contaminated by the electrolyte and impurities during prolonged electrolysis. Moreover, the shape and size of the SS-cathode are extremely limited and deuterium is not absorbed enough to keep the homogeneous distribution in the SS-cathode. In contrast, a DS-cathode that enabled the no limitation in size is separated into two parts, an outer-cathode and an inner-cathode, each of which performs a specific function. Specifically, the outer-cathode (B-zone) receives D^+ ions from the electrolyte (A-zone), and transfers these D^+ ions to the inner-cathode (C-zone). C-zone is filled with an inner-cathode material of the desired shape such as "Pd-black," and an electromagnetic energy can also be easily given [supplied] for inner cathode, as required.

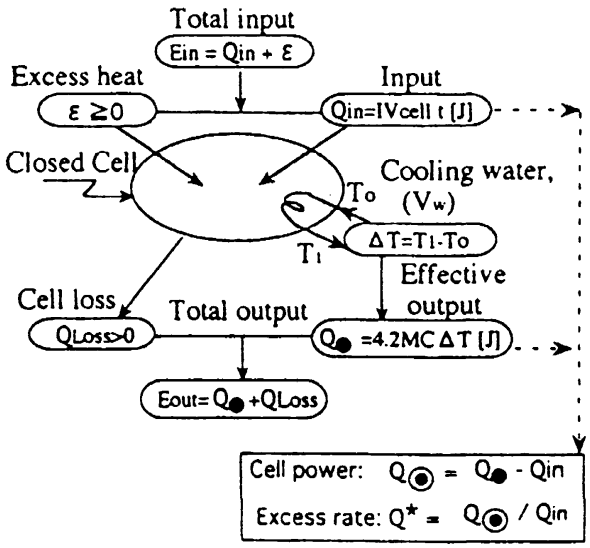


Fig. 5 Block diagram of the measurement system for the cell power.

If the "Pd-black" particles in the C-zone contact the inside wall of the outer-cathode, deuterium in the outer-cathode travels instantaneously and distributes homogeneously on the surfaces of all particles through the contact zone by "Spillover-Effect" [7] (surface migration), and penetrates quickly into all particles, respectively.

When the vacuum space of "Particle-gaps" (V_G: space between each particle) in the C-zone should be filled with D_2 gas as electrolysis progresses, the pressure P_C rises with time τ_C therein. Fig. 6(A, B) shows the P_C-τ_C characteristics in the C-zone. For example, the average time required for the deuterium to pass the B-zone and/or to reach the C-zone is $\tau_C = A_0$ in Fig. 6(A) when the electrolytic current density i=640 mA/cm^2. This is the incubation period of the D_2 gas appearing in the C-zone. The subsequent time required for Pc to reach 1, 4, ..., 10 atm. as the operation continues is $\tau_C = A_1, A_4, ..., A_{10}$ hr., respectively. The effect of the on/off state on P_C and on the pressure rise rate P_C at i=640 mA/cm^2 are shown in Fig. 6(A). Line $A_0A_4A_{10}$ is the pressure characteristic in the "on-state" (during switch-on state) in a "empty" C-zone (not filled with powder); line A_4Q_A indicates the "off-state" characteristic. Line B_0,B_1,B_4,B_{10} is the pressure characteristic in the "on-state" in a C-zone filled with Pd-black ("Pd-black" C-zone); line B_4Q_B indicates the "off-state" characteristic. It is very important that the incubation period in "Pd-black" C-zone is significantly longer than in "empty" C-zone, and that drop in pressure P_C is very gradual in the "off-state." It is notable that these phenomena also appear in the DS-vessel, as shown in Fig. 6(B).

Appendix III. The Characteristic of "Spillover-Deuterium". Fig. 6(C) is a schematic diagram of Fig. 6(A, B). A look at what happens in these figures shows that there is no incubation period in the "empty" C-zone or in the "Ni-powder" C-zone

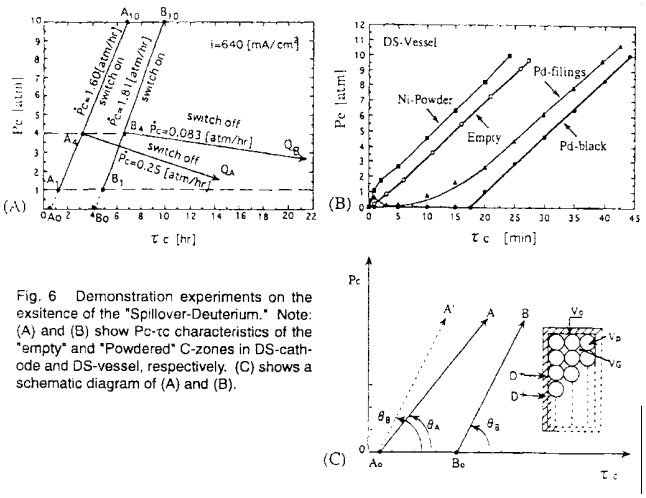


Fig. 6 Demonstration experiments on the exsitence of the "Spillover-Deuterium." Note: (A) and (B) show Pc-τc characteristics of the "empty" and "Powdered" C-zones in DS-cathode and DS-vessel, respectively. (C) shows a schematic diagram of (A) and (B).

(even 20 nm Ni black), which is defective [sic, read "not considered effective"] to absorb D_2 gas. On the contrary, the incubation period is very large in "Pd-black" C-zone. In other words, in a DS-cathode with constant electrolysis current or in DS-vessel with a constant D_2 gas inlet speed, internal pressure P_c rises linearly with time τ_C as the gas penetrates into the "empty" and "Ni-powder" C-zones respectively as lines A_0A and A_0A' in Fig. 6(C). However, there is no pressure range A_0B_0 appearing over a long period in "Pd-black" C-zone. This range expresses the time that deuterium is absorbed until the powder is saturated, providing clear proof that the deuterium is fulfilling its function as "Spillover-Deuterium."

In other words, if spillover-deuterium is not present, for example, the deuterium penetrating into the C-zone will first fill the "Particle-gaps" V_G ($= V_o - V_p < V_o$; where V_0 = C-zone volume, V_p = total particle volume), and the pressure should rise as shown by line A_oA' in Fig. 6(C) as in "Ni-powder" C-zone. The deuterium will then spread gradually into the particles as in "Pd-filings" C-zone in Fig. 6(B), which does not have as pronounced a "Spillover Effect" [7] as "Pd-black." These phenomena show clearly that "Spillover-Deuterium" instantaneously migrates to the surface of each particle of "Pd-black" and is evenly distributed. For such function of "Pd-black," we named "Pumping-up action" of ultra fine particles. The deuterium thereafter rapidly penetrates into the particles due to, for example, intercalation or lattice imperfection, reaching Bo near the saturation state, with the pressure suddenly rising and approaching the line BoB at an angle Θ_B ($> \Theta_A$). This conforms to the measured values. The spillover-deuterium phenomenon thus plays a key role in a "continuous new energy generation".

Acknowledgments. This research has been supported by a research grant from The Japan Academy and research funds from Kinki University. The authors express their appreciation for the helpful discussions of Prof. H. Fujita of Kinki University, Prof. T. Inui of Kyoto University and the research staffs at the Welding Research Institute of Osaka University. The authors are grateful to Daiichi Meteco Comp. Ltd. for their great help.

References

[1] Fleischmann, M., and Pons, S.: *J. Electroanal. Chem.*, vol 261, pp 301-308 (1989).
[2] Proceedings of the Third and Fourth International Conferences on Cold Fusion: ICCF3 and 4.
[3] Arata, Y., and Zhang, Y.C.: *Kakuyugo Kenkyu*: *J. Japan Soc. Plasma Sci. and Nucl. Fusion Research*, vol 62, p 398 (1989) (in Japanese); *Proc. Japan Acad.*, vol 66B, pp 1-6 (1990).
[4] ---:*Fusion Technology*, vol 18, p 95 (1990).
[5] ---:*Kakuyugo Kenkyu* (see Ref. 3), vol 67, p 432 (1992); *Fusion Technology*, vol 22, p 287 (1992).
[6] ---:*ibid.*, vol 69, p 963 (1993); Proc. ICCF4, vol 4 (1993).
[7] Proceedings of the Third International Conf. on Spillover, Kyoto, Japan (1993).
[8] Arata, Y.: *KŌshŌ*, no 14, p 28 (1990): *JIJI Atomic Report*, vol 121, p 1 (1958).
[9] Arata, Y., and Zhang, Y.C.: *High Temp. Soc. Japan*, vol 20, p 148 (1994) (in Japanese).

D. NEWS FROM THE U.S.

INTERNET LOOKS INTO COLD FUSION

Marcus Chown, "Net Backs Probe into Cold Fusion," *New Scientist*, 17 Dec. 1994, p 11.

SUMMARY

The Sci.Physics.Fusion forum on Internet has been the place to argue the pros and cons of cold fusion for quite a while. While it is dominated by hot fusioneers, sometimes cold fusion experimenters do get listened to. Recently, it was Jed Rothwell, of Cold Fusion Advocates, who stirred up some attention for the Griggs' pump, which generates over unity energy in the form of heat, turning the water it is pumping partially to steam.

At the suggestion of Steven Jones of Brigham Young University, physicists on the net have contributed small

amounts of money to a fund intended to send Tom Droege to Georgia to inspect the machine. Droege was the one chosen to investigate the pump because the is an engineer and physicist who is an expert at building complex electronic and mechanical apparatus.

So Droege will go to Georgia in January, but without much expectation of finding real proof of cold fusion energy. He has done some cold fusion experiments in the past himself, but never had any success with them; always finding the effects had some other explanations than cold fusion. He is looking forward to seeing the "interesting device," whatever the outcome, and will report his conclusions on the Internet.

CALIFORNIA - ELECTRON TRANSITIONS

J.A. Maly and J. Vávra (Applied Science Consultants, San Jose and Palo Alto), "Electron Transitions on Deep Dirac Levels II," *Fusion Technology*, vol 27, no 1, Jan 1995, pp 59-70, 18 refs, 3 figs, 1 table.

AUTHORS' ABSTRACT

It has been suggested that both the relativistic Schroëdinger and Dirac equations allow the existence of so-called "deep Dirac levels" (DDL) in all atoms of the periodic table. An estimate of the size of the DDL atoms is given, and a physics explanation is proposed for exciting the DDL transitions. Possible secondary nuclear reactions of the atoms on the DDLs are suggested, and preliminary experimental results are presented. A search has begun for some direct experimental results are presented. A search has begun for some direct experimental evidence supporting the proposed DDL model. So far, in electrolytic experiments, only calorimetric evidence was found.

CALIFORNIA - CF WITH ACOUSTICAL WAVES

Courtesy of Carol White

Carol White, "Achieving Cold Fusion with Acoustical Waves," *21st Century Sci & Tech,* Winter, 1994-95, pp 57-59, 3 refs.

EDITOR'S SUMMARY

Roger Stringham and Russ George of E-Quest Sciences in Palo Alto, California are melting some palladium targets in their acoustically-driven microfusion experiments. Ultrasound beamed into heavy water creates highly-energetic cavitation bubbles (akin to the bubbles that exhibit sonoluminescence). When the bubbles collapse a local temperature of at least 5,000 degrees Kelvin is produced. Challenged to show some kind of **nuclear ash**, Stringham and George submitted samples for testing for helium. Helium-4 was found and, in one case, an anomalous helium-3/helium-4 ratio was found. If the helium came from the environment (contamination) the helium-3/helium-4 ratio would be about 1 part in a million. However, a ratio of more than 1,000 times that amount was measured. This result suggests some type of nuclear reaction. Lately, experiments with titanium have produced superior results. Stringham and George state that the amount of heat energy produced is consistent with the amount of helium produced. Typically excess heat from 30 to 100 percent is achieved. These results occur only with the use of heavy water and do not occur when using ordinary water.

CALIFORNIA - COLD FUSION PATENTS

Courtesy of Chuck Bennett

Chuck Bennett, "The Oklahoma Land Rush for Cold Fusion Patents," privately published letter, January 1995. [Letter distributed to many Senators, Members of Congress, Secretary O'Leary, selected scientists, and news media journalists.]

The U.S. government has a major dilemma on its hands. After five and a half years of waffling and obscurity, cold fusion is catching on like wild fire in every major country except the United States. It will be left for the historians to go back and find out why such a great nation was the most laggard in accepting the new energy. Perhaps a sickness that is hopefully curable. The danger to the United States is that other countries could become energy self-sufficient.

The U.S. Patent Department is defunct. Just as the new Congress if planning to dismantle and restructure the Energy Department, this should be done to the Patent Department as well. **At present, no one has any proprietary rights on cold fusion in this country because the Patent Department has an obstinate and delinquent attitude to the new energy and is not issuing any patents on cold fusion.**

The solution to the dilemma is to open up the patent process for all cold fusion patents at one time. There would be a flood but the only fair method would be to open the gates at a predetermined date. It would be like the Oklahoma Land Rush.

The sign of momentum for the victory in acceptance for cold fusion are evident everywhere. Most notable is the ongoing debate on the Internet's cold fusion newsgroup. Cold fusion has been outgunned for some time by skeptics who support hot fusion research and have jumped on to this forum with loads of reasons for labeling cold fusion a hoax. **But cold fusion has stood fast and now this electronic boxing match is taking a sudden turn in favor of the advocates**. Now an "electronic knockout" victory for cold fusion is inevitable.

As with any human endeavor, the proof for the new fusion has not been perfect. However, new revelations that involve identical control experiments using ordinary hydrogen compared to deuterium show remarkable differences in energy output for the same conditions.

The roles have switched and now it is the skeptics who are resorting to emotion while cold fusion has taken on a new confidence. Like an underdog at the championship who has suddenly gained overwhelming control, cold fusion is headed for certain victory in the match.

EDITOR'S COMMENTS

Fusion Facts applauds Chuck Bennett and anyone else who is helping to increase the awareness of the reality of cold fusion. We share Bennett's lack of enthusiasm for the actions of the U.S. Patent Office. We estimate that there are well over 200 patents submitted to the U.S. Patent Office that are pending. The process includes rejections, answers to the objections, etc. **Internationally, over 150 patents have been issued on cold fusion. Meanwhile the U.S. is treating cold fusion as perpetual motion and refusing to issue patents.** ENECO, Inc. has a portfolio of over 30 patents pending in the U.S. Patent Office. ENECO is a Utah company that acquired the world-wide, exclusive rights to the Pons and Fleischmann patents pending from the University of Utah. With the continued successes in the replication of cold fusion, in the U.S. and abroad, the log-jam at the patent office will eventually be broken. It is suggested that the replacement of selected administrators at the Patent Office might help the process. We agree with Bennett that the signs for acceptance of cold fusion are evident. *Fusion Facts* finds and reviews new information about cold fusion developments and every issue contains reports on new progress. Were we to believe the pathological skeptics, we would have to label cold nuclear fusion as the most widely replicated (over 30 countries) hoax in the history of science!

FLORIDA - MAXWELL'S EK FORCE

Jorge C. Curé (Ramsey Laboratories, Delray Beach, Florida), "Action and Reaction in Electrodynamics," *Deutsche Physik*, Vol 4, No. 13, Jan-Mar, 1995, pp 5-10.

EDITOR'S COMMENTS

Maxwell's Electrokinetic Force is given by the following equation:
$F=K(qq'/r^3)[\mathbf{r}\{\mathbf{A}(\mathbf{v}*\mathbf{v}')+\mathbf{B}(\mathbf{r}*\mathbf{v})(\mathbf{r}*\mathbf{v}^3)/r^2\}+\mathbf{C}\mathbf{v}(\mathbf{r}*\mathbf{v}^3)+\mathbf{D}\mathbf{v}'(\mathbf{r}*\mathbf{v})]$,
where A, B, C, and D are shown in bold but are coefficients, **not** vectors.
The author provides the following table:

Author	Date	Values A,B,C,D
1. Ampere	1823	-2,3,0,0
2. Gauss	1835	-2,3,0,0
3. Grassmann	1845	-1,0,0,1
4. Weber	1848	-2.3,0,0
5. Riemann	1875	-1,0,1,1
6. Maxwell	1873	A,B,C,D
7. Clausius	1877	-1,0,0,1
8. Lorentz	1892	-1,0,0,1
9. Liénard-Schwarzschild	1903	-1,0,0,1
10. Einstein*	1905	-1,0,0,1
11. Ritz	1908	A,B,C,D
12. Whittaker	1912	-1,0,1,1
13. B.B. Brown	1955	1,-6,6,6
14. Aspden	1987	-1,0,1,-1
15. Marinov	1993	-1,0,½,½
16. D.E. Spencer	1994	-1,0,1,1

* Present Maxwell-Lorentz-Liénard-Schwarzschild-Einstein relativistic electrodynamics. This is the formulation, according to the author, that Peter Graneau has substantially demonstrated is inadequate.

The reader should be strongly amazed that after 172 years of studying electrokinetics, our best minds do not agree on the values for the A,B,C,D coefficients in Maxwell's equation. Readers should be even more surprised that we do not teach this fact in most of our college classes in science and engineering physics. It must be noted that some of these theories stemmed from **electrokinetics** and some from **electrodynamics.** The author notes "In this field of knowledge we are the spectators of the eternal dispute between the **continuum** versus the **void**." The author later discusses the difference between mathematical descriptions of **nature** using ordinary differential equations and partial differential equations. In one case the "**visible discreteness of the universe** is synthesized in the **invisible wholeness of the same universe.** Maxwell made the following observations: "*I found that, in general, the results of the two methods coincided, so that the same phenomena were accounted for, and the same laws of action deduced by both methods, but that Faraday's methods [**electromagnetics**] resembled those in which we begin with the whole and arrive at the parts by **analysis**, while the ordinary mathematical methods [**electrodynamics**] were founded on the principle of beginning with the parts and building up the whole by synthesis.*"

The author also cites the controversy of **action-at-a-distance** and **instantaneous interactions** versus the establishment of a proper **field theory**. Curé quotes Newton about the concept that **the force** propagates with an **infinite** velocity between particles, "so great an absurdity, that I believe no man, who has in philosophical matters a competent faculty of thinking,

can ever fall into it." Finally, Curé pleads, "...we must completely ignore the present **Relativistic Establishment** and concentrate on creating a **truly** relativistic electrodynamics for future generations. **It is imperative we no longer waste intelligence and consume our time by beating a dead horse.**"

FLORIDA - PHASE OUT FOSSIL FUEL
Courtesy of Don Kelly

Dr. Wingate Lambertson, "Phase Out of the Fossil Fuel Industries," *Explore More!*, no 8, 1994, pp 12-13.

AUTHOR'S INTRODUCTION

In 1993 John L. Peterson of the Arlington Institute announced in an obscure report, "The Road to 2012: Looking Toward the Next Two Decades for the U.S. Coast Guard," that in 20 years fossil fuel-based energy conversion devices will become obsolete. They will be replaced by zero-point energy (ZPE) conversion devices that will "**take energy out of the 'air' with no negative byproducts at all.... This may lead to turbulent national social psychologies**."

"On one hand, great hope would attend this new way of solving huge global problems. A new era would loom on the horizon. On the other hand, shifting to the new mode would not be easy for those who cannot change easily and quickly. This would produce great despair for many."

The purpose of this paper is a call for planning -- hopefully on an international level; at the very least on a state level within the United States -- on how this radical change is to be managed with the least trauma to the greatest number of people.* It is the opinion of this writer [Lambertson] that the electric generating market for the coal industry will be obsolete in 10 years, leaving metallurgical grade coal as its only significant market. The basis for this opinion is described [in the article]. Use of petroleum products, such as gasoline and diesel fuel, for combustion will phase out more gradually over the following decade.

It would be unconscionable to permit these two fields of commerce, which have been so important in the building of the industrial world, to fade into oblivion without developing some order to their demise. Now is the time to bring the problem out into the open for discussion and action by industrial and governmental leaders.

*[The book, Cold Fusion Impact in the Enhanced Energy Age, by Hal Fox, addresses these issues in detail.]

NEW MEXICO - 50% SURE CF FORMULA
Courtesy of Carol White

Carol White, "Storms Issues a Cold Fusion Challenge," *21st Century Sci & Tech,* Winter, 1994-95, pp 60-1, 3 refs.

EDITOR'S SUMMARY

Dr. Edmund Storms has issued a protocol for creating a successful Pons-Fleischmann type electrochemical cold fusion cell such that "**success will be achieved at least 50 percent of the time**." The essence of the protocol is to effectively determine the characteristics of the palladium sample. This process is accomplished by the use of precision micrometers, a highly-accurate scale, and optic equipment to view the surface structure of the palladium. A sample of the palladium to be used (Storms favors plates rather than rods) is carefully measured, weighed, and viewed for surface micro-cracks. The next step is to load the sample with deuterium in a standard heavy-water electrochemical cell (following all of the current well-published protocols to avoid contamination that could poison the process). After the palladium has been loaded, hopefully to about .75 D/Pd ratio, as can be determined by accurately weighing the sample, then the sample is measured and inspected. Storms has a formula for guidance. If the palladium has expanded more than 2 percent beyond the expected amount (as determined by the equation) then it is wise to reject that sample. In addition, Storms' protocol included how the palladium should be treated. He suggests oxidizing by heating in air to about 600°C for a few minutes. The subsequent reduction of the oxide by electrolysis enhances the absorption of hydrogen/deuterium ions. Storms also discusses the role of impurities. The end result is a better (probably better than 50%) chance of having a successful cold-fusion experiment. Storms also suggests that the sheath of hydrogen or deuterium ions around the cathode may be a mechanism by which neutrons created by a fusion event are being absorbed and, therefore, are not measurable.

[Send $3 for postage and handling and we will mail you a copy of this issue of *21st Century* magazine.]

NEW YORK - NEW SHOT AT COLD FUSION
Courtesy of Jed Rothwell

Malcolm W. Browne, "New Shot at Cold Fusion by Pumping Sound Waves into Tiny Bubbles," *Science Times* section of *New York Times*, Dec. 20, 1994, page D1 & D8, illus.

EDITOR'S COMMENTS

Browne's article discusses some of the most recent work of Dr. Seth Putterman at UCLA. As reported, the more recent

work on sonoluminescence has achieved higher temperature levels than previously obtained. While Putterman works with single bubbles, Dr. Kenneth Suslick, a chemist at the University of Illinois (Champaign-Urbana) has produced clouds of bubbles. The bubble temperature produced is inferred by the light emitted from the sonoluminescence. The article suggests that it may be possible to create high enough temperatures so that the fusion of deuterium can be achieved. It is noted that "this process must join together atoms of isotopes of hydrogen (either deuterium or a mixture of deuterium and tritium -- the same mixture that fuels hydrogen bombs). This yields helium nuclei and tremendous amounts of energy." The author later states that no neutrons have been detected. Also, the article addresses the problem of getting bubbles of hydrogen or hydrogen isotopes to produce sonoluminescence. The process which might be able to produce excess energy is compared with the process where glass spheres are used in inertial confinement hot fusion.

It is interesting that Malcolm Browne fails to mention that E-Quest Sciences has been producing nuclear by-products (as measured by scientists at the Los Alamos energy research laboratories) using the sonoluminescence phenomena at or near the surface of a metal (such as palladium). In addition, Browne makes no mentions of the paper by Julian Schwinger in which he suggests that the Casimir effect may be responsible for the forces which collapse the bubble so violently. Of course, the Casimir effect is a by-product of an energetic space and the E-Quest experiments suggest the reality of **cold nuclear fusion**. Neither of these two concepts are acceptable to the classical hot fusion community. **This article is an impressive demonstration of how one can select facts so as to avoid any acceptance of either the concept cold fusion or an energetic space.** Rather, the projected use of sonoluminescence is associated with high temperatures (of the collapsing bubble) and therefore, the possible similarity to inertial confinement. The concept of the catalysis of nuclear reactions on or near the surface of a metal lattice can be used to explain "sonofusion" as can much of the large body of experimental data for cold fusion. However, we are pleased that the prestigious *New York Times* would use the term "cold fusion" and publish an article without the usual attack on Pons and Fleischmann. Maybe, just maybe, this act of journalism heralds a gentle recognition of the continuing advances that have been and are being made in cold fusion technology.

See the latest report on E-Quest work, on page 8 this issue.

D. NEWS FROM ABROAD

ARGENTINA - NEUTRON YIELD IN A DPF DEVICE

Chemical Abstracts, vol 120, 27 June 1994

M. Milanese, R. Moroso, J. Pouzo (Inst. Fis. Arroyo Seco, Univ. Nac. Centro, Tandil), "Plasma Filamentation and Upper Pressure Limit for Neutron Yield in a DPF Device," *IEEE Trans. Plasma Sci.*, vol 21, no 5, 1933, pp 606-608.

AUTHORS' ABSTRACT

The observation is reported of plasma sheath filamentation when the energy available becomes insufficient to fully ionize the gas swept during the sheath propagation. At high pressure, when the plasma filamentation remains during the radial stage, the neutron yield drops as a consequence of an ineffective formation of the final pinch.

AUSTRIA - PLEA FOR HELP

Stefan Marinov, "Editorial", *Deutsche Physik*, Vol 4, No. 13, Jan-Mar, 1995, pg 3.

EDITOR'S SUMMARY

Deutsche Physik is a journal **open** to all physical problems. Every established physical law or concept is open to critical examination. The only requirement is that the logic has merit and **that the experiments support the assumptions**. However, there must be **impeccable mathematical basis and sufficient experimental confirmation.** The current journals are highly mathematical but often are lacking in having a substantial axiomatic basis for the established theories. The result is that much of the current journal articles present physical science as a maze of scholasticism. Marinov writes, "It is enough to ... look at the so-called **relativistic papers** to see the abyss in which physical science has fallen: For almost a century the physics journals are inundated by voluminous papers, with hundreds and thousands of formulas, dedicated to a theory in which one cannot find where is the beginning and where is the end, and which can be demonstrated to be wrong by childishly simple experiments." Joseph Alsop is quoted as saying, "A man who has bought a theory will fight a vigorous rear guard action against facts." The editorial concludes with "..DP is not a journal for old problems, it is a journal for new solutions."

EDITOR'S COMMENTS

Stefan Marinov is both an experimenter of note and a competent mathematical analyst. He was to have received support for some of his experimental work by funds raised

from a group of German shareholders. A lawsuit was filed against the company and the president, a German citizen, was sentenced to four years in prison for fraud (although none of the shareholders complained). The basis for the fraud was that the company was going to use the funds for "over-unity energy device." **Stefan Marinov is pleading with anyone who has a working "over-unity" energy device to provide him with information so that he can get his friend out of jail!**

AUSTRIA - MAGNETIC ANOMALY

Stefan Marinov, "Two Experiments of Rimiliy Avramenko," *Deutsche Physik*, Vol 4, No. 13, Jan-Mar, 1995, pp 55-60, 4 refs, photograph.

AUTHOR'S ABSTRACT

I give a short information on two important experiments carried out by Avramenko which contradict two fundamental concepts of conventional physics. Avramenko demonstrated with the first experiment the physical reality of the magnetic potential which is denied by conventional physics. Avramenko demonstrated with the second experiment that a rotating magnet does not generate an electric intensity, in contradiction to the assertion of conventional physics.

EDITOR'S SUMMARY

Avramenko is using a large torus (about 3 meters diameter as judged from photograph) made of high-frequency soft ferrite material. A primary coil around one part of the torus is supplied with high frequency alternating current (in the range of MHz). An electric bulb with two wires about 20 cm. long is placed near the center of the torus and the bulb illuminates. Quoting from the article: "According to the present electromagnetic concepts, the bulb can be lit up only in the case where its circuit **encircles** the torus, so that there will be a change of the magnetic flux through the surface spanned on the circuit." Avramenko performed another interesting experiment. He placed a secondary coil around the torus so that the coil could be moved along the torus (moving it farther from the primary). Avramenko observed that the phase difference as seen on an oscilloscope was zero. If that is an accurate observation, then the velocity of magnetization along the torus exceeded the speed of light, according to Avramenko. Rimiliy Avramenko is an academician with the Russian Academy of Natural Sciences.

In his second experiment, Avramenko used a cylindrical magnet rotating at high rotational speeds around its magnetic axis. "Avramenko observed that there was **no** force acting on the near-by electric charges at rest." However, the authors Landau and Lifshitz (Electrodynamics of Continuous Media, Moscow, Nauka, 1982) provide formulas for computing the electric field caused by a rotating magnetized sphere rotating about its axis of magnetization. Marinov comments as follows: "Hundred years the relativists assert that a rotating cylindrical magnet (or spherical magnet) must generate an electric field but nobody of them has done an experiment to see whether really there is an electric field. Avramenko did such an experiment: There was NO electric field." Comments anyone?

BRITAIN - NEW ASPDEN PATENT FOR 1994

Courtesy of Dr. Harold Aspden

UK Patent GB 2,278,491-A; "Hydrogen activated heat generation apparatus;" Harold Aspden, 30 Nov 1994, 25 May 1993. In order to research the generation of heat by promoting the fusion of protons or deuterons adsorbed by a host metal, the apparatus provides a structural configuration by which the direction of heat flow through the metal is transverse to the direction of an applied magnetic field. Thermal priming means, which may include pre-cooling on the heat output side or electrical heating of the host metal, provide the initial temperature gradient triggering fusion. Alternating current activation of the magnetic field, the intensity of which may be enhanced by using nickel as the host metal, combined with a non-uniformity of the magnetic field and/or heat flow through the metal, assure the abnormal presence of a residual negative electron population in the metal. Such charge nucleates the merger of positive charge and enhances the fusion process.

[Dr. Aspden says that this is a 42 page patent disclosure published with the results of the patent examiner's search findings: the only search articles cited comprise two granted UK patents already assigned to ENECO by Dr. Aspden. International patent cover is being processed by ENECO.]

CANADA - ELIMINATING BLACK HOLES

Courtesy of Dr. Samuel P. Faile

Faye Flam (Staff Writer), "Theorists Make a Bid to Eliminate Black Holes," *Science*, Vol 266, No. 5193, 23 Dec 1994, pg 1945.

EDITOR'S COMMENTS

John Moffat of the University of Toronto has developed a modification of Einstein's general theory of relativity in which the singularities disappear. As Moffat states, the beauty of his theory is, "There's no singularity anywhere--there are no black holes--all of that disappears." The article cites other work being done to help resolve some of the problems with Einstein's theory. Einstein has been so highly respected,

especially in the West, that few theorists would consider trying to make changes to his theoretical work. However, that taboo has been breached, according to this article. The general approach is to modify the theory to alleviate some of the troublesome problems but not to abandon the theory altogether. In other parts of the world, especially in Russia, there is not the same reverence for Einstein's theory and much of it has been discarded, especially the basic concept of no ether and the idea that the speed of light is the same in all directions from an accelerating body.

In this issue of *Fusion Facts*, we also report on a book, The Big Bang Never Happened. The evidence that there are stars circulating invisible objects that have mass and density expected of a star-sized black hole has alternative explanations. See page 21 for more information on this alternative concept and what it might mean to cold fusion.

CHINA - LASER-PLASMA INTERACTION
Chemical Abstracts, vol 120, 4 Jan 1994

Xing Zhong Li (Dep. Phys., Tsinghua Univ., Beijing), "Anomalous Nuclear Phenomenon and Laser-Plasma Interaction," *Proc. SPIE-Int. Soc. Opt. Eng.*, 1992, International Symposium on Laser-Plasma Interactions, pp 231-241.

AUTHOR'S ABSTRACT

Progress of anomalous nuclear phenomenon studies are reviewed. The anomalous neutron emission from a glow discharge tube with flowing deuterium gas is addressed. Theoretical explanation based on the concepts of combined resonance tunneling and semi-resonance is presented. It is suggested to use laser-plasma interaction for testing the model.

CHINA - THREE-BODY DYNAMICS OF ^{11}Li, ^{14}Be, ^{17}B
Chemical Abstracts, vol 120, 27 June 1994

Chuliang Li, Yiwu Duan, Duzhi Huang (Dep. Phys. Xiangtan Norm. Coll, Xiangtan), "Three-Body Dynamics of Light Neutron Rich Nuclei ^{11}Li, ^{14}Be, and ^{17}B," *Wuli Xuebao*, vol 43, no 1, 1994, pp 14-19, in Chinese.

AUTHORS' ABSTRACT

Based on the three-body model proposed by Ren and Zu, an improvement on their variational wave function has been made. The structure and the interparticle correlations have been explored by inspecting the correlated densities. A direct verification supporting the neutron halo structure has been found.

CHINA - MEASURING NEUTRON ENERGY
Chemical Abstracts, vol 121, 22 Aug. 1995

Rong Liu, Dalun Wang, Suhe Chen, Yijun Li, Yibei Fu, Xinwei Zhang, Wushou Zhang (SW Inst. Nucl. Phys. Chem., Chengdu), "Measurement of Neutron Energy Spectra from the Gas Discharge Facility," *Yuanzi Yu Fenzi Wuli Xuebao*, vol 11, no 2, 1994, pp 115-119, in Chinese.

AUTHORS' ABSTRACT

In the process of research on cold fusion phenomenon with the gas discharge method, the NE-213 organic liquid scintillation neutron spectrometer was used to measure neutron energy spectra from the gas discharge facility. Neutrons were emitted from the gas discharge facility. The peak energy in neutron spectra is about 2.38 MeV. Neutrons whose energy is larger than 3 MeV haven't been found. The neutron spectra from the gas discharge facility and D-D neutron source are compared. The experimental error of neutron spectra is about ±6%.

CHINA - CF IN CONDENSED MATTER
Chemical Abstracts, vol 120, 21 Mar. 1994

Yongli Ma, Hongxiu Yang, Xianxi Dai (Dep. Phys., Fudan Univ., Shenghai), "Theoretical Study of the Possibility of Cold Nuclear Fusion in Condensed Matter," *Hejubian Yu Dengliziti Wuli*, vol 12, no 3, 1992, pp 171-177, in Chinese.

AUTHORS' ABSTRACT

A strongly coupled cold plasma model is presented for cold nuclear fusion in condensed matter. The cold fusion rate is analyzed and explicitly derived based on an electrochemical analysis taking into account the strong Coulomb screening and the micro-heat nuclear effects. The theoretical results show that the fusion rate is insensitive to the temperature and density of D ions while sensitive to the screening correction factor, η, of the local D ions. For $\eta>2$, cold fusion may be detectable. Cold fusion of D^+ in Pd or Ti electrodes is discussed.

CZECH REP. - Z-PINCH PLASMA JET
Chemical Abstracts, vol 120, 27 June 1994

P. Kubes, J. Kravarik, J. Hakr, P. Kulhanek, J. Pichal, V. Perina (Fac. Electr. Eng., Czech Tech. Univ.), "Z-Pinch Plasma Jet," *IEEE Trans. Plasma Sci.*, vol 21, no 5, 1993, pp 605-606.

AUTHORS' ABSTRACT

The z-pinch is formed in a low pressure pulsed discharge between two conical electrodes having an axial symmetry. In

such a configuration the plasma jet can be created. Results of the jet study by the schlieren and interferometric diagnostics were used for the design of the application with a similar electrode configuration, where the z-pinch effect drives the plasma through the hole in the cathode towards a metallic surface placed behind the anode. Preliminary results of the pulse coating of the target by material from both the anode and the chamber-filling gas are presented.

FRANCE - EMBRITTLEMENT BY TRITIUM

G. Bellanger (Commissariat à l'Energie Atomique, Centre d'Etudes de Valduc, Is sur Tille), "Embrittlement of Palladium and Palladium-Silver Alloy Cathode Membranes by Tritium," *Fusion Technology*, vol 27, no 1, Jan. 1995, pp 36-45, 18 refs, 15 figs.

AUTHOR'S ABSTRACT

Palladium-silver cathodic membranes are used in industrial tritiated water processing to produce very high purity tritium gas and its isotopes. During electrolysis, these adsorb on the cathodic surface, diffuse through the alloy, and finally are desorbed on the side opposite of the cathodic entry surface. This desorption occurs in a gas-tight compartment separated from the electrolyzer allowing the recuperation of pure isotopes. The diffusion is dependent on cathodic surface, PdAg thickness, temperature, deposits on the surface to favor the adsorption, and applied cathodic potential. Here, the embrittlement of palladium and PdAg alloy cathode membranes and the diffusion and solubility parameters were studied in tritiated water. Voltammetry curves were plotted to ascertain the conditions of cathodic charging with tritium as well as the effect of radiolytic hydrogen peroxide on palladium or PdAg. From the voltammetric curves, the diffusion coefficient, the surface solubility of tritium, and the thickness of the palladium and PdAg alloy involved were determined. Scanning electron microscope examinations show that the cracking is transgranular in the case of palladium, while it appears to be intergranular for the PdAg alloy. With palladium, this cracking involves all the surface subjected to charging, whereas for the alloy, only the surface at the electrolyzer gas atmosphere/electrolyte bordering zone would appear to be embrittled. This could be the result of the presence of two tritiated phases in palladium or in palladium-silver. The PdAg alloy is the less sensitive to embrittlement.

FRANCE - MAGNETIZED PLASMA

Chemical Abstracts, vol 120, 27 June 1994

Petro P. Sosenko, Viktor K. Decyk (LPMI, EC. Polytech., Palaiseau, Fr.), "Microscopic Theory of Magnetized Plasma: Quasiparticle Approach," *Phys. Scr.*, vol 49, no 5, 1994, pp 619-624.

AUTHORS' ABSTRACT

A quasiparticle approach is applied to develop the microscopic theory of magnetized plasmas and low-frequency phenomena in such plasmas for the case of potential interaction between the particles. The reduced Poisson law is derived in order to relate the self-consistent electric field in the plasma to the quasiparticle density in the reduced phase space. The reduced expression for the microscopic particle flux is also obtained. The importance of the finite-Larmor-radius effects in particle fluxes is demonstrated, and the polarization particle flux is explained with regard to the kinetic effects.

GERMANY - MUON-CATALYZED P-T FUSION

Chemical Abstracts, vol 12, 21 Mar. 1994

F.J. Hartmann, P. Baumann, H. Daniel, T. von Egidy, S. Grunewald, R. Lipowsky, E. Moser, W. Schott, P. Ackerbauer, et al. (Phys. Dep., Tech. Univ. Muenchen, Garching), "The PSI Experiments on Muon-Catalyzed p-t Fusion," *Hyperfine Interact.*, vol 82, nos 1-4, 1993, pp 259-269.

AUTHORS' ABSTRACT

The experiments on pt [protium-tritium] fusion performed at Paul Scherrer Institut, Villigen, Switzerland, are described. Liquid triple mixtures of protium, deuterium and tritium with low concentrations on deuterium and tritium were used. Gamma rays, x-rays, neutrons and, for the first time, conversion muons, were measured. Preliminary results are: Rate for spin flip from the triplet to the singlet state of $t\mu(1s)$, $\lambda_{10} = (1.0 \pm 0.2) \times 10^3\ \mu s^{-1}$; rate for muon-catalyzed pt fusion from the (I = 1) nuclear-spin state, $\lambda_{pt}^{f}(I=1) - 0.07 \pm 0.01\ \mu s^{-1}$; and the molecular formation rate, $\lambda_{pt}^{m} = (7.5 \pm 1.3)\ \mu s^{-1}$ (all normalized to liquid hydrogen density).

JAPAN - COLD FUSION EXPLANATION

Chemical Abstracts, vol 120, 27 June 1994

Hideo Kozima (Fac. Sci., Shizuoka Univ., Oya), "How the Cold Fusion Occurs?" *Rep. Fac. Sci., Shizuoka Univ.*, vol 28, 1994, pp 31-52.

AUTHOR'S ABSTRACT

Origin of the cold fusion phenomena is explained, putting weight on the typical and recent experimental results. The trapped neutron catalyzed fusion model is used to explain

consistently almost all experimental data obtained in this field until now.

JAPAN - STATUS OF COLD FUSION

Chemical Abstracts, vol 120, 21 Mar. 1994

Ken Ichiro Ota, Hideaki Yoshitake, Nobuyuki Kamiya (Yokihama Natl. Univ., Yokohama), "Present Status of Cold Fusion," *Hyomen Kagaku*, 1993, vol 14, no 9, pp 570-573. A review with 9 refs.

JAPAN - MULTIBODY FUSION MODEL

Akito Takahashi, Toshiyuki Iida, Hiroyuki Miyamaru, and Morio Fukuhara (Dept. Nucl. Engr., Osaka Univ., Osaka), "Multibody Fusion Model to Explain Experimental Results," *Fusion Technology*, vol 27, no 1, Jan. 1995, pp 71-85, 28 refs, 16 figs.

AUTHORS' ABSTRACT

Worldwide cold fusion experiments have given anomalous results with regard to levels of kilo-electron-volts per atom excess heat, ^{4}He generation, level of emission of neutrons and tritons with a 10^{-4} to 10^{-7} neutron-to-triton yield ratio, and emission of high-energy charged particles, which cannot be explained by the known d+d fusion process. A previously proposed multibody deuteron fusion model in solids is elaborated further to explain these anomalous results.

A transient dynamics in metal deuterides is proposed to generate close pairs and clusters of deuterons with time-dependent deep atomic potential inducing a strong screening effect on Coulomb barrier penetration. Very approximate numerical estimations of reaction rates for the competing 2D, 3D, and 4D fusion processes in PdD_x and TiD_x are obtained with high-level reaction rates enough to explain observed heat levels. Decay channels of virtual compound states, i.e., ^{4}He*, ^{5}He*, ^{6}Li*, ^{7}Be*, and ^{8}Be* by 2D, H+2D, 3D, H+3D, and 4D fusions, are discussed in detail to know the nuclear products. Major generation of ^{4}He by H+2D, 3D, H+3D and 4D processes are concluded. Identification of particle types and their specific released kinetic energies is given to explain measured charged-particle spectra by deuteron beam implantation experiments.

NETHERLANDS - REDUCED RADIOACTIVITY OF TRITIUM

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

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 may point to a connection with cold DD-fusion.

AUTHOR'S CONCLUSIONS

...If we assume that tritons absorbed in the extremely small single Ti-crystals can combine into pairs and that the decay constant of such a pair is much smaller than that of a free triton, then the observed behavior of all TiT_x experiments can be explained.

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.

PAKISTAN - CONTAMINATION IN LOW ENERGY PLASMA

Chemical Abstracts, vol 120, 7 Mar. 1994

M. Zakaullah, Imtiaz Ahmad, G. Murtaza, M. Yasin, M.M. Beg (Dep. Phys., Quaid-i-Azam Univ., Islamabad), "Effect of Insulator Sleeve Contamination on the Low Energy Plasma Focus Performance," *Fusion Eng. Des.*, vol 23, no 4, 1994, pp 359-365.

AUTHORS' ABSTRACT

The characteristics of a low energy plasma focus of copper electrodes operated by a single 32 μF, 15 kV (3.6 kJ) capacitor with an insulator sleeve contamination are studied. When the plasma focus is operated, the insulator sleeve is contaminated due to the deposition of copper evaporated from the electrodes.

A slight contamination improves the system performance. When the cumulative discharge energy over successive shots across the insulator sleeve exceeds ~1 MJ, the copper deposition on the sleeve surface makes it rough with a grain-type structure, with a result that the system becomes less reproducible and shot-to-shot variations in neutron yield are pronounced. In addition, a high voltage probe records multiple foci formation, giving rise to multiple neutron pulses, multiple x-ray pulses, as well as multiple ion beams. When the cumulative discharge energy approaches 1.6 MJ, the neutron yield starts deteriorating, and the resistor divider signal begins to indicate less compression. The neutron yield degradation occurs due to copper coating with grain structure on the sleeve surface, which decreases the resistance of the sleeve surface and may therefore increase the current partition and eventually lower the snowplow efficiency. The situation may improve if low-sputtering-rate conductors are employed for the electrodes of the device or the truncated end of the anode is lined with low-sputtering-rate material like molybdenum.

ROMANIA - QUASIMOLECULAR STATES
Chemical Abstracts, vol 121, 22 Aug. 1994

Cornelia Grama, N. Grama, I. Zamfirescu (Inst. At. Phys., Bucharest), "New Class of Resonant States for Potentials with Coulomb Barrier: Quasimolecular States," *Ann. Phys. (San Diego)*, vol 232, no 2, 1994, pp 243-291.

AUTHORS' ABSTRACT

The global method for all S-matrix poles identification is extended to a short-range potential with Coulomb and centrifugal barrier. The pole function $k=k_l(g)$ is analyzed by constructing the Riemann surface on which it is single valued and analytic. New-class poles are identified and their properties are studied. They are located in finite regions of the k-plane in a neighborhood of the stable-points on the images of certain Riemann sheets. The new-class poles approach the stable-points for a sufficiently deep potential well. For a given potential strength g there are new-class poles on the others. The special points of the Riemann surface acquire a remarkable physics meaning. The branch-points are transition points of the quantum system from the old-class resonant states localized in the region of the potential well to the new-class resonant states localized in the region outside the potential well. The stable-points are points where the system is almost insensitive to the variation of the potential strength. The new-class resonant states are doorway states whose stability is a consequence of the localization of the wave function rather than of a symmetry. The states of the system are characterized by the quantum number n with precise topological meaning: the label of the Riemann sheets. Analytical formulas for the energy and width of a new-class resonant state corresponding to a pole in the neighborhood of a stable-point are given. Quasimolecular states are new-class resonant states corresponding to poles in the neighborhood of certain stable-points. The properties of the quasimolecular states (energy, widths, deviation from the linear dependence of the energy on 1(1+1), doorway character, and criteria for observabilty) result naturally from the general properties of the new-class resonant states. A unitary treatment of the quasimolecular states moth below and above the Coulomb barrier is given.

RUSSIA - RADIATION MEASUREMENT
Chemical Abstracts, vol 121, 22 Aug. 1994

V.S. Bushuev, V. B. Ginodman, L.N. Zherihina, S.P. Kuznetsov, Yu.A. Lapushkin, I.P. Matvienko, A.I. Nikitenko, A.D. Perekrestenko, N.P. Saposhnikov, et al. (Russia), "Experimental Measurement of Nuclear Radiation from Electrolyzed Heavy Water," *Tr. Fiz. Inst. im. P.N. Lebedeva, Ross. Akad. Nuak*, vol 220, 1992, pp 89-95, in Russian.

AUTHORS' ABSTRACT

An attempt was make to detect the proposed emission of neutrons and gamma-rays during the electrolysis of heavy water with Pd electrodes. The effect of pulsed emission of neutrons is very unstable. The absence of reproducibility does not allow one at present to reach any unequivocal conclusions on either the mechanisms of this effect or its magnitude. Several types of electrolytic cells were used and the electrolyte was a 30% solution of D_2SO_4 and D_2O.

RUSSIA - PROBABILITY OF CF IN SOLIDS
Chemical Abstracts, vol 121, 22 Aug. 1994

V.S. Demidenko, V.I. Simakov (Russia), "Deuterium State and Probability of Cold Nuclear Fusion in Solids," *Izv. Vyssh. Uchebn. Zaved., Fiz.*, vol 36, no 10, 1993, pp 20-30, in Russian.

AUTHORS' ABSTRACT

Calculations were made of the deuteron potential and the probability of the cold fusion reaction of D in the compound TiD_2 and its alloys with 3D-transition elements. In the band model of a deuteron gas in the solid state, the influence was examined of diffusion fluxes on the reaction rate. Even the solid-state itself substantially decreases the Coulomb barrier of the nuclear reaction in comparison with a deuteron gas. However, it is a required condition in the solid state that there are present physical processes in the field forming the nonequilibrium state of the deuteron subsystem..

RUSSIA - RADIATION & TRITIUM GENERATION
Chemical Abstracts, vol 120, 21 Mar. 1994

R.A. Stukan, Yu.M. Rumyantsev, A.V. Shishkov (Inst. Khim. Fiz. im. N.N. Semenova, Moscow), "Generation of Hard Radiation and Production of Tritium in the Electrolysis of Heavy Water," *Khim. Vys. Energ.*, vol 27, no 6, 1993, pp 65-70, in Russian.

AUTHORS' ABSTRACT

The development of hard radiation in the electrolysis of D_2O with Pd or Ti cathodes is shown. The characteristics of the radiation allow one to suggest the existence of a neutron component in its makeup. The significant generation of radiation begins after an induction period of 1-3 hours; the buildup of Tritium in the bulk of the electrolyte is also observed at the same time. If it is proposed that the generation of neutrons and the formation of Tritium are related to the 2 channels of the nuclear reactions $D + D \rightarrow {}^3He + n$ and $D + D \rightarrow T + p$, then from preliminary estimates, the probability of the 2nd channel is >5 orders of magnitude greater than that of the channel in which neutrons are formed. Excess heat production was not observed in the experiments.

RUSSIA - TITLES OF PAPERS PUBLISHED
Chemical Abstracts, vol 120

Only the titles have been translated at this time.

N.S. Biryukov, B.V. Zhuravlev, M.G. Kobozev, S.P. Simakov, V.A. Talalaev (USSR), "Search for Neutrons in Cold Nuclear Fusion," *Kholod. Yader. Sintez,* vol M, 1992, pp 41-44, in Russian, from *Ref. Zh. Fiz. (A-Zh)*, 1993.

B.V. Deryagin, A.G. Lipson, V.A. Klyuev, Yu.P. Toporov, D.M. Sakhov, M.A. Kolobov (USSR), "Mechanoemission and Cold Nuclear Fusion," *Kholod. Yader. Sintez,* vol M, 1992, pp 45-48, in Russian, from *Ref. Zh. Fiz. (A-Zh)*, 1993.

B.Ya. Gupsovskii (USSR), "Experiments for Seeding Cold Nuclear Fusion," *Kholod. Yader. Sintez,* vol M, 1992, pp 49-52, in Russian, from *Ref. Zh. Fiz. (A-Zh)*, 1993.

R.N. Kuz'min, A.P. Kuprin, P.O. Revokatov, E.M. Sakharov, B.N. Shvilkin (USSR), "Yield of Products of Nuclear Reactions in Metal-Deuterium Systems," *Kholod. Yader. Sintez,* vol M, 1992, pp 97-102, in Russian, from *Ref. Zh. Fiz. (A-Zh)*, 1993.

Yu.N. Bazhutov, A.B. Kuznetsov, Yu.P. Chertov, V.A. Zhirnov, E.I. Saunin, A.A. Khodyakov (USSR), "Experimental Studies of a Model of Cold Nuclear Fusion," *Kholod. Yader. Sintez,* vol M, 1992, p 7, in Russian, from *Ref. Zh. Fiz. (A-Zh),* 1993.

UKRAINE - THREE CLUSTER SYSTEMS
Chemical Abstracts, vol 120, 27 June 1994

A.V. Nesterov (Inst. Teor. Fiz. im Bogolynbova), "Many-Particle Oscillator Basis Technique in the Study of Three-Cluster Systems," *Yad. Fiz.*, vol 56, no 10, 1993, pp 35-46, in Russian.

AUTHOR'S ABSTRACT

The problem of the generalization of the RGM algebraic version to the three-cluster systems is considered. The main points of the calculation technique are discussed.

F. ARTICLES FROM OUR READERS

HYDROGEN IN COSMOS, METALS AND LIFE
By C. Warren Hunt

The atomic universe is built on a base of hydrogen, a one-proton, one-electron combination that comprises 97% of all matter in the universe. Other elements are composites of this pair, and their chemical and physical behavior result from interactive attractive and repulsive forces between the components.

Of the forces involved: gravity, the weak and strong atomic bonds, Coulomb forces, electromagnetism, and magnetism, nothing fundamental is understood in science. All of these forces appear to act at a distance; and no one knows how they are transmitted from one component to another. Scientists have devised ways to deal with the forces and thus to predict them; and this understanding has led to the much-vaunted technology of our day. But we still know little of the fundamentals behind these forces, which is the same as saying, "we do not understand the source of the energy of the universe!"

Neither do we understand the fundamentals of the matter in the universe. The simple proton-electron combination of hydrogen is just a start on what makes up the protons, electrons, their neutral and opposite-sign counterparts, and the menagerie of variously-stable disintegration products. However, the rules for prediction seem to work.

Essential factors for confidence by scientists rest with the laws of thermodynamics. "Everything obeys the laws of thermodynamics!," says a physicist-colleague of mine. "But does it," I respond, thinking of life forms. Primitive bacteria abhor oxygen and live on energy they extract from hydrogen. But out of their environment these creatures produce the sustenance for "more advanced" forms that not only tolerate oxygen but wither and die without it. The great chain of life then starts with a building process, a seemingly purposeful assembling from previously lifeless but often complex and supposedly randomized dispersions, new molecular compounds that sustain further forms that do similar things. And, so forth, it goes in an endless chain of improvement. It all starts with the essential energy of primordial hydrogen, from which the most "primitive" forms extract useful components and fashion new combinations, composites that are often ingeniously contrived, astonishingly functional, and ultimately supply the entire requirements of self-conscious organisms.

Hydrogen is key. Elemental hydrogen is the most energy-packed material of our universe. It has twice the energy of its nearest rival, acetic acid; triple that of light metal hydrides (like LiH); four times as much as most metal salts; six times as much as methane and water; fourteen times as much as nitrogen; and fifteen times as much as oxygen. Nothing can touch hydrogen as the primal energy carrier.

In 1994 we are reading about the strange experiments called *cold fusion* in which heat is released when hydrogen nuclei, protons that is to say, "fuse" spontaneously into other metals, notably palladium, but more recently into common metals such as sodium and potassium, and light metals such as lithium. Such an addition of a hydrogen proton entering the atomic nucleus is considered to be "fusion" (as distinct from the case of atomic hydrogen permeating the crystalline lattice of the metal, which is merely diffusion). Adding a proton to a metal atom changes the metal into something else, generically, we may say, into an "intermetal," the phenomenon is truly *transmutation* in the classical definition of that long-discredited term, an element made from another. Unavoidable consequences of adding a proton (which carries a positive charge) to an atomic nucleus are first that the diameter of the atom shrinks in response to the added attraction between the nucleus and the orbiting negative charges of the electrons and second, that the compressive action of the shrinking perimeter gives off heat.

The source of the heat in this kind of fusion is not known but may be analogous to the heat given off during the compression of gas. Orthodoxy says the latter heat is the sensory result of the gas molecules bumping each other more frequently after compression. But I am not aware that this has been demonstrated. And, even if it be true, what is radiant heat, photons vibrating at infra-red frequencies? There is nothing tangible here, only conceptions of convenience.

I would pose the question "What, if any, is the common link between, on the one hand, the extraction of heat from ambient hydrogen by primitive organisms, and on the other hand, the heat released by the *fusion* of a proton into an existing metal atom?" On the one hand, latent heat holds a key role in energizing the construction of something that did not exist previously, something that ultimately is conscious and self-motivating. On the other hand, we have heat release after *fusion* that happens spontaneously.

Light is shed on the fusion process by USSR research of Vladimir N. Larin [1]. **Larin showed that it takes high pressure (4GPa+ [about 64,000 tons/in^2]) to force hydrogen protons into potassium, but that continuing to raise the pressure injects more and more hydrogen in a straight-line relationship up to the limit of the experimental equipment.** Larin's injunction would be consistent with thermodynamic theory (the cold fusion injunction, which only occurs under special conditions that are difficult, to the point of chaotic, to reproduce, would violate it). Presumably fusion must give off heat, due to the occurrence of compaction, and the emitted heat should be comparable in quantity to the heat given off by gas compression. [The author apparently is not taking into account the exothermic properties of the proton-metal nuclear reaction. -Ed.]

The aspect of cold fusion that bears further attention is the difficulty of reproducing results. Large and reputable laboratories have reported no positive fusion results. Others turn up new and interesting positive results in an ongoing stream. Many different metals and processes are being tried. In one interesting report, it has been said that different batches of palladium made under apparently the same process behave differently in the laboratory, one giving fusion results, the other not. Quantum dynamics theory might suggest that this is a function of the "observer," in this case a worker in the preparation or in setting up the cold fusion experiment. [A tongue-in-cheek suggestion.]

What, then, is the difference between, on the one hand, unseen, *primitive* microbes working on disordered debris to produce sustaining heat and apparently willfully storing some of it in complex amino acids for future use, and on the other hand, spontaneous transmutations that only happen in defiance of thermodynamic law (entropy) and evidently with input from human operators, for the benefit of human operators. Which is the more creative? Could it be that life is defined as the will and ability to manipulate hydrogen nuclei?

[1] V.N. Larin, Hydridic Earth: the New Geology of our Primordially Hydrogen-rich Planet, 1993, Polar Publ., Calgary, ISBN-9695406-2-1

EDITOR'S COMMENTS

We suggest that the author read the following reference:

Hisatoki Komaki (Biological & Agricultural Research Institute, Shiga-Ken, Japan), "An Approach to the Probable Mechanism of the Non-Radioactive Biological Cold Fusion or So-Called Kervran Effect (Part 2)," Proceedings: Fourth International Conference on Cold Fusion, Volume 4, pp 44-1 to 44-12.

Perhaps we could change Hunt's last sentence to: "Could it be that life has the will and the ability to catalyze both chemical and nuclear reactions based on hydrogen nuclei?

We asked Hunt if the atom which when "adding a proton to an atomic nuclear are first that the diameter of the atom shrinks" necessarily had to shrink. He faxed, "I took the collapse idea from Larin, who poses it as the reason for negative isostasy - oceanic trench formation - among other things." We asked if there was laboratory evidence of elemental transformation under the high pressures. Hunt faxed, "The idea of intermetal formation - fluidic metals - is anathema to that of new, stable isotopes or transmutations to other elements. The + charge, as I see it, is the reason intermetals behave like free ions, i.e. fluidically. They are inherently unstable, and lose the extra proton with pressure decrease. I have explained low pH(3-4) waters, which we encountered in the transformed granite terrain at Ft. McMurray, Alberta, as carrying these escaped protons, H^+ ions, in other words. I cannot see any other source for such pHs in natural environments."

We are grateful to C. Warren Hunt for bringing to our attention another view of hydrogen from the technology of geology. The basic concept that the earth (and other planets) were formed by the accretion of hydrogen-rich elements and that the high pressures result in dramatic changes (possibly nuclear changes) denotes a new cosmic chemistry. Add to this another concept that shows that a solar mass rotating in a thin plasma can transfer its momentum to the fingers of the solar plasma by electromagnetic forces and we have an engaging view of how the solar system could have been formed. See the review on The Big Bang Never Happened next in this issue.

A PARADIGM TOO FAR?
By Peter Glück

Is cold fusion a science? Not yet, because by definition: "A science is any discipline in which the fool of the present generation can go beyond the point reached by the genius of the last generation" (Max Gluckman).

We all, geniuses, bright scientists, common researchers, fools and me belong to the first generation dedicated to battles and sacrifices, we try to build the House of Cold Fusion in perpetual stormy weather. The next generation will have the decisive advantage to use the good paradigm and will take the profit.

I dare to predict that finally everybody will be happy: the skeptics because cold fusion is not exactly genuine D-D fusion. The believers because cold fusion is the inexhaustible source of energy of the future, and, finally, Mankind because he will use this energy.

To be a science, cold fusion needs its own paradigm, and this isn't ready yet.

A paradigm for Cold Fusion.

A basic difference: Cold Fusion belongs to Solid State which is: Developing science/Developed technology.

Hot Fusion belongs to Plasma Physics which is: Developed science/Developing technology.

In both cases, as in politics or economics, `developing' is merely an euphemism for underdeveloped; many essential subfields of solid state e.g. high temperature superconductivity, conductive polymers, porous silicone, heterogeneous catalysis actually do not have a real, quantitative, predictive theory but are prospering technologically. **Each of these fields is a technological miracle grafted on a theoretical quagmire, and who cares?** This is always forgotten and a cold fusion theory is ever more insistently requested, however both similarity and synchronicity suggest that such a theory cannot be worked out yet.

Two recent papers [1,2] written by seven authors with a total IQ of well over 1000 (is this really additive?) scan the entire range of cold fusion theories and conclude, one explicitly [1] and one implicitly [2]: no theory possible.

For cold fusion a paradigm shift or a new paradigm is necessary; this is a complex action comprising: transport, transfer, and transformation of truths, theories, totems and taboos of established fields for the use of the new one. The paradigm of hot fusion was the first choice, however, the two paradigms are so different, between them there is a conceptual abyss, and the strategy adopted was, unfortunately, enough to pass this abyss by small steps. The result is: many strange hybrids with a very low life expectancy.

Troubles with the replacement paradigm.

The central problem of hot fusion is the Coulomb barrier, an obstacle which can be passed by high temperatures; for room temperature fusion, we have to find something similar, according to the replacement paradigm, it has to be high pressure! A palladium lattice oversaturated with deuterium is ideal for packing and squeezing the deuterons, therefore, the great totem has to be the D/Pd ratio, and everything happens inside the lattice, and only in the lattice. In the whole lattice, cold fusion is a bulk phenomenon. Little was changed when Mills and co-workers demonstrated that heat excess can also be obtained with light water [3], that is: CF is not a privilege of deuterium, and later new proofs of a kind of Isotopic Democracy came to change the first naive image of the field: the systems of Dufour [4] (gas sparking), Piantelli et al. [5] (gas/solid, electromagnetic stimulation) are working with both H and D, however, democracy is not perfect equality. Two systems using ultrasound to obtain excess heat have been discovered. One is based on heavy water [6] and gives heat plus helium. The other is a commercial patented apparatus for heating fluids, extracting a lot of free Btu's from ordinary water [7].

Many other materials besides palladium proved to be `CF active' that is CF is more general and less specific than we had thought in 1989.

Actually a theory has to elucidate three aspects of the phenomena locus, nature and mechanism. The first two of these are correlated in part but not predetermined as it was considered by extrapolating the paradigm of hot fusion well beyond its limits of validity. Despite a plethora of experimental facts, "the locus is the bulk" and "the nature of the reactions is obviously D-D fusion" became axioms and only a few heretics tried to discuss about possible alternatives.

Due to the domination of the hybrid paradigm, the problem of understanding cold fusion was attacked in the reverse order (the proper being: locus - nature - mechanism) or only in part by treating the mechanism of reactions, admitting tacitly that locus and nature are well known from the start. Invariably, only depth-first approaches have been used, however, we now need breadth-first approaches, so useful in cases of interdisciplinary fields where a vision is essential. In these circumstances, after over 5 years, cold fusion has existential problems. In the same time this situation is quite normal for a brand new science, and a question "To be or not to be?" for CF is actually stupid, a symptom of dualistic thinking. The answer as almost always given by nature is of the "mu" type (see please the books of Pirsig, Hofstadter, Capra which are essential for understanding physics). Actually, the skeptics are searching for genuine fusion and the believers for a non-chemical, non-exhaustible source of energy. The answer, any answer has different significance for the parties in confrontation.

To some extent, both skeptics and believers are victims of **group think**: dualistic thinking and thinking small.

An alternative.

By an objective analysis of the facts, and by trying to use the methods of creative thinking, I started to build an alternative paradigm [8,9]. The essential points are:

- cold fusion is an extreme case of catalysis;
- positive and negative results are compatible, in the frame of our approach we can accommodate seemingly antithetical concepts;
- irreproducibility is not the karma of CF, it is a direct consequence of the catalytic nature of the phenomena, it is a great informational asset and can be eliminated by technology;
- to understand the field we need a global approach: all systems, all results, all phenomena, and above all, all the isotopes of hydrogen;
- everything happens on the surface or very near to it, and only in certain active sites of it, just as in case of catalysis; the role of the bulk is to support the surface;
- the clue is not pressure but mobility.

Two papers published in 1994 demonstrate the creative abilities of the very high surfaces; using titanium soot, impregnated with tritium, Reifenschweiler[10] could change the radioactivity of tritium; the double structured cathodes of the Arata cell comprising palladium black, i.e. another ultra-dispersed material with a huge surface resulted in a reproducible, intense heat excess (200 MJ in 3000 hours). Such particles guarantee the presence of many catalytic centers.

The very high loading ratios attained by Celani, et al. [12], D/Pd = 1.2 who used very short pulses of current, didn't give the expected great excess heat values, substantiating our idea that global loading is nothing more than a prerequisite of high local loading.

Excess heat was obtained in a new system, ionic implant of deuterium in aluminum followed by electron bombardment, a very important result, I think (Kamada, l994). The micrographs clearly show that the metal is locally melted at the deuterium molecular collections/Al interface. [13]

Temporarily, we have to give up hope (but not search !) for a theory and have to accept that cold fusion will develop as a technology and: "Technology is not a science, not a discipline, not a tool and not engineering. It's know-how." (Alfred Wechsler)

This is very bad news for some of our friends. However, we will soon be able to understand some basic facts and will have a usable paradigm. Don't forget, even Confucius was advised by his ancestors to "Gain power by accepting reality."

References.

[l] V.A. Chechin, V.A. Tsarev, M. Rabinowitz, Y.E. Kim, "Critical Review of Theoretical Models for Anomalous Effects in Deuterated Metals," *International Journal of Theoretical Physics*, vol 33, no 3, 1994, pp 517-670

[2] M. Fleischmann, S. Pons, G. Preparata, "Possible Theories of Cold Fusion," *Nuovo Cimento*, vol 107A, no 1, Jan. 1994, pp 143-154 (these papers do not pass the barrier of the Pd/D_2O system)

[3] R.L. Mills, S.P. Kneizis, "Excess Heat Production by the Electrolysis of an Aqueous Potassium Carbonate Electrolyte and the Implications for Cold Fusion," *Fusion Technology*, 20, Aug. 1991, p 65.

[4] J. Dufour, J. Foos, J.P. Millot, "Cold Fusion by Sparking in Hydrogen Isotopes," Cold Fusion Source Book, edited by Fusion Information Center, Utah, May 1994, paper no 27.

[5] S. Focardi, R. Habel, F. Piantelli, "Anomalous Heat Production in Ni-H Systems," *Il Nuovo Cimento*, vol 107A, no 1, Jan. 1994, pp 163-157.

[6] R. Stringham, "Cavitation Induced Micro-fusion," 4th International Conference on Cold Fusion, Maui, Hawaii, 6-9 Dec. 1994, paper no 3.9.

[7] J.L. Griggs, "Calorimetric Study of Excess Heat Production within the Hydrosonic Pump System using Light Water," Cold Fusion Source Book, edited by Fusion Information Center, Utah, paper no 42.

[8] P. Gluck, "The Surfdyn Concept: An Attempt to Solve the Puzzles of Cold Nuclear Fusion," *Fusion Technology*, 24 Aug. 1993, p 122.

[9] P. Gluck, "Cold Fusion - a Logical Network Approach," International Conference on Cold Fusion, Minsk, Belarus, May 24-25, 1994.

[10a] O. Reifenschweiler, "Reduced Radioactivity in Small Titanium Particles," *Physics Letters A*, 184, 1994, pp 149-153.

[10b] O. Reifenschweiler: II. More detailed description of our experiments with proposals to improve the experimental technique (provided by the author)

[11] Y. Arata, Y-C. Zhang, "A New Energy Caused by `Spillover Deuterium'," Proc. Japanese Academy 70, ser. B (1994), pp 106-111, communication by Jed Rothwell. See page ?? this issue.

[12] F. Celani, A. Spallone, P. Tripodi, A. Petrocchi, D. Di Gioacchino, M. Boutet, "D/Pd Loading Ratio up to 1.2:1 by High Power Microsecond Pulsed Electrolysis in Pd Plates," Cold Fusion Source Book, edited by Fusion Information Center, Utah, May 1994, paper no 25.

[13] K. Kamada, H. Kinoshita, H. Takahashi, "Anomalous Heat Evolution of Deuteron Implanted Al on Electron Bombardment," National Institute for Fusion Science, Report NISF-281, May 1994.

G. BOOK REVIEWS

THE BIG BANG THAT WASN'T
A New View on Cosmic Energy
Review by Hal Fox

Eric J. Lerner makes a strong case that the **Big Bang** didn't happen [1]. In this book is an excellent, in my view, alternative cosmology based on some of the work of Ilya Prigogine [2]. The following is my summary of Lerner's description [page 295ff in Reference 1]:

The Early Plasma Sea (Power Density: 10^{-34})

Instead of a "Big Bang" out of nothing, assume that much earlier than the hypothetical "Big Bang," there was a relatively uniform, vast (infinite, if you like) sea of hydrogen plasma (protons and electrons) characterized by some motion and energy and, therefore, there would be magnetic and electric fields. Any small perturbation in such a plasma (plasmas are, generally, unstable) would result in some localized combinations of vortex and filament flow. As shown in the laboratory, such plasma instabilities can be expected to combine with other perturbations moving in the same direction. Over time, say one trillion years, these low level plasma filaments of energy would tend to collect, increase in size, and become locally highly energetic. Based on Maxwell's equations, it can be expected that huge webs of large filamentary structures would eventually be formed. The largest of such rivers of energy could measure five billion light years in radius. These structures would not be inconsistent with the size of large galactic clusters observed in our universe. If Maxwell's law of electromagnetics were the only forces involved, such a universe would run down eventually.

Energy From Gravity (Power Density: 10^{-6})

About one trillion years later it would be expected that some new elements should have been developed within these plasma bodies and, together with the hydrogen, would have been the source of gaseous clouds from which suns and planets could develop. Now a new source of energy is available: the energy from gravitation. As matter compresses, energy is provided locally and the power density increases. If gravitational energy only were involved, again we could expect an ultimate decay of this universe. This evolving universe could consist of galaxies after about 1 billion years, galactic clusters after about 10 billion years, and super clusters after about 100 billion years. However, another force is needed.

Nuclear Reaction Energy (Energy Density: 1,000)

The energy from the collapsing of matter into large bodies (fueled by gravity) now enables nuclear reactions to take place in the center of large bodies. The enormous energy (from nuclear reactions) creates sun-like radiation, X-rays, and eventually the huge explosions from the occasional supernovas. These explosions provide the debris from which some of this process can begin again. Energy increases, new elements are formed, suns, planets, moons, galaxies, and clusters of galaxies, continue to be produced and evolve. These rotating galaxies become enormous electrical generators and ribbons of energy flow out axially from the centers of rotation (as has been observed in the heavens). Now the universe is more highly energetic. What else can increase the energy?

Biological Energy (Power Density: 30,000)

Regardless of how life was formed or evolved, it is interesting to note that life is an ordering process. The energy provided within a cell of a mammal is far higher, in terms of Power Density, than the power density of energy within our sun. The decay of, or the "running down," that is characteristic of some systems (increasing entropy) is reversed within a biological structure. These life forms become sources of energy and contribute to the production of new compounds (even new elements according to some sources). Now consider how else the local energy density might be increased.

Social Energy (Power Density: 10^{31})

Some life forms, especially humanoid, have gathered into social organizations, have developed a better understanding of the universe (at least locally), and have become creators of energy. Energy creation and use has grown from animal power, to fossil fuels, and to nuclear energy. At this time we have been able to increase the local density of energy to a remarkable 10^{31} ergs per second per square centimeters in a plasma-focus device. Who knows what may happen next?

New Forms of Energy (Power Density: ???)

Not covered by Eric Lerner in his book is the question of radiative energy. As the ordering process in the universe has occurred over the past two trillion years (of the above scenario), and assuming our location within a very large universe, we should consider what has happened to all of the energy that has been emitted as electromagnetic radiation. According to scientists like Boyer, Wheeler, and Puthoff [3] this energy is the Lorentz Field Vacuum Energy (also known as ZPE or zero-point energy) which exists throughout all space, including around and within us. After two trillion years of an "ordering process," we are now capable of giving serious consideration to tapping this enormous source of cosmic energy. First, we had to acknowledge that it existed. The discovering of new sources of energy and the reporting of results are the ongoing tasks of *New Energy News.*

Note: For those of you who have been concerned about the "Big Bang" that could end in a "Big Collapse," you may be comforted by this more rational cosmological view of the universe. Happy New Year!

REFERENCES

[1] Eric J. Lerner, The Big Bang Never Happened, Vintage Books, New York, c1992, 466 pages, 140 refs, 59 figs, indexed.

[2] Ilya Prigogine & Isabelle Stengers, Order Out of Chaos, Bantam Books, New York, c1984.

[3] Harold E. Puthoff, "Source of Vacuum Electromagnetic Zero-Point Energy," *Physical Review A*, Vol 40, No 9, Nov 1, 1989, pp 4857-4862.

THE HOMOPOLAR HANDBOOK, a Definitive Guide to Faraday Disk and N-Machine Technologies by Thomas Valone, Integrity Research Institute, 1377 K Street NW, Suite 204, Washington, D.C. 20005, c 1994, 180 pages, illus., indexed.

Review by Hal Fox

In the 1980s, Valone became very interested in the homopolar motor, first discovered by Faraday in 1831. The result has been both experimental and investigative research. Valone ends his preface with "The first few years of the 1980s were very exciting to me. As our collective knowledge continues to grow, stretching the boundaries of science and awareness, the future has to improve." In between, Valone has written forthrightly and without the flurry of emotion that often attends discussion of past relics and future promises. In his 37 pages of discussion, Valone covers an Introduction, the Historical

Development, the History of the Torque Controversy, The Classical Theory of the Faraday Disk Dynamo, "Unipolar Induction is Fundamentally a Relativistic Effect", General Relativistic Approach for Rigorous Scientists, The Theory of Armature Reaction and Resulting Back Torque, and Experimental Results with Different Homopolar Generators. The rest of the book is devoted to appended material which includes copies of a variety of papers about homopolar machines, some of which are papers by the author.

For anyone who would be involved in the development or the financing of homopolar motors or generators, this book should be carefully studied. Valone does not predict that this type of machine will provide over-unity energy, nor does he deny future developments. He does note that no one, to his knowledge, has proven that such a device can generate more energy than used to drive the device. In his final paragraph he states the following:
Naturally, the area of unipolar, homopolar, or Faraday generators will continue to grow as DC power comes back into use on a large scale. In the near future, superconductors will reach room-temperature and thereby make DC power much more efficient, safer, and less costly to transmit. Superconducting power transmission cables will be designed to carry large amounts of current without loss and the homopolar generator/motors will play a big role in power generation, utilization and possible inverting for AC output. Possibly we will then see developments in the efficiency of these generators, beyond what is achieved even in the highly-tuned research laboratories of today.

This reviewer's only fault-finding was Valone's unnecessary negative comments about Stefan Marinov. Unfortunately, for those who know Marinov well, the comments unfairly reduce Valone's creditability. The readers should ignore this faux-pas and accept the excellent contribution Valone makes to this subject.

H. MEETINGS & MISCELLANEOUS

The FIFTH INTERNATIONAL CONFERENCE on COLD FUSION--ICCF-5 9-13 April 1995
Monte Carlo, Monaco

We are pleased to announce that the Fifth International Conference on Cold Fusion (ICCF-5) will be held from 9 April (Sunday evening) - 13 April (Thursday) in Monte Carlo, Monaco.

Five years of intensive investigation have uncovered a wide variety of unexpected phenomena occurring in reactions of deuterium in condensed matter under ambient conditions. Further progress has been made in many laboratories during the last few months in experiment design, reliability and reproducibility.

The purpose of this conference is to provide a forum for scientists engaged in active research on the subject to interchange ideas, present recent results and consider the significance of these new results, demonstrations and developments in the theory. We would like to extend our warmest invitation to all of you to join together in this discussion of the research.

Registration was due on January 1, 1995, but you might write or call for information to:

Mr. Jacques Payet, ICCF-5
c/o IMRA EUROPE S.A., Centre Scientifique
B.P. 213 - 220, rue Albert Caquot
06904 Sophia Antipolis Cedex, France
Tel: (33) 93 95 73 37 Fax: (33) 93 95 73 30

FIRST CALL

1996 INTERNATIONAL WORLD ENERGY SYSTEM CONFERENCE
June 19, 20, 21, 1996
Toronto, Canada

"The World Energy System: The Transition from Local, National, Regional, to Global Energy Philosophy"

The aim of the conference is to define the requirements and evolution in new key areas of world energy system.

THEMES: Global and long term views on energy resources; infrastructure; conservation and efficient use of energy; new technologies; forecasts on future developments; models & management of energy systems.

SPONSORS: Faculty of Engineering and Applied Science, Ryerson Polytechnical University and the Canadian Institute World Energy System, both of Toronto, Ontario, Canada.

DATES: Participation notice: June 30, 1995; Date to submit papers: December 31, 1995; Registration of participants: June 18, 1996; Conference: June 19-21, 1996.

For information contact the Canadian Institute World Energy System, 5 Strathgowan Crescent, Toronto, Ontario, M4N 2Z6 Canada, Tel: (416) 487-0479, Fax: (416) 489-4413, E-mail: WES@acs.ryerson.ca

Fusion Facts Subscription Office
P.O. Box 58639
Salt Lake City, UT 84158
Phone: (801) 583-6232 NEW FAX: (801) 583-2963

Street Address: 540 Arapeen Drive, Suite 209
University of Utah Research Park
Salt Lake City, UT 84108

***FUSION FACTS* Each Issue Mailed First Class.**

12 ISSUES.....	(University or Corporate).....	$ 300
36 ISSUES.....	(University or Corporate).....	$ 800

***FUSION FACTS* SINGLE ISSUES**

CURRENT ISSUES EACH.....$ 30
3 MONTHS OR OLDER ISSUES EACH.....$ 10
All back issues available.

SUBSCRIPTION REQUEST

For your convenience you can order by phoning (801) 583-6232, or **FAX** (801) 583-2963, or use the **Mail.**

Send *Fusion Facts* to:

NAME:_____

COMPANY:_____

PO BOX, DEPT:_____

CITY:_____

STATE_____ZIP_____

Please pay with a check in U.S. dollars drawn on a bank located in the U.S. or with a Postal Money Order. Send check or money order with order and receive one extra issue free. Make checks payable to *Fusion Facts*.