FUSION Facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

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

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FUSION FACTS NAMES KUCHEROV, KARABUT, AND SAVVATIMOVA AS FUSION SCIENTISTS OF THE YEAR 1992

YAN R. KUCHEROV

ALEXANDER B. KARABUT

IRINA B. SAVVATIMOVA

CONTENTS FOR JANUARY 1993

A. SCIENTISTS OF THE YEAR

Fusion Facts is pleased to name Drs. Yan R. Kucherov, Alexander B. Karabut, and Irina B. Savvatimova as **FUSION SCIENTISTS OF THE YEAR 1992.** This annual award is made yearly by the staff of *Fusion Facts* and is awarded to the scientist or scientists whom we believe have published or presented the most interesting or newsworthy advance in the new science of cold fusion. These innovative and dedicated scientists all work with the Luch Association, Podolsk, near Moscow, Russian Federation. These three join the following former recipients of this prestigious award:

1. Drs. Stanley Pons and Martin Fleischmann, were the obvious winners of the award for 1989.

2. Drs. Bruce E. Liebert and Bor Yann Liaw, University of Hawaii, received this award for 1990 with their excellent work on molten-salt cold fusion.

3. Drs. Robert Bush, Robert Eagleton (both of California Polytechnical University at Pomona) and Dr. Randell Mills (Lancaster, Pennsylvania) shared the award for 1991 with their work on showing that significant cold fusion could be achieved using light water.

Note: Dr. Irina B. Savvatimova is the first female winner of the Fusion Scientist of the Year award.

GAS PLASMA DEVICE

These three inventors/scientists have invented and developed a gas-plasma device that has produced as much at 500 percent excess heat and has produced up to 1800 degrees C (but not at the same time.) The gas-plasma device uses electrodes with a thin piece of palladium imbedded in the cathode. Voltages up to 500 volts are applied using a low pressure (in the glow-discharge region) deuterium gas. Under proper experimental conditions excess heat is produced. In addition, the device has been shown to produce measurable amounts of neutrons that are definitely above background levels. Due to the amount of excess heat produced and because of the perceived potential for high temperature operation, this device appears to have great potential in the expanding number of devices that produce excess power. See References.

INTRODUCING THE WINNERS

Dr. Yan R. Kucherov was born February 23, 1951 in Kharkov, U.S.S.R. He graduated from the Moscow Physico-Engineering Institute in 1975 where he specialized in solid-state physics. His thesis topic was "Polarisation of semiconductor laser emission." He specialized in Heat Physics at the Podolsk Technological Research Institute and received his Ph.D. in 1984. His dissertation was "High Current Cathodes for Plasma Generators," a classified document. Dr. Kucherov also received his Patent Lawyer Diploma in 1985.

Kucherov joined the Lebedev Physical Institute as an Intern Engineer and served from 1974 to 1975. His work involved semiconductor lasers and physical optics. In 1975 he joined the Luch Association with an assignment in the Nuclear Materials Department where he worked for four years. In this research and development work he studied the physical properties of hydrides and refractory metals, and nuclear spectrometry. The next ten years (1979 to 1989) Kucherov worked at research and development in the Nuclear Rockets Department. His experience included high-current thermionic cathodes for arc-plasma generators; plasma test beds and their applications; nuclear materials compatibility; calorimetry, hydrodynamics, gas-dynamic lasers; plasma metallurgy; and program management. Since 1989 Dr. Kucherov has worked as a program manager in the Nuclear Material Science Department where he has managed research and development in plasma technology and cold fusion. During this eighteen years of service with the Luch Association Dr. Kucherov received promotions having the titles of Engineer, Junior Scientist, Scientist, Senior Scientist, and Leading Scientist.

Kucherov has 21 patents and 82 publications from the various fields of technology in which he worked. He received a 1982 award as Best Engineer at Luch. During the 1979-1987 period he received three awards as Best Young Scientist at Luch and six prizes for the best scientific work at Luch. He was twice nominated Secretary for the Near-Electrode Phenomena section of the Soviet Plasma Generators Conferences in 1986 and again in 1989. In 1983 he received the Inventor Medal. In 1985 he received a Progress award (classified) and in 1988 received the Silver Medal at the Economy Achievement Exhibition.

Dr. Alexander B. Karabut was born December 9, 1945 in Shostka, Sumi Region, U.S.S.R. He graduated from Baumanski Moscow State Mechanical University in 1974 with special studies in Nuclear Engines. His thesis topic was "10 megawatt arc plasmotron with porous cooling system." He received his Ph.D. from Podolsk Technological Research Institute in 1987 where he specialized in heat physics. His dissertation was "R&D of high power plasmotrons."

Since 1974, Dr. Karabut has been employed with the Luch Association at Podolsk. From 1974 to 1991 he served in the Nuclear Rockets Department where he performed research and development with arc-plasma generators, high temperature gas reactor elements, spectral diagnostics for gas-dynamic lasers, and plasma chemistry. In 1991 Dr. Karabut moved to the Nuclear Material Science Department where he has been involved in cold fusion research.

Karabut has 27 patents and 95 publications to his credit. He has received five awards for the best scientific work at Luch

during the time 1975 to 1984. He also received the State Prize of the U.S.S.R. in 1982 for "Plasma arc generators development."

Dr. Irina B. Savvatimova was born February 10, 1942 in Gorki, U.S.S.R. She graduated in 1966 from Gorki Polytechnical Institute with special studies in welding technology. Her diploma topic was "Welding shop design." She received her Ph.D. at the Podolsk Technological Research Institute in 1982 specializing in material science and heat treatment of metals. Her dissertation was "The investigation of materials damage by low-energy ions."

Dr. Savvatimova has progressed from Engineer to Junior Scientist, Group Leader, to Senior Scientist in her 27 years working with the Luch Association. From 1966 to 1974 she worked in the Welding Laboratory where she was involved in the research and development of nuclear reactor fuel elements. In 1974 she joined the Nuclear Materials Science Department where she has performed research and development tasks involved in material damage by low energy ions, in plasma technology, and cold fusion.

She has 5 patents to her credit and has written 53 publications in the various fields in which she has worked. In 1982 she received an award as Best Scientist at Luch. In 1991 she received the Silver Medal at the Economy Achievement Exhibition. We especially congratulate Dr. Savvatimova for being the first woman to receive the Fusion Scientist of the **Year 1992 award.**

REFERENCES:

A.B.Karabut, Ya.R. Kucherov, I.B. Savvatimova (Scientific Industrial Assn. LUCH, Podolsk, Russia, "Cold Fusion Observation at Gas-Discharge Device Cathode." paper given at Conference on Nuclear Power Engineering in Space, May 15-19, 1990, Obninsk Institute of Physics and Power Engineering.

A.B.Karabut, Ya.R. Kucherov, I.B. Savvatimova (Scientific Industrial Assn. LUCH, Podolsk, Russia, "Gamma-Spectrometry at Glow Discharge in Deuterium," paper presented at ICCF3 Nagoya, Japan, Oct. 21-25, 1992.

A.B.Karabut, Ya.R. Kucherov, I.B. Savvatimova (Scientific Industrial Assn. LUCH, Podolsk, Russia, "Nuclear Product Ratios for Glow Discharge In Deuterium," *Phys. Lett A*, vol 170, 1992, pp 265-272. (Holland publication)

B. C.F. CONFERENCE AT MIT

Dr. Mitchell Swartz organized a cold fusion conference which was held during the Independent Activities Period at Massachusetts Institute of Technology (MIT, Cambridge, MA) on Saturday, January 16, 1993. The participants at the conference included the following speakers and subjects:

Mitchell Swartz chaired the conference. He is an electrical engineer (Sc.D., M.D.) who was working with low voltage noble metal cathodes for the inactivation of viruses and some tumors before Pons and Fleischmann announced their discovery. Dr. Swartz showed video films of some of the more recent Pons-Fleischmann work in France, tapes which they graciously provided for the seminar. These impressive videos were similar to those shown at the Nagoya conference in October, and were augmented by other video tapes.

Eugene Mallove (author of Fire From Ice, the best book to date on cold fusion) discussed the history of cold fusion.

V. Noninski (a Bulgarian scientist who with his famous father were the 5th group to replicate the Pons-Fleischmann Effect) discussed the problems that Cal Tech and MIT had with calorimetry in their early cold fusion work.

Peter Hagelstein (Associate Professor, MIT) summarized the latest experimental evidence from the Nagoya conference and discussed his theory of cold fusion.

Robert H. Rines (chairman of the Franklin Pierce Law Center) discussed the current patent problems caused by the patent office's treatment of cold fusion as not being a real technology.

Larry Forsley (from Rochester, N.Y.) made a brief presentation on his recent cold fusion experiment in which the palladium cathode boiled away the heavy water electrolyte.

Hal Fox (Editor of *Fusion Facts)* presented a paper on the commercialization of various types of cold fusion phenomena.

The conference was attended by about 90 persons including faculty, students and public.

The presentation by Dr. Hagelstein made no apologies for the new science of cold fusion. He presented some of the latest data that was presented at the Nagoya conference; stated his acceptance of the reality of cold fusion; and presented a summary of how cold fusion can be explained from fundamental physical principles.

Robert H. Rines discussed the problems with the current patent office treatment of cold fusion patents and made the following suggestions: Do not use the term cold fusion in any patent applications. If the application is rejected then the applicant has the options of filing a continuation in addition to a possible appeal of the rejection. If you have a successful experimental device or process have your work replicated by a party not involved with your patent application and have such person write a testimonial letter stating that your process

works and he has replicated it. He reminded us that inventors need not be concerned if their patent is not issued soon, as it may run out before cold fusion has commercial value.

This was followed by Hal Fox's presentation, which was clearly much more optimistic about the earlier and wider commercialization of cold fusion. The main thrust of Hal Fox's presentation was that there are now several devices, in addition to the original Pons-Fleischmann cell by which nuclear reactions in ambient conditions can produce excess heat. Hal suggested that the audience save some of their healthy skepticism (or dedicated denial) for the following methods of producing excess heat: light-water, nickel-cathode electrochemical cells; molten-salt electrochemical cells; gas-loaded devices; and capillary fusion. Commercialization potential was defined as the capability of a device to produce over 300% excess heat as compared to the input power.

Eugene Mallove presented a lengthy review of the history and politics of cold fusion. He began with the idea that nature was atomic (about 400 b.c.). Mallove continues to be one of the most vocal supporters of the concept that the government has no right to deny the existence of cold fusion. He has been very active in bringing the reality of cold fusion to the attention of government officials (both appointed and elected). Mallove planned a second presentation showing that cold fusion had the potential for the future propulsion of space vehicles, but the seminar ran out of time on this, too.

Larry Forsley showed the cell structure that was involved in a January 4, 1993 "turn on" of his palladium cathode that resulted in the "boil-off" of the heavy-water electrolyte. Forsley claims that he believes he has a repeatable process for loading and that he obtained large amounts of excess heat from a Pons-Fleischmann cell. A CCD camera and large-screen monitor was provided so that the entire audience could examine the actual cracked calorimeter in-situ.

At the end of the conference, Dr. Swartz initiated discussions for the planning of the first "HEAT-OFF". This will be a contest between small (non-industrial size) cold fusion units. JET Technology began the planning. FEAT has now joined the growing list of sponsors. This addition of FEAT to the sponsors was announced at the seminar when Hal Fox offered to donate a palladium medal for the winner of the "HEAT-OFF" contest.

In summary, that more than four score of effervescent people attended this cold fusion seminar at 9AM in midwinter, coming from MIT, from Boston, Maine, Connecticut, and beyond, all with deep interests in this field, is a barometer as to expectations for cold fusion in 1993. [For more about Dr. Swartz see page 17]

C. NEWS FROM THE U.S.

BUSINESS WEEK - FINDS MORE C.F.

TWO MORE TELLTALE SIGNS OF COLD FUSION

"The circle of evidence suggesting that cold fusion may be real after all has closed a little tighter," observed Business Week in a small article on page 109 of the Nov. 9, 1992 issue. Section editor Otis Port cited the reports (at ICCF3) of both Nippon Telegraph & Telephone Corporation (NTT) and India's Bhabha Atomic Research Centre (BARC) that they had found the telltale "ash" (^{4}H or tritium) of nuclear reactions in cold-fusion experiments.

Mr. Port considers the NTT findings most significant because they were conducted in a vacuum chamber, and thus less likely to be subject to contamination. But, the article ends on somewhat of a questionable note, since it claims scientists are "reserving judgement" because of past experiment contamination at some other research facilities, and these new findings will have to be replicated by other labs.

IEEE - HOT FUSION $ SUPPORT

Statement by the Energy Policy Committee, Institute of Electrical and Electronics Engineers -- United States Activities, on the FY1993 Department of Energy Budget Request for Fusion Energy, *Fusion Technology*, vol 23, no 1, January 1993, pp 131-134.

EDITOR'S COMMENTS & QUOTES

This report concerns the written statement of the Institute of Electrical and Electronics Engineers -- United States Activities (IEEE-USA) Energy Policy Committee concerning the FY1993 U.S. Department of Energy budget request for the support of hot fusion R&D. These views were presented to the Energy Subcommittee of the House Committee on Science, Space, and Technology on February 20, 1992.

Major portions of the statement were written by a subcommittee of the Plasma Science and Applications Committee (PSAC) of the IEEE Nuclear and Plasma Sciences Society (NPSS) at the request of Ned Sauthoff (Princeton Plasma Physics Laboratory), the NPSS liaison representative to the IEEE-USA Energy Policy Committee. The PSAC subcommittee was chaired by Mary Ann Sweeney of Sandia National Laboratories. Her subcommittee members were Igor Alexeff (Univ. of Tenn.), Ian Brown (Lawrence Berkeley Laboratory), John Glowienka (Oak Ridge National Laboratory), Steve Gold (Naval Research Laboratory), John Maenchen (Sandia National Laboratories), J. Reece Roth (Univ. of Tenn.), Nikos Salingaros (Southern Methodist Univ.), Loren Steinhauer (STI Optronics), and Linda

Sugiyama (M.I.T). The final statement was approved by the IEEE-USA Energy Policy Committee prior to release. The views expressed in the statement represent a consensus of the PSAC Subcommittee on Fusion Energy Funding Policy and of the IEEE-USA Energy Policy Committee. These views do not necessarily represent the opinion of any particular individual, laboratory, university or place of work.

EDITOR'S COMMENTS

The views represent a strong statement for continuation of the status quo in funding hot fusion. No mention is made of cold fusion or any other alternative energy research and development.

CALIFORNIA - POLYNEUTRONS

John C. Fisher (Thomas Paine Associates, Carpinteria, California, USA), "Polyneutrons as Agents for Cold Nuclear Reactions," Fusion Technology, vol 22, no 4, pp 511-517, 5 refs, 8 figs.

AUTHOR'S ABSTRACT

New nuclear reactions are described where polyneutrons exchange neutron pairs with charged nuclides, liberating substantial energy with only minor production of neutrons and tritium. It is postulated that polyneutrons are bound in a totally paired collective phase analogous to the Bardeen-Cooper-Schrieffer superconducting phase, that massive precursor hydrogen nuclides are bound in the same collective phase, and that polyneutrons are generated from precursor hydrogen by reaction with neutrons. The concentration and disposition of precursor hydrogen, of lithium, and of neutron-moderating and neutron-absorbing materials in the reactor environment emerge as key variables in cold nuclear reaction processes.

AUTHOR'S IMPLICATIONS

The evidence from cold nuclear reaction experiments points to a new branch of nuclear physics. Bound polyneutrons are postulated as mediators of cold nuclear reaction. Stable massive hydrogen is postulated as a polyneutron precursor. Stability of these nuclides implies a collective-pair structural phase of nuclear matter. The model of polyneutrons as participants in chain reactions that multiply their numbers and as agents for transmutation and energy production as they grow by accretion of neutron pairs removed from ordinary nuclides, appears capable of accounting for the experimental results. It suggests that the cold nuclear reaction discovery of Fleischmann and Pons may have opened the way to rich new fields of nuclear science and technology.

CALIFORNIA - 2-D BLACK HOLES

Jorge G. Russo, Leonard Susskind, Larus Thorlacius (Dept. Phys., Stanford Univ., California, USA), "End Point of Hawking Radiation," *Phys. Rev. D: Part. Fields*, 1992, vol 46, no 8, pp 3444-3449.

AUTHORS' ABSTRACT

The formation and semiclassical evaporation of 2-dimensional black holes is studied in an exactly solvable model. Above a certain threshold energy flux, collapsing matter forms a singularity inside an apparent horizon. As the black hole evaporates the apparent horizon recedes and meets the singularity in a finite proper time. The singularity emerges naked, and future evolution of the geometry requires boundary conditions to be imposed there. There is a natural choice of boundary conditions which matches the evaporated black hole solution onto the linear dilation vacuum. Below the threshold energy flux no horizon forms and boundary conditions can be imposed where in-falling matter is reflected from a time-like boundary. All information is recovered at spatial infinity in this case.

[Does this explanation relate to some of the phenomena of cold fusion found by Matsumoto? See Letter to the Editor by Matsumoto, page 20. Ed.]

CALIFORNIA - TRANSPORT DYNAMICS

S. Szpak, P.A. Mosier-Boss, S.R. Scharber, J.J. Smith (Nav. Ocean Syst. Center, San Diego, California, USA), "Charging of the Palladium/Hydrogen or Deuterium (Pd/^{n}H) System: Role of the Interphase," *J. Electroanal. Chem.*, 1992, vol 337, no 1-2, 21 refs, 11 figs, pp 147-163.

AUTHORS' ABSTRACT

The dynamics of transport of electrochemically generated deuterium across the electrode/electrolyte interphase was examined by slow scan (10 mV s^{-1}) voltammetry. The study covers the potential range -1.2 to +0.4 V measured by an Ag/AgCl reference electrode. A coupled, 2-layer model of the interphase describes the observed behavior as a function of scan rate and electrolyte composition. The effect of chemisorbing species, e.g. CN^- ions, as well as reactive species, e.g. $SC(NH_2)_2$, on the transport across the interphase is also discussed. Results are contrasted with those obtained for light H_2O.

HAWAII - MOLTEN SALTS

B. Y. Liaw, P. Tao, B. E. Liebert (Dep. Mech Eng., Hawaii Nat. Energy Inst., Hawaii), "On charging palladium in an

aluminum/lithium chloride-potassium chloride eutectic, excess lithium hydride (deuteride)/palladium cell", *Proc. Electrochem. Soc.* 1992, Vol. 16 (Proc. Int. Symp. Molten Salts, 8th, 1992), pp 1-13.

AUTHORS' ABSTRACT

An anomalous heat effect was found during high-current deuterium charging of an Al/LiCl-KCl eutectic with excess LiD/Pd in an electrochemical cell at elevated temperatures. The electrochemical and calorimetric behavior of this molten salt approach is discussed. The thermochemical aspects of possible reactions at each charging stage are interpreted by the cell potential to seek a possible explanation for the anomalous heat. The authors were unable to identify any conclusive chemical nature of the anomalous phenomenon. The phenomenon is nonreproducible because of several material-related problems and the lack of understanding of the control of predominant electrochemical reactions during the excess power excursion.

ILLINOIS - NEUTRON DIFFRACTION

F.J. Rotella, J.W. Richardson, Jr., L. Redey, G.P. Felcher, R.L. Hitterman, R. Kleb (Intense Pulsed Neutron Source Div., Argonne Natl. Lab., Illinois, USA), "Palladium Deuteride Formation in the Cathode of an Electrochemical Cell," *KEK Proc.*, vol 92, no 1, pp 1-13.

AUTHORS' ABSTRACT

A neutron diffraction study was made of a Pd cathode in heavy water electrolysis in a cell with a Pt anode and LiOD-saturated D_2O electrolyte. The amount of deuterium absorbed by the Pd cathode after charging and the orientation of the crystallites in the Pd rod are discussed.

LOUISIANA - ELECTRON COUPLING

Courtesy of Dr. Samuel Faile.

A.R.P. Rau (Dept. of Physics and Astronomy, Louisiana State Univ., Baton Rouge, LA.), "Excitation and Decay of Correlated Atomic States," *Science*, vol. 258, 27 Nov. 1992, pp 1444-1451, 2 tables, 6 figs., 49 refs.

Doubly excited states of atoms and ions in which two electrons are excited from ground configuration display strong radial and angular electron correlations. They are prototypical examples of quantum-mechanical systems with strong coupling. Two distinguishing characteristics of these states are: (i) their organization into successive families, with only weak coupling between families and (ii) a hierarchical nature of this coupling, which starts from one family decaying primarily to those in the next lower family. A view of the pair of electrons as a single entity, with the electron-electron repulsion between them divided into an adiabatic and nonadiabatic piece, accounts for many of the dominant features. The stronger, adiabatic part determines the family structure and the weaker, nonadiabatic part the excitation and decay between successive families. Similar considerations extend to three-electron atomic states, which group into five different classes. They are suggestive of composite models for quarks in elementary particle physics, which exhibit analogous groupings into families with a hierarchical arrangement of masses and electroweak decays.

MASSACHUSETTS - NOTOYA AT MIT

Courtesy of Dr. Eugene Mallove

Elizabeth A. Thomson (MIT News Office), "Cold Fusion Discussed at Friday Talk," *MIT TECH TALK*, 9 Dec 1992, pg 12.

EDITOR'S COMMENTS

This article describes the visit by Dr. Reiko Notoya of Hokkaido National University and her discussion of her successful replication of the Mills/Bush/Eagleton cold fusion work using light water. Her light-water, nickel-cathode cells have produced as much as 400% excess heat. Notoya was invited to visit MIT after Dr. Peter Hagelstein saw her demonstration at the Nagoya conference. This Friday Talk was sponsored by Hagelstein and Professor Emeritus Louis D. Smullin. Although Dr. Notoya brought along her table top demonstration, a problem with a contaminated cathode prevented its successful operation. She returned from Japan a few days later and did demonstrate a working light-water cold fusion cell. Professor Smullin observed, "That it is nuclear **fusion** I think is an abandoned theory, but it may still be nuclear." Dr. Hagelstein is quoted as saying, "If it's chemical it's some very interesting chemistry. I think we can safely conclude that either it's nuclear or it's a mistake. I'm completely convinced that it's nuclear."

MICHIGAN - CRACK FORMATION

W. Zhong, Y. Cai and D. Tomanek (Michigan State University), "Mechanical Stability of Pd-H Systems: A Molecular-Dynamics Study," *Physical Review B*, vol 46, no 13, 1 Oct. 1992, pp 8099-8108, 9 figs., 27 refs.

AUTHORS' ABSTRACT

We use the Nosé and Rahman-Parrinello molecular-dynamics formalism to study the equilibrium structure and elastic properties of bulk Pd as a function of temperature and hydrogen concentration. Introducing tensile stress as an independent variable into this formalism enables us also to

study the elastic breakdown and crack formation as a function of an uniaxially applied load. The calculations are performed using a model many-body alloy Hamiltonian based on *ab initio* density-functional results for Pd-H systems. Our results indicate that the microscopic origin of "hydrogen embrittlement" is an increased *ductility* and *plasticity* in regions saturated by hydrogen, in agreement with the postulated hydrogen-enhanced local-plasticity mechanism.

MINNEAPOLIS - SELECTION OF DOE SECRETARY
Courtesy of Dana Rotegard & Dr. Samuel Faile

TWO MEDIA REPORTS:

Randy Furst & Kurt Chanler (Staff Writers), "O'Leary's NSP work is springboard for backers' praise, critics' caution," *Minneapolis Star Tribune*", Tuesday, Dec 22, 1992, pp 1A and 12A.

EDITOR'S COMMENTS

The writers review Hazel O'Leary's work with the Northern States Power Company (NSP) and quotes from both plaudits and critics. O'Leary is an attorney, and one who is viewed as favorable to new ideas. Mark Hugo, also with NSP, has briefed O'Leary on the cold fusion developments. O'Leary is familiar with the work of EPRI (Electric Power Research Institute) in the support of cold fusion. Senator Paul Wellstone (Democrat, Minnesota), a member of the Energy Committee in the U.S. Senate, intends to meet with O'Leary and "press for details about her plans." Senator Wellstone has been briefed on the developments of cold fusion and appears to be receptive to alternative energy projects. O'Leary was born in Newport News, Va., and obtained a law degree from Rutgers (N.J.) in 1966 after graduating from Fisk University in Nashville, Tenn. She served as administrator of the 2,000-person Economic Regulatory Administration with the Department of Energy during the Carter administration.

Barnaby J. Feder, "New Energy Chief has Seen two Sides of Regulatory Fence," *New York Times*, 22 Dec 1992, pg C20.

EDITOR'S SUMMARY

Hazel O'Leary has worked for the Northern States Power company where she has been executive vice president for corporate affairs. She has been active in energy conservation and alternative energy projects similar to those praised by President-elect Clinton and Senator Al Gore. She was a former regulator in both the Ford and Carter administrations. Mrs. O'Leary had just been appointed by the Northern States Power company as president in charge of their natural gas operations with the assignment to begin January 1, 1993. At DOE she will be overseeing the spending of billions of dollars in cleanup costs of mismanaged DOE-funded facilities.

NEW YORK - DENSE DEUTERIUM

N.W. Ashcroft (Mater Sci. Center, Cornell Univ., New York, USA), "Dense Deuterium and Deuterium-muon Systems," *Springer Proc. Phys.*, 1992, vol 59, pp 85-98.

AUTHOR'S ABSTRACT

The states of dense deuterium are treated starting with the fundamental highly symbolic Hamiltonian where all interactions are entirely Coulombic. Such a system is known to be unstable to deuteron pairing and crystal ordering at low densities; experimentally it was probed to densities one order of magnitude higher than normal solid deuterium. At densities somewhat higher than this, deuterium is predicted to undergo a dynamic instability to a monoatomic metallic state passing on its way through a paired band-overlap phase. Some of the pairing characteristics are immediately transferable to the states formed when muons are introduced into dense deuterium.

NEW YORK - RETRACTION

R.J. Beuhler, Y.Y. Chu, G. Friedlander, Lewis Freidman, W. Kunnmann (Chem. Dept., Brookhaven Natl. Lab., New York, USA), "Deuteron-Deuteron fusion by impact of heavy-water clusters on Deuterated Surfaces," (erratum to document cited in CA113(16):139993w), *J. Phys. Chem.*, vol 96, no 11, 1992, p 4724.

AUTHORS' ABSTRACT

Further searches for direct experimental evidence for artifact contributions have indicated the conclusion, that energy amplification processes during and after cluster impact were responsible for the observed fusion events, was in error. The error was reflected in the abstract, but not in the index entries.

EDITOR'S COMMENTS

If I am not mistaken it was Dr. Richard Petrasso of MIT who proposed to Beuhler et al. that the impact cold fusion results originally reported could be due to artifacts. That Petrasso was correct may strengthen (in the view of some listeners) his verbal attacks against cold fusion.

PENNSYLVANIA - CENTER FOR FRONTIER SCIENCES
Courtesy of Dr. Samuel Faile

Staff, "New Periodicals - Fusion Facts," *The Center for Frontier Sciences*, Vol 3, No. 1, Fall, 1992, pg 44.

EDITOR'S COMMENTS

We wish to thank this publication for taking note of *Fusion Facts*. We welcome the spread of positive treatment of the reality of cold fusion. Thank You.

UTAH - ZERO-POINT ENERGY

Moray B. King (Eyring Corp., Provo, Utah), "Progress and results in zero-point energy research," *Proc. Intersoc. Energy Convers. Eng. Conf.*" 1992, 27th, Vol 4, pp 297-302.

AUTHOR'S ABSTRACT

A discussion with 49 references. The vacuum polarization of atomic nuclei may trigger a coherence in the zero-point energy (ZPE) whenever a large number of nuclei undergo abrupt, synchronous motion. Experimental evidence arises from the energy anomalies observed in heavy-ion collisions, ion-acoustic plasma oscillations, sonoluminescence, fractoemission, large-charge deuteron plasmoids, abrupt electrical discharges, and light water "cold fusion" experiments. Further evidence arises from inventions that utilize coherent ion-acoustic activity to output anomalously excessive power.

VIRGINIA - NUCLEON CLUSTER MODEL

Ronald A. Brightsen and Eugene F. Mallove (Clustron Sciences Corp., Vienna, VA.), "Explanation of Cold Fusion Reaction Based on the Nucleon Cluster Model (NCM)," draft submitted to *Fusion Technology*, Aug. 9, 1992, 18 refs.

AUTHORS' ABSTRACT

The applicability of the Nucleon Cluster Model (NCM) to explaining cold fusion is described, including a brief synopsis of the path that author R.A. Brightsen followed after successfully applying the NCM to earlier nuclear issues, such as the selection rules for beta stability of isotopes and the precise characteristics of thermal neutron fission. The three most significant features of the NCM Cold Fusion Model are: (1) Its ability to provide a unified explanation for excess heat of nuclear origin in both dominantly D_2O and dominantly H_2O electrochemical cells; (2) Its ability to explain observed reaction products: tritium, and helium; (3) Its ability to explain why nuclear reaction end products commensurate with observed excess heat have not been found *inside* cold fusion cells. The explanation lies in the unsuspected structure of the proton, which is *required* by the Nucleon Cluster Model of the nucleus as the bridge between matter and antimatter. The implications of this realization will have profound significance for much of physics, chemistry, and a host of power generation and other technologies.

D. NEWS FROM ABROAD

ARGENTINA - GAMMAS FROM C.F.

A.R. Lopez Garcia, H. Vucetich, A.E. Bolzan, A.J. Arvia (Fac. Cienc. Exactas, Univ. Nac. La Plata, Argentina), "Gamma-radiation detection limits for electrochemically induced deuterium cold-fusion rates," *Nuovo Cimento Soc. Ital. Fis.*, 1992, Vol. 105A, No. 7, pp 987-92, in English.

AUTHORS' ABSTRACT

An experiment was performed in order to detect cold fusion in an electrochemical set-up similar to that described by Fleischmann et al. The detection of gamma-rays from deuteron formation was made with a NaI(Tl) scintillator. Upper bounds for the neutron production rate of 0.53 c/s and 0.23 c/s stationary and the transient processes, respectively, were detected.

BRAZIL & ITALY - NEUTRONS FROM PLASMA
Courtesy of Dr. Roberto Monti

Carlo Borghi (Centro de Energia Nuclear {CEN}, Recife, Brazil), Camillo Giori (Inst of Physics, Univ. of Parma, Italy), & Attilio Dall' Olio (CEN, Recife), "Experimental Evidence on the Emission of Neutrons From Cold Hydrogen Plasma," manuscript provided consisted of 19 pages, 7 figs, 6 refs, 1 table.

AUTHORS' INTRODUCTION

We have tried to see experimentally whether there is some interaction between electric charges, other than the Coulombic one, and whether it may produce some kind of bound states between a proton and an electron, electrically neutral but different from a hydrogen atom state. This requires that the stronger, and quicker, Coulombic interaction may be avoided to prevail, by means of a high frequency ionizing electro-magnetic field. This field succeeds in maintaining a "cold" plasma, that is a considerable number of protons mixed and colliding with an equal number of free electrons, for a time very larger than 10^{-8} per second. This limit is suggested by the known average recombination time of the ionized hydrogen atom. The just said high frequency has been taken of the order of 10^{10} per second, with amplitudes large enough for ionizing the low pressure pure hydrogen contained in the resonant cavities of a klystron-like oscillator. The excitation of this klystron is actually obtained by means of a bunched beam of hydrogen ions, but it is probable that this excitation could as well be made by means of a strong external microwave source. The device we used works with an anode-cathode (grounded) potential difference of about 500 volts. The fact that twice in a period, the free protons and the free electrons are accelerated in opposite directions by the electric

field of the microwave, produces a considerable number of collisions between these particles.

AUTHORS' DISCUSSION

[Excerpts:] It seems evident that no properly called fusion is responsible for the production of these neutrons with a plasma nearly at the room temperature [in these experiments]. [The hydrogen used was produced by the electrolysis of water plus sulfuric acid and a current of 1 amp.] [The authors make calculations of the expected neutron flux from expected reactions between the oscillating and interpenetrating protons and electrons. They then conclude as follows:] As a matter of fact, f [the fraction of the total current entering into the oscillating cavity] can be taken to be the ratio of the inlet hole area of the klystron versus the whole discharge cross section area. In our device this ratio is 1/36. With this value one has N_{dd} = 7 neutrons/sec. Which [value] is several orders of magnitude less than the observed [neutron] flux. Thence we may conclude that this experiment seems to confirm the possibility of observing directly the assumed non-Coulombic interaction between protons and electrons. **[The most interesting part of this paper is that the dates shown for the data are all in the year 1970!]** [Bracketed words are added by FF editor. It is not kown where this manuscript was published.]

CHINA - EXPLOSION

Courtesy of the authors.

Yibei Fu, Dalun Wang, Suhe Chen, Daxiao Fan, Wenjiang Chen and Yijun Li (Southwest Inst. of Nuclear Physics and Chem., Chengdu, P.R. China), Zinwei Zhang (Inst. of Applied Physics and Computational Math., Beijing, P.R. China), "Experimental Studies on the Anomalous Phenomenon in Pd Metal Loaded With Deuterium," manuscript, 12 pages, 1 table, 9 figs., 4 refs. in English.

AUTHORS' ABSTRACT

The anomalous phenomenon in metal loaded with deuterium has been studied using the electrolysis and the cycle method of temperature and pressure (CMTP). In the report, the experimental results are introduced, including the explosion which occurred, and neutron and tritium measured in electrolysis experiment. The sensitization phenomenon of x-ray film was found in CMTP experiment. It is considered that the reason of sensitization is derived from the chemical reaction and the anomalous effect in metal loaded with deuterium.

CHINA - X-RAY FILM EXPOSED

Courtesy of the authors.

Yibei Fu, Suhe Chen, DaLun Wang, Wenjang Chen, and Yijun Li (Southwest Inst. of Nuclear Physics and Chem., Chengdu, P.R. China), Xinwei Zhang (Inst. of Applied Phys. and Computational Math., Beijing, P.R. China), "The Sensitizing Phenomenon of X-Ray Film in the Experiment of Metal Loaded with Deuterium," manuscript, 8 pages, 5 figs., 3 refs.

AUTHORS' ABSTRACT

The sensitizing phenomenon of X-ray film was studied, in metals loaded with deuterium by a cycle method of temperature and pressure (CMTP). The experimental results showed that the sensitization of X-ray film was derived from the chemical reaction and the anomalous effect of metals loaded with deuterium.

CHINA - VACUUM ENERGY GAP

Yuanjie Li (Dep. Phys., Huazhong Univ. Sci. Technol., Peoples Rep. China), "Vacuum Energy Gap Inside a Nucleus and a New Mechanism of Nuclear Energy Release," *Huazhong Ligong Daxue Xuebao*, 1992, Vol 20, No. 1, pp 135-7, in Chinese.

AUTHOR'S ABSTRACT

The metric of Einstein-Yukawa's equation is used for searching for the vacuum gap of scalar particles inside a nucleus. The vacuum gap can form a potential well inside the nucleus and the well will admit the scalar particles into some bound states. The particle will release energy when a free particle becomes bound. The mechanism proposed is different from that usually described in relevant literature. In the author's model, the potential well with bound energy is a well of vacuum gap.

CHINA - GLOW DISCHARGE EFFECTS

Heqing Long, Sihai Sun, Hongquan Liu, Renshou Xie (Institute of Sichuan Material and Technology, Beijing, China), Xinwei Zhang, Wushou Zhang (Institute of Applied Physics and Computational Mathematics, Beijing, China), "Anomalous Effects in Deuterium/Metal Systems," paper presented at the ICCF3 at Nagoya, Japan.

AUTHORS' ABSTRACT

Stable and high yield of neutron had been measured repeatedly in the glow discharge process of the flowing rare deuterium

gas in a Deuterium/Metal system consisting of Pt, Nb, W, Cu, Mo, Ag or Fe with D respectively.

A layer of metal film which was deposited on the inner surface of glass reaction bulb in the glow discharge process and insulated from electrodes played key action on inducing anomalous effects repeatedly. Neutrons had been measured by activation detector (^{115}In, ^{193}Ir) and recoil proton neutron spectrometer; there was a continued spectrum in the energy range from 0.5 Mev to 11 Mev. The average neutron energy was 3.55 Mev; different heights of peak appeared at (0.5-1.0) Mev, (3.0-3.5) Mev, (5.0-5.5) Mev, (8.0-8.5) Mev, (9.0-9.5) Mev and (10.0-10.5) Mev; but the neutrons of (2.0-2.5) Mev, interestingly, appeared in a valley of the energy spectrum and their yield was only 7-8% of the total yield of neutrons. The highest yield of neutron appeared in D/Pt system, the lowest appeared in D/Fe system, the highest average yield of neutron was 8.3×10^3 n/s in D/Nb system (observed time 470 min.), the yield of neutron burst was $(0.26\text{-}6.2) \times 10^6$ n/s (time interval 0.1 sec).

Intense gamma-ray emission had been detected at the same time, the average activity was 3.1×10^4Bq (detected time 175 min.). There was a continued gamma spectrum in the energy range from tens Kev to >20 Mev, different heights of peak appeared at tens Kev, 0.81 Mev, 1.32 Mev, 2.15 Mev and 4.88 Mev. The peaks of energy >7 Mev were not quite certain.

Similar experiments were conducted many times with hydrogen or helium gas instead of deuterium but no neutron over background was detected.

CHINA - LOW LEVEL GAS DISCHARGE

Heqing Long, Renshou Xie, Sihai Sun, Hongquan Liu, Jinbang Gan, Bairong Chen (Institute of Sichuan Material and Technology, Beijing, China), Xinwei Zhang, Wushou Zhan (Institute of applied Physics and Computational Mathematics, Beijing, China), "The Anomalous Nuclear Effects Induced by the Dynamic Low Pressure Gas Discharge in a Deuterium/ Palladium System," presented at the ICCF3 at Nagoya in slightly different format).

AUTHORS' ABSTRACT

Neutron emission which average rate was 13-33 n/s and X-ray which average energy $>eV_{max}$ were continuously detected from a gas discharge reaction bulb, these neutrons were divided into two groups of 2-2.5 Mev and 2.5-7 Mev, the emission of neutron was 100% reproducible.

CONCLUSION

It is possible that palladium film played a key role for obtaining the anomalous nuclear effect. In the experiment, regulating current limiter, there would be glow discharge occurring, and palladium atom (or atom cluster) was sputtered from the tip of electrodes meanwhile, electrodes were getting shorter, [therefore] the distance between electrodes getting longer. The temperature of reaction bulb wall raised to 60-200° C at the same time. We occasionally observed added current pulse over the stable current signal, the average value of current pulse was ~1A, the maximum >10A, and the characteristic time was several ms, but the current induced by glow discharge was less than 100 mA. neutrons observed were mainly distributed in higher energy region of 2.5-7 Mev, the production rate of higher energy neutrons was about 9 times of 2-2.5 Mev lower energy neutrons, the maximum was 30 times, we had tested this ratio repeatedly in applied voltage of 10-20KV, the most probable value was about 9.

Because low gas pressure was carried out and high voltage was applied, it is suspected that neutrons were caused by beam-target effect. But beam-target effect was not the main effect, the reason are: (1.) 2.5-7 Mev higher energy neutrons were observed and their production rate was higher than that of 2.0-2.5 Mev, but the applied voltage on the reaction bulb was less than 15.5 KV, it can't be explained by the classical Beam-Target Model; (2.) if neutrons were caused by beam-target effect, the yield of neutrons would increase when the gas pressure decreased, but results were close to each other when gas pressure was 4 Pa and 27 Pa separately; (3.) when the applied voltage increased, corresponding to beam-target model relatively the yield of neutron would have increased but this didn't happen in the experiment. So the beam-target neutron was not the main effect there.

CHINA - H AND D IN Pd

Q.C. Qiu, Q.H. Dong, F.X. Gan, S.J. Wang (Envir. Sci. Dep., Wuhan Univ., Peoples Rep. China), "PAS Studies on the New Topic: Cold Nuclear Fusion," *Mater. Sci. Forum*, 1992, vol 105-110 (Positron Annihilation, Pt. 3), pp 1961-1964, in English.

AUTHORS' ABSTRACT

The use of e^+ annihilation spectroscopy (PAS), combined with electrochemical H permeation, was used to study the behaviors of H and D in Pd. The behavior similarity between H and D in Pd and some mechanisms of cold nuclear fusion were discussed.

CHINA - NO HEAVY QUASI-ELECTRONS

Yunyu Wan, Xiaowei Tang, Juhua Yang (Inst. High Energy Phys., Acad. Sin. China, Beijing, Peoples Rep. China), "Search for Heavy Quasi-Electrons in Heavy Water--Palladium Electrolysis System by Positron Annihilation," *Positron Positronium Chem., Int. Workshop, 3rd*, 1990, pp 420-422, in English.

AUTHORS' ABSTRACT

Two possibilities of quasi-electron states are considered in connection with the electrolysis of D_2O with a Pd cathode. The annihilation x-ray spectra were measured with both a high-purity Ge and a Ge(Li) detector in the electrolysis process. There was no confirmation of the existence of the heavy quasi-electron even in the polyelectron complex as suggested by Cheuk-Yin Wang (1986).

FRANCE - DETECTING GAMMAS

S. Pons (Univ. of Utah, USA) and M. Fleischmann (Univ. of Southampton, UK), "Concerning the Detection of Neutrons and γ-Rays from Cells Containing Palladium Cathodes Polarized in Heavy Water," *Il Nuovo Cimento*, vol 105A, no 6, 22 refs, 8 figs, in English.

AUTHORS' SUMMARY

It is shown that neutrons generated in "cold fusion" cells can be detected following thermalization by means of high-resolution spectroscopy of the γ-rays generated by the (n,γ) reaction in light water. It is further shown that to achieve this characterization it is essential to use data analysis procedures which do not discriminate against the steady-state or quasi-steady-state generation of neutrons in the cell.

ITALY - SEARCH FOR NUCLEAR ASHES

Courtesy of the authors.

L. Bertalot, F. De Marco, A. De Ninno, A. La Barbera, F. Scaramuzzi, V. Violante, P. Zeppa (ENEA Rome, Italy), "Study of Deuterium Charging In Palladium by the Electrolysis of Heavy Water: Search For Heat Excess and Nuclear Ashes," 7 pages, 4 figs., 4 refs, in English.

AUTHORS' ABSTRACT

The production of heat excess (HE) in electrolytic cells with heavy water and palladium cathodes is, in Cold Fusion, the experiment that has had more confirmations, even though still doubts are cast on its nuclear origin. Furthermore, the correlation of HE with some features of experiment seems to be well established, the most convincing of which is a threshold in the D/Pd ratio. What is yet not quite clear is how to obtain a high D/Pd ratio, since this feature seems to depend both on the material and on the procedures adopted for the electrolysis. In this paper we will propose a novel approach to this problem, which permits to correlate HE with other features of the experiment. In particular, we try to study the transport of matter across the palladium lattice during the electrolysis. A model, proposed by two of us (ADN and VV), and presented in this Conference, helps to interpret the experimental results, and gives interesting hints for future research.

As far as the nuclear of the HE is concerned, it seems today clear that the only serious way to address this problem consists in performing experiments in which the presence of "nuclear ashes" is searched, ^4He nuclei being the most likely to be found. Such an experiment has been performed once, and needs confirmation. We plan to perform an experiment in which the production of ^4He nuclei can be detected in the gases evolving from the electrolytic cell, in coincidence with the production of HE. A cryogenic system able to separate ^4He from other gases, including D_2, has been designed, and preliminary data on its behavior are presented.

AUTHORS' CONCLUSION

The following conclusions can be drawn from this experiment: (1.) The production of HE in Electrolytic cells with heavy water and palladium cathodes has been confirmed. The use of Pd anodes has presumably improved the quality of the surface, by regenerating it continuously, thus favoring deuterium charging of the cathode. The correlation of the overpotential with HE seems to indicate that the overpotential is a function of the D/Pd ratio. (2.) The novel geometry proposed, with the cathode facing on one side of the electrolyte and on the other D_2 gas, permits to study the motion of D in Pd during electrolysis, by measuring the pressure variations on the gas side: a model tending to describe this motion and to correlate it to HE is presented in this Conference by two of us (AND and VV).

Presented at the ICCF-3 Nagoya, Japan, Oct. 21-15, 1992. [*Reviewed in FF*, Dec. 1992. Paper received with more information to share with our readers.]

ITALY - UNIFYING MODEL

C.F. Cerofolini, A. Foglio Para (Funct. Mater. Lab., San Donato, Italy), "Alternatives in Low Energy Fusion?" *Springer Proc. Phys.*, vol 59, 1992, pp 129-147, 44 refs, in English.

AUTHORS' ABSTRACT

This work reviews the status of cold-fusion and related phenomena, discusses the 'warm' fusion resulting from the impact of heavy water clusters ($(D_2O)_n$) into TiD, and eventually proposes a unifying model explaining not only claims of cold or warm fusion, but also the possible causes of their poor experimental reproducibility.

JAPAN - FUSION KIT FOR SALE

Staff, "Takeout Cold Fusion," *Science*, Vol 258, 18 Dec 92, pg 1879.

Reports on the offer by Advanced Film Technology, Inc. a subsidiary of Nippon Telephone and Telegraph (NTT) to sell a research kit for creating cold fusion. The price of $560,000 causes the editor to comment, "...investigators may be unwilling to be risking a cool half-million on cold fusion." Some groups are betting that amount and more: EPRI in the U.S. is betting over a million dollars a year; MITI is betting several million; and some far-sighted companies, **even in the U.S.**, are betting larger funds on the reality of cold fusion.

JAPAN - COMPLEX CATHODE

Yoshiaki Arata, Yue Chang Zhang (Res. Inst. Sci. Technol., Kinki Univ., Japan), "Cold Fusion in Deuterated Complex Cathode," *Kaku Yugo Kenkyu*, vol 67, no 5, 1992, pp 432-444, in Japanese.

AUTHORS' ABSTRACT

A new type cathode, consisting of a Ni or (Pd) rod with a Pd layer applied by plasma spraying was developed as a complex cathode. The Pd layer activated the surface functions of the deuterated cathode, and reliable evidence was obtained that a new type of heat generation occurred, and a highly reproducible cold fusion reaction was produced in the complex cathode.

JAPAN - ALKALINE HYDROGEN ABSORPTION

M. Enyo and P.C. Biswas (Catalysis Research Center, Hokkaido University, Sapporo, Japan), "Hydrogen Absorption in Palladium Electrodes in Alkaline Solutions," *J. Electoranal. Chem.*, 335 (1992) pp 309-319, 10 figs, 3 refs.

AUTHORS' ABSTRACT

The entry of hydrogen into a palladium electrode in alkaline solutions was investigated. It is shown, from analysis of the overpotential components observed in transient polarization measurements, that the hydrogen electrode reaction on palladium obeys the Volmer-Tafel mechanism, similar to that in acidic solutions studied earlier. Hydrogen pressures equivalent to hydrogen overpotentials are evaluated. They increase with the overpotential but the dependence is much less than that calculated by applying a Nernst type equation to the total overpotential; this is also similar to the behavior observed in acidic solution. The equivalent hydrogen pressure is practically independent of the concentration of alkali but slightly dependent on the kind of alkali, being highest in KOH solution.

JAPAN - NEUTRONS FROM Pd PLATE

Masanori Fujiwara and Koichi Sakuta (Electrotechnical Lab., Ibaraki, Japan), "Statistically Significant Increase in Neutron Counts For Palladium Plate Filled With Deuterons By Electrolysis," presented at the Third International Conference on Cold Fusion, October 21-25, 1992, Nagoya, Japan, *Fusion Facts*, Dec. 1992, pp 19-20, 1 table, 1 fig., 4 refs.

AUTHORS' CONCLUSIONS

Four Pd samples were tested with alternating D_2O electrolysis. One sample indicates highly significant increases of neutron counts for the deuteron filled state. The level of significance is 1% in statistics. The excess neutron count rate corresponds to the fusion rate of 0.8 to about 3.2×10^{-23} fusions/deuteron pair/sec. Other samples indicate no significant difference. Further experiments are necessary to confirm the reproducibility.

JAPAN - NINE-HOUR BURST

Shigeru Isagawa, Yukio Kanda and Takenori Suzuki (National Lab. for High Energy Physics, KEK , Ibaraki-ken, Japan), "Search for Excess Heat, Neutron Emission and Tritium Yield From Electrochemically Charged Palladium in D_2O," submitted to ICCF-3 (The 3rd. International Conference on Cold Fusion), Nagoya, Japan, October 21-25, 1992, 4 figs., 4 refs.

AUTHORS' ABSTRACT

The electrolysis of heavy water is being investigated with two types of open calorimetric systems. Pd cathodes, Pt anodes and D_2O/0.1M LiOD electrolytes have been used. Until now no clear-cut heat bursts as reported have been observed. One exceptional phenomenon showing abnormal power imbalance without neutron and tritium anomalies was found, but has not been repeated under the similar experimental conditions. Neutron emission, on the other hand, as a very rare case showed an abnormal increase for only short term during one of another series of experiments. The increase of about 3.8σ

above the background level lasted for 9 hours on the 20th day after starting the electrolysis. The emission rate amounts to about 27.2 ± 11.2 neutrons per sec, which is equivalent to about 700 times as much as the background level. Neither excess heat nor tritium were, however, observed. The reason for the lack of repeatability of these experimental results is discussed.

JAPAN - KAMIOKANDE STUDY

Taku Ishida (Inst. for Cosmic Ray Research, Univ. of Tokyo, Japan), "Study of the Anomalous Nuclear Effects in Solid-Deuterium Systems," University of Tokyo Master Thesis, ICRR-Report 27-92-15, February 1992, 64 Figs., 11 Refs.

AUTHOR'S ABSTRACT

By applying the Kamiokande nucleon decay/neutrino detector to neutron measurement, we have achieved the unprecedented detection properties, namely efficiency and background of 20.5% and 0.25 events per hour (random mode), respectively, and 37.4% and one event per year (burst mode), respectively. A series of definitive tests on the "Cold Fusion" were carried out with this ultra-low background detector in 1991. The experimental procedures and the results obtained by the on-line analysis are presented in this thesis.

JAPAN - FUSION IN ALUMINUM

Kohji Kamada (Nat. Inst. for Fusion Sci., Nagoya), "Electron Impact H-H and D-D Fusions in Molecules Embedded in Al I. Experimental Results," *Jpn. J. Allp. Phys.*, vol 31, pt 2/9A, 1992, 9 refs, 4 figs, pp 1287-1290, in English.

AUTHOR'S ABSTRACT

Both H-H and D-D fusion reactions, detected via high energy particle emission on CR-39, are shown to occur when 200 and 400 keV electrons are bombarded onto H^+ or D^+ ion implanted Al thin crystals. Roughly 1-2 x 10^3 particle emissions, including both hydrogen and helium isotopes, in whole space were observed in each case. Collisions between recoiled D atoms due to the high energy electron impact give only 10^{-12} to 10^{-26} times smaller fusion rates than the experimental results. The present observations suggest the presence of a new kind of fusion reaction which occurs with negligible kinetic energy of the reacting nuclei.

JAPAN - ALUMINUM BUBBLES

Kohji Kamada (Inst. of Plasma Physics, Nagoya Univ., Nagoya, Japan), "Hydrogen Implantation Effects In The Subsurface Layer Of Aluminum-Bubble Pressure and Surface Modifications," *J. of Nuclear Materials*, Vol. 169, (1989), pp 141-150, received 2 Feb. 1989; accepted 20 June 1989.

AUTHOR'S ABSTRACT

Energetic hydrogen ion implantations were performed on pure Al, and the microstructural change was investigated by use of transmission electron microscopy (TEM) together with the measurement of the implanted hydrogen distribution by use of the elastic recoil detection (ERD) method. A microstructure called "tunnel structure" (T.S.) was found in the fluence range of about (5-10) X 10^{17} H^+/cm^2. Prior to the T.S. formation, numerous bubbles were formed in the fluence range of about (4-5) X 10^{17} H^+/cm^2. In the latter fluence range, the molar volume of the hydrogen was determined from measurements of the total bubble volume and the hydrogen retained in the subsurface layer.

Internal pressure of the bubbles was determined from the molar volume referring to the equation of state of high pressure hydrogen, and evaluated to be around 7 GPa for the specimen implanted up to 4 X 10^{17} H^+ per sq cm. The dislocation punching mechanism during the irradiation was discussed. This also predicted such high pressures exceeding the Greenwood et al.'s estimation of the dislocation punching pressure, supporting the experimentally observed high pressures. The pressurizing mechanism in the bubbles was discussed, predicting roughly the same pressure as measured experimentally.

JAPAN - FUSION STARS

Takaaki Matsumoto (Hokkaido Univ., Dept. of Nuclear Eng., Sapporo, Japan), "Observation of Stars Produced During Cold Fusion," *Fusion Technology*, vol 22, no 4, Dec. 1992, pp 518-523, 6 refs, 6 figs.

AUTHOR'S ABSTRACT

It has been indicated that multiple-neutron nuclei such as quad-neutrons can be emitted during cold fusion. These multiple-neutrons might bombard the nuclei of materials outside a cold fusion cell to cause nuclear reaction. Observations of nuclear emulsions that were irradiated during a cold fusion experiment with heavy water and palladium foil are described. Various traces, like stars, showing nuclear reactions caused by the multiple-neutrons have been clearly observed.

JAPAN - MESH-LIKE TRACES

Takaaki Matsumoto (Dept. of Nuclear Eng., Hokkaido Univ., Sapporo, Japan), "Observation of Mesh-like Traces on Nuclear Emulsions During Cold Fusion," *Fusion Technology*, vol 23, no 1, pp 103-113, 14 refs, 10 figs.

AUTHOR'S ABSTRACT

Cold fusion products from the electrolysis of heavy water have been directly measured by using a thin palladium foil. Several anomalous traces have been clearly recorded on nuclear emulsions. Some traces have mesh-like structures, which are classified into two types: (a) ones associated with ring traces that are caused by the gravity decay of quad-neutrons and (b) ones with no ring traces. The mechanisms that form these mesh-like traces are discussed in terms of the Nattoh model. It is inferred that multiple-neutron nuclei such as quad-neutrons, covered by itonic mesh and iton beads, are born during cold fusion. Furthermore, other anomalous traces suggest the production of a new heavy particle during gravity decay.

JAPAN - DIFFUSION RATES

T. Mizuno, T. Akimoto, K. Azumi, M. Enyo (Fac. Eng., Hokkaido Univ., Japan), "Diffusion rate of deuterium in palladium during cathodic charging," *Denki Kagaku oyobi Kogyo Butsuri Kagaku*, 1992 vol 60, no. 5, pp 404-11, in Japanese.

AUTHORS' ABSTRACT

The absorption and release rates of D into or from Pd were measured during electrolysis in a closed cell. At least 2 states of D in Pd are deduced from the behavior of the diffusion. The difference in the diffusion constants is of the order of 10^{-6} and 10^{-8} cm^2/s, respectively, at room temperature. The α, β, and a new phase contribute to the diffusion processes in these 2 fast and low steps, respectively.

JAPAN - ROLE OF LITHIUM

Mutuhiro Nakada, Takehiro Kusunoki, Makoto Odamoto and Osamu Odawara (Tokyo Inst. of Technology, Japan), "A Role Of Lithium for the Neutron Emission In Heavy Water Electrolysis," paper, 6 pages, 1 table, 2 figs, 2 refs, in English.

AUTHORS' ABSTRACT

The depth profiles analysis of Pd, Li, Na, D has been performed by means of SIMS to clarify the roles of lithium in D_2O Pd electrolysis for cold fusion research. Very clear differences between the depth profiles of Li and D in the Pd electrode surfaces with the neutron emissions and without it. The depth profiles were also found to depend on the mode of the electric current employed. Based on the above findings , it is discussed that the anomalous deuterium accumulation in the surface region of the Pd with the neutron emission attributed to the formation of Pd-Li layer in the surface region and to the Low/High pulse mode electrolysis of heavy water with LiOD.

JAPAN - EMISSION DETECTION, Pd & Ti

H. Uchida, Y. Hamada, Y. Matumura and T. Hayashi (Dept. of Applied Physics, Faculty of Engineering, Tokai Univ., Kanagawa, Japan), "Detection of Radioactive Emissions in the Electrolytic Deuteriding-Dedeuteriding Reaction of Pd and Ti." post-deadline paper, 3rd International Conf. on Cold Fusion, Nagoya.

AUTHORS' ABSTRACT

In previous investigations [1-3], we found that the pulse-modulated electrolytic deuteriding-dedeuteriding reactions of Pd in KOD cell at current densities from 600 to 4000 mA/cm^2 exhibit GM [gamma] counts much higher than background or radiations in the hydriding-dehydriding reaction. The increase of current density seems more effective than the cold-working of Pd-samples for the detections of the almost continuous excess radiations. The details of our experimental conditions are reported elsewhere [1-3]. In this work, we report on the occurrence of excess radiations in the electrolytic deuteriding of Ti in comparison with the results for Pd.

AUTHORS' RESULTS AND OPINIONS

1. The excess radiations can be observed even in the preliminary deuteriding of Ti at low current densities of 30-50 mA/cm^2. The excess radiations can be measured also at higher current densities between 2000-4000 ma/cm^2. However, no distinct effect was measured in the pulse-modulated deuteriding-dedeuteriding reactions. This result is different from that of Pd in which the excess radiations can be measured only by pulse-modulated deuteriding-dedeuteridings at current densities higher than 600 mA/cm^2.
2. No excess GM [gamma] counts can be measured in the hydriding of Ti using a KOH cell or when hydrogen absorption by Ti does not take place because of the presence of thick surface oxide layers on Ti samples.
3. Marked difference in the occurrence of the excess radiation between Ti and Pd samples in the course of the electrolysis: Ti samples exhibit slow burst in the excess GM [gamma] counts which appear in about 60 min. after current switch on and attain maxima much higher than those exhibited by Pd and then decrease to disappear in 10 to 30 min. at stationary current densities. Pd samples exhibit almost continuous excess GM [gamma] counts in the course of pulse modulated deuteriding-dedeuteridings. These observations imply some radioactive emissions like X-rays detectable by GM [gamma] counters in the deuteriding reactions of these metals.

[1]. H. Uchida et al., Proc. of the 40th Int. Soc. Electrochem. Meet., Sept. 1989, Kyoto, Japan, Rept. 22-01-13-G.

[2]. H. Uchida et al., *J. Less-Common Met.* 172-174 (1991) A40-41.

[3]. H. Uchida et al., Proc. Int. Symp. Metal-Hydrogen Systems, Uppsala, Sweden, June 1992.

JAPAN - HIGH REPRODUCIBILITY

Courtesy of the authors.

Eiichi Yamaguchi, Takashi Nishioka (NTT Basic Research Lab., Musashino-shi, Tokyo, Japan), "Direct Evidence of Nuclear Fusion Reactions in Deuterated Palladium," manuscript from 3rd International Conference on Cold Fusion, Nagoya, 10 pages, 5 figs., 11 refs.

AUTHORS' ABSTRACT

Using our own "*in vacuo*" method with the heterostructure of deuterated Pd (Pd:D), we have for the first time succeeded in "*in situ*" detecting ^{4}He production, with high reproducibility. The real time observation has been performed by quadrupole mass spectroscopy having high resolution (0.001 amu at 4 amu). The amount of produced ^{4}He gas was strongly correlated to the excess heat evolution, and was increased with increasing the loading ratio of D to Pd. At maximal loading ratio of D to Pd, we have also observed T production by detecting HT. The amount of HT is increased at the final stage of ^{4}He production. On the other hand, the system of H-loaded Pd (Pd:H) exhibits neither ^{4}He nor T Production. Furthermore, simultaneous detection for the energy spectroscopy of charged particles has revealed that α particles with the energy of 4.5-6 MeV and protons with 3 MeV were emitted from the oxide surface of Pd. However, the amount was extremely small in comparison with that of ^{4}He. These facts strongly suggest the occurrence of a new class of nuclear fusion in the system Pd:D(H).

AUTHORS' CONCLUSION

In conclusion, we have for the first time succeeded in "*in situ*" detecting ^{4}He production with high reproducibility, using our own "*in vacuo*" method. This gives the first definite evidence for the reality of "cold nuclear fusion" in solids. The real time observation has been performed by quadrupole mass spectroscopy with high resolution (0.001 amu at 4 amu). The amount of produced ^{4}He gas was strongly correlated to the excess heat evolution, and increased with increasing the loading ratio of D to Pd.

At largest loading ratio of D to PD, we have also succeeded in observing T production by detecting HT. The amount of HT is increased at the final stage of ^{4}He production. On the other hand, the system of hydrogen loaded Pd (Pd:H) exhibits neither ^{4}He nor T production. Nevertheless this system shows the excess heat evolution, when explosive gas release with 3 amu occurred.

Furthermore, simultaneous detection for the energy of 4.5-6 MeV and protons with 3 MeV were produced from the oxide surface of Pd. However, the amount was extremely small in comparison with that of ^{4}He. These facts suggest that the main reaction is d + d → ^{4}He + Photons/phonons and p + d → ^{3}He + photons/phonons is the system Pd:D and Pd:H/D, respectively.

Presented at ICCF-3 Nagoya in slightly different format (*F.F.*, Nov. 1992).

KOREA - COLD FUSION REVIEW

Kwang Pil Lee, Won Sik Kim, Kil Ung Choi, Sun Tae Hwang (Korea Stand. Res. Inst., S. Korea), "Cold Fusion," *Anal. Sci. Technol.*, 1991, vol 4, no 1, 8 refs, pp 103-107, in Korean.

AUTHORS' ABSTRACTS

Review of room temperature nuclear fusion phenomena controversy started by Fleischmann and Pons.

POLAND - NO NEUTRONS

Z. Szeflinski, M. Kozlowski, S. Osuch, P. Sawicki, G. Szedlinska, Z Wilhelmi, K.B. Starowieyski, M. Tkacz (Inst. Exp. Phys., Warsaw Univ., Poland), "Upper Limit of Neutron Emission from the Chemical Reaction of Lithium Deuteride (LiD) with Heavy Water," *Phys. Lett. A*, vol 168, no 3, pp 83-86, in English.

AUTHORS' ABSTRACT

A search for fast neutrons induced by the chemical reaction LiD + D_2O has been performed using the pulse shape discrimination technique for neutron identification. Contrary to A.V. Arzhannikov and G. Ya. Kezerashvili (1991) neither continuous nor bunched neutron emission was observed. The upper limit of neutron emission was estimated as $\leq$2.5 neutrons per g of deuterized matter during the chemical reaction.

SPAIN - ALKALINE BEHAVIOR OF Pt

Emilia Morallón, José Luis Vázquez, Antonio Aldaz (Dep. Quím. Fís., Univ. Alicante, Spain), "Electrochemical Behavior of Platinum (111) in Alkaline Media -- Effect of Specific Adsorption of Anions," *J. Electroanal. Chem.*, vol 334, no 1-2, 1992, pp 323-338, English.

AUTHORS' ABSTRACT

The electrochemical behavior of a Pt(111) surface in 3 alkaline solutions ($NaHCO_3$, Na_2CO_3, and NaOH) was studied. The voltammograms show 2 very well-defined zones for the 3 media investigated. The one located at lower potentials corresponds to weak H adsorption states. In the second zone, at more positive potentials, several processes are superimposed that were separated by the strong specific adsorption of anions (Br^- and I^-). The shift of part of this second zone to less positive potentials with the increase of the anion-specific adsorption could be compatible with a H-like adsorbed species, while the shift to more positive potentials of the other part could be compatible with an oxygenated adsorbed species.

SWITZERLAND - THE N MACHINE

Courtesy of Samuel P. Faile

Shiuji Inomata, (Electrotechnical Lab., MITI, Ibaraki, Japan), "Small Nd Magnet Twin N-Machine Topical Area: New Technology for Energy Utilization," Speech given at IECEC 93, Zurich, Switzerland.

AUTHOR'S SUMMARY

The author presented a paper, entitled "New Paradigm And N-Machine" at the 26th IECEC 91, Boston Conference. Since then, the author has developed a small neodynium twin N-machine to validate the theory. The sizes of the four Nd ring magnets are the outer diameter, 9 cm, and inner diameter is 6.8 cm respectively, and eight copper carbon brushes are installed. Twin Nd N-machine is driven by a 24 volt 400 watt DC motor. The open circuit EMFs are 107mV for 3000rpm, and 143 mV for 4000 rpm; current with 1 milli-ohm load is 9.5 amp for 3000 rpm, 11.4 amp for 4000 rpm. The back torque current could not be detected by ordinary accuracy measurements. Liquid metal brushes could increase the collected electrical current up to about 100 amps. The output electrical power is not from the drive motor but from the vacuum, according to the theory. The critical condition of the vacuum energy extraction would be realized for Nd magnet of 20 cm diameter and liquid metal brushes. In the N-machine, both electrical charge and energy, ie. "electrical power," are thought to be extracted from the vacuum. The theoretical treatments are also presented from the author's New-Paradigm Science and vacuum theories. The author's vacuum theory is different from Dirac's theory. The vacuum is considered as a balanced sea of both positive and negative "shadow energy" of infinite depth, which well coincides with various shadow energy experiments. The extrapolation of the data obtained from the small N-machine up to bigger N-machines, which utilize not only neodynium magnets, but also super-conducting magnets has been made. An estimate has indicated that 16 Tesla superconducting magnets, 1 meter diameter twin N-machine could extract 320 mW vacuum energy at 5000 rpm rotation, well above the critical state, solving the environmental problems. The experimental video of the small Nd magnet twin N-machine will be displayed at the conference.

EDITOR'S COMMENTS

There are a number of rotating machines that produce "over-unity" energy. We thought our readers would appreciate this report from a MITI-funded study of one such enhanced-energy machine. Note that the author suggests that the machine is tapping ZPE (Zero-Point Energy). See also page 8 for Moray King's report on progress in ZPE research.

UKRAINE - NO NEUTRONS

V.A. Rashko, V.I. Vitko, I. G. Goncharov, V.F. Zelenskii, G.D. Kovalenko, S.M. Krivoruchko, Yu. N. Ranyuk, I.K. Tasarov (KhFTI, Kharkov, Ukraine), "Neutron emission-based study of nuclear fusion in palladium during electrolysis," *Vopr. At. Nauki Tekh., Ser.: Fiz. Radiats. Povrezhdenii Radiats. Materialoved.* 1992, No. 2, pp 54-63, in Russian.

AUTHORS' ABSTRACT

The emission of *n* was studied in cold fusion reactions. A schematic of the application is described, in which 14 SNM-18 counters were used, filled with ^3He under a pressure of 4 atm. The application is characterized by a transmission of 0.1 pulse/*n* and a background of 200 pulses/h. Several measurements sessions are described, each of duration > 100 h. The systematic errors were investigated. An increase in the intensity of *n* emission above the background intensity was not observed. An upper limit was obtained for the intensity of *n* emission in a cold fusion reaction.

UKRAINE - ALUMINUM AS A CATALYST

A.N. Sofronkov, L.I. Korolenko (Odessa Teknol. Inst., Ukraine), "Aluminum as a promoter of Nickel Catalyst of Hydrogen Electrode of Electrochemical Generator," *Ukr. Khim. Zh.*, (Russ. ed.) 1991, vol 57, no 4, pp 395-397, in Russian.

AUTHORS' ABSTRACT

The electrochemical activity was studied for Al-Ni electrodes as a function of the Al amount, temperature and conditions of electrode preparation. Additions of Al influenced the electrochemical activity and stability of the electrode.

UKRAINE - COLD FUSION MODEL

V. F. Zelenskii (KhFTI, Kharkov, Ukraine),"Nature of phenomena initiating fusion reactions of deuterons in substances," *Vopr. At. Nauki Tekh., Ser.: Fiz. Radiats. Povrezhdenii Radiats. Materialoved.* 1991, No. 2, pp 34-45, in Russian.

AUTHOR'S ABSTRACT

A new approach was developed to explain the phenomenon of fusion of *d* in substances. The author starts from the fact that the D evolved from metals and metal hydrides are found in the partially ionized state. The redistribution of the ionized gas along the cracks filled with desorbed D developing in the voids of the substance (cracks, blisters, etc.), as well as the formation of bubbles of D in the electrolyte, is accompanied by an accumulation in these formations of significant electric charges and the development in them of a potential difference of 10s' of kV. The nuclear fusion reactions in this case are the result of a spark breakdown of the D layer at sites where an electric field potential is reached, which is sufficient for breakdown or where, by virtue of any source (e.g., interaction with the walls by fast charged particles or radiation, etc.), the electric strength of the gas layer is destroyed.

EDITOR'S COMMENTS

This paper describes conditions in an electrochemical cell that can produce high-density electron charge clusters (EVs or "electron beads"). See *Fusion Facts*, May 1992, pp 16-17, "What Happened to the Coulomb Barrier?".

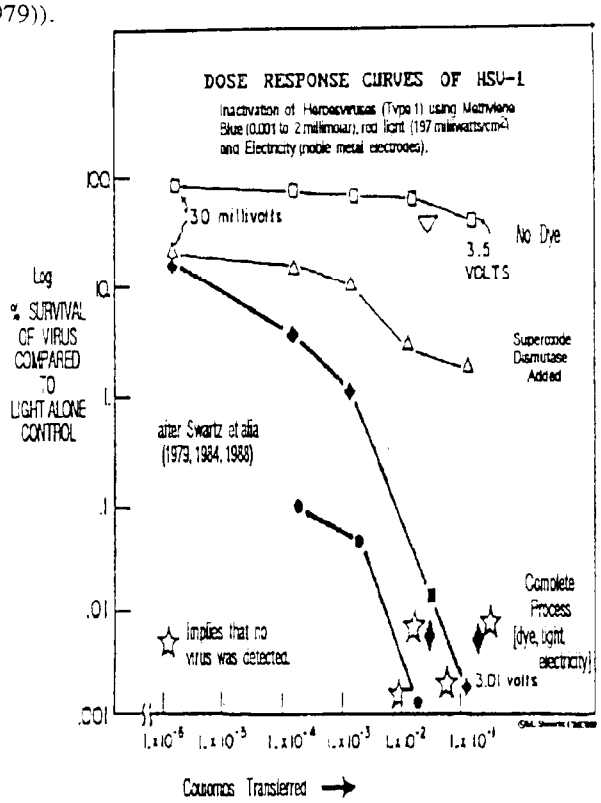
E. SHORT ARTICLES FROM READERS

Dye Catalyzed Photoactivated Charge Transfer Noble Metal Cathodes

Courtesy of Dr. Mitchell R. Swartz

Prior to the MIT seminar (see page 3), Dr. Swartz informally discussed his earlier work (from 1974) using palladium and platinum cathodes for the inactivation of viruses and some tumors [Patents 4,407,282; 4,402,318; 4,346,172; 4,181,128]. His work with viruses has demonstrated that, with proper procedures, an extremely small electrical current (even microamperes) for a few minutes can completely destroy large quantities of Herpes viruses. What it takes is: certain dyes which bind to the virus and visible illumination which photoactivates the dye allowing electron transfer from the cathode.

The discovery that dye, light and electrical currents (DLE) using noble metal cathodes can produce dose-related virus/bacterial /tumor inactivation levels far beyond those observed for any of the separate modalities, has created the potential of new medical treatments. The advantage is illustrated using Herpes viruses (HSV). For example, dilute methylene blue (10 micromolar) and red light (197 microwatts/cm) kills 70-95% of concentrated herpes virus in vitro (e.g. McIntyre strain, or clinically derived mixtures of Types 1 and 2). The therapeutic advantage of DLE can be seen in the figure below. With the addition of electricity (100 microamperes x 3 minutes) there develops the reproducible inactivation of more than 99.999% of virus (M. Swartz, G.A. Clark, "Advances in Photochemotherapy," *SPIE*, vol 997, pp 84-89 (1988); Swartz et al., *Proc. of the Society of Experimental Biology and Medicine*, vol 161, pp 204-209 (1979)).



[Note that the stars in the above figure indicate that no viruses were found. Dr. Swartz's discovery of how to treat an "incurable disease" using a mild form of "cold fusion electrolysis" is a fascinating story. Ed.]

It was the similarity of the unwanted evolution of gas at the cathode in the clinical DLE studies, that led Dr. Swartz from biomedical electrochemistry to the "loading" of palladium cathodes by isotopic fuels (including the Quasi-1-model, *Fusion Technology*, vol 2, no 2 (1992), pp 296-300, 2 figs, 11 refs. (*FF*, Sept. 1992)

Nuclear Transmutations at Room Temperature

by Dr. Harold Aspden, Southampton, England

The following comments are written in response to a personal enquiry from Hal Fox, the editor of *Fusion Facts*. He

referenced the September 1992 issue and the review by Dr. Bush concerning Alkali-Hydrogen Fusion which mentions evidence of transmutation of K into Ca and Rb into Sr in water-based electrolytes containing carbonates of potassium and rubidium when excess heat is being generated.

Most scientists expect new discoveries to be explained by old theories. New theories which reinterpret old discoveries are not heeded and so do not survive peer review. Therefore, when experiments do lead to new discoveries which conflict with what has become accepted theory there is confusion and disbelief. Once in a while one of those 'new theories' which one's peers try to suppress does cast light on the new discovery and its author is still on the scene to say: "I told you so!" Hence the following comment.

The question of nuclear transmutation of stable elements at room temperatures concerns why atomic nuclei are stable and the starting point is to know what the nucleus looks like. The evidence we have is based on numbers A and Z. We 'think' Z is the number of protons and (A-Z) is the number of neutrons somehow bound together in the atomic nucleus. We are puzzled because deuterons appear to fuse without shedding neutrons. So, let us 'think' on different lines.

We know that the core charge of an atomic nucleus is Ze, where e is the charge possessed by the positron. We should not jump to conclusions by saying there are Z protons in the nucleus, even though that is true when Z = 1. After all, we also know that heavier atomic nuclei can emit beta plus particles, which is another name for the positron.

We assume that the mass of an atomic nucleus is seated with its core charge, but we only know that when that charge moves the mass follows, just as do the satellite electrons. Therefore, we could suppose that the charge core is an aggregation somehow formed from Z positrons surrounded by a neutral satellite system of A heavy particles, which is further surrounded by the outer electron system.

Now the reason for advancing such a proposal is that (a) it is extremely easy to explain the way in which A is known to increment in relation to Z using simple energy analysis and (b) why atomic nuclei are stable. The 'secret' of this explanation is connected with the underlying fluid-crystal type lattice of the zero-point vacuum field background, because those A 'neutral' particles are not really electrically neutral. They appear so because they have replaced virtual charges displaced from sites in a lattice structure centered on that nuclear core charge.

The reader seeking to understand this in detail may find it easiest to refer to the article "The Theoretical Nature of the Proton in a Lattice Vacuum" appearing between pages 345 and 359 in the NATO ASI Series B publication (Volume 162) entitled "Quantum Uncertainties" and Edited by Honig, Kraft and Panarella (Publisher Plenum Press, New York, 1986).

There, in a few lines, one finds an explanation of the progressive increase of A/Z from 2 to A = 2.5 for stable elements ranging from Z = 2 to Z = 83, based simply on the model of the atom just presented. Note that those A neutral particles could be protons or antiprotons, depending upon whether the vacated vacuum lattice sites represent negative or positive 'holes'. Note also that quantum-electrodynamics is all about the effects at 0.511 MeV involving creation of electrons and positrons from the vacuum as if the shedding of an electron leaves a positive 'hole' in the black cloth of space.

We have here a theory which denies the presence of the neutron, as such, in the stable body of an atom.

Now, elsewhere, at an earlier date, the stability of a fundamental charge system was discussed in a published scientific paper. Most university libraries will not stock the publication in which it appeared, because the peer review system is reiterative in its blocking effect by being selective about libraries having periodicals containing papers which have passed the test of peer review at the first iteration. The reference is to the first issue of volume 1 of *Speculations in Science and Technology* published in 1978 where my paper on 'Energy Correlation applied to Psi Particles' appears at pp. 59-63. Psi here means those very exceptional particle resonances found by high energy particle physicists at 3095 Mev and 3683 MeV.

I there referred to what was termed 'charge interaction stability' and 'pair creation stability'. In summary, if an electric charge is confined within a sphere it has energy inversely proportional to radius. If therefore our vacuum energy medium is a plenum of energy, meaning that there is need to conserve the space occupied by matter if the energy balance is to hold, then the stability of a system of charges is assured only if their combined energy and space occupancy are separately conserved. The electric charge bounded by a sphere has a change of energy with change of volume that is proportional to its energy/volume ratio. True stability then requires a system of three charges, at least two of which are equal in charge, normal energy and space occupancy. This suggests that the seat of charge of an atomic nucleus has a quark-like form.

I would not think that such a charge core of the nucleus could transmute except under very violent conditions involving high energy impact but one can see scope for transmutation of the isotope, because that means that Z is stable at the core whilst A adjusts in the lattice field. Those heavy particles occupying the lattice sites are not so tightly bound as the components of the charge core.

Therefore, any excess heat on a scale signifying nuclear reaction and generated in low temperature experiments on what are normally deemed to be stable atoms could be examined as isotopic transmutations where A changes but not Z. The problem with the reports about light water-based excess heat generation with the sodium carbonate electrolyte is that sodium has only one stable isotope and this rules out an isotopic transmutation. Therefore, one is left to wonder if it is the H^1-H^2 isotopic exchange in the water solution which is the source of heat. In that case, if transmutation of K to Ca and Rb to Sr is found to occur, one then may see this nuclear action in water as the local trigger for the very energetic disturbance of the K or Rb nuclei charge.

In summary we should stay focused on the nuclear activity seated in the elements of the water (even light water) and regard the electrolyte only as the means for ion transportation.

H. Aspden
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Southampton S01 7HZ, England.

[Thank you! Any responses, readers? Ed.]

COLD FUSION AND OTHER SCIENTIFIC FIELDS

by C. Sanchez (Dept. Material Physics, Univ. Autonoma Madrid, Spain)

Cold fusion (C.F.) researchers form a scientific community like many others in modern sciences and technologies. We have organized several international meetings with considerable success, established a scientific network through which knowledge is continuously flowing and papers on CF already amount to several hundreds (P. Glück could tell us the exact figure). As other scientific communities we must look for connections and relations with other groups to gain in scientific scope, to apply more powerful experimental techniques and to make more fruitful our work. CF is by itself an interdisciplinary activity and several other research fields (metal electrochemistry, nuclear physics, solid state physics, and so on) are closely related to our investigations and activities. I particularly want to comment on the desirable relationships between people who are investigating in metal-hydrogen systems (MHS) and ourselves, the CF community.

The last Conference in MHS and their applications took place at Uppsala, Sweden, in June 1992. During my days in Uppsala, attending the meeting, I had the opportunity to discuss with several MHS colleagues on CF. Most of them appeared to be clearly skeptical, a few were "warriors" against it and a reduced number felt that something interesting is behind current research in CF. In any case, the important thing for me was not their attitude, but their knowledge and experience. Before starting with cold fusion experiments in 1989 our group in Madrid was devoted to metal hydrides and hydrogen storage so we had and continue to maintain good relations with all those colleagues. Through my conversations in Uppsala I confirmed several conclusions that I have got over the last three years.

Success in CF experiments with metals like Pd and Ti seems to require a high concentration of deuterium atoms in the metal lattice, as high as the stoichiometric ratio or even higher. One should expect that some questions relevant to CF phenomena should already be well answered thanks to the many years of research on MHS. Questions such as: How to produce PdD or TiD_2 by electrolytic techniques? How important are the detailed phase diagrams of TiD_x and PdD_x at high x? Are they crucial for us and can the information serve as a possible bridge between our research and that from MHS people? But the reality is that previous research on metal hydrides of pure metals deals mostly with compounds of very low x values, much lower than the concentration in which we are interested. One can understand this gap between our needs and the present knowledge and experience. On the one hand, low hydrogen metal hydrides are easy to handle and quite stable and their properties have been widely investigated. On the other hand, electrolytic loading of pure metals (or even alloys and intermetallic compounds) has been scarcely used in MHS research.

Scientists have preferred the gas loading systems due to its closer proximity to thermodynamic conditions, higher efficiency, and less time consuming. In fact, on dealing with MHS problems, electrolytic loading has been usually applied for short electrolysis times (minutes or hours) and rarely loading times of weeks or months have been investigated. As a consequence one can say that we accomplished old experience of reduced utility in the new experiments .

A second point I want to emphasize is related to the non-equilibrium conditions we claim as necessary to trigger CF reactions. For reasons that we do not fully understand, at present, those conditions appear in some samples (Pd, Ti pieces) and they do not in others. Which conditions, in turn, are connected with the difficulty in getting high loading ratios. With this view we are pushed to investigate the peculiarities of each one of the samples, looking for relations between high loading ratios (and/or non-equilibrium conditions) and cathode characteristics. So we are not only interested in knowing as much as possible about general properties of the MHS (Pd-H, Ti-H and so on) but also those particularities that make a metallic piece different from another one. Is this the interest of colleagues making research on MHS? When I presented this point of view to one of the friends in Uppsala he answered me: "I am interested in investigating the properties of the metals and I do not care about anomalous behavior of this or that particular piece. When I find a piece with an irregular behavior I leave it apart and I take another one". My impression is that this point of view is quite extended.

So, the real present circumstances seem to be that not very much is known about properties of PdD_x or TiEx; not very much is known about electrolytic loading with long electrolysis times; and not much interest exists in "wasting" time with anomalous samples. In these conditions it is clear to me that at present we are not only making research and progresses in CF itself but also significant contributions to other fields like MHS, solid state physics, and metal electrochemistry. Some well known researchers (Prof. Gerischer is one of them) are already recognizing these contributions and progresses. I am quite sure that many more members of the scientific groups I mentioned at the beginning of this note will, finally, join us to look for the truth in the many tantalizing questions we face under the cold fusion denomination.

F. LETTERS TO THE EDITOR

LETTER FROM MATSUMOTO

... The Science and Technology Administration of Japan (STA) have started research and development of cold fusion. The Japan Atomic Energy Research Institute (JAERI) that belongs to STA had earlier tried to replicate Pons and Fleischmann's experiment but they drew the negative conclusion. By accepting the recent results at the Nagoya conference, NTA says that cold fusion is very remarkable, when we have nuclear reactions without harmful neutrons.

As you write the reviews of the Nagoya conference [in *Fusion Facts*] will you mention that I can send photographs of cold fusion research to researchers who request a copy. Would you please ask [your readers] to request it from me?

Dr. Takaaki Matsumoto, Associate Professor
Department of Nuclear Engineering
Hokkaido University
Sapporo 060, JAPAN
Phone: 011-716-2111 (ext. 6682)
Fax: 011-736-2856

[Requested and Done. Ed.]

LETTER FROM ENGLAND
from Harold Aspden

Dear Hal,

As I noted in the comments of mine which you published at p. 3 in the October 1992 issue of *Fusion Facts*, the news circular of the University of Southampton in England reported on September 9 that Professor Fleischmann had backed up his previous claims by the public showing of a video of a cold fusion cell bubbling intensely and emitting 1 kilowatt of excess heat per cubic cm. of cathode alloy. This was on the occasion of the annual meeting of the British Association for the Advancement of Science. The report was of particular interest locally owing to Professor Fleischmann's connection with Southampton University and the fact that Southampton was the venue for this year's B.A. event.

Now, consistent with your aim to report the 'facts' concerning cold fusion, it was fair reporting to refer to that video presentation by Professor Fleischmann. However, it seems that the 'peer' opinion amongst scientists at Southampton University is that the British Association for the Advancement of Science did wrong in staging a situation which would retard the advancement of science. A spokesman writing in the University's *New Reporter* for October 28, 1992 and given three times the space accorded to the earlier report about Fleischmann, says that "it is necessary to correct the impression that the scientific community at the University universally endorses the claims for cold nuclear fusion." The argument against Professor Fleischmann is not scientifically based but concerns the policy governing news media practice. **It is said that when a scientist claiming a new discovery takes the platform to explain what he has discovered, then an opponent should be invited to argue against what is claimed and that, in the case of Fleischmann's presentation, since no opponent could be found, Fleischmann's talk should have been cancelled!**

Quoting from the *New Reporter* commentary:

"The question as to why such a one-sided presentation on cold fusion was allowed at the B.A. meeting must be raised. In fact, this was not the original intent and a 'panel discussion' was billed during which the other side of the case was to have been made. **However, at a very late stage, it was claimed by one of the organizers of the session that no opponent willing to appear in this debate could be found.** Rather than cancel an event of great media interest at such short notice, it was decided, in my view unwisely, to proceed with a one-sided presentation of the scientific case of Professor Fleischmann."

The author expressing that opinion on behalf of the university was Anthony Hey, stated to be an engineer and former nuclear physicist.

The scientific community is surely suffering from a state of delusion, if the facts of science have to be decided by a well-balanced debate between an opponent armed only with eloquence and a proponent backed by video proof of experiment. The delusion is even more serious when it extends to general criticism because no willing opponent can be found to stage the challenge. This situation does, indeed, underline the need for, and the value of, *Fusion Facts*!

[Thanks, Dr. Aspden. You have made a case for a review of peer review. Emphasis added. Ed.]

LETTER FROM CHARLES BENNETT

Dear Editor:

Enclosed is the text of a speech I gave recently in Sacramento. In trying to acquaint people in this area about the state of cold fusion-type experiments, I have discovered how hopeless and cynical most Americans are about the future. The possibility of a new science renews their hope and destroys cynicism.

NEW ENERGY FOR AMERICA

My name is Chuck Bennett and I want to talk to you this morning about the sorry state of American energy production. Traditional fossil fuel plants foul the atmosphere and deplete our mineral resources. Current nuclear power plants produce toxic waste and create nightmare visions of Chernobyl. Is there an alternative?

The Japanese think that there is. The Japanese government has earmarked 2.7 billion yen ($22.4 million) for cold fusion experiments over the next four years. This is at least seven times more money than American industry has spent over the last three years on cold fusion research.

What exactly is cold fusion? No matter what name is used, the experiments ordinarily employ the use of "heavy" water (deuterium, a hydrogen isotope) and metal such as palladium or titanium, heat trigger, and/or electrolysis. The goal is for output power (heat) to exceed input power. At present the scientific community in America either labels cold fusion as "black magic", a "hoax" or a dabble in test tubes trying to prove if it exists or not.

I think that America has waited long enough. I think it is time for America to embrace a new science. And there is no need to argue over what to call it--as some scientists are doing. Whether you call it "cold fusion" or "excess heat from the electrolysis of heavy water" the end result of such experiments will be the same.

Top research scientists at Los Alamos National Laboratory in New Mexico have successfully replicated a Japanese experiment. Researchers at SRI International in Menlo Park have also produced successful experiments at least 38 times in the last three years. But 38 times in three years is just not enough to help put America on a new track. And America badly needs new hope and new opportunities. A new energy source would mean new jobs, more jobs, and a safer environment. Currently, however, scientists are not helping to create this new world. They are sitting in labs when they ought to be out building power plants. Fusion is much, much simpler than most scientists realize. It is also much, much bigger.

How can this be so? The confusion stems in great part from the controversy surrounding cold fusion. In 1989 Drs. Pons and Fleischmann created an uproar when they said they had produced cold fusion. Unfortunately, they were unable to reproduce the process on demand. Scientists world-wide raced to repeat Pons and Fleischmann's success and most failed. Some claimed that cold fusion did not exist at all.

How can the obvious contradictions be resolved? A knowledge of gases suggests that the electrolysis in Pons and Fleischmann's original experiment merely concentrated deuterium at the surface of the palladium. Then a concentration gradient of the deuterium drove deuterium into the metal lattice rather than electrolysis driven potential. When the metal was saturated with deuterium, Pons and Fleischmann turned up the current. The increased Joulean heating elevated the temperature of the deuterium-laden metal and the process I call lukewarm fusion occurred, causing the metal electrode to melt.

The "nuclear fusion furnace" illustrates how this process would work. This "furnace" is simply a fusion pile that continuously accepts pellets of titanium previously saturated with deuterium at liquid nitrogen temperatures. The furnace remains at a high temperature due to the mitigated, damped fusion process of lukewarm fusion heated by molten metal and gamma bursts from the fusion of deuterium atoms. A surrounding shroud, such as thick steel or lead, captures the heat and high energy photons and creates steam to power electric turbine generators.

In lukewarm fusion the deuterium is coaxed into a metal lattice at very low temperatures, such as that attainable with liquid nitrogen, while the deuterium is under very high pressure. Then upon quick elevation to higher temperatures the deuterium atoms become thermally active and actually fuse as occurs in the hot hydrogen bomb. However, because of the unique combination of the entrapped, adsorbed state along with the increased thermal activity, the process can occur at much lower temperatures than the billions of degrees required for free floating hydrogen isotope ignition. The new process is a highly mitigated, damped ignition that can be controlled for useful purposes other than flashing an entire city. The "nuclear combustion" process will be complete and pure helium will be the by-product.

The theory of lukewarm fusion suggests that residual helium or radioactivity need not be present to prove that a new realm of fusion energy exists. The fusion would be complete, leaving no trace of radioactivity, and all helium produced would be liberated at the surface of the metal leaving none imbedded within the metal. This is not to suggest that lukewarm fusion is utterly risk-free. While this new energy process is in the development stage, there are safety measures that must be taken.

In January 1992 Dr. Andrew Riley was killed during a cold fusion-type experiment at SRI International. Investigators suggest that scientists were not cognizant of all the risks involved in research. Certainly, extreme care may have been lacking, but there is another factor to consider. SRI is the lab where huge bursts of "inexplicable and unpredictable" excess power have occurred during experiments. These bursts have sometimes ranged up to 300% of the input power. While scientists remain uncertain of the constituent levels needed for controllable experiments, any experiment seeking cold fusion type results will be dangerous.

But no more lives need be lost. There is no reason why scientists cannot run experiments under optimum conditions with remote control. If they are given encouragement and funds, scientists will eventually develop this new energy source. And it will mean many, many good things for America. Not only would this new science create new jobs and more jobs, it would create something just as important. New hope. Hope that America could harness the power contained within the sun to benefit society.

What can you do to help make this new power source a reality? First, you can rally scientists to action by letting American industry and American policy makers know that you're tired of the status quo. You can call your Congressman and support cold-fusion type research. You can tell your friends about the reality of this new power source.

And, most importantly, you can believe in new energy for America while we still have time to make a change.

[Charles Bennett is congratulated for his enthusiasm. His engineering example may not be the technological winner in the commercial cold fusion race, but some type of an enhanced energy system will be. Ed.]

LETTER TO DR. BUSH

Dear Prof. Dr. Robert T. Bush,

We established the Earth Environment University (President Dr. Hisatoki Komaki) and the Earth Environment Science Academy Foundation (President Dr. Hisatoki Komaki and Vice-President Dr. Eisaburo Saito, Senator of the Japanese Parliament, ex-Minister of Science and Technology of the Japanese Government; Professors are about 150 Presidents and Professors of about 50 Japanese Universities) in Japan. We should be much obliged if you would very kindly accept our Honorary Degree of Doctor of the Earth Environment Science, of our Earth Environment Science Academy Foundation, with the complete agreement of our American chapter: the Earth Environment Academy of America.

Please kindly accept our Honorary Degree (under separate cover, we are now sending the Diploma) as a token of our sincere thanks for your heart-warming encouragement to us.

Very truly yours,
/s/
Prof. Dr. Hisatoki Komaki
Komaki Peace Foundation
Shiga-ken, Japan

LETTER FROM SAM FAILE

"Is Oxygen Playing A Spectator Role?"

It seems that oxygen is present "where the action is" in cold fusion. There is oxygen nearby in electrolytic cold fusion that takes place near the surface. In Yamaguchi's NTT technique, much of the excess heat activity is associated with the semipermeable Mn-O layer. In Kaliev et al.'s technique, the effect may be from the bulk (or at least as far as the channels extend) which is not surprising since the bronze W-O compound has oxygen all the way through it. The exceptions appear to involve higher energy techniques such as plasma focus or Karabut's glow discharge technique. Perhaps the oxygen plays an unexpected collective screening role.

[When the electrolysis of water is conducted using carbon electrodes and iron is produced, oxygen is also present. Ed.]

LETTER FROM DR. PETER GLÜCK

Dear Hal,

Both the inspiring discussions with, and the excellent presentation of the ICCF-s Nagoya breakthroughs, and of other results in *Fusion Facts*, have helped me to develop a rather clear and optimistic vision of cold fusion. The forecast for 1993 is great leap toward understanding and commercialization on the basis of immense volumes of research work which has to be guided by an efficient strategic thinking. In my opinion, some firm elements of this strategy are the following concepts:

1. Alkali-hydrogen fusion: I entirely agree with its co-founder [with Dr. Randall Mills], Dr. Robert Bush, that we will see "overwhelming evidence" for this type of transmutation in 1993 [1].

2. The penetration of the Coulomb barrier accomplished by neutral particles - real or virtual (may I remind you, the apocryphal Russian legend of the girls who have been able to climb the otherwise completely inaccessible, many miles high diamond mountains due to temporary metamorphosis into swans). I think the Kamada paper [2] is one of the good, direct proofs for this idea.

3. The "surface-dynamics" concept [by Dr. Glück] with its straight forward guidance to an efficient cold fusion process/device. If the nuclear processes are localized at certain active sites on the very surface of the cathodes or other generators, then the enhancement of these processes can be achieved by:

3.1. Extension - increasing the surface;

3.2. Activation - increasing the density and the efficiency of the active sites on this surface; and

3.3. Protection - good means to avoid poisoning/ aging/ decay/ destruction of these active sites [3].

For 3.1. We have seen recently many methods to increase the active surface, for example, Arata's complex sputtered Pd/Ni cathode [4], Mills; miles-long nickel wire cathodes [5], the porous Ni-alloy cathodes of Bush and Eagleton [6], and as a potential ultimate record, the brilliant idea of the Kaliev group to MOVE THE SURFACE INSIDE THE VOLUME in channels of one atom's thickness [7]. This idea has arrived to us in a significant synchronicity with both J.P. Vigier's theory regarding capillary fusion [8] and represents a third degree encounter of cold fusion with one of the most important, just-new-emerging fields of materials science: nanostructured materials. This is a decisive encounter, therefore, I dare to recommend to our cold fusion friends to read some illustrative papers [9-11] and a book [12] on this subject. Only nanometallurgy could help us to develop really performant palladium, nickel etc. cathodes with active sites cleverly dispersed in the whole volume.

For 3.2. The use of pulser (electrical, heat, laser, acoustical etc.) seems to be an efficient way to raise active sites. We have to consider such pulses at least on three levels of length of time: kiloseconds - the long cycles used by Takahashi [13]; the effect of these is probably some rearrangement of the crystal faces as shown in a very important paper on electrocatalysis [14], milliseconds - used e.g in Mills' light water process [15]. It is probably an oversimplification to consider these pulses only as a means to decrease the size and the number of the gas bubbler which inactivate the surface, their functions can be much more complex. Microseconds - *Fusion Facts* had informed us about Joe Champion's results based on the use of a combination of two radio frequencies [16].

The engineering dilemma, sophisticated vs. simple technical solutions was decided a long time ago by the plating finishing industry in the favor of the former. Very complex patterns of pulsed currents are used in the actual practice of this industry in profitable ways [17]. The use of asymmetrical alternate currents is sometimes the best solution [18]. The very high current densities attained during the pulses, the resonance phenomena characteristic for some predictable frequencies, the relaxation stages between the consecutive pulses, the short inverted polarity periods - all these represent interesting possibilities for the enhancement of surface dynamics and nuclear catalysis.

For 3.3. We need more accurate data regarding the structure and functions of the active sites. I want just to mention that the use of pulled current is also a means to avoid the deposition of some harmful impurities. The discovery of new white magic methods like McKubre's Al- and Si-based "Pixie Dust" [19] can contribute to the understanding of how active sites work. However, later more logical knowledgeable methods for assuring longevity of the active sites have to be worked out.

"Computers have to think, people have to gather data" is a good saying. You have to use all the data facts to achieve a global vision. You have to consider and accept both positive and negative data which are actually complementary not contradictory. Corroborating the ideas regarding nature (alkali-hydrogen fusion), mechanism (neutral-particle based) and topology (active sites localized on the surface) of the cold fusion reactions, we will be able to demonstrate once again that "the value of a scientific theory lies not only in its explanatory power but also in its generative capacity." [20]

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ADDENDUM: Received from Dr. Glück near press time:

In my letter I have inattentively omitted to mention the early prophetic interest of *Fusion Facts* for nanostructured materials (see *F.F.* vol 3, no 12, June 1992, pg 9). I apologize for this error and ask for adequate correction according to the Didenko et al. paper. Resonance frequency for K ions is .2475 Hz. Can you try such a high value?

Best Regards,
/s/ Peter Glück

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