

# 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

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## A. PRIMER ON NUCLEAR CHANGES

By Hal Fox, Editor-in-Chief

The recent historic conference on Low Energy Nuclear Reactions (Texas A&M, June 19, 1995) is expected to have an impact on the acceptance of the concept that nuclear reactions can and do occur at low energy levels under specific conditions. This newsletter has, for some years now, used the terms **proton capture**, **nuclear catalysis**, and **catalysis of nuclear reactions on or within a metal lattice**. Substituting names for events adds zero knowledge except to identify a suspected process.

For those who are new to the concept of low-energy nuclear reactions, one of the basic concepts is that by electrolysis (or some other means) a hydrogen atom is extracted and ionized (thereby becoming a proton). Under conditions that we do not fully understand, usually near the surface of a metal lattice (or possibly within a metal lattice), the proton appears to be able to combine or fuse with another element. For example, in light-water electrochemical cells, the current from anode to cathode creates protons at or close to the surface of the nickel cathode. Also present is the electrolyte, such as potassium carbonate. Something in the process of the production of the proton, in the vicinity of the nickel cathode surface (or, perhaps, slightly below the surface) and in the presence of an ionized element of the electrolyte (especially, the alkali elements) promotes or catalyzes a fusion between the electrolyte ion and the proton.

The fusion of protons with relatively heavy elements (heavy with respect to say lithium) has been considered to be highly unlikely. However, a recent paper by Yeong Kim [1] shows that such a nuclear event to be up to fifty orders of magnitude more likely than fusion of protons with lithium! Here we have the newest theoretical work supporting the observations of the more recent experimental work, as is highly appropriate.

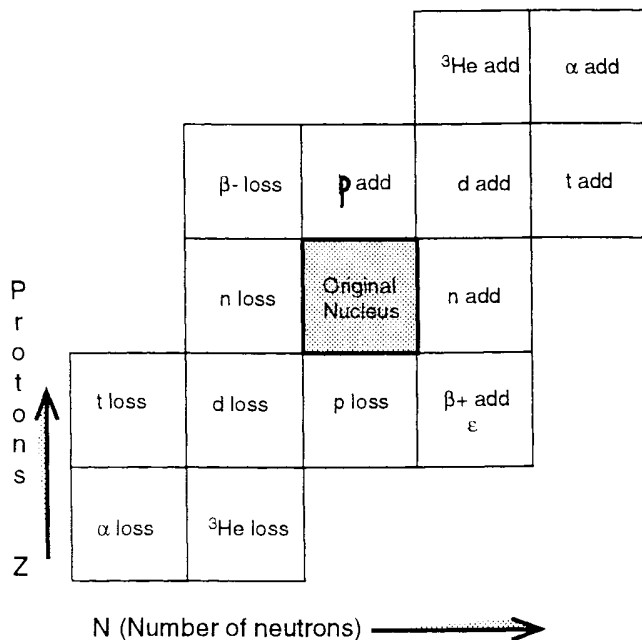
Changing people's habits and  
ways of thinking is like  
writing your instructions in the snow  
during a snowstorm.

Every 20 minutes you must  
rewrite your instructions.  
Only with constant repetition  
will you create change.

--Donald L. Dorvar

In the Fig. 1 that follows, is presented a graphical description of the changes that can be made to an original nucleus by various fusion (added) or fission (loss) of various elemental particles ranging from protons to alpha particles (ionized helium-4 nuclei.) It is important to understand that if the original nucleus is stable, the nucleus formed by the addition or loss of a particle may or may not be stable. If not stable, then the new nucleus will decay (most often by  $\beta$  emission) to a stable element. At the present time the only recognized ways in which such an original nucleus can be easily changed is by particle bombardment with a high-energy beam of particles ranging from protons to alpha particles.

The newly-found ways in which the original nucleus can be transformed is through the use of cold-fusion type electrochemical cells using light water (and producing protons) or using heavy water (and producing deuterons). It would be expected, but not as yet reported, that tritium water as the electrolyte would produce tritons and provide for suitable nuclear transformations.



Symbols:  $\alpha$  = alpha particle;  $\beta^-$  = electron;  
 $\beta^+$  = positron;  $\epsilon$  = electron capture; d = deuteron;  
 n = neutron; p = proton; t = triton (tritium).

Fig. 1. GRAPH OF NUCLEAR CHANGES TO ORIGINAL NUCLEUS

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Fig. 1. GRAPH OF NUCLEAR CHANGES TO ORIGINAL NUCLEUS

In a recent paper, Dr. Robert T. Bush [2] reports on the experimental findings made by himself and his associate

(Robert D. Eagleton) wherein they measured the presence of transmuted elements produced in a light-water electrochemical cell using rubidium in the electrolyte. Mass spectroscopy analysis of the scrapings from the nickel cathode showed the presence of transmuted elements from rubidium through tin. Among the many isotopes developed by proton capture there are many unstable elements produced that decay by the emission of a beta particle. It is important to notice that there are very few such nuclear reactions that emit neutrons. Nearly all of the neutron-emitting unstable elements are in the high-Z end of the periodic table. Therefore, it is expected that these electrochemical cells (cold fusion cells) can be operated with little or no neutrons being emitted. All other emitted particles are easily controlled or are benign.

More studies on the transformation of nuclei using light-water electrochemical cells have been made than those using heavy-water cells. It is strongly suggested that the key to the reduction of radiation in radioactive nuclear wastes lies in this byproduct of cold fusion experiments. The following steps are suggested for the proposed experimental work:

1. Obtain a radioactive alkali element and use this material to form a carbonate as the electrolyte in a light-water cold fusion electrolytic cell.
2. Operate the cell at relatively high currents. Although the power amplification factor may not be as high, it is expected that the number of atoms transmuted per hour will be higher than at lower current densities.
3. Use a closed cell system with a catalytic devices to ensure that the generated hydrogen and oxygen are recombined to drip back into the operating cell.
4. Observe all of the proper safety precautions when using a closed cell so that excess pressure cannot develop and damage the cell.
5. Make careful measurements of the electrolyte on a before and after basis to determine the degree of radioactivity per unit volume of the electrolyte.
6. Make careful measurements of the nickel electrode on a before and after basis to determine the degree of radioactivity for the cathode.
7. Make careful measurements of the amount of the element that is expected to be the result of transmutation that is contained within or on the surface of the cathode before the experiment is run.

8. Carefully abrade the cathode surface and make accurate measurements of all elements present in the abraded material removed from the cathode. If transmutation is occurring by proton capture, there may be a series of elements deposited on the cathode surface all of which began with the radioactive element in the electrolyte.

9. The experimenter must take great care to ensure that there are no contaminating chemicals in the light-water cell that would prevent the normal cold fusion effect. Therefore, it is important that this experimental work be done by those who have been successful in previous light-water experiments. The development of excess heat should be monitored as the experimental verification that the cell is performing as expected.

It is hypothesized that the following results will be found with a successful experiment:

The radioactivity of the electrolyte will decrease and the rate of decrease will be proportional to the total number of Coulombs of current.

Little or no radioactivity will be found in the abraded material removed from the cathode.

Evidence of a series of transmuted elements will be found after the cell has run and the amount of materials will be proportional to the number of Coulombs of current passed through the cathode.

**In view of the enormous need for methods to reduce the radioactivity of byproducts from both weapons and energy related nuclear experiments, this type of experiment should receive the highest national priorities.**

The biggest difficulty that will be found in obtaining funding for this research is that the reviewers will probably reject the experiment as being impossible **because the current model used to explain nuclear reactions does not apply to low-energy experiments.** Therefore, funding may have to come from sources outside of the government offices where professional skeptics impose their outdated models in evaluating new proposals.

#### REFERENCES

[1] Yeong Kim (Professor, Purdue Univ., Indiana), "Uncertainties of Conventional Theories and New Improved Formulations of Low-Energy Nuclear Fusion Reactions," Proceedings of the Conference on Low-Energy

Nuclear Reactions, published by Fusion Information Center.

[2] Robert T. Bush (Cal Polytechnic Univ - Pomona), "Electrolytically Stimulated Cold Nuclear Synthesis of Strontium from Rubidium," Proceedings of the Conference on Low-Energy Nuclear Reactions, published by Fusion Information Center.

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## B. NEWS FROM THE U.S.

### CALIFORNIA - BUCKY FUSION?

Charles Bennett (The Fullerene Fusion Group), "Fullerene Fusion Electrodynamic Generator," Patent application.

#### AUTHOR'S ABSTRACT

This invention relates to the production of electricity and heat energy by means of an electrodynamic fusion plasma utilizing the material Buckminsterfullerene. Co-inventor Warren L. Cooley worked from a theoretical basis established by the late Buckminster Fuller and experimented with the concept that energy can be harvested to do useful work from shape, and that certain shapes are inherently energetic. The invention herein described demonstrates that shrinking these characteristics and principles to the scale inherent in naturally occurring structures, i.e., carbon fullerenes, results in a catalyst and means of confinement for a fusion reaction.

Accordingly, several objects and advantages flow from the invention herein described. The technology represented in the development of this invention is at the cutting edge of a number of scientific disciplines including general chemistry, surface chemistry, fluid dynamics, electrodynamics, high energy physics, quantum physics and aspects of other related specialty fields. The elements of the invention are combined in a manner that could be described as emulating, to some extent, the natural stellar fusion processes that exist in the universe. A primary element of the invention is, in fact, a naturally occurring phenomena of the universe, i.e., Carbon<sub>60</sub>. The invention has implications that are cosmological and may be precursors to a new richer understanding of the origins and workings of our universe. Another advantage of the invention is that the raw materials necessary for the production of energy in the invention are abundant and cheap. They also are converted to energy by a means that

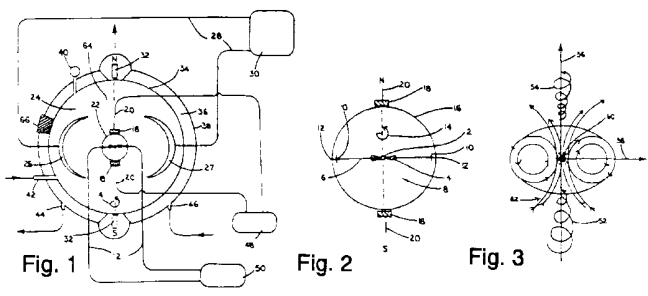
produces no environmentally harmful side effects or by-products.

This combination of cheap and environmentally benign energy production resulting as a product of the invention opens the possibility for the escalation of a worldwide standard of living that heretofore was imaginable only in the context of the distant future. The ramification of a rapid increase in standards of living without drastic and damaging environmental consequences has implications for humanity even beyond the imaginations of the inventors.

Fig. 1 is a cross sectional diagram of the essential elements comprising the apparatus of the invention, a fullerene fusion electrodynamic generator.

Fig. 2 is a cross-sectional diagram of a fullerene fusion fuel capsule viewed perpendicular to the magnetic axis running through the concentric center of the fuel cell when positioned for ignition.

Fig. 3 is a cross sectional view of a plasmoid showing the axis of the magnetic field and the axis of the electric field with streamlines showing the plasma vortex flow patterns.



A fullerene fusion electrodynamic generator designed to produce a direct conversion of fusion energy to electricity and excess heat energy of sufficient temperature to be useful for the production of steam. The carbon sublimates and converts fusion energy release into a mitigated self-holding torroid of supercharged plasma. This fusion-powered combined cycle co-generation unit can be scaled to any level from very small to a central power plant producing multiple megawatts of power. The generator will burn a fuel cell (22) comprising a seed catalyst (4) of  $\text{ND}_2@C_{60}$ , endohedrally deuterated fullerene molecules, formed in a donut shape (4) around an air bubble (2) and suspended by conductive filament (6) and encapsulated by a shell (16) in a surrounding solution of  $\text{LiD}+\text{D}_2\text{O}$  (8). The fuel cell (22) is loaded into a plasma burn chamber (64) that is configured with the axis of a magnetic field

(14) is ignited by a phased resonance of electromagnetic waves and acoustic waves to produce a torroid plasmoid that spins around the axis of the generators magnetic field (14). The seed catalyst (4) of deuterated fullerene molecules allows the fusion plasma to take an electrodynamic shape that holds itself together around a spinning vortex (60). This vortex action not only provides a means for pulling fuel into a fusion region but also eliminates the requirement for large power consuming magnetic fields of containment, as typical of current hot fusion experimental protocol.

For more information contact the Fullerene Fusion Group  
P.O. Box 191394, Sacramento, CA 95819-1394, USA.  
Phone: 1-800-713-9345.

### CALIFORNIA - COMMENT ON MORRISON

Robert Bass, "CERN's Disinformation Agent, Douglas Morrison," *"Cold Fusion,"* issue 12, pp 19-22.

#### EDITOR'S COMMENT

Dr. Bass carefully, but joyously, takes the statements of Dr. Douglas Morrison, the perennial pathological skeptic of cold fusion and reduces them to near nonsense. Bass uses his extensive background in cold fusion, ranging from his experience as a registered patent agent, a student of high-energy physics, and a world-class theorist, to demolish Morrison's perennial attack on cold fusion. Then Bass challenges Morrison to carefully study the materials that Bass has written in his development of the Lattice Induced Nuclear Transmutation (LINT) theory. Bass concludes with a comment and a challenge that many of the cold fusion community would gleefully support, **"Instead of repeating your monologue about polywater & N-Rays and pathological science, why don't you do some real science for a change, and either refute my QM theory above or admit to having been a fountain of pathological skepticism!"**

We suggest that our readers read both the Morrison comments on the ICCF-5 conference and Dr. Bass's comments to Morrison in this issue of "Cold Fusion." Having become a personal friend of Dr. Morrison and found him to be learned, articulate, and full of excellent scientific knowledge, we will welcome him with friendly good humor and glad acceptance when he finally awakens to the fact that cold fusion is a viable new science. He

will be a great ally in making this a better world with abundant clean energy.

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## CALIFORNIA - GETTING LITHIUM INTO CARBON

Staff, "Increasing the Lithium Capacity of a Carbon Electrode," *NASA Tech Briefs*, July '95, vol 19, no 7, pg 52.

### EDITOR'S SUMMARY

Lithium added to carbon anodes can be used in rechargeable lithium battery cells. This article explores methods by which lithium can be implanted into the commercial graphite carbon electrodes. Two techniques for loading lithium into carbon have been developed. The first is to use an electrochemical with an electrolyte composed of a  $\text{LiAsF}_6$ , ethylene carbonate and 2-methyl tetrahydrofuran. The cell then is taken through slow discharge/recharge cycles for four cycles. Then the lithium can be introduced (intercalated) into the carbon at very near theoretical maximum amount of 1 part lithium to 6 carbon. The second technique is similar except that different discharge cycles and rates were used.

[This article may be of interest to those who are interested in the concept of "loading" electrode with hydrogen such as being done for cold fusion electrochemical cells. Ed.]

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## CALIFORNIA - INTEGRATING OPEN CALORIMETER

Melvin H. Miles (Chem. & Matls. Br., Res. & Technol. Div., Naval Air Warfare Ctr., Weapons Div., China Lake), "The Extraction of Information from an Integrating Open Calorimeter in Fleischmann-Pons Effect Experiments," *Cold Fusion*, " issue 12, pp 24-28, 11 refs, 3 figs, 4 tables.

### AUTHOR'S ABSTRACT

Our first 5 months of investigating the Fleischmann-Pons effect in 1989 experiments produced no significant enthalpy. The November 1989 Report of the Energy Research Advisory Board to the U.S. DOE listed China Lake with MIT, Caltech, Harwell, and other laboratories as one of the groups *not* observing excess heat. Later experiments using palladium from another source (Johnson-Matthey), however, produced up to 30% excess

power and 1,400 kJ of excess enthalpy. This amount of excess enthalpy is difficult to explain by any chemical reaction. Numerous experiments have shown that there is no recombination of the  $\text{D}_2$  and  $\text{O}_2$  electrolysis gases when fully-submerged palladium cathodes are used. Recombination can occur when palladium particles are exposed to the gas phase. In this case, our experiments prove that this recombination can be readily detected and easily corrected. In general, only about 20% of our experiments have produced measurable amounts of excess enthalpy. The cathode material used is apparently a major factor since successful experiments cluster around Johnson-Matthey supplied palladium.

### CONCLUSIONS

Our experiments show that the patience to continue experiments over long time periods is essential to observing the excess enthalpy effect reported by Fleischmann and Pons. Our 1989 results were very similar to the reports by Caltech, Harwell, and others over the April-September time period, i.e., no excess heat was detected. The major difference is that we continued to investigate palladium from other sources and eventually observed significant excess enthalpy production. The ratio of successful experiments, nevertheless remains low. Apparently, some metallurgical property of palladium is a major factor for producing the Fleischmann-Pons effect.

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## CALIFORNIA - NANOSCALE ROBOTICS

Courtesy of Dana Rotegard

Mark Goldes (Magnetic Power, Inc.), "Supercold Fusion and the Pion Drive -- Is Nanoscale Robotic Exploration of the Stars a Realistic Possibility?" *Futurics*, vol 19, no 3&4, pp 22-23, 10 refs.

### EDITOR'S SUMMARY

Dr. Robert L. Carroll in 1971 had his patent application for supercold fusion rejected by the patent office. Carroll was one of the first physicists to applaud Pons and Fleischmann on their discovery as he believed that the fusion was a catalytic reaction between platinum and hydrogen. As a non-believer in some aspects of relativity, Carroll has been struggling for years to register his objections to the invariability of the speed of light. Light speed is a function of the amount of matter in the vicinity. In interstellar space an object should be able to travel at many times the near-earth speed of light according to Carrollian

mechanics. Thus the concept of a small robotic craft to examine the nearby stars for life (or for new worlds to colonize). As a propulsion means, Carroll has specified the use of a pion drive. Based on experiments at Lawrence Berkeley Lab in 1947 that demonstrated that proton, anti-proton annihilation yields highly energetic pi neutral mesons (pions), Carroll has specified the development of a pion space drive.

Carroll was granted a patent on a heat transfer device in 1972 that could be the basis for a low-temperature control of hydrogen for use with platinum in his supercold fusion and space propulsion system. In his search for ways to travel faster than the local speed of light, Carroll has detailed his dissenting interpretation of many key experiments that are used to support relativity. The combination of a nanotechnology spacecraft and robotic sensors could be sent to the nearer stars to return data for proof of the non-constant speed of light and perhaps for proof of life in other parts of the local universe.

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## ILLINOIS - ASTROPHYSICS & FUSION

Yeong E. Kim and Alexander L. Zubarev (Dept. Phys., Purdue Univ., West Lafayette, IN), "Optical Theorem and Finite-Range Effect for Nuclear Reactions in Astrophysics\*," paper courtesy of author.

### ABSTRACT

Optical theorem formulations of low-energy nuclear 2-body and 3-body reactions are presented. We obtain analytical formulae for the cross section  $\sigma(E)$  which exhibit explicitly the energy and charge dependences of  $\sigma(E)$  and may provide a better physical understanding of anomalous low-energy enhancement of  $\sigma(E)$  observed in nuclear fusion reactions relevant for the primordial nucleosynthesis and stellar evolution.

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## MASSACHUSETTS - MIT FUSION-LIKE PATENT

Brian S. Ahern, Keith H. Johnson, Harry R. Clark, Jr. (MIT), Patent title: "Method of Maximizing Anharmonic Oscillations in Deuterated Alloys," granted May 5, 1995. Articles in *Deseret News*, July 22, 1995, p A-1 (from interview) and *Salt Lake Tribune*, July 23, 1995 (AP news item).

Professor Johnson, of Materials Science, says the heat produced is the result of a chemical reaction releasing the "latent heat energy of water," an energy conversion process. "Its due to a chemical recombination of hydrogen

and deuterium within the material, to form molecular hydrogen and deuterium," says Johnson.

The theory that this patent is based on was published in 1989, shortly after the Pons and Fleischmann announcement. Johnson had been experimenting with high-temperature superconductors, and found that a palladium device charged with deuterium reacted at one degree Kelvin warmer than did the same device charged with hydrogen. Not much of a difference, but the explanation was the important thing. "When Palladium has enough hydrogen and deuterium in it, the hydrogen and deuterium atoms undergo rather severe vibrations," Johnson states, "These are vibrations that are said to be anharmonic; that is, they do not obey the conventional laws of vibrations..."

"I thought maybe the effect they [P&F] were observing at room temperature and above, mainly the product of apparent excess heat, might have something to do with these vibrations. However, my theory does allow for very, very low levels of nuclear activity, such as a slight increase in the probability that deuterium will fuse." That could produce the very low levels found in successful cold fusion experiments. Johnson also predicted that if his theory were true, then the effect was also possible in light water. More recent work he and his colleagues have done includes experiments using both palladium alloys and nickel alloys.

There is criticism by other scientists that no conventional chemical reaction can produce energy in the quantities that have been measured. "However, this theory and patent explain why this catalytic reaction can occur many times per second and lead to apparently large amounts of heat." This is where the latent hydrogen heat energy of water comes in, extracted through an electrolytic process. Johnson believes the heat phenomenon has next to nothing to do with nuclear fusion.

This effect may not be as large as people have hoped. Potential uses would be low-level, such as for heating a home or powering a vehicle. Johnson and his collaborators are building a water engine that uses ordinary water to produce heat. The only byproduct will be water and clean energy. The unit will be similar to a catalytic converter in that it will work for an extended amount of time and then it must be replaced.

Summary by D. Torres

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US 5,411,654, "Method of Maximizing Anharmonic Oscillations in Deuterated Alloys," Brian S. Ahern, Keith H. Johnson, Harry R. Clark, Jr. (MIT), appl. 02 July 1993;

issued 02 May 1995, 26 pp. Abstract: For a condensed-matter system containing a guest interstitial species such as H or its isotopes dissolved in the condensed-matter host lattice, the invention provides tuning of the MO degeneracy of the host lattice to enhance the anharmonicity of the dissolved guest sublattice to achieve a large anharmonic displacement amplitude and a correspondingly small distance of closest approach of the guest nuclei. The tuned electron MO topology of the host lattice creates an energy state giving rise to degenerate sublattice orbitals related to the 2nd nearest neighbors of the guest bonding orbitals. Thus, it is the nuclei of the guest sublattice that are set in anharmonic motion as a result of the orbital topology. This promotion of 2nd nearest neighbor bonding between sublattice nuclei leads to enhanced interaction between nuclei of the sublattice. In the invention, a method for producing dynamic anharmonic oscillations of a condensed-matter guest species dissolved in a condensed-matter host lattice is provided. Host lattice surfaces are treated to provide surface features on at least a portion of the host lattice surfaces; the features have a radius of curvature  $<0.5 \mu\text{m}$ . Upon dissolution of the guest species in the treated host lattice in a ratio of at least 0.5, the guest species undergoes the dynamic anharmonic oscillations.

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## MASSACHUSETTS - EFFICIENT SOLAR PANEL

Jonathan Haber, "A New Solar Electric Invention," *Solar Today*, May/June 1993, pp 24-25.

### EDITOR'S SUMMARY

Alvin Marks is a senior citizen enjoying his 80's by working to further develop his concept of "solar cell on a plastic roll." Last year (1994) Advanced Research Development, Inc. (ARDI) of Athol, MA and DOE's Argonne National Lab entered into a cost-sharing cooperative arrangement for the further development of the **Lumeloid** (t.m. reg.) product. This light-to-electric concept is based on replication of part of the photosynthesis process. The solar panel uses molecular diodes called "diads." The **Lumeloid** process includes the diads in a stretch-oriented electrically conductive polarized film. The polarizing molecules act as antennae to convert light photons to electric power. Efficiencies as high as 72% appear possible.

Supported financially by EPRI (Electric Power Research Institute) ARDI had designed, fabricated, and tested a small **Lumeloid** fabricating device. Argonne National Labs has developed improved diads that are highly efficient. The combination of these two developments are expected to reduce the cost of solar electric power

generation to about 50 cents per peak watt. This cost compares favorable to fossil fuel plant costs of \$1.50 per watt and nuclear energy of about \$6 per watt. Present semiconductor photovoltaic systems cost over \$4 per peak watt.

For further information on this product you may contact Elizabeth Masterson, Advanced Research Development, Inc. 359R Main Street, Athol, MA 01331, Tel (508) 249-4696, Fax 2134.

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## MARYLAND - SCANNING PROBE TECHNIQUES

J.A. Dagata, J.J. Kopanski (Nat. Inst. Std. & Technol., Gaithersburg), "Scanning Probe Techniques for the Electrical Characterization of Semiconductor Devices," *Solid St. Technol.*, July 1995, pp 91-97, 9 refs, 5 figs, 1 table.

### AUTHORS' ABSTRACT

The spatial resolution, sensitivity, and accuracy required for electrical characterization of device structures in the semiconductor industry suggest that scanning probe microscopy (SPM) tools may offer an alternative to existing measurement techniques. Due to their two-dimensional imaging capabilities, high spatial resolution, and nondestructive nature, SPM-based characterization tools are evolving from lab to lab. This article examines the current standard of performance for electrical measurements of semiconductor devices and the prospects for the application of SPM as a next-generation tool for dopant profiling and defect inspection of device structures.

### CONCLUSION

The lack of accurate 2D dopant profiles and other spatially resolved measurements has hindered the optimization of sub-micron technology but not stopped its development. Product manufacturability has always been the technology driver, while the relative performance of characterization techniques has lagged. SPM-based characterization is unusual in that its potential spatial resolution has leapfrogged minimum lithography dimensions. As the semiconductor industry demands manufacturing tolerances in the nanometer-scale regime, the effective use of technology computer-assisted design (TCAD) and the advanced characterization represented by SPM will be an increasingly attractive way to reduce development cost and time.

Combining the spatial resolution and two-dimensionality of SPM with conventional measurements, such as C-V or

surface potential, allows application to local regions within real device structures. The key issue is the development of strategies that can effectively couple and direct these evolving techniques to device and process control, development, and analysis problems that can most impact the semiconductor industry.

[This SPM technology may be useful to measure cold fusion reactor electrodes on a before and after basis. Alternately, working and nonworking electrodes may be measured. -Ed.]

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## MICHIGAN - HALO NUCLEI

Sam M. Austin & George F. Bertsch, "Halo Nuclei," *Scientific American*, June, 1995, pp 90-95, illus., 4 refs.

### EDITOR'S SUMMARY

This newsletter finds it interesting to cite articles that reveal more of the unexpected reality of nature. In this article, the authors inform us that nuclei are not so stable as our models. The sub-title states, "Nuclei having excess neutrons or protons teeter on the edges of nuclear stability, known as drip lines. Under this stress, some develop a halo." Some nuclei, instead of exhibiting an expected well-defined surface, will have some of the neutrons or protons move beyond the "surface" and exhibit a misty cloud or halo.

The halo is cited as being a quantum phenomenon that does not obey the laws of classical physics. Therefore, the authors suggest that the study of halo nuclei may yield additional insight into the mysteries of nuclear binding. [The experimental discoveries of some cold fusion experiments where "proton capture" is taking place and the new optical equations theory of Yeong Kim also add significantly to our insight into the mysteries of matter.]

If the nuclei are displayed on a graph with the number of neutrons as the y-axis and the number of protons as the x-axis, there will be a plethora of stable and less-stable isotopes of the 92-plus elements. Those nuclei, in general, that lie farther from the main axis of this plot of elements and isotopes have the shorter lifetimes (if unstable). At some distances from this diagonal, isotopes break up as soon as formed (if formed). There is a boundary suggested between the marginally stable isotopes and those that immediately break up. This boundary is called the drip line and occurs on both sides of the plot of isotopes. However, the upper drip line encloses many more semi-stable isotopes than the lower drip line.

If unstable elements are formed into a beam and shot through a thin target foil, the percentage that pass through the target foil is used to determine the "cross-section" of the isotope or element. The explanation of those having large cross-sections (and therefore not able to penetrate the numbers of elements in the foil) is that they have a halo which essentially enlarges the nuclei so that fewer get through the foil. For example, it was found the lithium-11 had weakly-bound neutrons that, though conditionally stable, roamed well beyond the nuclei and that these neutrons could easily be stripped away in their passage through the target foil. These last two neutrons of the lithium-11 are bound by only a few hundred thousand electron volts and therefore need relatively little energy to move away from the more tightly bound nuclei. [We wonder if there is some similar, but as yet unexplored phenomena, that can account for the relative ease with which some nuclei participate in the catalysis of "proton capture" and thereby transmute into new isotopes. Ed.]

The article states, "Now that a new aspect of nuclear behavior has been discovered and studied, one naturally asks the question, Where do we go from here?" The authors report that experiments are planned to see if lithium-11 can be treated to a beam of protons to see if the protons can pick up the two loosely-bound neutrons and make tritium. [Why not, the creation of tritium is reliably produced in electrochemical cells where the energies are orders of magnitudes lower. Ed.]

This editor hopes that the august and popular *Scientific American* will soon find out that by using the relatively simple experimental procedures of the cold fusion heavy-water and light-water electrochemical cells, we are making great discoveries about the nature of matter. Low-energy nuclear reactions are being studied in many laboratories in at least 30 countries. We trust that someday, the editors of *Scientific American* will discover this amazing new technology.

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## MINNESOTA - A NEW GENERAL THEORY

Courtesy of Dana Rotegard

Roland L. Hron, "Special and General Relativity, Competing Theories," *Futurics*, Vol 19, No 3&4, pp 24-27, 1 table.

### EDITOR'S SUMMARY

By using four space dimensions plus time Hron has developed a theory which he compares to the Special Theory of Relativity (STR) and the General Theory of Relativity (GTR). The article presents a tabular array of



Phenomena and cites the explanation under the Hron theory and under the STR & GTR theories. The phenomenon listed are as follows:

- Description of the Universe
- Time and the Velocity of Light in Moving Platforms
- Time in the Vicinity of a Central Mass Object
- The Twins Paradox
- Maxwell's Equations
- Black Holes
- The Relationship Between the Universal Gravitational Constant, G, and the Distribution of Mass in the Universe.
- Mass and Energy

With each of the above phenomenon, the author lists both his theory's explanation along with the standard Einsteinian explanation. Hron's concept of the speed of light is similar to Carroll's.

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## MISSISSIPPI - CAVITATION FREEZES, TOO

Robert Hickling (Nat. Ctr. Physical Acoustics, Univ. Miss., MS), "Transient, High-Pressure Solidification Associated with Cavitation in Water," *Phys. Rev. Lett.*, vol 73, no 21, 21 Nov. 1994, pp 2853-2856, 21 refs, 4 figs, 1 table.

### AUTHOR'S ABSTRACT

The very high pressures (> 1 GPa) that occur during the final stages of collapse of a cavitation bubble force the liquid near the bubble wall briefly (~1 ns) into a metastable state of subcooling, relative to the equilibrium phase diagram. Estimates for water show that solidification in the form of high-pressure ice particles can occur at a sufficient rate to affect the collapse. This explains a number of different phenomena associated with cavitation in water.

*There has been renewed interest in the physics of cavity collapse or implosion in liquids because recent experimental results have determined, for the first time, the surprisingly short duration (<50 ps) of flashes of light emitted by single cavitation bubbles.*

Light emission from cavitation, first observed in 1933, is usually called sonoluminescence (SL), because it is detected principally in cavitation induced by sound fields in liquids. The very short duration of SL pulses was discovered following the development of a technique for

observing SL from a single, stable bubble. SL is generally believed to be caused by the rapid compression of gas to high temperatures inside collapsing cavitation bubbles, but the details of this mechanism have required further thought, because of the unexpectedly short duration of the SL pulses. This has led to the development of the theory of microshocks converging at the core of the gas in the bubble to create a very short-duration, high-temperature compression. It would seem that any explanation of SL and its characteristics has to be consistent with other known effects of cavitation. It is the purpose of this letter to develop such an explanation based on the assumption of transient high-pressure solidification in the water near the bubble wall during the final stages of bubble collapse.

**...It appears anomalous that bubble collapse can generate a high-temperature spike in the gas inside the bubble, and, at the same time, transient solidification (freezing) in the water next to the bubble wall.** Estimates have shown, however, that during the short period of time involved, the amount of heat radiated and conducted from the high-temperature spike does not cause a large enough temperature rise in the water next to the bubble wall to inhibit the solidification. Another apparent anomaly is that cavitation erosion is reduced whereas the intensity of SL pulses is increased, as the water temperature approaches 0°C.

...Water is one of only a few liquids whose equilibrium phase diagram has a decrease in the solidification temperature with increase in pressure in the region immediately above atmospheric pressure. If the transient solidification hypotheses is correct, differences between the equilibrium phase diagrams of liquids can be used to explain differences in SL, cavitation erosion, and other effects associated with cavitation in different liquids.

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## NEW JERSEY - NEW LIFE FOR TOKAMAK?

Courtesy of Dr. Samuel P. Faile

James Glantz, "Researchers Build a Secure Plasma Prison," *Science*, 28 July 95, pp 478-479.

### EDITOR'S SUMMARY

A new announcement of increased ability to control a plasma in the TFTR (Tokamak Fusion Test Reactor) at Princeton may support another year of funding. The discovery that by a tailoring of the magnetic fields for the TFTR can provide a more stable plasma within the TFTR may lead to funding support. A doubling of the output of a deuterium-tritium fuel mixture is estimated. [That achievement would put the output from this hot fusion

device close to 100% efficiency, if you ignore supporting power used. However, the problem of generating considerable radioactivity, though less than using a fission nuclear process, remains.]

The improvements were based on theoretical calculations made by Charles Kessel and co-workers. The calculations indicated that a reactor might be improved if the plasma currents were "hollow" in the center. The tweaking of the supporting magnetic fields apparently have achieved this type of plasma current with an excellent increase in effectiveness. Rush Holt, assistant director of the Princeton Plasma Physics Lab reflects that even if the fusion program is terminated, "Sometimes, people lose sight of the really beautiful and intricate physics that is being accomplished here."

[It would have been even more beautiful and fruitful if the hot-fusion community had not been so blatantly against cold fusion discoveries. It could have been Princeton, MIT, and Cal Tech that would have become the leaders in cold fusion instead of Japan. Ed.]

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## **SOUTH CAROLINA - DIFFUSION COEFFICIENT**

*Chemical Abstracts*, vol 122

Sathya Motupally, Christopher C. Steinz, John W. Weidner (Dept. Chem. Engr., U.S.C, Columbia), "Proton Diffusion in Nickel Hydroxide Films. Measurement of the Diffusion Coefficient as a Function of State of Charge," *J. Electrochem. Soc.*, 1995, vol 142, no 5, pp 1401-1408.

### **AUTHORS' ABSTRACT**

Electrochemical impedance spectroscopy (EIS) was used to measure the solid-state diffusion coefficient of protons in Ni hydroxide films at room temperature as a function of state of charge (SOC). A model for the complex faradaic impedance of the Ni hydroxide active material is presented and used to extend the diffusion coefficient of protons from the EIS data. Impedance data over a range of frequencies can be used to extend a constant diffusion coefficient without the knowledge of the initial mobile proton concentration or the form of the charge-transfer kinetic expression. The proton diffusion coefficient is a strong function of SOC and decreases approximately 3 orders of magnitude from  $3.4 \times 10^{-8}$  to  $6.4 \times 10^{-11}$  cm<sup>2</sup>/s as the electrode discharges from the completely charged to the completely discharged state. The measurements were performed on well-conditioned Ni hydroxide films, and therefore it is likely that the measured diffusion coefficients correspond to the  $\beta$ -phase of the active material. The diffusion coefficient of protons was

measured for 3 different film thicknesses, namely 1.5, 1.2, and 1.0  $\mu$ m. The diffusion coefficient is independent of the thickness of the film, as predicted by theory. The 3 orders of magnitude decrease in the diffusion coefficient of protons can be explained on the assumption that the protons move predominantly through the oxidized phase (NiOOH) which is interdispersed along with the reduced phase (Ni(OH)<sub>2</sub>) in the active material.

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## **C. NEWS FROM ABROAD**

### **AUSTRIA - LATEST FROM MARINOV**

Courtesy of Stefan Marinov

Stefan Marinov (editor), *Duetsche Physik*, vol 4, no 16, October-December, 1995.

#### *FF* EDITOR'S COMMENTS

Every issue of *Deutsche Physik* contains challenging reading. Although original contributions are printed in Russian, German, and English, most of the important facts are presented in English for the benefit of we who are not so multi-lingual as Marinov. In this issue Marinov explains further work with his Siberian Coliu machine as he searches for ways to make it operate continuously without power input. In addition are several articles:

"The tide lung of Heinz Kalmus" on an ingenious method of obtaining power from tides.

An article in German about an amazing experiment with the static charge buildup in falling water, "Hochspannung aus fallendem Wasser." This article is followed by "The water drops influence perpetual motion machine CLEPSYDRA" by S. Marinov telling how Stefan will try to harness this electrical charge accumulation effect to make a perpetual motion machine.

"About the density of the potential and radiation electromagnetic energy," by S. Marinov.

This issue concludes with copies of letters written by and to Marinov in attempts to have some of his articles that challenge the current model of science to be printed in peer-reviewed scientific journals. The letters of rejection are also included.

As always, Marinov makes us think about the status-quo of current science. He loves to find experiments that are contrary to accepted scientific belief. We of the cold fusion community find this topic to be highly appropriate in today's world.

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**BELARUS - THREE-SIDED EFFECT**

By Alexander V. Frolov

Frolov has sent *NEN* a paper with the following introduction:

The theory for gravity as an induced effect that exists thanks to other forces of Nature is developed mainly for quantum level. This approach use the term "zero-point fluctuation" as the description of a process of virtual electron-positron pair creation and annihilation [H.E.Puthoff, *Speculations in Science and Tech.*, Vol. 13, No. 3, p 247]. In the present paper, the author tries to find the reason for the existence of gravity without application of quantum mechanics since gravity displays itself mainly for the macrosystems level, as gravitational field of planet, for example. The conclusion is made that Conservation of Energy, in a general sense, is Conservation of zero-point of energy level, or Conservation of Rest.

If any of our readers have a specific interest in this topic, send a self-addressed legal-size envelope to *Fusion Facts* and we will send you a copy. [Hal Fox, Ed.]

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**INDIA - MULTIPLE NEUTRON BURSTS**

Courtesy of M. Srinivasan

A. Shyam, M. Srinivasan, T.C. Kaushik and L.V. Kulkarni (Neut. Phys. Div., Bhabha Atomic Research Center (BARC), Trombay, Bombay), "Observation of High Multiplicity Bursts of Neutrons During Electrolysis of Heavy Water with Palladium Cathode Using the Dead-Time Filtering Technique," preprint of paper.

**AUTHORS' ABSTRACT**

A series of experiments were carried out to detect production of neutrons from a commercial (Milton Roy) palladium-nickel electrolytic cell operated with 0.1 M LiOH or LiOD as the electrolyte at a current density of about 80 mA/cm<sup>2</sup>. Neutron emission was monitored using a bank of 16 BF<sub>3</sub> detectors embedded in a cylindrical moderator assembly. A dead-time filtering technique was employed to detect the presence of neutron "bursts," if any, and characterize the multiplicity distribution of such neutron bursts. It was found that with an operating Pd-D<sub>2</sub>O cell located in the center of the neutron detection set-up, the daily average neutron count rate increased by about 9% throughout a one month period, over the background value of about 2386 counts/day indicating an average daily neutron production of about 2220 neutrons/day by the cell. In addition analysis of the dead-time filtered counts data

indicated that about 6.5% of these neutrons were emitted in the form of bursts of 20 to 100 neutrons each. On an average there were an additional 6 burst events per day during electrolysis with LiOD over the daily average background burst rate of 1.7 bursts/day. The frequency of occurrence of burst events as well as their multiplicity was significantly higher with D<sub>2</sub>O + LiOD in the cell when compared with background runs as also light water "control" runs.

**SUMMARY AND CONCLUSIONS**

The total neutron counts per day with the D<sub>2</sub>O cell was found to be consistently about 9% above the background level. However, in the case of the H<sub>2</sub>O experiment which was conducted immediately after a month long D<sub>2</sub>O run, the average daily count rate was found to steadily decrease to background level, suggesting that this behavior can probably be attributed to the slow replacement of D by H, within the Pd cathodes over several days. The frequency distribution of 5s counts was close to Poisson distribution in case of background but contained several large multiplicity events in presence of the H<sub>2</sub>O or D<sub>2</sub>O cells. Moreover, while the background counts did not show even a single count with multiplicity of 4 or more throughout the 15 day period, there were several events with multiplicity of 6 and even 7 counts in the 100  $\mu$ /s duration data, in presence of H<sub>2</sub>O or D<sub>2</sub>O cells. On the whole, the number of burst events were very few, the average values being 1.7, 3.8 and 7.6 bursts per day for the cases of background, H<sub>2</sub>O cell and D<sub>2</sub>O cell respectively.

In the present experiment since the overall neutron detection efficiency was about 10%, one can say that approximately 10 neutrons are emitted by the electrolytic cell for every neutron detected. Likewise, a multiplicity of 4 counts during a 100  $\mu$ /s interval implies emission of a burst of roughly 40 neutrons by the cell. Out of the 2608 neutrons detected per day in presence of the Pd-D<sub>2</sub>O cell, after subtracting the background of 2386, the balance of 222 counts/day can be attributed to the cell. Of this about 14.5 counts per day can be accounted for by high multiplicity (> 20) burst neutron emission. Thus the conclusion from the present series of experiments is that about 6.5% of the neutrons produced by the Milton Roy electrolytic cell can be attributed to high multiplicity (> 20 neutrons/burst) events, and the balance 93.5% is produced either as single neutrons (with Poisson distribution) or with multiplicity of < 20 neutrons.

The present experiment thus once again confirms that a small component of the neutrons emitted by Pd-D<sub>2</sub>O cells is produced in the form of temporally bunched neutrons.

Any theoretical explanation of cold fusion must account for this phenomenon also.

### INDIA - TRITIUM GENERATION

Courtesy of M. Srinivasan

T.K. Sankaranarayanan, M. Srinivasan, M.B. Bajpai, and D.S. Gupta (BARC, Trombay, Bombay), "Evidence for Tritium Generation in Self-Heated Nickel Wires Subjected to Hydrogen Gas Absorption/Desorption Cycles," preprint of paper.

#### AUTHORS' ABSTRACT

The loading characteristics of hydrogen gas in electrically self-heated nickel wires was investigated with a view to maximize hydrogen absorption and thereafter "trigger" it to generate anomalous excess heat as reported by Focardi et al. in early 1994. The nickel wires were found to absorb substantial quantity of hydrogen following several alternate cycles of absorption/desorption. But, calorimetric studies conducted with the system so far indicate that we have not succeeded in triggering excess heat generation. However, on dissolution and counting using standard liquid scintillation techniques, a number of hydrogen loaded nickel wires were found to contain tritium in the range of 3 Bq to 2333 Bq. This finding corroborates the detection of tritium in light water solutions electrolyzed by nickel cathodes reported by the authors first at ICCF-3 (Nagoya, 1992) and again at ICCF-4 (Hawaii, 1993), confirming the occurrence of anomalous nuclear reactions in nickel-hydrogen systems.

#### AUTHORS' SUMMARY AND CONCLUSIONS

Hydrogen loading characteristics of self-heated nickel wires have been investigated with a view to try and replicate the anomalous production of excess heat, first reported by Focardi et al. We seem to be obtaining bulk loading ratios of at least a few hundred ppm. The loading ratio in the near surface region may be somewhat higher. We have, however, not been able to obtain the conditions necessary for the production of excess heat. About two thirds of the loaded nickel wires indicated presence of tritium on dissolution and counting in a liquid scintillation counting set up, using standard procedures. **Tritium generation is, however, found to be non-uniform along the length of the wire.** The quantum of tritium in individual cut wire pieces was in the range of 3 to 63 Bq except for one wire segment which gave an unduly large amount of 2333 Bq. These results corroborate the generation of tritium reported earlier by us, as well as Totoya et al. during electrolytic loading of hydrogen in

nickel cathodes. It is possible that a significant amount of tritium is getting lost from the wires during the desorption phase and hence it may be worthwhile to search for tritium in the gas phase also. **A couple of loaded nickel wires have given clear autoradiographic images on medical X-ray film.**

Although no excess heat has been detected by us to date, the occurrence of some anomalous nuclear process in hydrogen loaded nickel wires stands confirmed in view of the observation of tritium in several samples.

### INDIA - LOADING Pd WIRE

Courtesy of M. Srinivasan

A.B. Garg, R.K. Rout, M. Srinivasan, T.K. Sankaranarayanan, A. Shyam, and L.V. Kulkarni (BARC, Trombay, Bombay), "Protocol for Controlled and Rapid Loading/ Unloading of H/D<sub>2</sub> Gas in Self-Heated Pd Wires to Trigger Nuclear Events," preprint of paper.

#### AUTHORS' ABSTRACT

It has now been established that during electrolysis of LiOD using Pd cathodes a threshold loading ratio of at least 0.85 needs to be achieved before excess heat production can be expected. However, for emission of neutrons and tritium and possibly charged particles and transmutation products to much lower D/Pd ratios, in the region of 0.4 to 0.7 appears to be adequate. This has been independently corroborated in a variety of electrolytic and gas loading experiments. It is not so much the magnitude of the steady state loading ratio, but rather creation of non-equilibrium conditions which facilitate rapid migration/transport of deuterons within the Pd lattice that seems to be required. With this in view, a systematic study has been undertaken using electrically self-heated 0.125 mm dia. Pd wires in H<sub>2</sub>/D<sub>2</sub> atmospheres to optimize the conditions under which rapid loading/unloading of H<sub>2</sub> or D<sub>2</sub> can be achieved. Pd wire was of 99.9% purity and was procured from Lieco Industries, USA.

#### AUTHORS' APPLICATIONS AND CONCLUSION

Having learned to absorb/desorb H<sub>2</sub> or D<sub>2</sub> in a 100% reproducible and controlled manner in Pd wire, creating non-equilibrium conditions, following experiments have been carried out/or proposed to be carried out in our center, in search of anomalous nuclear effects:

1. Autoradiography: After loading the wire with H<sub>2</sub> or D<sub>2</sub>, it was autoradiographed using medical X-ray photographic film. Every loaded wire is found to fog X-ray film. Even

a low loading of 0.1 fogs the film. This is the phenomena of PdH<sub>x</sub> luminescence first reported by our group in 1991. Efforts to understand the cause for mechanism of fogging are continuing.

2. Charged particle emission: Solid State Nuclear Track Detectors (SSNTD) and surface barrier detector were employed to search for emission of charged particles if any from PdD<sub>x</sub> wires subjected to repeated cycles of loading/unloading of deuterium. So far we have not detected any charged particles from self-heated Pd wires.

3. Tritium and neutron detection experiments are under way.

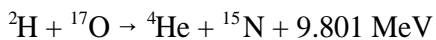
[We applaud the careful work of these scientists and their willingness to share their results. -Ed.]

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### ITALY - SPIN AND PARITY

In a recent letter to "*Cold Fusion*," Bill Collis brings our attention to:

Alan DeAngelis (letter, "*Cold Fusion*," issue 10, p 10) quotes experimental evidence for 9.8 MeV alphas when <sup>17</sup>O is bombarded by deuterons in an attempt to show that the reaction is not "forbidden."



I suspect that any alphas from this reaction were of lower energy as the <sup>15</sup>N will also take away energy to conserve momentum. The point I made in my original letter ("*CF*" issue 8) was not that the reaction is forbidden but rather that it is suppressed due to the rarity of the oxygen (<sup>17</sup>O) isotope and the apparent non-conservation of spin and parity. In this reaction spin and parity may be conserved by the emission of a single (gamma or x-ray) photon. This fact suppresses the rate of reaction by many orders of magnitude. It was the absence of significant gamma rays which lead Kucherov et al. to propose that spin and parity etc. must be conserved in cold fusion.

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### ITALY - NEW SPECTROMETER USED

*Chemical Abstracts*, vol 123

M. Bruschi, U. Marconi, A. Zoccoli (Dept. Phys., Univ. Bologna), "The Neutron Spectrometer of the Cold Fusion Experiment under the Gran Sasso Laboratory," *Hadronic Phys. Winter Course, 8th*, pub. World Sci., Singapore, 1994, pp 332-354.

### AUTHORS' ABSTRACT

The characteristics of a new coincidence spectrometer are described that allows neutrons in the MeV energy range to be detected by exploiting a two-stage pulse-amplitude analysis.

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### JAPAN - LATTICEQUAKE

*Chemical Abstracts*, vol 123

Yoshiaki Arata, Yue-Chang Zhang (Japan), "Cold Fusion Reaction Driven by Latticequake," *Proc. Jpn. Acad., Series B*, 1995, vol 71B, no 3, pp 98-103.

### AUTHORS' ABSTRACT

The authors have proposed a new "Model" which can reasonably explain the existence of Cold Fusion Reaction and also verify the generation of tremendous excess energy in the DS-cathode which is fifty thousand times higher than chemical reaction energy. The new model is named "Latticequake Model." Cold Fusion is caused by high energetic deuterium similar to "hot" fusion.

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### JAPAN - NUCLEAR REACTIONS IN SOLIDS

Ken-ichi Tsuchiya (Tokyo Nat. Col. Technol, E. Engr. Dept., Tokyo), Kazutoshi Ohashi (Tamagawa Univ., Fac. of Engr., Tokyo), and Mitsuru Fukuchi (Keio Univ., Fac. Sci. & Technol., Yokohama, Kanagawa), "A Possible Mechanism for Nuclear Reactions in Solids," *Fusion Technol.*, vol 27, no 4, pp 452-457, 10 refs, 5 figs, 2 tables.

### AUTHORS' ABSTRACT

The boson tendency to clump deuterons in palladium, which is caused by an attractive force, supplies kinetic energy to deuterons moving toward the center of the cluster. On the other hand, repulsive forces between deuterons in the cluster reduce the tendency to clump. The deuteron with kinetic energy determined from these two forces may penetrate the barrier by a tunneling effect at the center of the cluster. In this research, the transmission coefficient and power density generated from cold nuclear fusion are calculated as functions of the number of deuterons included in the cluster. When a nonlinear screened deuteron-deuteron pair potential is used as a repulsion, power densities for clusters that include 24 deuterons are 10.8 W/cm<sup>3</sup>, which gives good fit to the experimental results of 10 W/cm<sup>3</sup> by Fleischmann et al.

### AUTHORS' CONCLUSIONS

Bush and Eagleton noted the tendency of identical bosons to clump and derived the N dependence of kinetic energy gained from the attractive symmetry force. However, repulsive forces also influence deuterons in a cluster because each deuteron has a positive charge. In this work, we added this effect to Bush's Eq. (6), derived our Eq. (9), and tried to use some potentials for calculations. When a direct Coulomb repulsion is used,  $E_k$  is negative for  $N < 8$ , so the tunneling effect cannot be catalyzed for a small N. When the Thomas-Fermi screening potential is used,  $E_k$  is positive for  $N > 4$ , and power density is small even for a large N. On the other hand, when the nonlinear screening potential is large enough to measure for  $N > 21$ . Therefore, we find that the nonlinear screening effect has an important role in this problem.

Last, we consider the probability for the clumping of an N-deuteron cluster in palladium. As listed in Table II in the paper, for the result that uses the nonlinear screening potential, power density for  $N = 24$  is  $p = 10.8 \text{ W/cm}^3$ . When Eq. (2) is used, the radius of the cluster for  $N = 24$  is found to be  $0.66 \text{ \AA}$ . Comparing this value with the nearest neighbor palladium-palladium distance of  $a/\sqrt{2} = 2.75 \text{ \AA}$ , we can estimate that one candidate for the site of such a big cluster including 20 deuterons may be vacancies in the face-centered-cubic palladium lattice.

### JAPAN - JAPANESE PATENTS

JP 95 104,080, "Reaction Apparatus for Generating Cold Fusion by Using Heavy Hydrogen-Containing Gas," Tadahiko Mizuno, Araki Masao, appl. 05 Oct. 1993; issued 21 Apr. 1995, 6 pp. The reaction apparatus contains a proton conductor. The reaction apparatus is manufactured by sintering a mixture of powdered metal oxides to form a proton conductor, and an electrode layer is formed on it. An a.c. [current] is applied to the reaction body in a heavy hydrogen-containing atmosphere to bring about cold fusion. Cold fusion can be initiated and run continuously with high efficiency and good controllability.

JP95 104, 081, "Apparatus for Generating Heat Similar to Cold Fusion," Hiroshi Kubota, appl. 05 Oct, 1993, issued 21 Apr. 1995, 4 pp. In hydrogen or heavy hydrogen gas, a cathode is coated with a hydrogen-permeable material such as a proton conductor, a high-temperature superconductor, a solid electrolyte, or a ceramic, then a metal thin film is applied to adhere to the surface and form an anode. Then, electricity is passed through the 2 electrodes to generate heat. Both the cathode and anode can be Pt, Pd, Ti, Ni, or a hydrogen-occluding metal. The

electric current can be d.c., pulsed current, intermittent current, triggered current or a.c. Stable nuclear fusion can be carried out with a higher probability.

### KOREA - DEFORMED Pd CATHODES ANALYZED

Heui Kyeong An, Eue Jin Jeong, Jae Hwa Hone and Youngpak Lee (Res. Inst. Indust. Sci. & Technol., Phys. Dept., Pohang, Kyungbuk), "Analysis of Deformed Palladium Cathodes Resulting from Heavy Water Electrolysis," *Fusion Technol.*, vol 27, no 4, pp 408-416, 33 refs, 7 figs, 1 table.

### AUTHORS' ABSTRACT

Earlier experiments suggested that large differences in heat release between the two sides of a palladium electrode coated with gold on one side and manganese oxide on the other cause observed electrode deformation with high-pressure  $D_2$  gas loading in an electrolysis-like cell. Similar experiments were repeated using heavy water electrolysis. Palladium/titanium coatings on one side and gold coating on the other were made for the preparation of the palladium electrodes. Biaxial bending, partial discoloration, and microcracks of palladium electrodes were observed after 18 days of electrolysis. Analysis of the deformed palladium cathodes was performed. It was discovered that to convert this configuration to a practical energy-producing cell, a coating technique must be found to reduce outward diffusion of deuterium, i.e., to maintain a high D/Pd ratio over longer periods of time.

Excerpts from authors' discussion:

The Pd/Ti coated side is expected to have much higher transmissibility of D atoms than the one acaudate with gold. The biaxial bending of the samples may be explained by observing the potential well diagram. It is expected that the density gradient is formed high from the surface of the palladium cathode coated with gold and low to the other. Heat may be generated from the spots where the density reaches above threshold. If one keeps charging with the overpotential, the D/Pd or H/Ni ratio will reach the maximum near the surface and the minimum at the center. If the density at the center is kept at below the threshold and only the surface area is kept above, the heat generation will be the surface effect as in the case of the typical nickel-light water system....

Using Pd/Ag alloys as the cathode is known to have the effect of preventing the microscopic cracks resulting from the high-density charging. The experiments performed by Fleischmann and Pons, presented by video at the Nagoya

conference at which they showed pictures of the heavy water boiling off as the result of electrolysis, are the series of experiments using alloys. However, since they have not found 100% reproducibility in their experiments, there must be some other conditions required, possibly the potential barrier by intentional coating.

Metals have transmission probabilities and diffusion rates different from each other for hydrogen isotopes. In some of the experiments that have been reported, the addition of aluminum in their electrolyte solution increased the heat generation by >20%. This is also seen to have a bearing on the picture presented earlier since the aluminum or its oxide variation has much more resistance to the hydrogen transmission than that of palladium. The continuing activity of the cells after turning off the external potential also matches with this picture very well. Once the incoming flux of the deuterium stops, the active cells will continue to be so until the natural out diffusion through the barrier formed during the electrolysis slowly lowers the density below the threshold.

#### AUTHORS' CONCLUSIONS

If the aforementioned threshold deuterium density, D/Pd ratio, is the prior condition for the attainment of excess heat, attention must be focused on how to prevent the leakage or out diffusion of the hydrogen isotopes from the host metals. This has been extensively discussed by using the diffusion model. **It is evident that the thin films of hydrogen opaque materials on the surface of the cathode, whether they have been implemented intentionally or not, have played and will continue to play the major role in the cold nuclear fusion phenomena.**

As a precaution, it is warned that this type of sealed experiment should not be attempted without a proper test-proven recombiner being installed.

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#### POLAND - HOT SPOT MECHANISM

Roman E. Sioda (Inst. Indust. Org. Chem., Warsaw), "Evaluation of Energetics of Cold Fusion Phenomenon According to "Hot Spot" Mechanism," *"Cold Fusion,"* issue 12, (July 1995), pp 6-7.

#### AUTHOR'S ABSTRACT

The recent paper by Karabut, Kucherov and Savvatimova presents experimental data on the cold fusion process, which can be interpreted in favor of the "hot spot" mechanism. The present paper gives lines of possible

discussion which can lead to further evolution and development of the mechanistic hot spot model.

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#### RUSSIA - DENSE PLASMA FLUXES

*Chemical Abstracts*, vol 122

V.A. Alekseev, V.L. Vasil'ev, V.A. Romodanov, Yu.F. Ryzhkov, S.V. Rylov, V.I. Savin, Ya.B. Skuratnik, V.M. Strunnikov (Russia), "Generation of Tritium upon Interaction of Dense Plasma Fluxes of Deuterium with Metal Surfaces," *Pis'ma Zh. Tekh. Fiz.*, 1995, vol 21, no 6, pp 64-68, in Russian.

#### AUTHORS' ABSTRACT

A study of the interaction of pulsed dense plasma fluxes with the surfaces of different metals (such as Ti, V, stainless steel, Zr, and Nb) is useful for examining the nature of cold fusion. Therefore, the dependency of the T generation efficiency on the target material in Z-pinch plasma fluxes at the TRINITY facility was investigated. The intensity of the T generation increased upon increased solubility of H in the metal and upon increase in atomic number of the metal.

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#### TAIWAN - EFFECTS OF pH AND ANION

*Chemical Abstracts*, vol 122

Chi-Chang Hu and Ten-Chin Wen (Dept. Chem. Engr., Nat. Cheng Kung Univ., Tainan), "Effects of pH and Anion on Hydrogen Sorption/Desorption at/within Oxide-Derived Pd Electrodes," *J. Electrochem. Soc.*, 1995, vol 142, no 5, pp 1376-1383.

#### AUTHORS' ABSTRACT

Oxide-derived Pd electrodes were obtained by cathodic polarization of Pd oxide-coated Ti electrodes (fabricated by thermal decomposition) at 0 V (RHE) for 30 minutes in 1.5 mol/dm<sup>3</sup> NaOH. The H adsorption/absorption (denoted hereafter as sorption) and desorption within/at these electrodes were obtained using cyclic voltammetry (CV), chronopotentiometry, and linear sweep voltammetry (LVS). CV results revealed that  $\beta$ -PdH formation/oxidation is more reversible in either concentrated acid or base solutions than in intermediate pH media, and the rate of  $\beta$ -PdH desorption is faster in a solution of pH <10. The oxidation of  $\beta$ -PdH is electron transfer controlled in the intermediate pH media, especially in weakly basic solutions, due to the adsorption of H<sub>2</sub>PO<sub>4</sub><sup>1-</sup>/HPO<sub>4</sub><sup>2-</sup>. The sequence of anions with respect to increasing ability to

inhibit H sorption is:  $\text{OAc}^- < \text{Cl}^- < \text{HSO}_4^- \approx \text{HC}_2\text{O}_4^- < \text{H}_2\text{PO}_4^-$ .

## D. SHORT ARTICLES

### REIFENSCHWEILER REFERENCES

In "*Cold Fusion*" newsletter, issue 6 (July 1995), there are a group of 10 short articles, comments and responses about the research of Dr. Otto Reifenschweiler, concerning both his experiments in the 60s and his recent (ICCF-5) paper. They are:

Victor Lapuszynski, "On Otto Reifenschweiler's Experiments."

Chris Illert, "Cold-Fusion in Room Temperature Baryonic Superconductors," from *Alchemy Today*, vol 2.

Otto Reifenschweiler, "Some Experiments on the Decrease of the Radioactivity of Tritium Sorbed by Titanium," from ICCF-5, excerpt.

Ewald Wicke, "No Decelerated Beta Decay of Tritium Solved in Titanium," from *Z. Naturforsch.*, vol 49a, 1994, pp 1259-1261, excerpt.

Richard A. Blue, "Criticisms from Dick Blue," from blue@pilot.msu.edu.

Hideo Kozima, "On Otto Reifenschweiler's Experiment "Reduced Radioactivity of Tritium in Small Titanium Particles."

Bill Page, "Brief Comments from the ICCF-5 Discussion Group."

Olof Sundén, "From Report on ICCF-5," excerpt "*Cold Fusion*" issue 10.

Otto Reifenschweiler, "Decelerated Beta Decay of Tritium Solved by Titanium," a reply to Prof. Wicke; and

Otto Reifenschweiler, "Introduction to a More Comprehensive Article," excerpt:

... In a recent letter, the author has given a short description and preliminary interpretation of the experiments with a first attempt to explain the effect in terms of a "nuclear pair hypothesis." The present article gives a more detailed description and interpretation of these and additional experiments. **This results in a high degree of evidence for the strange effect of the decrease**

**of tritium radioactivity.** This treatment seems to the author to be important because of the growing interest in the effect, to facilitate repetition of the experiments and to stimulate further exploration. Furthermore, understandable skepticism requires this more comprehensive treatment.

## E. EDITORIAL

### HOW TO PROFIT FROM THE COMMERCIALIZATION OF COLD FUSION

By Hal Fox

There is no question but that you and your friends will have thought about how to profit from the coming commercialization of cold fusion. Many of us would have liked to have been invested in Zerox, IBM, or 3M in the early days of these megacorporations. Others would have liked to have been the inventor of some much used device that is now a part of one of these new widely-sold technologies. Others look at the opportunities in writing or teaching the new concepts that will need to be widely disseminated before these new technologies are fully developed. In view of these concepts, it is evident that there are several methods to prosper from the coming commercialization of cold fusion and other enhanced energy systems.

Here are some of the **dos** and **don'ts** of prospering in these enhanced energy times.

#### INVESTING MONEY

The following **dos** and **don'ts** of investing money should be carefully considered. The advice is easy: **Invest in startup companies that will become highly successful.** The problem is how to identify such companies. The answer is that you will probably not always pick the winner. Here are some ways to increase your chances of successful investing:

**1. Invest in management.** There will be no management experienced in enhanced energy systems but you will find managers who are experienced in manufacturing and distributing new technologies.

**2. Read the Business Plan.** If the business plan is not fully developed, then the managers are not ready to launch a business.

**3. Try to invest during the founder's investment period.** It will be the lower cost of the founder's stock that will provide the best multiples of returns on investment.



**4. If the company is going to manufacture a product, be sure they have patent protection.** The biggest danger in this new enhanced energy field is not knowing who has the better product. Not everyone is disclosing their state of the art products.

**5. Analyze the risks.** Distributing organizations have the least risk. If the product to be marketed has not yet been produced and tested, then the risks may be high.

**6. If the product is a cold fusion product, there will be a public suspicion that anything nuclear is to be avoided.** There will be a hard sell period while it is thoroughly determined if the device has any harmful radiation.

**7. Do not worry about the size of the market.** The size is huge (an estimated 5 trillion dollars per year is spent on energy). Be more concerned about the acceptance of the end product. There will be more government regulation against consumer products than for products that will be used in a manufacturing plant.

**8. Be extremely wary of the "get-rich-quick" schemes.** There will be a lot more companies that are based on scam than based on merit. One check is to ensure that they have qualified experts on their staff who have been working in this new energy industry (unfortunately, there will be a shortage of qualified persons).

## 9. Diversity.

### ADVICE TO INVENTORS

There is still a lot of politics in getting a cold fusion patent. Because the opponents know that commercialization is difficult without patents, they have been very effective in exercising unrighteous dominion over the patent examiners. Here are some comments for inventors:

1. Keep daily logs of all research and development in bound (with stitches) lab notebook.
2. Describe any invention in detail and get it dated, signed "read and understood" by one or more persons. Have the work notarized periodically.
3. Write down experimental results or paste into your book the printouts of computer-acquired data summaries.
4. Don't use the words cold fusion in a patent application (at least not yet and not until the patent office is no longer controlled by anti-cold-fusion skeptics).

5. Consider working with a group who are handling a portfolio of intellectual properties (such as ENECO).

### WRITING & EDUCATING

There will be a much higher acceptance of both peer-reviewed articles and articles for the popular press. Unfortunately, there will be a lot of misinformation. It is important to be accurate in your writing which means that you need to have access to accurate information. In this newsletter, we have tried to check out sources, but we have published some inaccurate statements (however, all have been corrected that have been brought to our attention). Here are some suggestions:

1. Become informed by reading widely and by attending conferences. (One of the best books about cold fusion is Fire from Ice, by Dr. Eugene Mallove. He collected a great deal of information before he ever wrote his book and he presented the information honestly.)
2. Know your sources. Get acquainted with the sources of honest information. Normally, they will help you. Be aware of those who are overly skeptical, they may have lost objectivity.
3. Look for verification. There are those who will tell you that they have the answers to all kinds of devices. Ask for replications. Use the who, where, when, what, and why helpers.
4. Cite your sources and give credit where it is due. The most complete bibliography list is updated periodically and published on a diskette from the Fusion Information Center. We can help you locate many documents and usually charge only copy costs.
5. Be honest. If you don't know say so but also try to find the answer and communicate your findings. For example, there is such a plethora of new phenomena associated with cold fusion that it may not be possible to explain all of the effects with one theory. Therefore, at present we do not have **one perfect theory** for cold fusion.
6. Your work is valuable. Charge for it. The time is rapidly coming when there will be a large demand for writers, lecturers, and consultants. However, when communicating with a new client invest some of your time. Follow up all verbal communications with fax or letter. Your client (or potential client) will appreciate your response.

7. If you have done your homework, don't be reticent about claiming to be an expert. You don't have to be humble but you do have to be honest.

### NOTE ON POTAPOV DEVICE

In a recent communication with Dr. Peter Glück of Romania, he stated his opinion that the tests being done with the Potapov vortex heater suffered from fatal engineering errors. He stated that the side pipe recirculates the water flow from below the cavitation region to the top of the vortex chamber and that the heat is produced from the injection of that flow into the vortexing and cavitating region. The by-pass pipe is "the core and heart of the machine," says Dr. Glück who has visited with the factory and strongly believes that the development of heat is a real phenomenon.

### SURPRISING EFFECT OF EM-RADIATION

The July issue of *Popular Science* reports an observation that the red pines near the 55-mile-long Navy communications antenna in the Upper Peninsula of Michigan grow taller than red pines in other parts of the forest. Also, it was discovered that the trunks of both aspen and red maple trees near the antenna are thicker than normal. New discoveries seem to be rampant and not controversial except to the pathologic skeptics.

## F. LETTERS

### LETTER FROM RON BRIGHTSEN

The author has developed a new model for structure in nuclei, both stable and radioactive. It is based on the Nucleon Cluster Model, which for beta-stable nuclides, has three principle clusters: Neutron-Proton (NP), Neutron-Proton-Neutron (NPN) and Proton-Neutron-Proton (PNP), which leads to a Periodic Table of Beta-Stable Nuclides. This table is characterized by complete systematics, symmetry, and periodicity and contains all beta-stable nuclides known to man.

For negatron emitters, (beta minus) additional NN clusters are found, and for positron emitters (beta plus) PP clusters appear.

In the June 1995 issue of *Scientific American* an article entitled "Halo Nuclei" (see page 8) appeared describing extensive experimental work on the halo nuclide  ${}^{11}\text{Li}_3$ . The experimental evidence leads to the conclusion that the

last two neutrons (dineutron) are very loosely bound to a  ${}^9\text{Li}_3$  core.

The author believes that the readers of the June 1995 "Halo Nuclei" article (and the researchers noted therein) would be most interested in detailed information on the structure of three lithium isotopes:  ${}^6\text{Li}_3$  (stable),  ${}^9\text{Li}_3$  (beta active) and  ${}^{11}\text{Li}_3$  (beta active) as revealed by the Nucleon Cluster Model.

Let us first consider beta-stable  ${}^6\text{Li}_3$ , which can be represented as follows:

$${}^6\text{Li}_3 \quad \begin{array}{ccc|cc} & \text{A} = 2 & & & \text{A} = 3 \\ & \text{NN} & \text{NP} & \text{PP} & \text{NPN} & \text{PNP} \\ \hline & 0 & 0 & 0 & 1 & 1 \end{array}$$

At least four other structures can be developed with NP values of 6, 3, -3, -6, with appropriate changes in NPN and PNP values, in order to balance mass and charge. All five values (perhaps more) of NP represent nuclei of  ${}^6\text{Li}_3$ . Note that clusters may have negative as well as positive values, and that negative values represent anti-matter clusters.

To continue, we next examine  ${}^9\text{Li}_3$ , which has 3 more neutrons than  ${}^6\text{Li}_3$ . Its structure can be represented as:

$${}^9\text{Li}_3 \quad \begin{array}{ccc|cc} & \text{A} = 2 & & & \text{A} = 3 \\ & \text{NN} & \text{NP} & \text{PP} & \text{NPN} & \text{PNP} \\ \hline & 0 & 0 & 0 & 3 & 0 \end{array}$$

Further, the model describes the cluster structure of  ${}^{11}\text{Li}_3$  as:

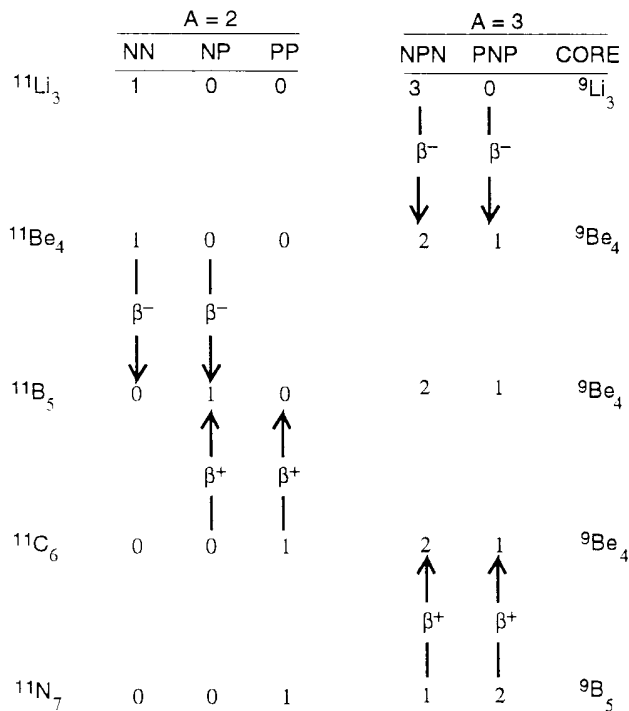
$${}^{11}\text{Li}_3 \quad \begin{array}{ccc|cc} & \text{A} = 2 & & & \text{A} = 3 \\ & \text{NN} & \text{NP} & \text{PP} & \text{NPN} & \text{PNP} \\ \hline & 1 & 0 & 0 & 3 & 0 \end{array}$$

Clearly, the dineutron (NN) appears as a separate entity, in agreement with the experimental evidence cited in the "Halo Nuclei" article.

As an extension of this analysis, let us consider all nuclides with A=11, from Z=3 (Li) to Z=7 (N), including beta-stable  ${}^{11}\text{B}_5$ .

This formulation of structures strongly suggests that halo protons (the diproton) must exist in  ${}^{11}\text{C}_6$  and  ${}^{11}\text{N}_7$ . It also shows a significant difference in positron and negatron decay modes. For negatron decay, at one charge unit removed from beta stability, a dineutron converts to an NP cluster, while at two charge units from stability, an NPN cluster converts to a PNP cluster. Exactly the reverse occurs with positron decay.

An analysis of structures at A=14 and A=8 leads to



identical conclusions.

A copy of the definitive paper entitled "The Nucleon Cluster Model and the Periodic Table of Beta-Stable Nuclides" can be obtained from Clustron Sciences Corp., 1917 Upper Lake Drive, Reston, VA 22091, for a fee of \$5.00 to cover reproduction and postage. (Phone 703-476-8731, Fax 703-827-4066)

Sincerely, /s/ R.A. Brightsen

**LETTER FROM TOKYO**

Dear Dr. Fox

Why don't you change the strategy of fighting with the anti-cold fusion.

What is the common sense? The reason why the ultra-high temperature should be needed for the realization of nuclear fusion seems to be recognized in both sides. It is the common sense.

Then why do they fight each other? Why is the anti-cold fusionist irritated so much by the activities of the cold-fusionist and why the latter becomes die-hard so much.

Do all the cold fusionists believe the "cold fusion" really? Do they have any reason to believe it against the common sense?

Do anti-cold fusionist can really state negative for "cold fusion" with clear reason except common sense?

Why don't you back to the G. Gamows' common sense. Is ultra-high temperature really should be needed for nuclear fusion?

Now, the obstacle is common sense!

Sincerely yours,  
Dr. Positive  
at Nowhere  
[Postmarked Tokyo]

**LETTER FROM CONGRESSWOMAN WALDHOLTZ**  
July 31, 1995

Dear Harold:

Thank you for contacting me to express your views about proposals to eliminate the Department of Energy. ...

The Department of Energy (DOE) was created in 1977 by President Carter to deal with the energy crisis the country experienced in the 1970s, facing gasoline lines and the prospect of inevitable energy shortages and ever-increasing energy prices. The crisis, however, was in large part the result of price and allocation controls imposed by the Federal government. As President Reagan observed, the country suffered not from a shortage of energy but from a surplus of government. Once unnecessary government controls were dismantled, the gasoline lines and natural gas shortages disappeared.

Today, the DOE has strayed from its original mission of energy oversight, while at the same time the Department has grown by 155 percent since its creation. Whereas, in the 1970s fully 80 percent of the DOE budget was spent on energy-related functions, today that activity is now at an all-time low of just 20 percent. **In fact over two-thirds of the DOE budget is related to national security functions.**

On May 18, 1995 the House of Representatives made history by passing a plan to balance the federal budget for the first time in a generation. Our seven-year plan will balance the budget and eliminate the deficit by the year 2002. **Included in that plan is a proposal to begin the**

### **orderly termination of the Department of Energy and transfer critical functions to other agencies.**

As we work to balance the budget, we must ensure that we receive a full and fair return on our energy dollars. By eliminating administrative and bureaucratic costs, we can direct our scarce resources toward basic research and other critical functions.

As part of the continuing budget process, the appropriate House committees will now consider the proposals outlined in the budget plan and combine those issues into a single reconciliation bill to be voted on by the House later this fall. Please be assured I will carefully consider your concerns as Congress considers the future of the Department of Energy.

Thank you again for the benefit of your views. I hope you will continue to let me know of issues that are important to you...

Sincerely, /s/  
Enid G. Waldholtz  
Member of Congress

[Emphasis added. -Ed.]

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## **G. MEETINGS**

### **IEEE/NPSS 16th SYMPOSIUM ON FUSION ENGINEERING**

The Chancellor Hotel & Convention Ctr.  
Champaign, Illinois  
30 September - 5 October 1995

The conference explores the scientific, technological and engineering issues associated with controlled thermonuclear fusion. There will be papers, poster sessions, company exhibits, a minicourse in Fusion Blanket Technology (8/30-9/1), and a golf tournament (9/1). Cold Fusion will be presented for the first time in a poster session by Dr. Robert Bass and Hal Fox, "Cold Fusion vs. Hot Fusion Branching Ratios." Three technical tours are offered to members, to: Argonne National Laboratory, McDonnell Douglas Aerospace (St. Louis), or to a boiling water nuclear power plant in Clinton, IL, on Oct. 6.

For more information in the conference contact their office from 8:00 am to 5:00 pm by phone or 24 hours by fax. Phone: 217-352-6667 Fax: 217-352-8108

## **RUSSIAN CONFERENCE ON COLD FUSION**

### **Third Russian Conference on Cold Fusion and Nuclear Transmutation**

taking place in a resort in Sochi  
(on the shore of the Black Sea)  
on October 1-8, 1995.

The program of the Conference includes the following subjects:

1. Experimental research of Cold Fusion and Nuclear Transmutation with the different scientific methods and instruments;
2. Cold Fusion and Nuclear Transmutation theoretical models;
3. Cold Fusion applied technologies and devices.

We are pleased to invite you to participate at this conference and to make a report on any subject preferred by you. No preliminary abstract of the report is needed but please send us the title of your report, if it will be presented. The language of the Conference will be Russian and translation into English will be available.

If you want to take part in our Conference you should inform us by Fax until July 15, for we will be able to organize your meeting and provide you with railway tickets.

The registration fee of \$500 for participants, which covers Conference proceedings, a hotel stay in Moscow and transportation by railway from Moscow to Sochi and back. If you pay before July 15, your fee may be reduced to \$450. In this case, we inform you about our account number. Accommodations in Sochi must to be paid by every participant personally. The price of the room can vary from \$25 to \$50 per person per night. The price of the meals (breakfast, dinner and supper) is equal to \$10 per day.

We will be ready to meet with you from September 28 to noon of September 29 in Moscow, if you would give us the information about flight date and number. The projected date of return flight from Moscow is October 10-11. Please inform us of your E-mail address.

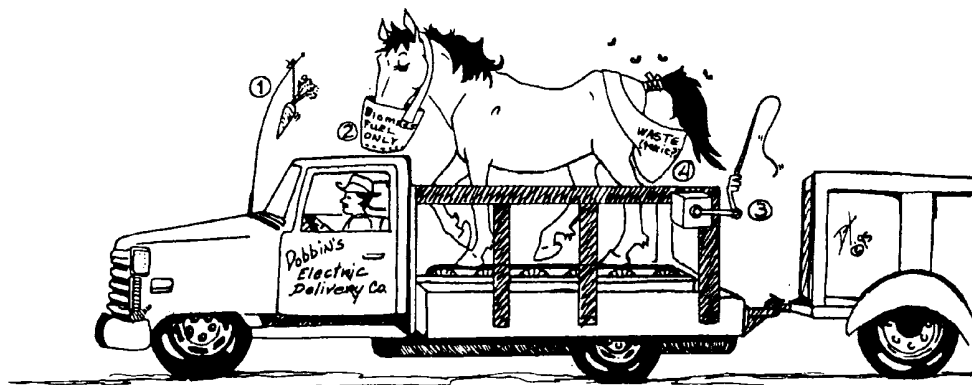
### **3rd Russian Conf. on Cold Fusion and Nuclear Transmutation**

**Russian Academy of Science  
P.O. Box 169, "Erzion" Center  
105077 Moscow, Russia**

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# Onboard <sup>Battery</sup> Charger

## Enhanced Energy System for Electric Trucks



1. ignition (incentive) system
2. no petroleum products used
3. overdrive system
4. non-radioactive waste removal system  
(still some exhaust problem)

### COMING: THE ON-BOARD BATTERY CHARGER

By Hal Fox, Editor

Dineh Torres' rendition of the on-board battery charger for use with electric vehicles is not quite what we had in mind. If you think pollution is a problem now, think of what ten million Dobbins would do to the environment.

Seriously, the advent of new, improved batteries, better d.c. electric motors, and the suggested on-board battery charger **will make revolutionary changes in the electric vehicle business.** The important questions are: How soon? and What with?

It is estimated that the on-board battery charger for personal "stop-and-go" automobiles should provide from 500 to 1,000 watts and charge continuously (except when batteries are fully charged.) It is estimated that an average of 5,000 watts will propel a small automobile. If you drive 2.4 hours per day (one tenth of the time), then you will require a minimum of a 500-watt battery charger. With a larger car or with longer driving time, you should be able to handle most city stop-and-go driving with a 1,000-watt battery charger.

If the enhanced energy device produces thermal energy (such as the use of a cold fusion reactor), then such a device must be coupled with some type of thermal to

electric converter. The simplest method is to use a highly-efficient thermal-electric converter. However, the current state of the commercial art is about 20 percent or less. Assuming the use of a 20% efficient thermal converter, the cold fusion reactor must put out from 2500 to 5000 watts of thermal energy. There are rumors that a 60%-efficient thermal-electric converter is pending or at least possible. When such a unit is available, then 1200 to 2500 watts of thermal energy, used continuously, would provide the required power.

A better approach is to use a device that provides a direct electric-to-electric input-output. Such devices as the Magnetic Resonance Amplifier, the Winn-Lambertson circuit, or a commercialized version of the unit invented by Kenneth Shoulders (U.S. Patent 5,018,180) would be appropriate. Independent, professional, verifiable, and signed test results of none of these three devices are available. However, the inventors of these three different devices are optimistic that such verification is pending.

Who will win the race to provide a one-to-two cubic foot on-board battery charger is not, as yet, determined. However, the race is on. Laboratory demonstrations are promising. Commercialization has begun. **We predict that the on-board battery charger will be demonstrated as a pre-production prototype by July 1996.** Sorry Dobbins, back to the pasture for you.

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