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HOW DO WE GET NEW ENERGY DISCOVERIES ACCEPTED BY THE SKEPTICAL SCIENTIFIC COMMUNITY?

By Pat Bailey, President INE

Here is how: We write short articles on these topics; we provide names and research addresses of where the work is taking place; we report the experiments, the results, data, and plots; and we summarize the results so that any high-school student can understand it. Next we publish the results in *NEN*.

Then, we post those articles on the INE website, and also post the articles as email messages to various UseNet bulletin boards.

This process will cause the search engines, like www.hotbot.com and www.altavista.digital.com to pick up these topics and include them in their search engine databases.

About a month later, we post messages to high school teachers and college professors, providing them with a summary of these various topics, and cite the website links to look at per their interest. A real good reference is: <http://www.padrak.com/ine/SUBJECTS.html> which lists all of the material in the INE website according to subject. There are also pages organized by the author's names.

Finally, we write letters to the main stream press, UPI and AP, and to major TV shows, such as 60 Minutes, to tell them the status of our research and to determine if they have the guts to do a story.

Anything else is just talk.

Let's create action!

INE NEW-ENERGY SYMPOSIUM - 1998

Call For Papers

Please submit abstracts by May 15, 1998. Deadline for papers July 15, 1998.

Meeting will be held at the University of Utah Union Building on Friday 14, Saturday 15, 1998. Cost is $100 for members if paid by August 1, 1998; $125 for non-members if paid by August 1, 1998, $150 at the door.

All papers accepted for presentation will be published in the *Journal of New Energy*. The journal will be available immediately after the conference.

Author's are encouraged to send their abstracts immediately. The editorial staff of the *Journal of New Energy* will be used to select the papers to be presented. Authors will have from 30 minutes to one hour for their presentation depending on the number of papers that qualify for presentation. If excess papers are offered, new-energy experimental papers will be give preference.

The Outdoor Retailers Convention is being held in Salt Lake City, August 13-16, 1998. Almost ALL hotels have blocked rooms for this convention. If you are not attending this convention, have your travel agent book motel or hotel space for you immediately.

With great regret we note the passing (or at lease temporary reduction to inactivity) of our parent IANS and our sibling ANE. We welcome friends of both to join with INE in continuing the great exploration to discover new energy and new science. – Editor.

Fusion Briefings

ABSTRACTS FROM ICCF-7

April 1998 – Vancouver, BC, Canada
Program Manual and Abstracts

Proceedings will be available in July from:
ENECO, 391-B, Chipeta Way,
Salt Lake City, UT 84108.

K. Sasaki, M. Muraki, T. Nakagawa (Lab. of Nagaiki, Tokyo, Japan), C. Akbar (Kushi Foundation, Brookline, MA, U.S.A.), "**Iron from Carbon and Oxygen Under Electro-Discharge**," p 21.

Our objective was to confirm the 1960's theory and experiments George Ohsawa and Michio Kushi for the low-energy transmutations

$$_6C^{12} + {}_8O^{16} \rightarrow {}_{14}Si^{28}$$

$$2_6C^{12} + 2_8O^{16} \rightarrow ({}_{26}Fe^{56}, {}_{27}Co^{59}, {}_{28}Ni^{59})$$

where the unstable cobalt and nickel are predicted to quickly decay to more stable iron. In 1994 J. O'M. Bockris & R. Sundaresan and independently M. Singh et al. reported anomalous iron production from arcing between carbon rods in water. We performed a similar carbon arcing in both water and air and examined magnetic reaction products.

The experiments were carried out in the laboratory of T. Mizuno in the Department of Nuclear Engineering, Hokkaido University, Sapporo, Japan. Our method was to strike an electric arc of 46 volts and 20 amps for 5 minutes between a carbon rod and carbon powder (>99.97% pure by EDX; 99.9995% by spectroscopy) in a graphite crucible in air. The remaining carbon powder was carefully gathered and found in part to be attracted to a magnet. We analyzed these apparent ferromagnetic products with microphotograph (100x) and EDX analyzer. Under magnification, a brilliant alloy seemed to appear.

Results of EDX analysis of the magnetic reaction powder for four runs of the carbon arcing from 4/14/97 to 4/17/97 production of Fe (40%), Si (30%), Ca (20%), Cu (5%), Zn (2%), others (3%). This experiment has high reproducibility.

In conclusion, we believe that atomic transmutation happened at low energy and standard atmospheric temperatures and pressures. We suggest mass spectroscopy to analyze isotopic abundances; but the high percentages of iron and silicon in reaction products compared to amounts in the original carbon powder and rods appear to eliminate contamination as an explanation for the results. Reduction of current and voltage, increasing arcing time, and decreasing ambient temperature are predicted to result in higher yields of iron, and these should be tested. Our results do seem to confirm the theory of Ohsawa and Kushi, and corroborate previous carbon arc experiments.

George Andermann (Dept. Chem., Univ. HI, Honolulu), "**Nuclear Electron Capture and Entrapment as Precursors for Nuclear Transformation Events with Deuterated Metals**," p 22.

A compelling fact in cold fusion is the necessity of having either deuterium (D) or hydrogen (H) involved in the lattice. In this treatment only D will be considered. To date most theoretical arguments involved either fusion processes (conventional / modified), or neutral particles to overcome the forbidding Coulomb barriers. Since Coulomb repulsion is even greater for d-d interactions in the lattice L than for d-d interactions, the use of neutral particles is inviting. The purpose here is: (1) to reargue the model involving the creation of stable dineutrons ^2n via electron capture (EC), (2) to introduce the plausibility of quasi stationary dineutrons $^2n^*$ via electron entrapment (EE), and (3) to show how these particles lead to observed nuclear transformations.

The probability of EC for an isolated nucleus is the product of two terms, namely, one term involving $(Z/r)^3$ and the other being the electric dipole transition matrix element. While early considerations emphasized lowering r values through changes in lattice pressure, this does not lead to drastic reductions in r. However, it is possible to look at lattice vibrations to see how r might be decreased by larger factors. A plausible scenario is to assume that a fraction of D atoms are either bonded or are available as free atoms to be used as 'knock on' atoms D' against bonded D-s. When D' collides with D in bonded LD, kinetic energy from D' forces D against L. The greater the 'collisional chaos' in the lattice, the smaller the internuclear distance between D and L. Since the lattice atom L has a very large number of electrons surrounding the nucleus 1, there can be very little valence electron deformation for L. On the other hand, charge density deformation about D, known in the field of lattice vibrations as electrical anharmonicity (EA), can cause decreases in r. The unique aspect of CF experiments is that it is possible to achieve enhanced EA. As emphasized in earlier arguments, once EC occurs a vacancy is left behind in the previous LD bonding orbital and a dineutron ^2n is created, which, as shown before, can

be stable with respect to dissociation into 2 separate neutrons. It can be shown that with ^{2}n it is possible to have a number of nuclear transformations, essentially corresponding to thermal dineutron absorption, by any atom which encounters ^{2}n.

G. Andermann, E. Hajime (Univ. HI, Chem. Dept., Honolulu, HI), "**Rationalization of Cold Fusion Transmutations Via Thermal Absorption of Complex Neutron Aggregates**," p 23.

In the field of cold fusion a challenging theoretical problem is the rationalization of the recently observed transmutation of lattice elements L (Pd, Ni, Ti, etc) involving large changes in Z (plus or minus), as well as changes in the isotope ratios of the transmutation products. Starting with nuclear transformations involving d and or p, most rationalizations appeared to ignore the possibility of their fusion with the heavier lattice nuclei 1. While a number of rationalizations using such simple neutral particles as n and dineutron ^{2}n did argue for their interactions with L, the very use of these simple particles excluded the possibility of large changes in Z, as well as, drastic changes in the isotope ratios of the transmutation products. The purpose here is to show how more complex neutron aggregates are used to rationalize either the unusual 'fission' or 'fusion' like transmutations, as well as the unusual changes in the isotope ratios of the transmutation products.

First, it is necessary to recall that in all experiments high energy neutron emission has been sparse. Our model rationalizes this with the stipulation that all neutral particles are created to have very low kinetic energies, thus, they tend not to leave the lattice. With D in the lattice we stipulate that there are two kinds of simple neutral particles, primary and secondary, where the primary includes dineutrons ^{2}n and quasi-stationary dineutrons ^{2}n*, and the secondary includes n and quasi-neutrons n*. Since these simple particles tend to stay in the lattice, under enhanced-energetic conditions of the experiments it is possible to obtain significant population densities for them. A relatively high population density of the simple aggregates allows them to be interacting either with each other or with any element in microscopic 'reaction zones' in the lattice. This interaction leads to complex aggregates: (1) n-n (neutron dimer) or n_2, n-n-n (neutron trimer) or n_3,or larger linear neutron polymers, (2) some non linear polymers, or to (3) polyneutrons formed from ^{2}n-s and from ^{2}n-s with n-s. The above polymerization takes place when the coalescing entities do not have antiparallel spins. When they do, we get polyneutrons, such as, ^{2}n, ^{4}n, ^{6}n, etc.. The aggregation schemes with n*, ^{2}n* are similar, and we can get quasi-neutron, or quasidineutron polymers (linear or nonlinear) as well as their emergence into stable polyneutrons. With H in the lattice similar kinds of aggregate buildups can occur except the primary simple particle is n*.

G. Andermann (Dept. Chem., Univ. HI at Manoa), "**Unified Theory for Cold Fusion Phenomena**," p 24.

The observed phenomena in cold fusion may be separated into three phases. The first phase is the deuterium phase, since it was believed that D was essential. During this phase the observable included low energy events, such as, excess heat, UV and X-ray radiation, electrons, and high energy events, such as neutrons, Tr, He-3 and 4, charged particles and gamma rays, as well as the irreproducibility of these events. The most puzzling phenomena were the dominance of low energy over high energy events and the near total absence of gamma rays. The second phase showed that H was also capable of leading to cold fusion. The third phase demonstrated transmutation of elements in the lattice coupled with frequent changes in the isotope ratios of the transmuted elements. Theoretical rationalization has met serious difficulties since to-date no single theory could explain satisfactorily all of the observable [experimental results]. The objective here is to suggest a unified theory which may rationalize all observables for all three phases.

For Phase I events the model suggests the capture of electrons to create dineutrons ^{2}n, which are stipulated to be stable. However, it is also possible to create relatively unstable quasi-stationary dineutrons ^{2}n* as well, if the electroweak interaction is 'incomplete'. ... The production of excess heat is ascribed to cooperative phenomena involved in low energy solid state electron physics. The absence of gamma ray production *is* rationalized on the basis of solid state controlled nuclear magnons coupled to lattice electron magnons which provide nuclear spin states with a wide array of total spin quantum numbers. Since the electron spin states are coupled to electron orbital states there is a set of electron exciton states which provide the ultimate degradation of gamma rays to a series of lower energy photons and then through the coupling of these excitons to phonons.

The rationalization of Phase II phenomena stipulates the creation of a neutral particle involving chemically bonded hydrogen to the counter element, Ni, for example. In this case, the proton cannot capture an electron, but it can still 'hug' the electron similar to the ^{2}n* case, creating a quasi-neutron n* but even with a more limited lifetime than that of ^{2}n*.

Phase III modeling requires the stipulation that all nuclei in the reaction zone can absorb any kind of neutral particle. However, the tremendous changes in Z indicate that n*-s, ^{2}n*-s and ^{2}n-s may be insufficient. Thus, it is suggested that the conditions of the experiments can allow for the creation of polymers made up out of the above three substances and of polyneutrons. It has been possible to demonstrate, for example, that starting with a lower valued Z element in the reaction zone, any number of schemes involving the above species can lead to an increase in Z, where the aufbau principles of closed nuclear sub-shells tend to hold true. Conversely, for the cleavage of higher Z elements the use of relatively small neutron configurations can yield products which are in agreement with the results of various experiments. Isotope ratio changes appear to follow different rules than aufbau processes.

George Andermann (Dept. Chem., Univ. HI, Honolulu), "**Excess Heat in Cold Fusion Via Dineutron Models**," p 25.

It is generally accepted that excess heat is the dominant feature of low-energy events in cold fusion, and, that furthermore, low-energy events dominate high energy (nuclear) events. At the same time it has been argued successfully by chemists that the observed heat cannot be due to ordinary chemical reactions, and by most nuclear physicists that it cannot be due to fusion. It is the purpose here to show that a third alterative exists according to which the dominant feature of heat production is due to the consequences of forming neutral particles in the lattice. When using deuterium (D) in the lattice, the neutral particles are dineutrons ^{2}n and/or quasi-stationary dineutrons ^{2}n*, with hydrogen (H) they are quasi-stationary neutrons n*.

It can be shown that ^{2}n-s may play different roles than ^{2}n*-s in heat production, since their optimal formation requires different kinds of chemical bonding between D and lattice atoms L. First, it is necessary to consider the 'static' nature of the chemical bonding between D and lattice atoms. This topic itself is controversial and, therefore, it has been necessary to suggest a novel 'charge disproportionation' model, which is a unique application of a 'static' Lewis acid - Lewis base configuration in the lattice. The advantage of this new model is that it provides a compromise amongst the different viewpoints on the valence electron structure of metal hydrides and deuterides. However, further complications arise since under the application of an external potential the 'static' equilibrium is shifted. Because of these features of the solid state chemistry involved in these experiments, these considerations are dealt with elsewhere. ....

Semiquantitative calculations show that it is possible to obtain large gains in excess heat provided appropriate experimental factors governing EC and electron entrapment (EE) are controlled properly. These experimental factors include amongst others: (1) sufficient saturation of the lattice with D or H, (2) the provision of collisional chaos, (3) the judicious supply of mobile electrons, (4) the availability of microscopic and angstro-porosity, and (5) depending on whether or not ^{2}n-s or ^{2}n*-s are desired, the judicious shift in the 'static' equilibria discussed above.

N. Asami, T. Senjuh, T. Uchara, M. Sumi, H. Kamimura, S. Miyashita and K. Matsui (R&D Center for New Hydrogen Energy, Inst. of Applied Energy), "**On the Material Behavior of Highly Deuterated Palladium**," p 26.

It has been proposed that the reproducibility of the NHE phenomena is dependent mainly upon achieving control of the cathode material properties as well as the electrolysis environment. Several observers have pointed out that attaining a deuterium loading ratio greater than ~ 0.85 might be a prerequisite for observing the excess heat generation phenomena. Thus, we have presumed that achieving high reproducibility of the anomalous effect may depend upon reproducible, high-loading ratios. Material developments and analyses of cathode materials in this project has proceeded according to this postulate.

Numerous observations of the microstructures of palladium during deuterium loading and deloading has been carried out to determine the conditions for high loading. The β-phase nucleation and growth, slip band formation, and hydrogen bubble generation were directly observed by in-situ optical micrographs during electrolysis. ...

Crystal phase and lattice parameter changes were also measured to find any new phase by the insitu X-ray diffraction system which was newly developed at the NHE-Lab. The phase transition of $\alpha \Leftrightarrow \beta$ during the loading and unloading process was well identified, however no new phase was observed up to a loading ratio of about 0.85.

By modification of the working process, heat treatment, surface treatment, and the electrolysis conditions, deuterium loading up to 0.9 ~ 0.96 was achieved with relatively high reproducibility. Detail features of the loading and deloading process occurring at relatively high loading states were observed by gas chromatographic analysis.

Isotopic effects of H, D, T on loading were also investigated using NMR and a liquid scintillation counter for attaining the basis of nuclear and excess heat measurements. Hydrogen enhancement phenomena of palladium at various current densities and H/D ratios in the electrolyte were quantitatively observed. Tritium amounts, however, did not exceed the amount in the electrolyte in any measured specimens.

Yu. Bazhutov ('Erzion' Center, Moscow, Russia), "**Influence of Spin and Parity Preservation Laws on Erzion Model Predictions in Cold Fusion Experiments**," p 27.

Spin and parity preservation laws were used for Erzion-nuclear reaction probability analysis. It was shown, for instance, on some nuclei that not all Erzion-nuclear reactions can run with zero spin and in this case cross-sections of such reactions become rather small. This analysis is able to divide all of them by priority degree. As supposed before, it was found that Erzion-nuclear reactions on deuterium, protium and tritium have best priority degree. It is in best accordance with all cold fusion experimental results. Some recommendations on best chemical elements for using in cold fusion experiments have been done.

Yu.N. Bazhutov, V.P. Koretsky ("Erzion" Center, Moscow, Russia), "**Neutron Generation at Ultrasonic Cavitation of Some Liquids**," p 28.

Neutrons were registered during 20 hours on the level of 30-100% background excess and statistical reliability no less then 3μ after 131 hours of ultrasonic cavitation of some salt water solutions and liquid mixtures. Neutron generation changed in 0. 5 - 8 hour region. The event trust was confirmed with the impulse spectrum of the He-3 neutron counter.

M. Bertolotti (Dip. di Energetica, Univ. di Roma "La Sapienza", Roma - Italy), G.L. Liakhou (Technical Univ. Moldova), R. Li Voti, S. Paoloni, C. Sibilia and V. Violante (ENEA/INN/NUMA Centro Ricerche Casaccia, Rome, Italy), "**Non-Destructive Evaluation of the Thermal Properties of Palladium-Hydrogen Compounds by Photothermal Techniques,"** p 29.

In recent years the photothermal techniques have been successfully applied to investigate the thermal properties of solid samples subjected to a surface treatment. In many cases the treatment causes a microstructural change and, consequently, a change of the surface thermal properties. In the palladium-hydrogen compounds the loading process generates an high hydrogen concentration at the surface together with a stress field which could inhibit the heat conduction. In this sense both the thermal conductivity and diffusivity depth profiles, which can be measured by photothermal techniques, can be correlated to the hydrogen concentration depth profile and give a supplementary information about the quality of the loading processes.

The non-destructive evaluation of the thermal depth profile has been the subject of many articles in the **photothermal** field. The idea is to generate thermal waves at the sample surface by the means of a laser whose intensity is modulated periodically in time at the modulation frequency. The waves penetrate inside the sample, are partially back scattered by the changes of the thermal parameters and contribute to the temperature rise at the surface, which is eventually detected by the infrared emission (**radiometry**), by related optothermal (**mirage**) or acoustic effects in the surrounding medium (**photo acoustic**). The laser power is now adjusted so to have the maximum temperature rise of few some degrees. Then the hydrogen content in the sample is not modified. The modulation frequency, which is also adjustable, drives the penetration depth of the thermal waves used to reconstruct the thermal depth profile: high frequency thermal waves allow [one] to investigate the surface properties (1μm) while low frequency thermal waves allow to investigate deeper (1 mm). Therefore it has been demonstrated that from the surface temperature vs the modulation frequency one has all the data required to reconstruct the whole depth profile. We present this technique to reconstruct the thermal effusivity depth profile which is a quantity related to both conductivity and diffusivity, and discuss the results obtained for some palladium-hydrogen compounds at different loading ratios showing that the hydrogen concentration reduces the effusivity.

J.-P. Biberian, G. Lonchampt, L. Joncourt, L. Bonnetain (Commissariat a L'Energie Atomique, Grenoble, France), "**Excess Heat in Solid State Electrolytes**," p 30.

At ICCF-5, we have shown results of experiments exhibiting excess heat during electrolysis of solid electrolytes in a deuterium atmosphere at high temperature. One of the major difficulties in this approach of cold fusion is the manufacturing of the samples. We have been able to make new ceramics with known concentrations of vacancies. We show the results obtained with these new sample.

E. Botta [(1)], T. Bressani [(1,2)], C. Fanara [(1)], F. Iazzi [(1,3)] [(1) INFN, Sezione di Torino, Italy), (2) Dip. Fisica Sperimentale, Univ. di Torino, Italy), (3) Dip. di Fisiea, Politeenieo di Torino, Italy], "**Correlated Measurements of D_2 Loading and ^{4}He Production in Pd Lattice**," p 31.

Following the traditional line of the Torino Group of searching for nuclear ashes as Cold Fusion reaction signatures, a set of measurements of ^{4}He production in a D_2 loaded Pd sheet has been performed. The apparatus, already used for previous measurements presented at ICCF-6 (which gave positive results), was slightly modified in order to better monitor the Pd temperature: in this version it consists of a cell for loading D_2 into Pd, a High Resolution Mass Spectrometer, a vacuum circuit connecting the cell and the spectrometer to each other and both to the gas feeding system and to the turbo molecular pumps.

The cell contains a thin strip of Pd: at the ends of the strip an electric field is applied in order to favor the

electromigration of D^+ ions and their accumulation toward the cathode (Coehn effect). The pressure and temperature of the D_2 gas around the strip and the temperature at the center of the strip and near the cathode are continuously monitored.

A set of measurements have been performed following this procedure: the cell and the circuit, previously degassed down to some 10^{-6} mbar, were filled by pure D_2 (99.99%). The ^4He contents in the D_2 filled circuit was measured by the spectrometer and a value of the background was obtained. Then the circuit, separated from the cell by a high vacuum valve, was evacuated. In the cell, the Pd strip was submitted to a series of electric fields (increasing up to $\approx$ 0.36 V/cm) in order to increase the absorption: and a loading up to $\approx$ 0.8 D^+ / Pd was reached (average value along the strip). A not uniform temperature distribution along the strip was observed indicating an accumulation of D^+ near the cathode beyond the mean value 0.8.

After switching off the electric field, the ^4He content of the desorbed gas was analyzed. The results, after 10 measurements, didn't show a ^4He production significantly higher than the background.

We will continue the above measurements on other Pd sheets in order to have a better statistics on this phenomenon.

Ben Bush, J.J. Lagowski (Univ. TX, Dept. Chem., Austin), "**Methods of Generating Excess Heat with the Pons and Fleischmann Effect: Rigorous and Cost Effective Calorimetry, Nuclear Products Analysis of the Cathode and Helium Analysis.**" p 32.

The results from a growing number of laboratories suggest that the Pons and Fleischmann effect (the production of "excess heat" during the electrolysis of D_2O at palladium electrodes) is real. Moreover, data from these laboratories indicate that excess heat events are accompanied by ^4He production. Excess heat generation appears to depend on a number of factors: the quality --nature-- of the cathode, chemical species present in the D_2O / LiOD electrolyte, the conditions surrounding the electrolysis process -- current density, potential, time, and the previous history of the cathode. Methods for obtaining useful cathodes will be described.

Calorimetric problems have dominated the excess heat measurements. There is little standardization of methods employed by different laboratories and the performance characteristics of the various methods are obscure. We have settled upon high performance Calvet calorimetry as a cost effective, but highly reliable method for measuring excess heat. A 3 x 3 x 9cm device provides a dynamic range from milliwatts to hundreds of watts (depending on water bath capacity). Conceptually, the high performance Calvet calorimeter is a box with each of the six walls being a thermal flux transducer. Thus, the series sum voltage of the thermal flux transducers represents all the heat flow that occurs during an experiment. Thermal homogeneity (the isoperibolic assumption) is unimportant as long as the water bath temperature is stable. With multiplexed computer data acquisition high performance Calvet calorimetry (AKA Seebeck™; Geoscience, San Diego) is very labor efficient. The Calvet devices can be made in any size or shape, and they combine the fastest time response and largest dynamic range with the most fundamental method of calorimetry known.

We entered the field with concurrent heat versus helium analyses. Subsequent quantitative helium analyses showed that the excess heat appeared to be generated by the D + D→ ^4He + 23.82MeV (heat) reaction pathway. The helium was found in the electrolysis off-gas indicating a surface reaction. As the electrolysis proceeds a non-conductive film of oxyhydroxides builds up on the cathode surface. This film acts as a temperature sensitive activity step up transformer; in the Pons and Fleischmann type isoperibolic calorimeter excess heat causes the cell temperature to rise which decreases the degree of hydration (hence decreases deuteron mobility) so fewer deuterons carry the current and their activity increases which increases the excess heat...in a cycle that goes to thermal run-away and boil down. In highly active cathodes one should expect. multiple nuclear reaction pathways, hence the nuclear products analysis of the cathode will shed light on the reaction mechanism. Secondary ion mass spec. is a non-ideal method due to ion fractionation of the light isotopes, and sensitivity is dependent on the ionizability of the elements. Neutron activation analysis is sensitive to a few elements, but renders the sample radioactive. Prompt gamma activation analysis using a cryogenic neutron beam is ideal because of reasonable sensitivity, analyzes the entire sample and doesn't render it excessively radioactive.

Robert T. Bush (Phys. Dept, California State Polytech. Univ. Pomona, CA), "**Consequences of Lattice Occupational Symmetry for Cold Fusion**," p 33.

A one-dimensional statistical mechanical model is considered in which the stoichiometry, S, determines the relative probabilities for the two production scenarios: (i) He^4 + phonons and (ii) (t,p) and (He^3, n), with (t,p)-production linked to (He^3,n)-production by a branching ratio of about 10^{-9} favoring (t,p). The model shows that He^4 production in Pd is linked with d-on-d reactions for which two nearest-neighbor reactant d's each have an additional nearest neighbor. In contrast, lacking one, or both, of these two additional nearest neighbors favors [(t,p), (He^3,n)]-production. Thus, a highly symmetrical interstitial lattice with regard to occupation (high S, S > 0.82) favors scenario (i): He^4 production and detectable excess heat. On the other hand, "broken symmetry" with regard to occupation of the interstitial lattice with a fraction of empty interstitial sites specified by 0.6 < S < 0.8 leads to scenario (ii).

Among the predictions of the model are: (1) Excess heat production (associated with He^4 production) typically first begins to be large enough to be detectable in the range of

S = 0.82 to S = 0.85 (McKubre). The greater the value of S above 0.82, the more scenario (i) dominates (ii). (2) Tritium (t) production peaks at about S = 0.7 and plunges rapidly with increasing S. Thus, the Bockris curve, which implies an excess heat production roughly a thousand times greater than can be accounted for by the observed tritium production, corresponds to an approximate S value of 0.8. (3) Item (2) also explains the anti-correlation reported between neutron flux and excess power (Takahashi, Bush and Eagleton). (4) Boundaries, such as grain boundaries and surfaces, automatically "break" the occupational lattice symmetry since a d occupying a lattice site nearest the boundary can have only one nearest neighbor along the one-dimensional model axis. Thus, unannealed samples are superior to annealed samples for tritium production (Claytor). (5) In connection with (4), dendritic growths, sometimes observed to precede tritium production in Pd (Bockris) provide a large surface-to-volume ratio. However, as the diameter of the dendrites increases, this ratio would go down, favoring an increasing ratio of He^4 production and excess heat relative to tritium production (Bockris) [See (2)]. (6) Spectacular autoradiographs produced at the surfaces of deuterium-loaded titanium samples have been presented (Srinivasan) [See (4)]. (7) Production of H and He^3 at the surface of carbon black with the ratio of the latter to the former considerably exceeding their natural abundance ratio (Arata) [See (4) (5)].

Robert T. Bush (Phys. Dept., California State Polytechnic Univ. Pomona), "**Cold Fusion / Cold Fission Reactions to Explain Mizuno's Electrolytic Experiment Employing a PD Cathode and PT Anode**," p 34.

A nuclear model with specific nuclear reactions for cold fission and cold fusion is hypothesized to account for the experimental findings of T. Mizuno, T. Ohmori, and M. Enyo (University of Hokkaido) in an experiment employing a Pd/Pt electrolytic cell. While the model shows that cold fusion products make a contribution to their results, it predicts that cold fission predominates. For both cold fusion and cold fission, the reactions are "catalyzed" by electrons. However, for cold fission the electrons are relatively more numerous. Thus, the nucleus finds itself with a reduced number of protons and an augmented number of"neutrons" (at least, cargoes). Fission occurs to produce nuclear products with neutron-to-proton ratios placing them nearer to the well known nuclear stability curve.

According to Mizuno et. al, the major stable products produced are isotopes of Xe and Mg, with smaller amounts of K, Ca, Ar, CI, and Ti. (Ar production, however, cannot be studied due to the fact that their mass spectrometer employs Ar ions.) The model explains the large amount of Xe produced in the experiment as the result of three principal reactions: (1) Cold fission of the platinum that plates over from the Pt anode onto the Pd cathode, (2) cold fusion involving the addition of a deuteron to I^{134} and I^{129} to produce Xe^{136} and Xe^{131}, respectively, and (3) cold fission of the Pd of the cathode. The production of Mg, K, Ca, and Ti results in the model from nuclear reactions associated with the production of Xe from the cold fissioning of Pt and Pd.

A stunning result of the experiment by Mizuno et. al are the abundance shifts among the stable isotopes of Xe, and of Mg, K, Ca, and Ti. For example for Xe: Xe^{136}: Natural Abundance: 8.87%, Mizuno: 25%, Model: 21%; Xe^{134}: 10.44%, 12.5%, 11%; Xe^{132}: 26.89%, 18.5%, 16%; Xe^{131}: 21.18%, 28%, 23%; Xe^{130}: 4.08%, ?, 2.8%; Xe^{129}: 26.44%, 18%, 18%; Xe^{128}: 1.92%, ?, 2.3%; Xe^{126}: 0.09%, ?, 2.6%; and Xe^{124}: 0.096%, ?, 3.4%. A similar picture emerges for the comparison of the abundance shifts for the stable isotopes of Mg, Ti, Ca, and K. The general pattern, then, is one of significant shifts of Mizuno's results from the natural abundances, and reasonably good agreement of the model predictions with Mizuno's results.

Finally, G. Miley has indicated that his analysis of the nuclear reaction products for a Pd/Pt Patterson cell yields results similar to those of Mizuno. Thus, the agreement between the two sets of experimental findings and the predictions of the model provide a composite picture with some credibility. Moreover, it strongly suggests that the model is on the right track.

Bruce L. Cain (Mississippi State Univ.), Anne B. Cheney, J. Michael Rigsbee (Univ. Alabama at Birmingham), Roger W. Cain (Somerville, AL), Lonnie S. McMillian (Huntsville, AL), "**Thermal Power Produced Using Thin-Film Palladium Cathodes in a Concentrated Lithium Salt Electrolyte**," p 35.

During investigations to analyze the electrolytic loading of hydrogen and deuterium in thin-film palladium cathodes, significant thermal power (near 200 watts sustained over a 20 hour period) was observed from a 1.2 liter electrolyte cell of 2.5 molal LiOH-H_2O salt in D_2O. Features of the experiments included a flow calorimeter using a 2 liter tempering beaker, calibrated RTD sets on the inlet and outlet manifold, variable coolant flow rates from 0.5 to 4.0 lpm, PID controlled flow loop temperatures from 5 to 60° C, a 5 cm x 7.5 cm platinum gauze anode, and 7.5 cm^2 cathodes made up of sputter deposited palladium on alumina substrates. The experiments were further instrumented with pH and reference electrodes, two PTFE coated RTD's to measure electrolyte temperature, anode and cathode potential probes, PTFE coated platinum leads at 4 corners of the palladium film to measure the 4-wire resistance of the film during loading, and computer controlled data acquisition of process parameters during each run.

The palladium coatings were prepared by DC magnetron sputtering of a palladium target (99.95%) in an Argon working gas at 5 mTorr, with substrate cooling to keep deposition temperatures below 70° C. Films were deposited onto 2.5 cm x 5 cm x 0.127 cm (thick) conductor grade aluminum oxide (99.67%) during 45 minute runs which produced film thicknesses of about 5 microns. Both the alumina substrates and the Pd target were sputter

cleaned at several hundred watts using an Argon discharge before opening shutters to begin the deposition. The as-deposited films exhibited typical microcrystalline structure with randomly oriented micro-grains with maximum size of nominally 1-2 microns. The films had good uniformity and porosity less than 1%.

Although the experiments were originally designed for extended cathodic charging of the films to induce deuterium loading, by measuring the film resistance as the initial solution was added to the cell we observed a prompt film resistance increase of 20% followed within minutes by thermal power near 150 watts from the cell. Subsequent addition of electrolysis current (0.1 amps/cm^2, 6 watts electrolysis power) promptly increased the film resistance by 70% with a further increase of thermal power to near 200 watts. This power level continued for over 20 hours with the cell temperature maintained near 60° C by the calorimeter temperature controller. The thermal power ceased after reducing the cell temperature to 30° C. Subsequent runs have exhibited similar sustained periods of thermal excursions near 100 watts, normally after a very brief electrolysis charging and subsequent heating of the cell from 30° C to 60° C.

We conclude that significant thermal power is possible from this palladium catalyzed electrolyte arrangement, although details of its excitation mechanism are unclear. These results and corollary thin-film and electrolyte analysis details will be presented, along with discussion of possible catalytic mechanisms for the power observed.

Bruce L. Cain, Trace C. Scrivner (Mississippi State Univ., Mech. Engr. Dept.), Anne B. Cheney, J. Michael Rigsbee (Univ. of Alabama at Birmingham, Matl. & Mech. Engr. Dept.), "**Electrical Resistance and Morphology of Palladium Thin-Film During Hydrogen Loading**," p 36.

Sputter deposited palladium thin-film on alumina substrates were loaded with hydrogen and deuterium using electrolysis to observe the influence of loading on film morphology and electrical resistance. The palladium coatings were prepared by DC magnetron sputtering of a palladium target (99.95%) in an argon working gas at 5 mTorr, with substrate cooling to keep deposition temperatures below 70° C. Films were deposited onto 2.5 cm x 5 cm x 0.127 cm (thick) conductor grade aluminum oxide (99.67%) during 45 minute runs which produced film thicknesses of about 5 microns. Both the alumina substrates and the Pd target were sputter cleaned at several hundred watts using an argon discharge before opening shutters to begin the deposition. Several samples were then annealed at 700, 800 and 1000° C for one hour to allow for recrystallization and grain evolution.

The as-deposited films exhibited typical microcrystalline structure with randomly oriented and elongated grains of maximum size nominally 1-2 microns. The films had good uniformity with porosity less than 1%. Using digital image analysis on the serious of annealed samples before hydrogen loading, the grain-size distributions were measured using an intensity-analysis algorithm to identify grain boundaries in the three planar directions. These results showed essentially log-normal distributions with some evidence of abnormal growth during annealing. Average grain sizes were 0.5, 0.7, 1.1, and 2.5 microns for the as-deposited, 700, 800 and 1000° C anneals, respectively.

Samples were cathodically charged in a lithium-salt electrolyte using a 2.5 molal solution of LiOH-H_2O in D_2O. During loading of the films the electrical resistance of each sample was monitored using a 4-wire resistance probe made from Teflon insulated platinum wires friction pressed to the palladium film surface. To make these measurements the electrolyzing current was periodically cycled off to avoid electrical interference, resulting in a duty-cycle of about 60%. Unique "loading resistance curves" were obtained during constant-current loading at 1 mA/cm^2 which exhibit what are believed to be α / β hydride phase plateaus. After resistance increase of about 80%, the films were re-examined for morphological changes. All films delaminated from their alumina substrates during loading, and showed extensive swelling and embrittlement. However the as-deposited films retained much of their film integrity while the larger-grained annealed samples showed extensive cracking along grain boundaries.

These results along with more complex issues related to "surface blackening" during thermal power production and/or current reversal, will be discussed. Work is continuing to identify the "blackening deposits" using Auger and XRD analysis of the film surfaces.

L.C. Case, Sc. D., "**Catalytic Fusion of Deuterium**," p 37.

After much experimentation, I have found specific conditions under which D_2 gas catalytically fuses to He^4. Some of the prior cold fusion work may have adventitiously depended on such a catalytic effect.

In my process, D_2 gas is contacted at super-atmospheric pressure and a temperature of about 130 to 275° C, with a supported metal catalyst. I have looked at many such catalysts, and found that a platinum-group metal supported on activated carbon, at a loading of about ½ to 1% on the substrate, seems to be preferred. Pd, Pt, Ir and Rh all work, and Pd seems preferred. Other supported catalysts may ultimately be found to also work.

The process does not produce neutrons, or tritium, but two analyses of long-term tests have found about 100 ppm. of He^4 in the fuel gas.

Suitable equipment for this process is displayed. About 50 to 100 g. of candidate catalyst is loaded into the vessel, and the apparatus is sequentially tested with H_2 and gas at the same power input into the heating mantle. If the catalyst is active for D_2 fusion, the temperature reached with D_2 is more than 5° C higher than with H_2.

This process shows promise for cheap, large-scale energy production for the future.

F. Celani, A. Spallone, P. Tripodi, D. Di Gioacchino, S. Pace, G.A. Selvaggi (INFN-LNF, Frascati, Italy), P. Marini,V.Di Stefano, M. Nakamura (EURESYS, Roma, Italy), A. Mancini (ORIM, Italy), "**The Effect of α - β Phases Interface on H(D) / Pd Overloading**," p 39.

In the framework of Cold Fusion experiments, we studied since '94 the electrolytic set-up mainly characterized by a cathode shaped as long wire (pure Pd or Pd alloy). This arrangement was set-up in order to increase the deuterium concentration along the wire, according to the electromigration formula (Coehn effect):

$$C(x) = Co*e^{(aqV / KT)}$$

The H(D) concentration at the most cathodic end of the wire increases in accordance with rising up the voltage drop and decreasing the **actual wire temperature** T. In order to maximize the parameter V/T it is necessary to increase the resistance of the wire: long and thin wires (up to 5m long and diameter of only 0.05-0.1 mm) are therefore required.

Lasting over 3 years of experiments, by AC (20 KHz) wire resistance measurement method, to evaluate the H(D) / Pd loading ratio **and using an experimental set-up with 5 intermediate peak-up points along the wire** we found that, according to the electromigration effect, the D loading up is larger in the most cathodic side of the wire; however, after several hours of operations, the loading distribution along the wire generally tends to be reversed: the most loaded section of the wire was **not in the most cathodic zone but in the less one** (the central sides of the wire had intermediate loading). This surprising result, completely different from what expected according to the Coehn formula, suggests that a sort of "barrier" should exist at the most cathodic side of the wire, capable to prevent, as far as it is effective, the cathode deloading. Elapsing the time, the effectiveness of such a barrier gradually decays. We found that the barrier effect is connected with the different diffusion speed of D into Pd α and β phases. From this point of view, the wire temperature is important as well, because of its effect on the thermal phases stability.

Furthermore, we have some evidences that the Cu connections with external wires for power supply could play a crucial role, probably because of the specific Cu ability in reducing the lattice constant of Pd. We remark that, without a proper barrier, the Coehn effect itself could be deleterious for large loading.

We will report several new procedures (geometric electronic and chemical), able to make "Coehn effect" actually effective in order both to reduce strongly the non reproducibility of the experiments and increase the anomalous excess heat. We note, overall, that the results are qualitatively in agreement with our previous experiments using "high peak power pulse electrolysis."

Swe-Kai Chen (Matls. Sci. Center, Natl. Tsing Hua Univ., Taiwan), "**Observations of Cell Temperature Drops and High Vapor Temperatures in D_2O Electrolysis of Pd**," p 40, 5 refs.

After the announcement of Pons-Fleischmann experiment in 1989, scientists over the world have repeated the same experiment and have improved their experiment as well as have innovated many other experiments related to the cold nuclear fusion and nuclear transmutation phenomena. Among those innovated and improved experiments Arata and Zhang have demonstrated both the excess heat and nuclear product generation reproducibly using a small welded Pd container with 0.4 m Pd powder inside the container. Only the D_2O electrolyte temperature rises (e.g., excess heat) have been recorded in all the above experiments, while there is little report on the electrolyte temperature drops and/or on the vapor temperature rises in cell during electrolysis.

This experiment shows phenomena of anomaly heat absorption, rather than heat generation, in electrolysis, and how vapor temperature changes in electrolysis cell. In this experiment the electrolyte temperature can decrease from higher than the reference cooling temperature to lower than the reference cooling temperature, e.g., 19° C in 3 minutes, in a cell containing 350 c.c. D_2O and 0.5 c.c. Pd electrode. On the other hand, the highest vapor temperature can reach ca. 200° C, while the lowest temperature can touch a temperature below the reference cooling temperature. The anomalous heat absorption was explained as an effect of the inverse D(d, γ) ^{4}He reaction. The high vapor temperature suggests that the heat generated by the cell should consist of this vapor heat. One sometimes should also concern the heat hysteresis effect in the temperature measurement.

I.P. Chernov, Y.P. Cherdantzev, T.N. Melnikova (Phys. Dept. Tomsk Polytechnical Univ., Russia), "**Nuclear Reactions in Layer Structures at Deuterium Charge**," p 41.

Yield of γ - quanta, neutrons and acoustic emission (AE) was investigated in the process of deuterium charge of the samples at electrolysis. The layer structures were prepared by magnetron sputtering of the 0,4 μm Ti - films on Pd, Si, ceramic plates. Ni-WC samples were prepared from powder mixture including Ni (40-50% of weight, the powder dimensions were 1-10 mkm), WC (50-60% of weight, powder dimensions were 1-10 mkm) then passed and caked in vacuum furnace at temperature 1400° C during 60 min. The cell in which electrolysis has been realized was a hollow parallelepiped made of perspex. Electrolyte was 0.1 LiOD normal solution in D_2O. Current density was 5-10 mA/cm^2. Neutrons and γ - quanta detected by one-crystal scintillate spectrometer on the base of stilbene crystal with diameter equal to 20 mm. Spectrometer made possible to select signals from neutrons and γ - quanta with the help of scheme of pulse form discrimination. Spectrometer characteristics were determined by measuring with isotope sources of ^{257}Cf neutrons and ^{22}Na and ^{65}Zn γ - quanta. AE signals were detected by piezotransducers on the base of piezoceramics of ZrTiPb type.

It is known that in the process of hydrogen saturation of layer structures hydrogen is concentrated on two materials interface, **creates strong mechanical stress and provokes cracks. We suppose that cracks stimulate nuclear processes**.

During deuterium saturation of Ti-Pd, Ti-Si, Ti-ceramics the yield of γ - quanta exceeded the background 1.5-2 times as large. Neutrons yield has also been measured, but as a rule, it was on the background level. Yield of AE was correlated with the yield of γ - quanta. For Ti-ceramics sample the energy spectrum was measured. The energy of γ - quanta emission was equal to 3 MeV. ...

Thus, deuterium charge of layer structures is conducted by the yield of nuclear reaction products which appear, obviously, in process of cracks forming.

I.P. Chernov, N.N. Nikitenkov, L.N. Puchkareva, Yu.R. Kolobov, M. Krening, H. Baumbach (Phys. Dept. Tomsk Polytechnical Univ., Russia), "**Change of Isotopic Composition of Metals at Deuterium Charge**," p 42.

The aim of the given work was the receiving of new experimental data on isotopic composition change of metals under their deuterium charge finding out the condition of isotope exchange at diffusion. Isotopic composition of palladium, niobium, titanium (~0.4 μm films on ceramics) and admixtures in these materials was studied during deuterium charge and also isotopic copper composition change under its thermostimulated diffusion in nickel.

Saturation of samples by deuterium was produced in electrochemical cell using LiOD+D_2O electrolyte. Copper diffusion in nickel was studied by thermomechanical (and simply thermal) load in temperature interval of 423-873°C. The load was 20-25 kg/mm^2 and lasted for three hours. Isotopic composition of sample was measured by SIMS.

The studies had shown the significant isotopic composition change of elements matrices as well as admixtures. In particular, for titanium samples content of ^{48}Ti was decreased by 33,3%; at the same time a content of the other isotopes increases. ^{49}Ti and ^{50}Ti contents increase in the greater degree, by 8,6 and 17,8% correspondingly.

The most significant deflection of isotopic composition from natural one was in surface region of samples. While removing from the surface to the sample volume this deflection decreases. And on the certain depth depending upon the time of deuterium charge isotope composition comes natural level.

To understand a mechanism of this phenomenon copper isotopic composition was studied under its thermostimulated diffusion in nickel during presence and absence of mechanical stress in the sample. Thermostimulated diffusion of atoms in metal under the load imitates the processes occurring at saturation by hydrogen, since migrating hydrogen promotes diffusion of atoms matrices and admixtures, but its accumulation leads to significant stresses in metals. The significant isotope exchange takes place under mechanical loading samples. ^{63}Cu content was decreased by 44% and ^{65}Cu was increased by the same value. At the same time the absence of mechanical loading isotopic composition is not differ from natural one. The results obtained sufficiently proved that isotopic composition change of metals at saturation by deuterium was reached due to not only nuclear processes occurring under low energy, but also due to diffusional ones. Thus, the discussion on the problem of isotopic exchange mechanism must be extended.

Dan Chicea (Phys. Dept., Univ. "Lucian Blaga", Sibiu, Romania), "**About Deuterium Nuclear Reaction Rate in Condensed Matter** ," p 43.

The Coulomb barrier penetrability of two approaching nuclei is computed in the frame of the W.K.B approximation. A simple model for describing the screening effect of the Coulomb nuclear barrier by the high electron concentration in condensed matter is presented. The nuclear reaction rate of the hydrogen isotope nuclei, trapped in a metallic lattice is assessed, both for the unscreened and for the screened Coulomb barrier, averaged by the Maxwell distribution.

The low energy nuclear reaction rate in condensed matter is strongly enhanced by the effect of the electron screening, therefore the nuclear reactions at very low energies, in condensed matter, should be considered in a complete different manner than in free space. As the metal sample remains electrically neutral after loading with deuterium, the "free" electron concentration increases as the loading factor does, therefore a double value for the electron concentration should not be considered an abnormal one.

Even if the model overestimates the nuclear reaction rates, it predicts that, in certain circumstances, for porous or grainy samples which are subject to a negative electric potential and are heavily loaded with deuterium, very low nuclear radiation level might be detected. This could be the explanation for the very low tritium and neutron levels detected in some experiments, but not for the excess heat or for the very high nuclear transmutation rates which accompany the loading of deuterium in palladium or titanium, reported in the literature.

Dan Chicea (Phys. Dept., Univ. "Lucian Blaga", Sibiu, Romania), "**The Role of the Energy Fluctuations in the Possibility of Nuclear Reactions in Condensed Matter**," p 44.

In many papers concerning experiments of loading certain metals like nickel or palladium with hydrogen isotopes low radiation levels have been reported.

A simple model is presented in this article, to describe the energy fluctuation of a deuteron trapped in a lattice, considering elastic collisions in one dimension with the ions. The ions of the host lattice are considered to have a Maxwell distribution of their energies. The energy of a deuterium ion which collides randomly the ions of the host lattice is recorded over a high number of collisions and the energy distribution of the deuteron is obtained. The model predicts the existence of the energy fluctuations and the frequency of their appearance is assessed.

The energy fluctuations, even if the frequency of their real occurrence is lower than the predicted one, combined with the increase of the Coulomb barrier penetration probability produced by the electron screening effect, might lead to a very small and unsteady rate of low energy nuclear reactions produced by the hydrogen isotopes in condensed matter.

The very low energy nuclear reactions in condensed matter, produced in the classical manner by penetrating the screened Coulomb barrier, 'might explain the very low radiation levels reported in the experimental papers. Still, a new reaction mechanism to explain the excess heat and the high rate nuclear transmutations reported in the literature, without nuclear radiation emission is to be found.

Scott R. Chubb, Talbot A. Chubb (Oakton International Corp., Arlington, VA), "**Periodic Order, Symmetry, and Coherence in Cold Fusion**," p 45.

Solids are distinctly different from plasma's or high temperature environments that are usually associated with conventional fusion. Solids, at room temperature, "do not like" disruption. High temperature plasma's (HTP's) "like" disruption. Periodically ordered solids can coherently absorb momentum, all at once at a point, discontinuously, and through recoil processes in which the solid, as a whole, moves in response to a collision at an isolated location. As a result, in ordered solids, very often not only is the initial momentum of "colliding" particles **not conserved** by the particles during "collisions," but at low -

intermediate temperatures, these kinds of "collisions" play a dominant role in the following important effects: 1. the conduction of heat and electricity 2. diffraction of neutrons, electrons and X-rays, and 3. the Mossbauer effect. Because the idealized limit of stoichiometric PdD is periodically ordered, not only is there reason to believe, as we have discussed previously, that further D-loading will result in the occupation of ion band states by D-nuclei, it is probable that the potential nuclear reactions and transport of ion band conserving process involve indistinguishable particles (as in the case of D) and occur completely elastically, distinctly quantum mechanical forms of coherent internment become possible in which periodic order is preserved, and it can become "virtually" impossible to identify both the location of the interaction and the participating entities involved with the resulting release of energy. The paper provides a brief tutorial that summarizes the origin of this interaction, using well-known examples cited from solid state physics, and an overview of the predictions of the associated Lattice Induced Nuclear Chemistry (LINC) theory of Cold Fusion.

Scott R. Chubb, Talbot A. Chubb (Oakton Intl. Corp., Arlington, CA), "**Really Cold, Cold Fusion**," p 46, 5 refs.

A number of results from the Lattice Induced Nuclear Chemistry (LINC) theory of Pons-Fleischmann cold Fusion (PFCF) become rigorous in the limit of absolute zero temperature (T = O). These include: 1. The bosons-in and bosons-out rule and its generalization (which states that in PFCF only ground-state to groundstate nuclear transitions are allowed), and 2. The requirement that energy and by-product release occur at the crystal boundaries. Although considerable modification in the design of PFCF types of experiments are necessary as T → O, a number of potentially important, additional coherent effects are predicted by LINC that should be observable in this regime. To prove the reality of PFCF-related phenomena, as a consequence, it may be useful to consider conducting modified, PFCF-like experiments at low T. In particular, the many-body ion band state D and ^{4}He populations, which are both bosonic, could both exhibit coherent effects associated with the required sub-conducting (SC) behavior that occurs at T = O. Because the concentrations of these species are small, it may not be possible to identify direct effects on conductivity from the SC phases of these species. (It should be noted, however, that these kinds of effects could explain the known isotopic anomaly that occurs when D is substituted for H in PdH and the CS transition temperature Tc increases from 9.5°K to 11.5° K.) On the other hand, SC-induced magnetic phenomena (Meissner and Josephson effects) could be pronounced. Optimal crystal sizes (involving ~ 10^9 unit cells) for supporting coherent effects are predicted by the theory. As discussed in a second abstract, it is also possible for coherent interaction to extend beyond the boundaries of individual crystals. These results suggest that optimal geometries consisting of arrays of small crystallites could be used to enhance the magnetic effects, and because D is magnetic, magnetic effects from SC behavior could be anisotropic. An overview of these and other "really Cold, Cold Fusion effects" is presented.

Talbot A. Chubb and Scott R. Chubb (Oakton Intl. Corp., Arlington, VA), "**Deuteride Induced Strong Force Reactions**," p 47.

The American Physical Society categorizes cold fusion under PACS category 25.45 "Deuteride Induced Reactions." Fleischmann and Pons cold fusion is better described as due to "Deuteride-induced strong force reactions". Arata and Zhang have shown that the reaction products are ^{4}He and ^{3}He, which are products of the strong force reactions $D^+ + D^+ \rightarrow {}^4He^{++}$ and $D^+ + H^+ \rightarrow {}^3He^{++}$. Ion Band State Theory shows that D^+ and H^+ are subject to reduced Columbic repulsion and that the strong force reaction occurs coherently between ions fractionally occupying unit cells throughout a small volume of ordered lattice. De-excitation of the product state occurs by inelastic scattering between (1) Bloch elections that are coupled to and screen the band star ions in a dressed-ion configuration, and (2) the balance of the Bloch electrons that constitute the Fermi sea within which the lattice ions are embedded. If the screening Bloch electrons are coherent over a larger volume than the Bloch ions, de-excitation energy is distributed over a larger than the D^+ ion coherence volume. The main heating effects occur at surfaces and interfaces where periodic order is impaired. The distributed nature of the energy release prevents excitation of compact nucleus and precludes gamma-ray and energetic particle emission. The very occasionally observed nuclear emissions are presumably due to mechanical disruption of D^+ and H^+ Bloch ion systems.

T.N. Claytor, M.J. Schwab, D.G. Tuggle (Los Alamos Natl. Lab., NM), "**In-Situ Measurement of Tritium Concentration Variations During Plasma Excitation of Deuterium Loaded Palladium and Palladium Alloys**," p 48.

A number (22) of pure palladium samples and palladium alloys have been loaded with a deuterium or hydrogen plasma in a system that allows the in-situ measurement of tritium. By carefully controlling the plasma conditions, the plasma can be constrained to only contact palladium surfaces and to only lightly sputter the palladium. Long run times (up to 200 h) result in an integration of the tritium output and this, coupled with the high intrinsic sensitivity of the system (~ 0.1 nCi/l), enables the significance of the tritium measurement to be many sigma (> 10). In addition to the real time tritium measurement, the deuterium gas can be combined with oxygen, at the end of a run, resulting in water samples that were counted in a scintillation counter. The results of these confirmatory measurements of the tritium, in these water samples agree quantitatively with the decrease in tritium as measured by the gas ionization gauge. The energy spectrum and the half-life of the radioactive species are also in agreement with the assumption that the material is tritium: Magnetic fields, different types of pulse and RF excitation and the addition

of noble and other gasses have shown some effects that are difficult to reproduce. However, we have continued to investigate the effect of hydrogen additions on the output of tritium in these types of experiments and find that hydrogen additions always suppress tritium production. We will show the difference in tritium generation rates between batches of annealed palladium, as received palladium and the palladium alloys (Rh, Al, W, Co, Cu, Ni, Be, B, Li, Hf, Hg and Fe) of various concentrations to illustrate that tritium generation rate can vary from alloy to alloy as well as within between batches of the same (ostensibly) alloy. Other metals (Pt, Hf, Ni, Nb, Ta, V, W, Zr) have also been run in the system as background samples and to determine if tritium could be detected in the gas analysis system. In nearly all cases, they have produced results very close to background drift rate.

W.J.M.F. Collis (Strada Sottopiazzo, Italy), "**ENSAP - A Software Tool to Analyze Nuclear Reactions**," **Updated 1 November 1997**," p 49.

Over the last few years some progress has been made in demonstrating reproducible heat production in so called *Cold Fusion* experiments. This has not been matched by theoretical understanding as to the mechanism of heat production. It is important to establish which nuclear reactions, if any, are the source of excess heat before speculating on reaction mechanisms. Unfortunately experiment has not clearly demonstrated the consumption of any nuclear fuel nor production of nuclear ash. So any analysis must be able to cope with incomplete data. A computer is an ideal tool to cope with this problem.

ENSAP is a PC based program able to analyze reactions of the form:-

A + B -> C + D

A, B, C and D are (possibly incomplete) isotope specifications for the reaction products and reactants. Using a database containing nuclear data for all known isotopes, the program displays all reactions satisfying user specified criteria or conditions. Such criteria include:

1) Energy conservation (reaction should be exothermic).
2) Spin and / or parity conservation.
3) Gamow suppression factors.
4) Optional energy transfer from environment.

Wang Dalun, Chang Zheng, Jiang Li, Chen Shuhe, Yang Ke, Li Yijun, Fu Yibei (Inst. Nucl. Phys. & Chem., China Acad. Engineers Phys.), Zhang Xinwei, WuJun (Beijing Inst. Appl. Phys. & Comp. Math., Beijing , China), "**X-Ray in Glow Discharge**," p 50.

To make metals over-saturated with deuterium by the method of glow discharge, we have observed about 5×10^3 neutrons per second and X-ray for 10^{10} counts per second. The law of X-ray keep an accord under different conditions. The effect can be repeated for hundred percent. The abnormal phenomena can be controlled and be demonstrated at any time. The further research of X-ray property indicate: the X-ray whose energy is less than and more than the voltage discharge energy have anomalous long-range penetrating radiation.

A. De Ninno, M. Vittori Antisari, C. Giangiordano (ENEA, Frascati, Rome, Italy), "**Material Science Studies Aimed to the Excess Heat Experiments Reproducibility Improvement**," p 51.

We have studied the influence of the microstructure of Pd samples on the features of the hydrogen(deuterium) loading process in order to improve the reproducibility of excess heat experiments.

We have found that the Pd grain size is a significant parameter affecting in a strong way both the loading kinetics and the maximum concentration. A careful control of the microstructure appears necessary in order to obtain high loading ratios. We make the hypothesis that this can be related to the role of the grain size both on the density of short circuit paths for fast diffusion and on the mechanical properties of the material, which influence the metal ability in relaxing the stress field generated at the sample surface by the solute concentration gradient.

We started also the investigation on thin Pd films and multi layers (Ni/Pd). Our main goal is to prepare, in a reproducible way, Pd/D samples with a very high loading ratio (greater than 0.9) in order to systematically approach the main experimental problems of the excess heat production such as the calorimetric system improvement and the possible nuclear ashes production.

A. De Ninno, A. Frattolillo, V. Violante, F. De Marco, F. Scaramuzzi (ENEA/ERG/FUS, Fascati, Italy), "**Cold Fusion at ENEA Frascati: Progress Report**," p 52.

The research performed since ICCF-6 has followed two main lines.

The first line attains to the effort for reaching high values of D/Pd ratio in palladium samples, in order to achieve the best conditions for cold fusion phenomena, in particular power excess production. In order to obtain this result, a research program on material sciences, dedicated to the dynamics of hydrogen and deuterium charging in palladium has been started, in collaboration with other laboratories, both at ENEA and at some Universities. The results of this activity will be reported in another paper presented at this Conference (De Ninno et al.). The outcome of this research should be the definition of the starting characteristics of palladium (purity, shape), and of the particular procedures for its preparation and for its charging with deuterium. The calorimetry by now assessed at ENEA Frascati will be used for the detection of power excess.

The second line concerns the attempt to detect in a clear way the production of ^4He during the power excess episodes. A system aimed to the analysis of the gases evolving from the electrolytic cells is being realized. The gases will be catalyzed and the heavy water produced eliminated. The procedure consists in a static analysis of the residual gases, which will be progressively purified by all components other than noble gases. The calibration of a high resolution mass spectrometer and the test of the circuit leading the gases to the spectrometer is under way. Progress on this line will be reported.

D.D. Dominguez, P.L. Hagans, E.F. Skelton, S.B. Qadri, A.C. Ehrlich, D.J. Nagel, S. Crouch-Baker (U.S. Naval Res. Lab., Washington, DC), **"The Dynamics of PD-D(H) Phase Formation Monitored Using Synchrotron-Wiggler Radiation**," p 53.

Structural changes induced by the electrochemical absorption of deuterium or hydrogen into a Pd lattice were studied using very high energy x-ray photons available on the superconducting wiggler beam line, X- 17C, at the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory. Because of the high energy and high brightness of the x-rays (up to 80 keV), structural changes could be measured from the high energy diffraction peaks of Pd. The intensities of the Pd-(422) diffraction peaks for the α- and β-phases were monitored as a function of distance across the sample, electrolysis time and current density. From these data, diffusion rates and diffusivities were determined for deuterium and hydrogen absorption in a 1 mm diameter Pd wire cathode. For deuterium absorption, a diffusion rate of 57 ± 8 nm/s was found. The data also were used to evaluate the spatial dynamics of composition change in a volume element of about 0.18 nl as the solute atoms diffused through the Pd lattice. Other features of the structural changes associated with the absorption of deuterium or hydrogen into Pd were also observed. These observations lead to a model describing the temporal and spatial dynamics of deuterium or hydrogen absorption into Pd.

Jacques J. DuFour, Jacques H. Foos, Xavier J.C. DuFour (Lab. des Sciences Nucl., Paris, France), "**Formation and Properties of Hydrex and Deutex**," p 54.

By submitting various metallic hydrides to the action of a strong magnetic field (0.5 to 1.2 T), we have observed effects for which we have yet found no explanation by known phenomena. The most striking effects were observed with Uranium hydride and with Titanium hydride.

In the case of Uranium hydride, a 1 g sample of UII3 (made from Uranium metal N 0071 from the shelf and Hydrogen N 55 from Alpha Gaz) was placed between 2 magnets (remanence 1.2 T), under hydrogen (1 bar) at room temperature and submitted to intense (60 A) pulses of current, of low (40 V) voltage, of short (20 μs) duration and with frequency 4000 H. After 6 months of treatment, the Uranium hydride was oxidized (800° C for 5 mn), resulting in U_3O_8. A 1 g sample of the same batch of Uranium was directly oxidized according to the same procedure. The 2 samples were then counted in a completely similar way (ORTEC High Purity Germanium Detector, diameter 10 mm and height 7 mm). The treated sample exhibited a significative (3 sigmas) decrease of radioactivity, not explainable by any known cause (difference of position or type of preparation of the samples to be counted). This decrease was observed on 234-Th and 234-Pa, which are the direct daughters (by alpha and beta emissions) of 238-U, resulting in an "apparent" decrease of the α activity of 238-U of some 0.5 % in six months, which would correspond, during the time of the treatment, to an "apparent" period of about 100 years for 238-U under treatment, to be compared to 4.5×10^9 year for natural 238-U.

In the case of Titanium hydride, a 1 g TiH2 sample was placed between permanent magnets of varying remanence (from 0.1 to 0.5 T) in contact with a 2 cm^2 silicon photovoltaic cell, under hydrogen (1 bar) at 100° C. After 1 day, the photovoltaic cell was withdrawn and placed in the dark at room temperature. It then started to produce small, but well above background, amounts of electric energy (current of a few nA and voltage up to 300 mV) for periods up to 2 months. The phenomenon is reproducible and exhibits a threshold on the intensity of the magnetic field (which must be higher than 0.3 T). A series of blank experiments have shown that the phenomenon cannot be explained neither by temperature variations of the photovoltaic cell nor by a chemical interaction of the hydrogen with the components of this cell (no fuel cell effect).

To explain these results we propose an improved "hydrex" ("deutex") model. in line with our communications at ICCF-5 and ICCF-6 and which describes the bounding between an electron and a proton (deuteron) as a transient (several hours life-time ?) and very small (a few femtometers) species, resulting from the combined actions of the Coulombic and the Nuclear forces.

Veniamin A. Filimonov, Vitaly Yu. Solov'yov, Vyacheslav A. Kobets, Alia V. Skitovich (Inst. Physical Chem. Problems, Minsk, Belarus), "**Self-Organization Processes Under Metals Loading by Hydrogen Isotopes - Materials Science Basis for Cold Fusion and Transmutation Technologies**," p 55.

We have studied structure changes in Nb and Pd cathodes under and after electrochemical loading by hydrogen isotopes as related to Cold Fusion and Transmutation (CF&T) technologies. It is observed that previously deformed free crystalline metal plates treated at the temperature close to the critical point of Me-H (Me-D) system phases separation by asymmetric hydrogen (deuterium) loading recrystallize up to single crystals during some tens of hours. These plates when used as cathodes in CF&T experiments do not exhibit any dead time. Suitability of Nb and Pd treated as above for CF&T

use has been proved by excess heat, neutron emission (in D_2O) and ^{137}Cs transmutation (in H_2O) measurements.

This study is based on the fact that "hydrogen annealing" of metals together with defectness decreasing occurs under some conditions, which we ascribe to cooperative transport of hydrogen accompanied by huge enhancing of impurities diffusability.

Our method of electrolysis has some features, namely: (i) separation of cathode and anode areas of the cell to provide asymmetric loading; (ii) high current densities (3 to 300 mA/cm^2 for Pd, 30 to 1500 mA/em^2 for Nb) to provide dense hydride (deuteride) layer formation on the "face" side of cathode in spite of hydrogen (deuterium) deloading from the "back" side; (iii) working temperatures up to 180 and 90° C for Pd and Nb correspondingly (we used concentrated sulfuric acid as electrolyte in the case of Pd); (iv) insertion of probe in the electrolyte closely to cathode to estimate hydrogen (deuterium) content in cathode by its potential. Electrolysis was carried out in galvanostatic regime.

Methods of diagnostics were: (i) monitoring of cathode potential variation during the electrolysis; (ii) metallographic studies of cathodes; (iii) x-ray studies of the same. The first one exhibited potential variation accompanied by irregular fluctuations that was, in general, as follows: initial potential drop attributed to establishing electrochemical equilibrium (namely saturation of electrolyte with O_2 and H_2 (D_2); following potential increase attributed to dense hydride (deuteride) layer formation on the lace side of cathode; prolonged potential drift attributed to hydride (deuteride) / hydrogen (deuterium) solid solution interface moving to back side of cathode accompanied with cooperative H (D) transport and grain boundaries drift in the same direction.

Metallographic investigation have shown that after prolonged electrolysis runs (up to 100 hours) at higher temperatures recrystallization accompanied with grain growth up to single crystals with (111) orientation in parallel with face side of cathode plates takes place. This is also proved by x-ray studies.

When used in D_2O pulsed electrolysis at 20° C (voltage up to 110 V, frequency up to 10 kHz, duration of pulses up to 10 μs) these cathodes provide reliable enhancing of neutron emission up to twice as much as background value in 8 hours run; excess heat of about 300 % as related to the same cell with untreated cathode was shown under steady current D_2O electrolysis at 90°C in 8 hours run; and ^{137}Cs transmutation from 100 μCu down to background value was shown under H_2O electrolysis at 90°C in 8 hours run.

Veniamin A. Filimonov, Vyacheslav A. Kobets (Istituto per la Ricetea di Base, Monteroduni, Italy, and Inst. for Physical Chem. Problems, Minsk, Belarus), "**Nuclear Transmutation and Scalar Fields Generation under Chemical Detonation of Solids**, p 56, 5 refs.

^{137}Cs radioactive isotope accelerated decay and scalar (torsion) fields (SF) generation were observed while ammonium dichromate and trinitrophenol detonated in press form under complex action of "pressure and shear". Decrease of ^{137}Cs activity was 50 to 100% after single detonation event of about 1 μs duration. ^{137}Cs quantities of about 100 μCu was included into above noted explosives content by ion exchange together with non-radioactive Cs background. Scalar fields were detected using an electrically shielded probe as a shoulder of Witston direct current bridge, and electrical output of the latter was connected with electronic oscilloscope input.

Earlier we suggested a possibility of Cold Fusion and Transmutation processes occurring under action of chemical detonation of solids. **These processes were also observed independently by R. Monti.** A task of scalar fields detection under the same was inspired by the known but unexplained fact that a part of detonation heat effect is lost as related to burning of the same substance. We suggested that detonation of solids generate scalar (torsion) fields which may be detected using suitable techniques.

Gamma radiation of samples was measured by AMA 3000 multichannel analyzer before and after runs. Calibration using standard ^{137}Cs gamma source was also performed. Laboratory press having 4 metric tons capacity and 50 mm Plexiglas shielding and steel press forms of 5 mm and 9 mm inner diameter were used for pressurizing. Witston direct current bridge with electrical input voltage of 9 V, electrically shielded bifilar copper coil having 100 double turns of 7 mm diameter as working shoulder and carbon resistors as reference shoulders connected with input of C8-17 electronic oscilloscope in regime of triggered sweep with time-base of 1 to 10 μs.

So, our *a priori*. suggestion that synergetic activation (SA) taking place while detonation of solids provides high-energy excitations of atoms needed for transmutation seems to be proved. However, share of scalar fields generated might be evaluated taking into account that the latter imply intensely on radioactive species time of decay. It may be concluded that both SA and SF work in parallel for the same result.

Veniamin A. Filimonov, Alexandre N. Lavrenov (Istituto per la Ricerca di Base, Monteroduni, Italy, & Inst. Physical Chem. Problems, Minsk, Belarus), "**Dynamical Model of the Synergetic Activation for Cold Fusion and the Novel Concept for the Free Energy 'Generation,**'" p 57.

Computer simulation of the Synergetic Activation (SA) model (see author's ICCF-4 contribution) in dynamics as related to Cold Fusion has been made. The essence of self-organization in the system, namely the multistage excitations within vibration and/or ionization energy band structures due to separation of subsystems having different excitation energy levels under impact action on the system, was stated as before. ...

The exponential distribution of all the levels populations fitting the Boltzmann law was obtained after the first coll ision for both cases. As for vibration case, the certain features were shown in dynamics. (i) Populations N_i, of higher levels were much more than it was derived earlier from analytical SA expression, which was the sequel of possibility of excitations to more distantioned energy levels (excitations "tree") instead of the same to the closest energy levels only in previous computation (excitations "staircase"). (ii) Population of the highest energy level was high even if the number of quasi-particles in the system was not large enough to populate all the energy levels due to summation of probabilities of excitation to the above energy levels ("edge" effect). (iii) Systems exhibited auto-oscillation behavior and the period of oscillations depends on the volume of the system (number of particles). These three effects provide much more probability of high energy excitations as compared to stationary SA model.

Surprisingly, the total quantity of energy in the system was not conserved in spite of precise energy balance within each collision in each subsystem. Our analyze proved that the latter is not a sequel of procedure but is an intrinsic properly of self-organizing systems. If the system is sub-critical, it absorbs energy from the outside, if the system is above-critical, it releases energy.

This allows us to propose the Novel Concept for the Free Energy "generation". It suggests that known and further devices generating "excess" Free Energy do not need an "inner" energy source such as nuclear reaction, annihilation, etc. for their operation, though those and related processes may be implemented under condition of noted devices operation independently on and tn parallel with the main process of “space energy” conversion. It is suggested that the equivalent quantity of the Free Energy "born" in the system to be taken from infinitely distantioned source in which Free Energy is being lost due to exoenergetic irreversible processes taking place. The advanced physical concepts such as Zero Point Energy, Scalar (Torsion) Fields, Self-organization of Matter and Resonance are involved in the present concept.

John C. Fisher (Carpinteria, CA), “**Liquid Drop Model for Extremely Neutron-Rich Nuclei**,” p 58.

Nuclear energy levels are characterized in part by their isospin quantum numbers. Ordinary nuclides are well described by an independent-particle (IP) model with isospins equal to or close to the minimum possible value $|A/2 - Z|$. It has been suggested that extremely neutron-rich nuclei constitute a second branch of the table of isotopes whose ground states have the maximum possible isospin $T_{max} = A/2$, and that neutral members of the T_{max} branch (i.e. polyneutrons) serve as mediating particles for the new class of nuclear reactions discovered by Fleischmann and Pons. The energetics of the new reactions have been qualitatively described by a liquid drop model. Recent measurements of the mass spectrum of reaction products produced in the new reactions make possible a refinement of the model, providing an explanation for gaps of instability separating ranges of stability in the mass spectrum.

John C. Fisher (Carpinteria, CA), “**The Role of Polyneutrons in Cold Nuclear Reactions**,” p 59.

It is well established that reactions between charged nuclei cannot occur at ordinary temperatures. The situation is different for reactions between a charged nucleus and a neutral particle where there is no Coulomb barrier to prevent them from coming close enough to react. Conventional nuclear reactors exploit this situation using neutrons as the neutral particles. However we know that neutrons do not participate in the new class of nuclear reactions discovered by Fleischmann and Pons (FP reactions) because they are never observed in sufficient numbers.

FP reactions are unlike the ordinary nuclear reactions with which we are familiar. They do not occur between charged nuclei and must be mediated by neutral particles other than neutrons. They are a revolutionary discovery. We should not be surprised if they require a revolutionary explanation.

This analysis explores the possibility that the required neutral particles are polyneutrons (groups of neutrons bound together by nuclear forces at densities comparable with those of charged nuclei). Just as neutrons can support a chain reaction in ordinary reactors, polyneutrons are shown capable of supporting a chain reaction in FP reactors.

The existence of polyneutrons implies the existence of a second, extremely neutron-rich branch of the table of isotopes. Ordinary nuclei have isospins equal or close to the minimum possible value abs (A/2 - Z). It is suggested that nuclei in the extremely neutron-rich branch, containing polyneutrons as its neutral members, all have the maximum possible isospin A/2. The energetics of FP reactions are described by a liquid drop model.

M. Fleischmann, "**Cold Fusion: Past, Present and Future**," pp 60-61.

In 1983, Stanley Pons and I posed ourselves the following two question:

i) Would the nuclear reactions of deuterons confined in a lattice be faster and different from the fusion of deuterons in a plasma?
ii) Could such nuclear reactions be detected?

In the first part of this paper I will outline part of the background which led us to pose these seemingly senseless questions. This background can be summarized by the statement: "the behavior of ions in condensed phase systems above absolute zero (of which D^+ in a Pd - type lattice is an example) can only be explained by Quantum Field Theory, QFT." (it is likely that this statement applies even to gas phase systems). It has frequently been asserted that the explanation of Cold Fusion would require a Paradigm Shift. I believe that this is incorrect: the Paradigm Shift is well-known; the real difficulty lies in the application of this shift to the Natural Sciences.

We therefore believed that the two questions were sensible but, nevertheless, we expected the answers to be "Yes" and "No". At that time we listed possible systems for study under five headings:

(a) Systems based on the electrodifusion of D^+in host lattices (especially Pd wires);
(b) Systems based on the electrochemical charging of host lattices (especially of Pd electrodes);
(c) Chemical Systems based on superacid/ highly oxidizing conditions: the link to "Hot Fusion";
(d) Chemical Systems based on superbasic/ highly reducing conditions;
(e) Hybrids of these systems.

We started work on (b) as a preliminary to (a).

As is well-known the outcome of our experiments was radically different from our expectations. It became evident that there were markedly enhanced rates of nuclear reactions as shown by the generation of excess enthalpy at levels far above those which can be accounted for by chemical reactions. Moreover, this generation of excess enthalpy was not accompanied by the expected levels of the "nuclear ashes", tritium and neutrons.

The present state of knowledge of this section of the field can be summarized as follows:

1) Excess enthalpy generation can be detected provided "correct" electrode materials are used:
2) The early development of excess enthalpy generation can be detected provided experiments are carried out with adequately high levels of precision and accuracy;
3) In the normal conditions of operation, the systems show "negative feedback"; at longer times one can detect the onset of "positive feedback"which exceeds the effects of "negative feedback" (as shown, for example, by the increase in the rates of excess enthalpy generation with increases of temperatures);
4) "Positive feedback" appears to be associated with regular or chaotic oscillations;
5) "Bursts" in the production of excess enthalpy can sometimes be detected; during such "bursts' the rates of excess enthalpy generation far exceed the rates of enthalpy input even for the energy inefficient systems in current use;
6) The performance envelope is different before and after the onset of "positive feedback;"
7) "positive feedback" leads to the generation of high levels of excess enthalpy provided the systems are driven sufficiently rapidly through the region of the onset of "positive feedback". the outcome of experiments depends on the experimental protocol adopted;
8) high levels of excess enthalpy generation can be maintained for prolonged periods of time;
9) ^{4}He is the principal "nuclear ash"; tritium and neutron generation can be detected especially under non-equilibrium conditions;
10) the systems in use have been diversified to include the use of powders and electrodifusion in fine wires; the latter systems are especially promising.

(this survey will exclude investigations using light water).

Aspects of the Sociology of Science will be considered. While Cold Fusion is certainly interesting from the point of view of Science, it may now be appropriate to devote more effort to other topics which can only be explained in the framework of Q.F.T. in an attempt to ensure the required Paradigm Shift.

Finally, the Social Implications of this field of research will be considered. While it is still too early to say whether (and, if so, how) excess enthalpy generation can be maintained and used, it is clear that Cold Fusion could become a significant energy source in the next century provided identifiable technological obstacles can be resolved.

L. Forsley (JWK Intl. Corp., Emerging Technology Div.), R. August (Naval Res. Lab., Condensed Matter Div., Radiation Effects Branch), J. Jorne (Univ. Rochester, Dept. Chemical Engr), J. Khim (JWK Intl. Corp.), F. Mis (Health Physicist), G. Phillips (Naval Res. Lab., Condensed Matter Div., Radiation Effects

Branch), "**Analyzing Nuclear Ash from the Electrocatalytic Reduction of Radioactivity in Uranium and Thorium**," p 62, 6 refs.

A proprietary electrolytic system for the reduction of radioactivity in uranium and thorium was evaluated. An exhaustive analysis of reaction materials taken before, and reaction products taken during and after the experiments, was carried out. These tests involved trace metals analysis via neutron activation analysis (NAA), energy dispersive atomic x-ray (EDAX) analysis and inductively coupled plasma mass spectroscopy ICP/MS). Additional tests involved high resolution mass spectroscopy of evolved gasses and reaction products, allowing isotopic dffferentiation, and high resolution gamma spectroscopy. Neutrons were searched for via ^{235}U fission fragments and n-γ reactions.

The results of over 10 series of runs were ambiguous. However, the definitive test: operating a system in a low background cave wilt high resolution gamma spectroscopy, failed to show any radioactive reduction of the system *as* a whole. Regardless of these results, the testing protocols developed define the standard and rigor by which any proposed catalytically reduced radioactive system must be subjected. Careful attention must be taken to maintain statistically significant results.

J. Gruber (Chair of Stats. & Econometrics, Dept. Economics, Univ. Hagen, Germany), "**Economic Effects of New Energy Technologies (NET)**," p 64.

New Energy Technology (NET), also called Space Energy Technology (SET) and related (among others) to Cold Fusion (CF), taps a previously unknown, "renewable" source of energy: Space energy (SE), also called zero-point energy (ZPE), vacuum field energy (VFE), free energy, or ether (Æther) energy. SET-devices are usually based on new theories (still to be developed further), also published in peer-reviewed journals of (e.g.) mainstream physics. They usually have been thoroughly tested by independent experts and/or in replicated experiments. SET-devices are now subject to developmental research, some of them seem to be already close to commercialization.

The exact input-output relations of SET-devices for large-scale use (needed for mathematical modeling) are not yet known. Therefore, simple scenarios have been developed for using SET-devices on a large scale, e.g. in the transport sector and for electricity and heat production.

SET-devices have properties which make them not only economically viable but even highly competitive: They work permanently (24 hours per day, all year) and everywhere (on Earth and in space). Relatively small units suffice, only little or even no storage of energy is needed.

The widespread use of SET-devices (for which there are strong incentives) has tremendous economic, social, environmental, fiscal and monetary effects at various levels: for the individual consumer and producer, for local and regional governments and at the international level. The most desirable effect is that humankind can reach, at least as far as energy is concerned, a sustainable development. Of unbelievable advantage may also be SET-related procedures for the transmutation of elements (e.g. for reducing radioactivity and for producing new elements and/or materials).

Peter L. Hagelstein (Massachusetts Inst. Technol.,Cambridge, MA), "**Models for Anomalous Energy Transfer**," p 65.

Motivated by claims of observations of anomalies in metal hydrides, we have continued theoretical investigations into mechanisms that could give rise to anomalous effects. Anomalous effects that have been reported include observations of excess heat, ^{4}He, ^{3}He, tritium, gamma emission, MeV charged particles and neutrons. For any of these effects to be possible, a large quanta of energy must be exchanged between the lattice and nuclei within the lattice. Such an effect is presently unknown in solid state physics; if any of the experiments are right, then a pathway for such energy exchange must be present. Moreover, if such anomalous energy exchange is possible, then many of the claimed effects would be predicted to occur.

We have examined the possibility that energy exchange might occur mediated by the strong phonon nonlinearity present upon nuclear close approach in the lattice. The basic idea is that hydrogen nuclei can approach other nuclei at fm-scale distances with low probability. The interaction at close range includes both Coulombic and nuclear contributions, which constitute an exceedingly high order interaction when expressed in terms of phonon operators. Such nonlinear interactions are expected to be able to mediate the transfer of energy on the order of the interaction energy, but with an associated low probability due to the low tunneling probabilities.

We have constructed an idealized condensed matter model for a set of energetic two-level systems that interact with the lattice phonons through high order nonlinearities. With such model, we can address questions about how such energy transfer might occur, where the energy might go in the lattice, and whether cooperative effects (such as Dicke super-radiance) can occur. The competition between possible. coherent reaction channels and incoherent, decays can also be explored with this model.

Peter L. Hagelstein, Louis D. Smullin (Massachusetts Inst.Technol., Cambridge, MA), "**A Search for Anomalies in Vd_x**," p 66.

We have recently attempted to revisit an experiment conducted in our laboratory several years ago that appeared to give unexpected results.

Previously, the possibility of tritium production was explored in out gassing experiments with metal deuterides, using a sensitive ionization detector based on a Keithley

electrometer. Deuterium was absorbed in a vanadium wire, following the activation of the surface by heating; the VD_x was cooled to room temperature. Subsequently, the vanadium was heated and out gassing of the deuterium in the metal occurred.

In that experiment, large electrometer signals were observed that appeared to be related to effects caused by the out gassing. The electrometer signal persisted throughout the out-gassing, and then decayed roughly exponentially over the course of a few days. An attempt was made to detect associated gamma radiation using a nearly unshielded NaI detector that was not spectrally resolving. An increase in the count rate of roughly 20% was observed when the detector was at the position of the sample as compared with readings taken a few inches on either side.

We are presently revisiting this experiment, but this time using a high resolution HPGe x-ray/gamma detector. In most recent experiments, the out gassing is accompanied by no electrometer activity and no associated gamma emission. **One cathode that absorbed extremely well gave a large electrometer signal; a post examination showed that this cathode was fractured completely.**

Heinrich Hora, Jak C. Kelly (School of Phys., UNSW, Sydney, Australia), George H. Miley, Y. Marne (Fusion Studies Lab., Univ. IL, Urbana), "**Nuclear Shell Magic Numbers Agree with Measured Transmutation by Low-Energy Reactions**," p 67.

An evaluation is presented for the measured low energy transmutation of metals such as nickel and palladium into numerous other elements, using SIMS and NAA where some of the new elements detected do not have the normal isotopic abundance that would have been seen if they were merely impurities. Up to 10% of the original metal layers were converted into other elements. Following our model, the protons or deuterons in the host metals are considered as an exotic Maxwellian Plasma. We have proposed a "swimming electron layers" mechanism which partially shields the usual nuclear Coulomb repulsion and allows the nuclei to approach each other more closely, thus greatly increasing the rate of long range nuclear reactions. Recent low energy measurements of the fusion of DD to ^{4}He by Arata et al., agree with our previous estimates of the reaction distance of a few pm. This theoretical model is based on: a) a low energy nuclear interaction in the eV range contrary to high energy interaction models; and b) on non-localized states (exotic plasma state) of the reacting protons or deuterons in contrast to fixed states within the lattice.

This precludes the attempts of numerous models which try to preserve the status quo by asserting that cold fusion is only hot fusion in disguise. One example is the suggestion that internal cracks in a crystal are produced by the phase transitions. This is not the case as known from the measured DD reaction with very high tritium and helium production compared with neutron generation.

Our analysis of the measured abundance of the new elements results in an exponential law for the transmutation probability N as a yield curve with several maxima as a function of the atomic number Z. This new type of nuclear reaction is similar to pycnonuclear reactions and K-shell electron capture. The nuclear magic numbers are applied to the maxima of N(Z) and we derive a 3^n-law for the ratio of the maxima. This agreement is not a simple numerical speculation but based on the measured exponential increment of Z' = 10. This is an expression of a basic consistency of the fully independently gathered experimental results with a well established fundamental property of nuclei.

To the question how low energy multi body events can occur for generating very heavy nuclei we consider a three particle interaction as a model for generating very heavy transuranium nuclides which subsequently decay into the very heavy nuclei we have observed. The possibility of three particle interactions is supported also by the following aspect of a nuclear surface force model for explaining nuclei of the known density (H. Hora, *Model of Surface Tension of Nuclei and the Phase Transition to the Quark Gluon Plasma,* CERN-PS-Note 91/05, August 1991). This double layer model referring to the Fermi energy of hadrons also explained how, at six times normal nuclear density, the formation of separate nuclei is inhibited due to the relativistic change of the Fermi energy of the hadrons explaining also the large decay length for the nuclear charge as measured since Hofstadter's work on the subject. Using Lorentzian instead of Gaussian radial

profiles for the decay of this nuclear density gives overlapping wave functions for the two nuclei out to distances of pm for transition times in the cold fusion range of minutes to years. On a solid surface then why should a paired proton and a palladium nucleus not combine with another palladium nucleus? It is at least interesting to note that the following reactions are highly exothermic:

$2\ ^{106}Pd + p = 2\ ^{56}Fe + ^{101}Nb + 35\ MeV = 2\ ^{52}Cr + ^{109}Rh + 23.6\ MeV = 2\ ^{66}Zn + ^{81}As + 38.3\ MeV$

As an application, we discuss the possibility of adding radioactive atoms to the near surface or interface reaction areas, which may be a low cost method for eliminating long lived nuclear waste and plutonium.

NEW ENERGY PARTNERS, p 38.

New Energy Partners (NEP) is a venture capital limited partnership that was established in December, 1997 to invest in companies that are in the process of commercializing revolutionary new energy technologies. One of the initial technology areas of focus is new hydrogen energy. Because the participants at ICCF-7 are quite familiar with this technology, we will not detail it in this abstract.

NEP will focus on investing in companies that have demonstrated prototype products that are within two years of commercialization. The products must demonstrate dramatic new approaches to energy production, not just increment improvements in energy efficiencies. Specifically, we are looking for over unity devices that demonstrate the potential of 200% + over unity with 1-2 kilowatt outputs for a commercial product.

NEP is in the process of building an investment fund of $15 million. It is estimated that these funds will be invested in approximately 10 to 15 companies over the 7-10 year life of the portfolio. Since its inception, NEP has invested in two promising companies.

Mr. Daniel J. Cavicchio, Jr. manages the General Partner of NEP. For the past 14 years he co-managed Greenwich Venture Partners, a buy out firm specializing in turnarounds of technology-based companies. Prior to that he was with McKinsey and Company as an Engagement Manager consulting for technology-based companies, such as General Electric, AT&T, and Corning Glass. In addition, he served as Director, Business Development at American Can Company, where he managed new business, new product, and acquisition programs. Mr. Cavicchio holds a Bachelors Degree from Rensselaer Polytechnic Institute, where he graduated first in his class, and Masters and Ph.D. degrees from the University of Michigan.

NEP Will also consider licensing technologies that have strong commercial prospects. In this case, NEP will set up a new company to commercialize the technology with the original inventor receiving license payments and/or an equity position in the new company. In any event, Mr. Cavicchio will be closely involved with the progress of each portfolio company, and many cases will serve on the Board of Directors.

P A T E N T

GRANT OF US PATENT 5,734,122

On 31 March 1998, a U.S. patent having relevance to cold fusion was granted to Dr. Harold Aspden of Southampton in England. Dr. Aspden has posted a copy of this patent on his Web site <http://www.energyscience.co.uk>. The patent is a continuation-in-part of an application for a patent on the cold fusion theme filed at the U.S. Patent Office on 16 February 1990 with the benefit of the priority date of a U.K. Patent Application filed on 15 April 1989, within a month of the Utah announcement that began the cold fusion saga.

The examining section of the US Patent Office which is charged with processing cold fusion inventions has obstructed attempts to secure patents in this field, but Dr. Aspden has struggled relentlessly in confronting such opposition. Even though three of Dr. Aspden's such patent applications in the US Patent Office, all linked to that initial application, have not weathered the storm, he still has kept a fourth alive and pending, and the struggle is ongoing.

He tells the story of all this in his Web pages as "Cold Fusion: My Story: Parts I and II". Part II is a record of a blow-by-blow account of the struggle. The success now in securing the grant of U.S. Patent 5,734,122 emerges because Dr. Aspden filed his application as a **'Thermoelectric Energy Conversion Apparatus**.' The point of special interest is that Dr. Aspden included in the specification a very substantial Appendix concerning cold fusion.

The overall message is clear. As with the Patterson invention, if you are lucky enough to have your U.S. patent application classified for examination by a

group other than that specializing in rejecting cold fusion then you may secure patent grant!

[On the Web page, the text of the patent is split between the formal portion, with 10 figures that sits in Essay No. 9A and the portion in Essay No. 9 which is the Cold Fusion Appendix that occupies 7 of the 20 columns of print of the whole patent.]

RAD-WASTE ISSUES

UNSTABLE YUCCA MOUNTAIN
Courtesy James Pardau

Gannett News Service, "Doubt cast on nuke dump site -- Study raises seismic concerns at Nevada's Yucca Mountain," *Sacramento Bee*, Friday, 27March 1998, page A10.

EDITOR'S SUMMARY

(See same date issue of *Science*.) Brian Wernicke, Professor of Geology, Cal Tech, using data from various sources conclude that the Yucca Mountain area is moving. The area may be stretched by over a meter within a thousand years. It appears that historically this area has had spurts of geologic changes. In addition to the recent discovery that there is more water percolating through the mountain, this latest information may put a hold on the use of this multi-billion dollar facility for the long-term storage of high-level nuclear wastes. The Nevada politicians who oppose the use of Nevada as a nuclear dump site are pleased. The DOE spokesperson suggests that more evaluation, study and analysis are needed.

ECOLOGICAL ENERGY APPROACH

Marsha Freeman, "Kyoto Protocol Means U.S. Energy Austerity," *21st Century Sci. & Tech*., vol 11, no 1, Spring 1998, pp 83, 95.

NEN SUMMARY

In order to achieve the reduction of carbon emissions to 7% below the 1990 levels, as was agreed upon in the Kyoto Protocol, consumers will be looking at higher prices for energy and products and also a national GDP (Gross Domestic Product) loss relating to it. The money will be used by industry to comply with the guidelines passed down to them.

The government will allocate $2.7 billion (of a $6 billion Climate Change Initiative) over the next 5 years to developing technologies that are supposed to be more energy efficient and climate friendly. $100 million of that will be used to subsidize the use of "renewable" energy sources.... the older variety, i.e., wind, geothermal, biomass, and small-scale hydro. Most of the remedies are ones that have been tried before, with no remarkable results.

Unfortunately, these old renewable technologies are rendered non-competitive not just by price, but by the fact that the energy density is so low as to be much less productive than fossil fuel and nuclear sources. If the $2.7 million would instead be directed at such goals as the engineering and commercial development of "new" energy technologies and next-generation nuclear systems, this money could produce long term advances in our global energy technology. "Every federal dollar wasted on promoting low-technology, pre-industrial energy systems takes resources away from the technologies for the next century that, rather than being a drain on the economy, would increase the efficiency and productivity of all of our economic activity."

Although the Global Warming scenario may or may not be true, no one will gainsay the need to cut fossil fuel's grip on the energy economy. In the long run, the most feasible way is to invest in research into advanced energy sources and systems.

MISSED THE (RESEARCH) BOAT

Vic Comello (Sr. Editor, *R&D Magazine*), "Missed Opportunities of Leadership," *R&D Magazine*, vol 40, no 2, Feb. 1998, p 27.

NEN SUMMARY

Lost promises and missed opportunities were evident on the fifth anniversary of the Rio Earth Summit, where more than 160 countries had agreed to reduce fossil fuel emissions to 1990 levels by the year 2000. Unfortunately, the emissions reduction mandate of that meeting had been a nonbinding one. At the second meeting in Kyoto last December, the European Union (EU) proposed reducing emissions to 15% below the 1990 levels by 2010. A modest 5% reduction from 2008 to 2012 was advocated by Japan. This was seen as inadequate by environmentalists. What an opportunity for the U.S.,

the world's largest polluter, to have shown bold leadership in the planet's cleanup campaign. But it didn't happen. The President advocated no cuts whatsoever below the 1990 levels, and the U.S. delegation fought against he EU proposal. Finally an modest 7% was adopted, grudgingly.

President Clinton, has backed some environmental improvement measures that involve energy, but very unimpressive ones. In a 3 stage plan to combat global climate change, stage one timidly set apart $5 billion for research and tax incentives – which can accomplish very little. Some influential Congressmen have since spoken out in favor if increased R&D spending, but instead of upping the proposed spending allowance in view of a possible budget surplus, President Clinton merely added $1 billion to the total allocation for research.

Where could more money be gotten to back such important research? How about from the nearly $25 billion that the federal government now spends yearly to subsidize fossil fuels?

Miscellaneous

TORSION FIELD RESEARCH

Donald Reed, "New Concepts for SpaceTime and Corroborating Evidence from Torsion Field Research."

A bold new theory has surfaced pertaining to the structure of microscopic nature which, in junction with the recent findings of Russian research on torsion fields [1], has potential astounding implication for not only clarifying our understanding of the operation of vacuum-energy devices, but might shed fresh insight into many of the counter-intuitive features of quantum theory, such as the aspect of non-locality which accompanies quantum "entanglement"[2].

The theory in question is the brain-child of physicist Mark Hadley, who has taken a truly maverick position, claiming that contrary to widespread belief, quantum theory is a consequence of the Einstein theory of gravity, instead of vice-versa [3]. Expanding on the Wheeler-Misner theory [4] of charged particles conceived as wormholes -- distortions in the topology of space -- Hadley has taken this approach one important step further. Positing sub-atomic particles as kinks in the topology of space **and** time, this new theory views elementary particles as a region of space-time so intensely warped that it bends back upon itself like a knot. Such a knot necessarily contains a "closed time-like curve". This time-loop, which is also one of the puzzling features of general relativity, enables a particle to interact with other particles not only in its past but in its future. Consequently, a new way of looking at entanglement is that sub-atomic particles, by virtue of the time machines they contain, are not constrained by time. **There is nothing to prevent instantaneous interactions between particles, no matter the distance between them**.

This has been clearly demonstrated in the new discovery of quantum teleportation. Here, the quantum state of a photon has been successfully translocated and reconstructed. This has proved possible specifically with the aid of an auxiliary pair of entangled particles produced by parametric down-conversion inside a non-linear crystal. For more details on this fascinating development, see references [5, 6].

Hadley's work is also validated by research into torsion fields which, likewise, are apparently not bounded by time or space. Also, much like dual entangled particles, torsion fields possess two choral states which are inextricably entwined due to super-luminal transmission of torsion potential. Moreover, there is evidence to suggest that these modes possess a vortical topology [7]. In addition, torsion fields cannot be shielded by conventional fields, evidence no attenuation when propagated arbitrary distances, and possess a "memory" ghost field which exists in the massless vacuum upon the annihilation of particle-antiparticle pairs [7]. All the former characteristics indicate a possible strong association of torsion fields to "temporal" fields, such as Hadley's time-loop structures. In fact, it is possible that the current Russian research in this area, is actually an outgrowth of N. Kozyrev's original work demonstrating that time has an energy effect which can be manifested in the spin of elementary particles or macroscopic rotating bodies [8]. See also Bruce DePalma's work [9].

However, unlike the mechanism attributed to quantum spin effects, the torsion fields involve the use of long-range (Pauli) classical spinners to describe such interactions. Here, focus is not on the Dirac equation to describe fermion spin, but on a classical analogue, the Bargmann-Michel-Telegedi (BMT) equation to account for spin effects [10]. BMT

follows from a quasi-classical extension of the Dirac equation with an added Pauli term, and has been responsible for accounting for the anomalous magnetic moment of the electron, and confirms the effect of radiative self-polarization, both without the necessity for the standard application of quantum electrodynamics.

As pointed out by A. Akimov [7], empirical exhibits of torsion fields have possibly been found previously in conventional scientific research, but not yet recognized as due to such. Typical examples are the spin-polarization effect in proton beams [11], change in angle of polarization of gamma rays emitted in the aftermath of positron-electron annihilation [12], possibly the recent discovery of the anomalous rotation of radio waves in an astrophysical context [13], and the quantum non-locality phenomenon, which can be attributed to super-luminal transmission of torsion potential. Torsion fields also have the seemingly bizarre characteristic of being affected by the specific topology/geometry of macroscopic objects and biological fields [7], a feature which has been corroborated by the work of Glen Rein on DNA irradiated by non-Hertzian energy emanating from various geometric patterns [14].

Certain experimental work in the non-conventional area of new energy has also demonstrated the possible coupling of torsion fields to electromagnetic field configurations. Notable among these are the Hutchison lift and disruption effect [15], topological alteration of vacuum field impedance by caduceus coils which is sustained even when the coil is turned off [16], Chernetsky's discovery of self-generating discharge in plasmas [17], the anomalous inertial effects evident with the Biefield-Brown effect [18] and the Rudolf Zinsser apparatus [19], etc.

Moreover, the works of T. Bearden [20], H. Bateman [21], V. DeSabbata and M. Gasperini [22], as well as others, have specifically focused on the codification of novel electromagnetic waves that might actually signify a coupling to torsion fields. Along the same lines, the existence of both super-luminal and sub-luminal helically-polarized electromagnetic waves has been experimentally verified by W. Rodriques and J.Y. Lu [23] and R. Kiehn [24]. Unlike standard Hertzian radiation, one important feature of these spiral waves is a longitudinal field component. This, in turn, implies a non-zero value for the Lorentz Field Invariants [25] (i.e., $\mathbf{E} \cdot \mathbf{B} \neq \mathbf{O}$, which is also the case for another type of unique EM wave in which the **E** and **B** vectors are parallel [26]. This latter **E** // **B** wave has been realized in the "twisted mode" technique for obtaining uniform energy density in a laser cavity [27]).

Unfortunately, Mark Hadley's visionary theory cannot yet point to a specific solution of general relativity that corresponds to his hypothetical knot in space-time with the properties of an elementary particle. However, by incorporating into his model the new insights gleaned from torsion field research, as well as the ground-breaking work on non-Hertzian wave forms, and the evidence of over-unity power production from various energy devices, it is possible that the long sought-for unified field theory of space, time, energy and matter might emerge to synthesize both physics and metaphysics.

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LETTERS

LETTER FROM WESLEY BRUCE

In the March 1998 edition of *New Energy News* at the end of the Hydrogen Energy report the editor asked for plant photosynthetic efficiencies. I can provide the data and a few comments. Plants are normally less than 1% efficient and fuels made from them are often less than 0.1% efficient because not all the plants can normally be harvested or used, and because the plant uses up most of the energy in day to day respiration. So a solar hydrogen system that is 0.3% efficient is not a problem. About 5110 kiloCalories per meter squared per day reaches the surface of the earth (the Ecosphere.) 3400 kcal m^2 day reaches green plants. 170 kcal m^2 is used for photosynthesis. Most of this energy gets used up in respiration. 1 Kilocalorie is 4187 joules.

It should be pointed out that electrolysis is normally 90% efficient and conventional solar cells are 15-30% efficient. Thus a photovoltaic/ electrolysis technology should be 13 to 27% efficient in terms of the solar energy falling on the surfaces of a PV array. We have dozens of sustainable ways of generating electricity for electrolysis: Wind power; wave power; water current turbines; solar thermal; photovoltaics; Solar chimney (a solar assisted wind mill); mini- and micro-hydro and geothermal. All of these technologies are ideal for hydrogen production.

Photovoltaic solar-cells are likely to come down in price by a very large amount thanks to the Epilift technique of fabricating thin gauzes of silicon. These are grown as 0.1 to 0.5 mm silicon mesh on a substrate of micro-sculpted bulk silicon. The gauze is etched free of the substrate which is then reused. The process is both faster, cheaper and produces an optimal thickness of film for solar cell fabrication. The holes in the film allow metal contacts to be placed where they don't shade the surface of the cell and allow air cooling (Solar cells degrade if they get too hot). Epilift was invented here at the Australian National University where I am a student.

The big problem is hydrogen transport. People are scared of hydrogen. The oil industry has ran a small but successful scare campaign against hydrogen cars. Safety requirements for hydrogen cars far exceed those for petrol cars. Even with this difficulty we have developed several hydrogen storage technologies. Metal Hydrides, carbon hydrides, Ammonia storage, Pressurized tanks with emergency dump valves, cryogenic storage tanks. Yet few technologies are able to get past the prototype stage. Long distance large diameter pipelines can serve both as a transport and a storage system between the areas that produce solar-hydrogen and the cities that need the hydrogen. There is also the huge costs of building a parallel distribution and repair network in direct competition with oil, electricity and gas networks. Hydrogen is a good idea but getting all the infrastructure in place to use it is proving economically, socially, and politically impossible.

We will also find that safety barriers will be used to block Cold Fusion technology when it develops. Unless we have a nailed down, cast iron, explains-everything theory covering the workings of all cold fusion technologies, people in rival industries will be able play up the risks and talk regulators into crippling CF power plants with safety red tape.

Producing hydrogen photochemically at 0.3% efficiency is an achievement but the real challenge will be selling it.

Wesley Bruce, Canberra, Australia.
<b3061316@student.anu.edu.au>

LETTER FROM JOHN HUTCHINSON

In reference to your letter of March 24 regarding test results with the rebuilding of my lab, can I submit a brief summary of my progress?

10 years have passed since my very large scale demonstrations for the USA Army Intelligence, Canadian National News, McDonnel Douglas, Canadian Government, other news media and scientists - 750 demonstrations from 1970 to 1989. My efforts and lab were destroyed in the later part of 1989 by Canadian officials who did not want the lab going to Germany. The only help came from Europe and Japan as my former friends did nothing in Canada to help me.

On my 1991 return to Canada from Europe, finding only support from my lady friend, film maker Yin Gazda, and from Japan, I slowly built up my lab. The Japanese would invite me for lecture tours and pay me. Also, they would purchase my 2 ZPE cells as demonstrated in Japan 1995 at Hiroshima City, the 50th anniversary, and as documented by Tuasahi and Japanese scientists.

Finding moral support from USA scientists, a European Prince and my lady friend Yin, I proceeded to again harness natures power. With my own money and working for equipment off of three Canadian destroyers (a gold mine of physics equipment), I am assembling the equipment I need.

The moral support from the USA, Europe, and Japan gave me the inspiration to rebuild. Unfortunately, no outside investors.

I proceeded to get small results with an **electrostatic bubble** and 21 to 26 cm bands R.F., 455 kilohertz broad band and pulsing D.C., 20 Kv arranged in a geometric configuration, RF bands used sweep generators linked to RF simplifiers, small Tesla coil systems also used to produce off set waves, complex waves formed dual-tone generator outputs, using external modulation of signal generators, a complex array. Yet these signals can be put on a 42 input tape recorder, taken into D.C. amps to the RF generators, plus D.C. 20 KV put into a plasma state within a tube modulator. The above information provided in ful, could fill a large book.

The 1997 - 1998 results show slight movement of objects within 6 to 12 feet from the equipment with tiny levitation of common articles. A tennis ball levitated to 2 inches for 3 seconds. No metal has been effected yet. I realize that someday I will need to double the equipment for metal to be effected. But this is promising to say the least. I must point out these demonstrations have not been witnessed by many people, as were the 1980 to 89 tests.

I have 700 pounds of untested metal samples. 50 pounds have been tested in Toronto, Los Alamos, Europe and Japan plus other agencies and they showed fantastic results from the 1980 to 1989 time period.

The “Hutchinson Effect” stands as it is in the brief description above.

I was happy to learn that some great scientists I know, have duplicated some of my effects which gives strength to my case. Yet no investments have ever come my way. It appears funds are diverted to others who feel they can duplicate the effects with government contacts. I am not speaking of my USA, European or Japanese contacts. Until this funding wall is broken down, I can only do my best.

In my files I have many reports, letters, videos and metal samples collecting dust. If indeed there is interest I can release for publication the old files of observations through Vigier of France, Max Planck Labs of Germany and other agencies.

I simply wish to get going again in an proper location so that this scientific data can come out. About the Zero Point cells I am selling to Japan, this is unproven as no tests have been done in the USA. Only Kyoto Institute of Technology has shown unusual things. It is undetermined if ZPE is being tapped here. Cells produce 1/4 volt and a milliamp per cubic inch in good cells. Cells could be combined into cubic foot (using cubic inch cells in series parallel) to give useful power. As time goes by my results should be more impressive.

This small article is to say hello to my friends and ensure them I am still with it.

/s/ John Hutchinson

LETTER FROM BILL RAMSAY

Re: Infusing new discoveries and ideas into the skeptical scientific community.

I’m convinced we must seize the initiative and become the leaders, but leaders of a very special, perhaps now rare kind.

The Chinese sage, Lao Tsu, observed there are three kinds of leaders. Those who are followed out of fear are the least powerful and effective. Those who are followed out of respect and admiration are more powerful and effective. But the most powerful and effective of all are those who are not recognized as leaders.

So, how might his sage (and time proven) advice be put into practice for us to be successful in infusing new discoveries into the multitude of narrowly specialized scientific communities?

Obviously, we must do some soul searching first. If what we **really** desire (be honest!) is being first, or seeking recognition, prestige, status, respect, wealth, etc., we are stuck with the least powerful and effective forms of leadership. Which, it seems to me, is what ails the “cultist” formal sciences. Obviously, we must do better. But how?

Another observation by this sage rascal, Lao Tsu, begs the answer. There is no limit to what a man can accomplish as long as he is willing to allow others credit.

Are we humble enough and clever enough to pull this off? Shall we try to find out?

/s/ Bill Ramsay

LETTER FROM WIN LAMBERTSON, PH.D.
FOLLOW THE MONEY

Hal Fox, Editor of *New Energy News*, posed the question of "How do you get such new concepts of

aether-like, subtle fields, having velocities many times the speed of light accepted by the skeptical scientific community?" in the March, 1998 issue of *NEN*. My answer is: "follow the money." In the same issue, reports were given on a radioactive waste alert at Hanford, Washington; a Nuclear Waste Fund now totaling $14 billion; the importation of half of the United States crude oil which accounts for 40% of our total energy usage; a projected nuclear waste cost of $75 billion per year; a proposed $6.3 billion per year for more fuel-efficient cars; the work of Dr. Inomata on the Science of Consciousness; and my $1200 per year expenditures to collect energy from the vacuum continuum, ZPE. What can we do to change this one sided distribution of funding & experimental efforts?

Since formation of the guilds of the Middle Ages, mankind has used extensive resources to restrict and channel wealth and trade to those favored groups which are perceived to have the skills and resources to produce something of value. It is not our role to try to change the behavior of man. I propose reducing the $212 billion United States electric power business to $106 billion by changing it to the ZPE source and to share the savings with the user customers and those stockholders who fund the changeover. This will generate a profit of $53 billion a year and a high rate of return on the investment. This changeover, will result in large and unknown amounts of stranded costs. The costs will be minimized if the changeover is funded by our present utility industry rather than venture capitalists. The changeover will be of benefit to utility stockholders who lead in the change rather than to those who oppose this change.

My present estimate, based on a small ZPE research model, is that an investment of $25 million per year for five years will lead to a break-even position. I have been advised to seek funds from those organizations which are able to take a tax reduction from their investment. Thus their investment costs are reduced by about one-half. If the electric utility industry chooses not to change (and it is unnatural for one to want to reduce their market by half), a group of private investors will have to be organized.

March 31, 1998, Associate Press writer, Rob Wells, reported that in 1994 there were 1,137 Americans making more than $200,000 a year who didn't pay a cent in federal income tax. It is a very small group, only 0.102 percent of the taxpayers, but this is the group we need to approach. They accomplished their task by taking advantage of incentives to further specific social or economic goals. New energy development qualifies for those goals.

When just one of the New Energy goals succeeds commercially, then the money will flow into that field. ZPE for electric power is the furthest along and is logically the one in which to concentrate our effort. We will then have the muscle to influence the U.S. Department of Energy. Hal reported their 1999 budget request of $18.9 billion. This budget request can be reduced by half just by the availability of ZPE and other new-energy technologies for radioactive waste treatment. Once that is accomplished, the space program can be overhauled by going to antigravity vehicles.

Costs for the Department of Defense will be reduced dramatically by using ZPE for land, water propulsion, and (perhaps) antigravity for air vehicles. The communication industry is going to have to deal with their stranded costs as communication without wire or fiber will be replaced by using the vacuum. The next step could be the Department of Health. We will build on Dr. Inomata's foundation and learn to use ZPE for healing purposes.

Resistance to change is to be expected at each step of the way. Present day scientists may hang on until they retire but members of the new generation of young engineers are searching for ways to get into the New Energy field and still be able to make a living. The money is going to flow into this field because the potential profits are there. Scientists and engineers will "follow the money?"
April 2, 1998

Editor's Note: Dr. Lambertson may be optimistic about antigravity, faster-than-light communication, and health, **but he is right on to expect resistance to change.**

HE'S NOBODY'S FOOL!

When Albert Einstein was making the rounds of the speakers' circuit, he usually found himself eagerly longing to get back to his laboratory work. One night as they were driving to yet another rubber-chicken dinner, Einstein mentioned to his chauffeur (a man who somewhat resembled Einstein in looks and manner) that he was tired of speech making.

"I have an idea, boss," his chauffeur said. "I've heard you give this speech so many times, I'll bet I could give it for you."

Einstein laughed loudly and said, "Why not? Let's do it!"

When they arrived at the dinner, Einstein donned the chauffeur's cap and jacket and sat in the back of the room. The chauffeur gave a beautiful rendition of Einstein's speech and even answered a few questions expertly.

Then a supremely pompous professor ask an extremely esoteric question about anti-matter formation, digressing here and there to let everyone in the audience know that he was nobody's fool. Without missing a beat, the chauffeur fixed the professor with a steely stare and said, "Sir, the answer to that question is so simple that I will let my chauffeur, who is sitting in the back, answer it for me."

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American Pure Fusion Engineering and Supply: Warren Cooley, 1-800-789-7109 or 503-585-6746. Email to: Coolwar@aol.com

Clustron Sciences Corp.: Contact: Ron Brightsen, 703-476-8731.

ENECO: is in the business of commercializing the exciting new field of low energy induced nuclear reactions in solids via patent licensing, joint-ventures, and co-operative research. ENECO, University of Utah Research Park, 391-B Chipeta Way, Salt Lake City, Utah 84108 USA. Contact Fred Jaeger, Voice 801-583-2000, Fax 801-583-6245. Email: jaeger@ENECO-USA.com

E-Quest Sciences: Contact Russ George, FAX 415-851-8489.

Fusion Information Center (FIC): Research and development of new energy systems. The world's most complete resource depository for cold fusion research information, as well as other new energy research including zero-point energy; space energy research; electronic, electromagnetic, and mechanical over unity devices and transmutation. We are the publishers for ***New Energy News***, and *the* ***Journal of New Energy***. Voice 801-583-6232, Fax 801-583-2963. Contact Hal Fox.

German Association for Vacuum Field Energy: Wolfram Bahmann, Feyermuehler Str. 12, D-53894 Mechenich, Germany. Tel: 011-48/(0)2443-8246 Fax: 011-49/(0) 2443-901880 E-mail: dvs@gptec.com Internet: www.gptec.com/pace.

Holotec AG: Clean Energy Technology, contact André Waser, Gen. Mgr., Bireggstrasse 14, CH-6003, Luzern, Switzerland. Phone 011 41-41 360 4485, or Fax 011 41-41 360 4486.

Hydro Dynamics, Inc.: Rome, Georgia. Contact James Griggs, Voice 706-234-4111 Fax 706-234-0702.

JET Energy Technology, Inc.: Weston, MA. Contact Dr. Mitchell Swartz, Voice 617-237-3625. Fax 617-237-3625.

Labofex, Experimental and Applied Plasma Physics: Ontario, Canada. Contact Dr. Paulo N. Correa. Tel 905-660-1040
Fax 905-738-8427

Magnetic Power Inc.: Sebastopol, CA. Contact Mark Goldes, voice 707-829-9391, Fax 707-829-1002.

Nova Resources Group, Inc.: Denver, CO. Call Chip Ransford, Phone 303-433-5582.

Trenergy, Inc., has acquired rights to develop and produce a new-type of thermal power based on the controlled production of clean nuclear reactions from plasma injected transmutation. Contact through P.O. Box 58639, Salt Lake City, UT 84158-0639, Voice 801-583-6232, Fax 801-583-2963.

UV Enhanced Ultrasound: Hong Kong.
FAX 852-2338-3057.

"YUSMAR"- Scientific-Commercial Company: President: Dr. Yuri S. Potapov, 277012 Kishinev, Moldova. Phone and Fax 011-3732-233318.

Zenergy Corp.: Founded in 1996 to facilitate the introduction of commercially viable energy alternatives. 390 South Robins Way, Chandler, AZ 85225. Contact Reed Huish, 602-814-7865, Fax 602-821-0967, e-mail: info@zenergy.com

Note: The Fusion Information Center has been acting as an information source to many of these companies. We expect to augment our international service to provide contacts, information, and business opportunities to companies considering an entry into the enhanced energy market.

INFORMATION SOURCES

Advanced Energy Network Newsletter, quarterly. Advanced Energy Network, P.O. Box 691, Rondebosch 7700 Capetown, Rep. South Africa.

Antigravity News and Space Drive Technology, bimonthly newsletter, pub. J.E.Cox Enterprise, P.O. Box 655, Marietta, GA 30061-655 (Phone 770-218-9693). Per year $36. U.S., $48 foreign.

Cold Fusion Times, quarterly newsletter published by Dr. Mitchell Swartz, P.O. Box 81135, Wellesley Hills MA 02181.
Home Page: http://world.std.com/~mica/cft.html

Cycles, a R&D newsletter, published by Dieter Soegemeier, Editor, GPO Box 269, Brisbane, QLD.4001, Australia.
Phone/Fax: +61 (0)7 3809 3257.

Electric Spacecraft Journal, quarterly, edited by Charles A. Yost, 73 Sunlight Drive, Leicester, NC 28748.

Electrifying Times, 3/year magazine. 63600 Deschutes Market Rd, Bend, OR 97701
541-388-1908, Fax 541-388-2750,
E-mail <etimes@teleport.com>
www.teleport.com/~etimes/

Elemental Energy, monthly newsletter, edited by Wayne Green, 70 Route 202N, Petersborough, NH 03458. Email: <design37@aol.com>

Fusion Facts has become a section in the *Journal of New Energy*.

Fusion Technology, Journal of the American Nuclear Society, edited by Dr. George Miley, 555 N. Kensington Ave., La Grange Park, IL 60525.

Future Technology Intelligence Report, monthly newsletter, making available technological information now omitted from establishment media. Back issues available at substantially lower cost on the InterNet at <www.tarapublishing.com> FTIR, P.O. Box 423652, San Francisco, CA 94142-3652.

Infinite Energy, bi-monthly magazine. P.O. Box 2816, Concord, NH 03302-2816. Voice: 603-228-4516. Fax: 603-224-5975
E-mail 76570.2270@compuserve.com

Institute for New Energy (INE), organization to promote and help find funding for new energy research.
Visit our **Home Page**: www.padrak.com/ine/ which contains many important scientific papers and current reports on all areas of research.
E-mail: halfox@slkc.uswest.net
or ine@padrak.com
Salt Lake City, Utah. Voice 801-583-6232,
Fax 801-583-2963.

New Energy News monthly newsletter for INE, highlighting the research and development in the worldwide new energy arena. Edited by Hal Fox.

***Journal of New Energy*,** quarterly, presenting papers representing the new areas of energy research, leading-edge ideas in the development of new energy technology, and the theories behind them. Published by the Fusion Information Center, Inc. Editor: Hal Fox. Address & phone above.

KeelyNet BBS - Jerry Decker, 214-324-3501
Internet: www.keelynet.com
E-mail: jdecker@keelynet.com

Planetary Association for Clean Energy Newsletter, quarterly, edited by Dr. Andrew Michrowski. 100 Bronson Ave, # 1001, Ottawa, Ontario K1R 6G8, Canada.
Web page: http://energie.keng.de/~pace

Space Energy Journal, quarterly, edited by Jim Kettner & Don Kelly, P.O. Box 1136, Clearwater, FL 34617-1136.

The above list of commercial and information sources will be growing. New listings will be added as information is received. Send information to *NEN*, P.O. Box 58639, Salt Lake City, UT, 84158.

CONTENTS FOR MAY 1998