

# FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

ISSN 1051-8738

• University of Utah Research Park •

ISSN 1051-8738

Copyright 1995

-- Since 1989 --

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

VOLUME 7 NUMBER 5

FUSION FACTS

NOVEMBER 1995

## CONTENTS FOR NOVEMBER 1995

A. PATTERSON CELL IMPACT.....	1
B. TRITIUM TECHNOLOGY CONFERENCE	4
C. EDITORIAL.....	8
D. THIRD RUSSIAN CONFERENCE .....	10
E. A DIFFERENCE OF OPINION .....	11
F. NEWS FROM THE U.S.....	12
G. NEWS FROM ABROAD.....	15
H. PATENTS GRANTED .....	17
I. SHORT ARTICLES .....	18
J. LETTERS FROM OUR READERS .....	21
COMMERCIAL COLUMN .....	23

## A. PATTERSON CELL IMPACT

By Hal Fox, Editor-in-chief

After beginning with a media circus in late March, 1989, cold fusion became denied, written off, and relegated to the dust bin of history by some scientists and their media representatives before 1989 expired. According to three books [1-3], the "science that wasn't," faded and died. However, those who drank from Truth's holy grail were not so easily dismayed. Progress continued and was reported in each of the series of five international cold fusion conferences. The Patterson Power Cell™ (PPC) took the fifth conference and turned it into a resounding demonstration for the resurrection of that which had died only in the media. Now this technology stands ready to lead the revolution in power generation.

The size of the energy market has been estimated to be from \$3 to \$5 trillion annually. The question addressed in this editorial is "What will be the impact made by this exciting new technology?" Many have said that if cold fusion is real then it is the greatest discovery of the decade, century, or of all time, depending on the speaker. Regardless of what this new energy phenomena is named; regardless of how long it takes to fully understand the nature of the source of heat; and regardless of the new developments that the future may bring, the impact that it will have on thermal power generation will be significant. There is no doubt in this editor's mind but that the PPC is a commercially viable new source of energy that is cheap, environmentally friendly, and that will become reliable.

### The Uses

The impact of this means of creating thermal energy will be enormous. Every sector of society will be impacted by this technology [4]. Those of you who witnessed the power production of the PPC demonstration unit shown at the PowerGen conference (Anaheim Convention Center, December 4-7, 1995) have great confidence that you have

### COMING! In Future Issues

1995 Scientist of the Year  
Cold Fusion > 100 times input  
Picosecond Instruments  
Magnetic Motors > 200% Efficient

Devices that Transform Ether  
Power into Electrical Power

Commercialization of  
Enhanced Energy Systems

Don't Miss An Issue!

witnessed a technological breakthrough. You can understand that any process that needs thermal energy to heat air, heat water, cook, bake, distill, fry, boil, sterilize, render, melt, or heat-treat has the potential to be served with this new thermal power technology.

### The Limitations

The PPC is an electrochemical cell in which distilled water and dissolved salts (specifically, lithium sulfate) are the possible fuel sources of the thermal power produced. When water-based electrolytes are heated to a high enough temperature, they boil. Therefore, to attain higher temperatures, a pressurized cell must be used and a recombiner must be added (to turn the electrolyzed hydrogen and oxygen back into water). As the pressure increases so does the boiling point of the electrolyte, up to a certain maximum. That practical maximum is reached when the pressurized fluid no longer exhibits a liquid-vapor interface. With distilled water, this state is achieved at about 700 degrees Fahrenheit (and pressures of over 3,000 psia). If we desire to work at lower pressures, such as 2,000 psia, the temperature drops to about 635 deg F. With an excellent heat exchanger, we can expect to get from 500 to 600 degrees in a working fluid (air, water, chemicals, etc.). That is the thermal limitation.

### The Potential

It is intellectually useful to consider the market size for computers, cameras, copiers, or Post-it™ notes, when IBM, Polaroid, Xerox, or 3M began their companies. Compare the previous potential sizes of those initial product markets with the size of the energy market. Today there are about 100 million personal computers. At a high value of \$3,000 per computer, the total market would be less than \$30 billion. **The energy market is at least \$3 trillion or one hundred times larger.** That is today's market to be penetrated. The

pent-up desire to emulate the citizens of the U.S. and enjoy a high-energy level standard of living is enormous. The people of China, India, and all of the former countries that comprised the USSR are wanting to increase their energy standard of living. The energy market is poised for rapid expansion. Five trillion dollars per year by the year 2000 would be a reasonable estimate of the market size.

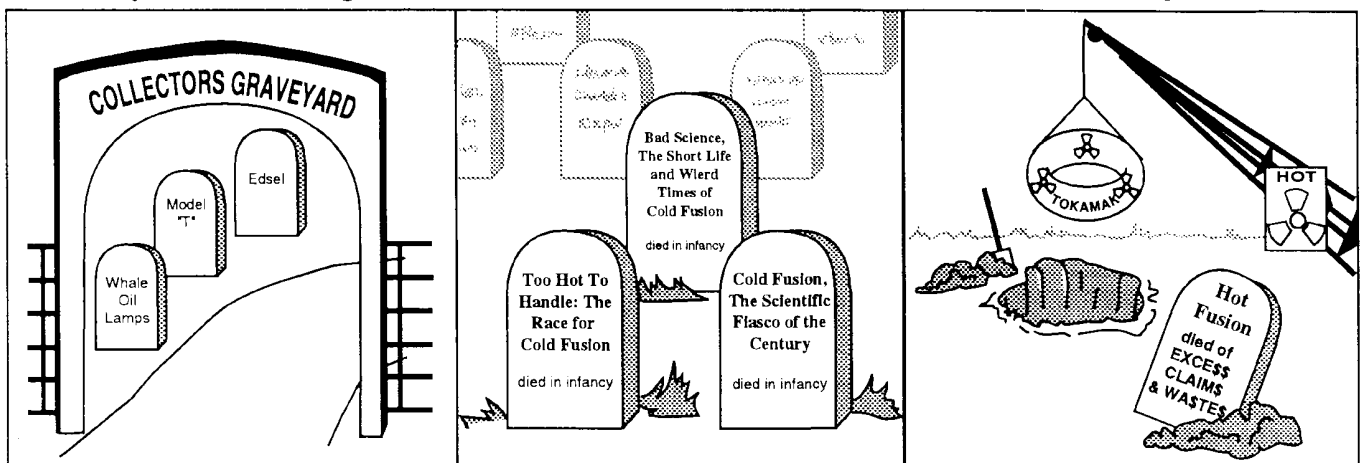
### The Beginnings

No one can guarantee which corporations will be among the first to design their equipment around the thermal power source of the PPC. However, any of us can come up with a few good applications where such clean, low-cost, and essentially inexhaustible power is needed. The PPC is clean because it produces no measurable contamination. If the scientific speculation is correct, balloon gas (helium) and heat will be the major byproducts of a PPC. These devices are low-cost because they produce so much thermal energy from a very small amount of "fuel". Lithium is believed to be part of the "fuel". Lithium is found in the earth's crust to about 50 parts per million. According to my calculations, there would be about 25,000 cubic miles of lithium in the top 1,000 feet of the earth's crust. That should be enough lithium to last for many decades in powering the PPCs. After that time, we will be mining the asteroids or using some other new source of energy.

### The Potential Uses

Here are some practical applications for the PPCs: Furnaces (either hot air or hot water); water heaters; steam cleaners; steam generators; sterilizers; furnaces; cookers; fryers; steam tables; steam-fired cookers; hot-air dryers; crude oil heating; low-temperature ovens; paint drying; paper drying; pre-heating of many fluids and materials; and etc. In short, any current need for thermal energy up to about 600°F could conceptually be filled by these new power cells.

## Good-Bye Old Paradigm



With the addition of efficient solid state heat to electric conversion devices, the PPC could possibly supply enough heat that, when converted to electricity, could supply the typical homeowner with all of his electricity needs. Such a device would require few moving parts and have an expected long life span.

*The important economic consideration is that there are no hidden social nor environmental costs.*

### Economic Considerations

The precise cost of thermal energy from the initial production models of power cells is not available. However, the best estimates, based on automated manufacturing equipment and volume production would be about one-fourth the current costs of thermal energy produced by electricity. This puts the thermal energy costs at less than the cost of natural gas, well below the cost of propane heat, and near the cost of some of the best coal-fired economics. However, the important economic consideration is that there are no hidden social nor environmental costs. Later, as the technology develops, it is expected that costs for thermal energy will be well below the costs of an alternative fuel technology.

### Thermal-to-Electric Conversion

It is obvious that heat energy can be used to produce electricity. Until the solid-state thermo-electric devices are vastly improved, the economic creation of large amounts of electricity will probably be accomplished through the use of a liquid/vapor fluid such as water or, preferably, a high-molecular weight working fluid and the best high-efficiency turbines. With such a design an overall efficiency of 30 to 40 percent is achievable. If the electricity is generated in connection with other uses for the unused thermal energy, then this type of co-generation could be highly economical. For example, heating a greenhouse and producing electrical power would be an effective combination. **This type of planning for the near future may make it possible to forstall the building of any more polluting electrical power plants in the United States.** Due to the stringent requirements for new electrical power plants to reduce atmospheric contaminants, the current cost of new electrical power plants is almost prohibitive.

### Distributed Energy

Just as the desk-top personal computers have replaced many of the main-frame computers (distributed data processing) so, too, will this new power cell technology impact the further expansion of central power plants and the networked distribution of electricity and natural gas. **Distributed Energy Systems or Distributed Power Systems** will be the new buzz words in the thermal power and the electric power

industries. This new technology will especially impact the distribution and use of thermal energy in the cities of the CIS (Commonwealth of Independent States -- the former USSR) where nearly all apartment and office heating is accomplished by central steam- and electricity-producing plants. Hot water pipes conduct heat for housing and offices for several kilometers. If your apartment is at the end of the hot water distribution system, you may not get your share of thermal energy and would be an immediate consumer of alternative heat source.

### Summary

We are entering a new **power generation age**, an age in which clean, inexpensive, and relatively inexhaustible sources of energy will be used. This new technology will have a greater impact on the way we produce and distribute power than any previous technological development. From wood to coal to oil to natural gas and now to power cells is the energy path. Each change has had its impact and usually with a higher price tag. Now the impact will be greater than any previous transition **and the price appears to be highly favorable.** The only concept that we are sure of is this: **The ingenuity of scientists, engineers, inventors, manufacturers, and distributors will constantly provide us with an improved standard of living. The Patterson Power Cell™ is no exception.** Welcome to the new power generation age.

### References

- [1] Frank Close, Too Hot to Handle: The Race for Cold Fusion, published in May 1991, died in infancy.
- [2] John R. Huizenga, Cold Fusion, The Scientific Fiasco of the Century, Univ of Rochester Press c1992. A publishing fiasco.
- [3] Gary Taubes, Bad Science. The Short Life and Weird Times of Cold Fusion, Random House, c1993. The short life of a bad book.
- [4] Hal Fox, Cold Fusion Impact in the Enhanced Energy Age, published in 1992 by Fusion Information Center, Salt Lake City, Utah. Book includes a computer diskette with a frequently updated bibliography of over 2500 references to the enhanced energy literature.

CETI, (Clean Energy Technologies, Inc.) in Texas, may be contacted at Voice 214-458-7620, Fax 214-458-7690.

## B. TRITIUM TECHNOLOGY CONFERENCE - SELECTED PAPERS

George Miley (Editor, *Fusion Technology*, Univ. of Ill.), "Comments," *Fusion Technology*, vol 28, no 3, pt 1, October 1995, Fifth Topical Meeting on Tritium Technology in Fission, Fusion, and Isotopic Applications, held in Belgirate, Italy, May 28 - June 3, 1995, pp 433-434.

The *Fusion Technology (FT)* staff is pleased to provide this proceedings from the Fifth Topical Meeting of Tritium Technology in Fission, Fusion, and Isotopic Applications. This is the fourth proceedings in this series of meetings to be published in *FT*. Earlier proceedings appeared in Vol. 8, No. 2 (September 1985) (the second topical meeting); Vol. 14, No. 2 (September 1988) (the third topical meeting); and Vol. 21, No. 2 (March 1992) (the fourth topical meeting).

Fusion researchers have begun to gain practical experience with tritium use in actual fusion devices through the deuterium-tritium (D-T) experiments at the Tokamak Fusion Test Reactor (TFTR) and the Joint European Torus (JET) and through the use of D-T-filled targets at a number of major inertial confinement fusion laboratories. Still, much of the fundamental data on tritium handling, transport, and environmental issues build on data obtained over many years of experience in nuclear weapons programs and from the fission power industry. Thus, it is essential that fusion researchers continue to maintain close ties with workers in these other fields through joint meetings and publications such as the current *FT*. Indeed, tritium technology represents a broad interdisciplinary scientific field, and we hope that the publication of these comprehensive papers in an archival volume such as this will provide a significant contribution to future fusion developments.

Stephen A. Birdsell and R. Scott Willms (Los Alamos Natl. Lab., New Mexico), "Modeling and Data Analysis of a Palladium Membrane Reactor for Tritiated Impurities Cleanup," *Fusion Technology*, vol 28, no 3, pt. 1, Oct 1995, pp 530-537, 10 ref, 7 figs, 5 tables.

### AUTHORS' ABSTRACT

A model was developed to explore the use of a palladium membrane reactor for fusion fuel processing. The model was benchmarked to tritium-containing experiments that simulated the expected plasma exhaust of the International Thermonuclear Experimental Reactor. This modeling effort has greatly improved our understanding of the processes occurring in the reactor.

P.L. Carconi, S. Casadio, A. Moauro, L. Petrucci (ENEA C.R. Casaccia, Rome, Italy), C.M. Mari (Dept. of Physical Chem. & Electrochem., Univ. Milan, Italy), "Decomposition of Water with Industrial Oxygen Sensor used as Electrolysis Cell," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 556-560, 14 refs, 4 figs, 1 table.

### AUTHORS' ABSTRACT

Industrial solid state oxygen sensors, using fully stabilized zirconia as electrolyte, were modified and used to split water vapor, mixed with inert gas. Such conditions were chosen for simulating the tritium removal from the ceramic breeder materials in solid blanket fusion reactors. The single cell performances were investigated at 973°K and 200 cm<sup>3</sup>/min flow rate using argon/water vapor mixtures ranging from 100 to 700 vpm [sic ? ppm]. The splitting efficiency was evaluated at 80%; steady state conditions were reached in a few minutes.

E.A. Clark, D.A. Dauchess, L.K. Heung, R.L. Rabun, T. Motyka (Westinghouse Savannah River Co., South Carolina), "Experience with Palladium Diffusers in Tritium Processing," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 566-572, 8 refs, 6 figs.

### AUTHORS' ABSTRACT

Hydrogen isotopes are separated from other gases by permeation through palladium and palladium-silver alloy diffusers, or permeators, in the Tritium Facilities at the US Department of Energy Savannah River Site (SRS). Diffusers have provided effective service for almost 40 years. This paper is an overview of the operational experience with the various diffuser types that have been employed at SRS. Alternative technologies being developed at SRS for purifying hydrogen isotopes are also discussed.

Satoshi Fukada, Katsuhiko Fuchinoue and Masabumi Nishikawa (Dept. Nucl. Eng., Kyushu Univ. Hakozaki, Japan), "Hydrogen Isotope Separation Based on Isotopic Exchange in Palladium Bed," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 608-613, 13 refs, 8 figs.

### AUTHORS' ABSTRACT

A continuous hydrogen isotope separation system using twin beds of metals or alloys is here proposed. The isotope separation system, called a twin-bed periodically counter-current flow (TB-PCCF), is analytically and

experimentally investigated. Palladium and  $\text{LaNi}_{4.7}\text{Al}_{0.3}$  were selected based on experimental data of the isotope separation factor and the isotopic exchange rate. Numerical calculations by a plate model revealed effectiveness of the TB-PCCF method which is composed of an enriching column packed with Pd particles and a stripping column packed with  $\text{LaNi}_{4.7}\text{Al}_{0.3}$  particles. A preliminary experiment was performed at the condition where absorption and desorption cycles are repeated between room temperature and 473°K for Pd and 363°K for  $\text{LaNi}_{4.7}\text{Al}_{0.3}$  at the total reflux, and it showed possibility of the hydrogen isotope separation.

Lu Guangda, Jiang Guoqiang, Shen Cansheng, (SW Inst. Nucl. Phys. & Chem., China), "An Experimental Investigation for Hydrogen and Deuterium Separation by Thermal Cycling Absorption Process," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 672-675, 5 refs, 4 figs.

#### AUTHORS' ABSTRACT

The Thermal Cycling Absorption Process (TCAP) is a semicontinuous gas chromatographic process for hydrogen isotope separation by which the experiment for hydrogen-deuterium separation has been carried out. The main operating parameters for optimum separation were obtained. On manual operation conditions the concentrations of product and raffinate gas were better than 99.5% simultaneously at a feed rate of 12.0% for a 1:1 hydrogen-deuterium mixture. Besides, TCAP is a good process for trace heavier isotope enriching from hydrogen. [sic] The concentration of deuterium can be reduced from 0.5% to less than 50ppm in hydrogen in ten cycles.

A.R.A. Haasz, K.T. Aust (Dept. of Metallurgy & Matr. Sci., Canada), W.E. Shmayda, G. Palumbo (Ont. Hydro Techn., Canada), "Hydrogen Transport in Nickel," *Fusion Technology*, vol 28, no 3, part 2, October 1995, pp 1169-1172, 19 refs, 5 figs, 2 tables.

#### AUTHORS' ABSTRACT

Hydrogen transport studies were confined to molecular hydrogen driven permeation through two largely different polycrystalline grain structures: (i) microcrystalline nickel with an average grain size of  $\mu\text{m}$  and (ii) nanocrystalline nickel with an average grain size of 78 nanometers. Permeation experiments were conducted in a double chamber ultra-high vacuum system separated by a test specimen. Hydrogen permeabilities and diffusivities through polycrystalline nickel were measured in the temperature range of 30°C to 200°C. At 30°C the nanocrystalline nickel

displayed a six-fold increase in permeability with respect to the microcrystalline nickel. The enhancement in permeability is believed to be the result of enhanced intercrystalline volume fraction in the nanocrystalline nickel.

Yuji Hatano, Toshiko Maetani, Masayasu Sugisaki (Kyushu Univ., Japan), "Characterization of Surface Barrier Effect upon Tritium Permeation Through Stainless Steel with Auger Electron Spectroscopy," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1182-1187, 8 refs, 12 figs.

#### AUTHORS' ABSTRACT

The surface barrier effect on tritium permeation through SUS-316 stainless steel was characterized with Auger electron spectroscopy for the surfaces which had been confirmed to have different barriers from our previous study. The surface which was prepared by heat treatment at 1273°K for 1 hr. in vacuum ( $10^{-4}\text{Pa}$ ) was not contaminated with oxygen and carbon but covered uniformly with a large amount of sulfur. The surface exposed to air at room temperature after the vacuum annealing was covered with duplex oxide layers: the top layer consisted of iron oxide and the inner layer consisted of chromium, iron and nickel oxides. The iron oxide in the top layer was easily reduced with hydrogen gas at elevated temperatures, but inner oxide layer was not completely reduced under the present conditions. These results were correlated to the surface barrier effect on tritium permeation based on our previous experimental results concerning the dissolution rate of gaseous tritium into stainless steel.

Gheorghe Ionita and Ioan Stefanescu (Inst. of Cryogenics & Isotopic Sepr., Romania), "The Separation of Deuterium and Tritium on PT/SDB/PS and PT/C/PTFE Hydrophobe Catalysts," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 641-646, 5 refs, 8 figs.

#### AUTHORS' ABSTRACT

The nature and performance of our patented catalysts, with platinum on carbon and polytetrafluorethylene [Pt/C/PTFE] and platinum on styrenedivynilbenzene and polystyrene [Pt/STB/PS], used in a water-hydrogen isotope exchange process are presented.

The behaviour of the two catalysts in tritiated water was tested by determining their physical and structural characteristics as well as the catalytic activity before and after immersion in tritiated water.

The test results emphasized that the two catalysts are highly active in the hydrogen-water vapor ( $H_{2(g)}-H_2O_{(v)}$ ) isotopic exchange and highly stable to tritium radiation.

It was discovered that Pt/SDB/PS catalyst proved to be quite unstable in the hydrogen-water vapor-water ( $H_{2(g)}-H_2O_{(v)}-H_2O_{(l)}$ ) isotopic exchange, while the Pt/C/PTFE catalyst was highly stable. Thus, the Pt/C/PTFE catalyst was chosen for hydrogen isotope separation by liquid hydrogen cryogenic distillation combined with water-hydrogen isotopic exchange in a demonstration scale plant.

N.P. Kherani\*\*, T. Kostaski\*\*, S. Zukotynski\*\*, W.T. Shmayda\* (\*Ontario Hydro Technologies, Toronto, Canada, \*\*Univ. of Toronto, Dept. of Electrical Eng. Toronto, Canada), "Tritiated Amorphous Silicon for Micropower Applications," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1609-1614, 18 refs, 5 figs.

#### AUTHORS' ABSTRACT

The application of tritiated amorphous silicon as an intrinsic energy conversion semiconductor for radioluminescent structures and betavoltaic devices is presented. Theoretical analysis of the betavoltaic application shows an overall efficiency of 18% for tritiated amorphous silicon. This is equivalent to a 330 Ci intrinsic betavoltaic device producing 1 mW of power for 12 years. Photoluminescence studies of hydrogenated amorphous silicon, a-Si:H, show emission in the infra-red with a maximum quantum efficiency of 7.2% at 50°K; this value drops by 3 orders of magnitude at a temperature of 300°K. Similar studies of hydrogenated amorphous carbon show emission in the visible with an estimated quantum efficiency of 1% at 300°K. These results suggest that tritiated amorphous carbon may be the more promising candidate for room temperature radioluminescence in the visible.

V.V. Kirsanov (Tver Tech. Univ., Russia), "Competition of Helium and Hydrogen in the Time of Their Migration," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1200-1204, 3 refs, 3 figs.

#### AUTHOR'S ABSTRACT

Simultaneous effects of radiation induced defects and gas atoms of various types in the near surface layers of the first wall material of a fusion reactor produced rather intricate pictures of their interaction and diffusion. This work describes our attempt, by using computer simulation methods, to look into He and H interaction reactions with

radiation-induced vacancies and interstitial atoms, to determine the more movable defect formations that are responsible for gas migration. More movable mixed helium-vacancy cluster is discovered ( $H + 2V$ ). Reactions of pushing out helium from substitutional position by self-interstitial atom as well as hydrogen by helium atom which has come to it have been discovered. It is shown that the latter reaction pointing out the possible competition between He and H, while occupying vacancy trap, can cause He permeability reduction compared to hydrogen permeability, that is supposed to affect gas porosity formation.

Nikolay F. Kolomiets (Inst. for Nucl. Res., Natl. Acad. Sci., Ukraine), "Manufacture and Use of Metal-tritium Products," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1605-1608, 6 refs.

#### AUTHOR'S ABSTRACT

The physical and technical properties of metal-tritium targets,  $\beta$ -radiation sources, and other tritium products, and some manufacturing practices that influence product quality and the environment are discussed.

Satoshi Konishi, Masahide Hara and Kenji Okuno, (Japan Atm. Energy Res. Inst., Japan), "Versatile Fuel Cleanup System Based on Palladium Permeation and Vapor Electrolysis," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 652-657, 7 refs, 5 figs.

#### AUTHORS' ABSTRACT

Some variations and extensions of a Fuel Cleanup System based on the combination of palladium diffuser and a vapor electrolysis cell were studied to improve its flexibility to accept broader range of flow rate, gas contents, and operation modes. Processing of inert gas -  $CH_4$ ,  $H_2$ ,  $He_2O$  mixtures in a closed loop showed satisfactory detritiation, with the processing of methane by catalytic steam reforming and oxidation, and electrolytic oxidation. The decomposition of hydrocarbon on the anode side of the ceramic electrolysis cell was tested to study its feasibility as an oxidizer. The zirconia ceramic membrane with Pt electrode were tested with methane at the anode for oxidation, and water vapor on the cathode for reduction. The cell converted methane to carbon dioxide and vapor with high efficiency and simultaneously decomposed water vapor to hydrogen. This application of the cell simplifies the process, and eliminates the use of catalyst and oxygen gas. A versatile fuel cleanup that eliminates most of the previous concerns and improves the performance is proposed.

K.J. Maynard, W.T. Shmayda, A.G. Heics (Ont. Hydro Techn., Toronto, Canada), "Tritium Aging Effects in Zirconium-cobalt," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1391-1398, 14 refs, 6 figs, 3 tables.

#### AUTHORS' ABSTRACT

The effects of tritium aging on ZrCo have been characterized to determine the suitability of ZrCo as a long term tritium storage medium. Four 1 gram ZrCo storage beds were aged for three years with varying amounts of tritium. Equilibrium tritium pressures were found to increase by approximately threefold at a given temperature and composition in the range of 100-300°C. At 25°C, the pressure increase is predicted to be twenty-fold. Tritium aged ZrCo retains the majority of decay  $^3\text{He}$  within the bulk. As this  $^3\text{He}$  concentration increases, the rate of helium release increases. Longer term tritium aging may result in a  $^3\text{He}$  release rate equal to its production rate from tritium decay. In such a case, the pressure within a sealed storage bed would steadily increase. These tritium aging effects indicate that practical ZrCo storage bed design should include conservative design pressure specifications, to safely contain the maximum possible  $^3\text{He}$  pressure.

Arthur Nobile, Thomas Bieniewski, Kandy Frame, Robert Little, and Kane Fisher (Los Alamos Nat. Lab., New Mexico), "Design Optimization of Metal Getter Reactors for Removing Tritium from Flowing Gas Streams," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1558-1565, 14 refs, 6 figs.

#### AUTHORS' ABSTRACT

A reaction engineering approach was used to design a SAES St 198 metal getter reactor for a glovebox detritiation system. The detritiation system will be used to decontaminate and decommission an Li(D,T)-contaminated glovebox previously used in the U.S. nuclear weapons program. The approach involved development of a model that calculates reactor breakthrough curves as a function of various reactor physical parameters. Experiments involving flow of deuterium in nitrogen through a small metal getter reactor validated the model. The model was then used to investigate the effects of temperature, getter pellet size, reactor diameter, and reactor volume on the reactor performance. The resulting design was a 7 cm diam. by 40 cm long cylindrical reactor that operates at 250°C, and is filled with 5 kg of as-received SAES St 198 getter pellets. The reactor handles a flow rate of 100 L/min. An St 909 getter reactor was used upstream of the St 198 reactor for impurity removal and water

decomposition. The glovebox cleanup system design and getter reactor mechanical design are discussed.

Shigeru O'hira, Hirofumi Nakamura, Kenji Okuno (Tritium Eng. Lab., Japan Atm. Energy Res. Inst., Japan), David J. Taylor and Robert H. Sherman (Los Alamos Natl. Lab., New Mexico), "Beta-decay Induced Reaction Studies of Tritium by Laser Raman Spectroscopy- $\text{T}_2$ -CO system," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1239-1243, 18 refs, 3 figs, 2 tables.

#### AUTHORS' ABSTRACT

The dynamic measurement of the reaction in  $\text{T}_2$ -CO 1:1 mixed gas was carried out using laser Raman spectroscopy. A catastrophic change was observed in the Raman spectra due to appearance of fine particles floating in the quartz Raman cell at about 100 min after mixing. Assignment of the new peaks on the spectra due to appearance of the particles was not successful. An attempt to specify the solid reaction product by mass spectroscopic analysis of the gas phase constituent showed the elemental formula of the product was about  $\text{C}_{1.4} \cdot \text{T}_{3.0} \cdot \text{O}_{1.0}$ .

Boris G. Polosukhin, Eugeniy M. Sulimov, Aleksey P. Zyfianov, and Georgiy M. Kalinin (Res. & Dev. Ins. of Power Eng., Zarechny, Russia), "Hydrogen Isotope Transfer in Austenitic Steels and High-nickel Alloy During In-core Irradiation," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1268-1273, 4 refs, 3 figs, 2 tables.

#### AUTHORS' ABSTRACT

The transfer of protium and deuterium in austenitic chromium-nickel steels and in a high-nickel alloy was studied in a specially designed facility. The transfer parameters of protium and deuterium were found to change greatly during in-core irradiation, and the effects of irradiation increased as the temperature decreased. Thus, at temperature  $T < 673^\circ\text{K}$ , the relative increase in the permeability of hydrogen isotopes under irradiation can be orders of magnitude higher in these steels. Other radiation effects were also observed, in addition to the changes from the initial values in the effects of protium and deuterium isotopic transfer.

Victor V. Sagaradze, Vadim L. Arbuzov, Sergei S. Lapin, (Inst. of Metal Phys., Ekaterinburg, Russia), Yuri N. Zuev, Nikolai N. Markelov, Yuri N. Dolinski, (Res. Inst. of Tech.

Phys., Russia), "The Influence of Hydrogen Isotopes and Radiogenic Helium on the Structure and Mechanical Properties of Radiation-resistant Steels with a Composite Alpha/gamma Structure," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1274-1277, 3 refs, 2 figs, 1 table.

#### AUTHORS' ABSTRACT

It is shown that the Cr-Ni-Mo stainless steel with a fine-plate austenitic-martensitic structure has a high resistance to radiation swelling. The influence of small amounts of tritium (0.015 at.%) and radiogenic helium (~2.5 appm) on the mechanical properties of the steel is analyzed.

John H. Scogin and Anita S. Poore (née Horen)(Savannah River Tech. Ctr., SC), "Startup and Operation of a Metal Hydride Based Isotope Separation Process," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 736-741, 2 refs, 4 figs.

#### AUTHORS' ABSTRACT

Production scale separation of tritium from other hydrogen isotopes at the Savannah River Site (SRS) in Aiken, SC, USA, has been accomplished by several methods. These methods include thermal diffusion (1957-1986), fractional absorption (1964-1968), and cryogenic distillation (1967-present). Most recently, the Thermal Cycling Absorption Process (TCAP), a metal hydride based hydrogen isotope separation system, began production in the Replacement Tritium Facility (RTF) on April 9, 1994. TCAP has been in development at the Savannah River Technology Center since 1980. The production startup of this semi-continuous gas chromatographic separation process is a significant accomplishment for the Savannah River Site and was achieved after years of design, development, and testing.

Kuniaki Watanabe, Masanori Hara, Masao Matsuyama (Hydrogen Isotope Res. Ctr., Muroran, Japan), Isao Kanesaka (Dept. Chem., Fac. of Sci., Toyama Univ.), and Toshiki Kabutomori (Japan Steel Works, Muroran Res. Lab., Muroran, Japan), "Stability of ZrCo and ZrNi to Heat Cycles in Hydrogen Atmosphere," *Fusion Technology*, vol 28, no 3, pt 2, Oct. 1995, pp 1437-1442, 15 refs, 6 figs.

#### AUTHORS' ABSTRACT

The stability of ZrNi and ZrCo to heat cycles in hydrogen atmosphere was studied through changes in absorption-desorption characteristics and in crystallographic structures.

ZrCo easily lost its absorption-desorption capacity of hydrogen below 30 heat cycles between room temperature and a given temperature in a range of 400°~600°C. X-ray diffraction analysis showed that ZrCoH<sub>3</sub> initially formed decomposed to ZrH<sub>2</sub> + ZrCo<sub>2</sub>. On the other hand, ZrNi was more durable than ZrCo to the similar heat cycles. But, it was found that the absorption-desorption characteristics was degraded by heat cycles over 500. The X-ray analysis showed that ZrNi also disproportionated to ZrH<sub>2</sub> and ZrNi<sub>3</sub>. The difference in the stabilities between the two materials appears to be due to the difference in crystallographic nature upon formation of the respective hydrides.

R. Scott Willms, Stephen A. Birdsell and Richard C. Wilhelm (Los Alamos Natl. Lab., NM), "Recent Palladium Membrane Reactor Development at the Tritium Systems Test Assembly," *Fusion Technology*, vol 28, no 3, pt 1, Oct. 1995, pp 772-777, 3 refs, 2 figs, 1 table.

#### AUTHORS' ABSTRACT

The palladium membrane reactor (PMR) is being investigated as a means for recovering hydrogen isotopes (including tritium) from compounds such as water and methane. Previous work with protiated water and methane showed that this device can be used to obtain high hydrogen recovery efficiencies using a single processing pass and with essentially no waste production. With these successful proof-of-principle results completed, recent work has focused on PMR development. This included studies various geometries and testing with tritium. The results, which are reported here, have led to a better understanding of the PMR and will lead to the ultimate goal of building a production PMR and putting it into practical tritium processing service.

### C. EDITORIAL

#### I KNEW IT ALL ALONG

**Oh Truth! Be Frank, how Close are we  
To when cold fusion true will be?**

**Old Father Time this fact unrolled:  
Fusion is better when it's cold.**

**And now we'll hear this joyous song --  
"I've supported it all along."**



[This verse is in honor of a talented and dedicated energy scientist and the author of Too Hot to Handle: The Race for Cold Fusion, published in May 1991 but died in infancy. In a radio debate between Frank Close and Eugene Mallove, March 8, 1991, Dr. Close said, "I'm a theoretical physicist and nothing would have given me more joy than if some really clear cut evidence had come out that here was an utterly new phenomena that would overthrow science as I knew it. Because we all want to be in there to staff a new revolution and be a part of the excitement of it." If the rumor is true, Dr. Frank Close, a former cold fusion skeptic, has now achieved his dream. We welcome him to the ranks of those who have discovered that cold fusion is, indeed, a new revolution. Welcome in to the cold, Frank. Ed.]

## QUIT BAD-MOUTHING THE ANTI-COLD FUSION GUYS!

By Hal Fox

"If only the DOE had recognized cold fusion in 1989..."  
 "If only the thermonuclear research group had spent a small fraction of their annual budget..." **Then what?**

Consider the following real world: Pons and Fleischmann left the U.S. and went to France where they have been hired using Japanese corporate funds **and have made great progress unencumbered by government requirements for reporting.** Dr. Michael McKubre and his associates have been doing excellent work supported by the Electrical Power Research Institute and are now supported by interested Japanese "new hydrogen energy" funds. Their work is continuing.

Fusion Resources and Future Energy Applied Technology were founded with private funds, obtained intellectual property rights on cold fusion, laid the groundwork to obtain many other patent rights (including the Pons and Fleischmann patents) and were merged into ENECO, Inc. **all with private funds and no hassle with government funds, government-required reports, and arguments over ownership of rights.**

Jet Technology and Clean Energy Technologies, Inc. have both been supported by private funds and both are emerging with advanced new hydrogen energy systems that can be sold to qualified buyers. All of this progress has been accomplished with private capital. None of these companies are beholden to any government agency nor to any political party or group.

The anti-cold fusion group (whoever they are) are now witnessing the free-market development of a world-girdling

(30 countries) effort that has gradually developed a whole new energy science. By rapid means of communication, this world group has been mutually encouraged by their continuing progress. Many scientists, engineers, inventors, and investing entities have worked apart from the standard academic, industrial, government community but with sacrifice, hard work, and long hours they have advanced this new industry.

### What would you change?

Several cold fusion scientists invested their intellectual property and some of their money as founders of a corporation. Their investment has multiplied dramatically. Would they have been better off to have worked under government funding? Would you change the way the patent office has prevented cold fusion patents from issuing? The strong resistance from the patent office has forced many inventors to spend time in proving their inventions. On the negative side, the official position of the patent office has been a great deterrent to many U.S. corporations from investing in cold fusion. Therefore, smaller groups have taken the risk and have invested in the development of cold fusion. Now the rewards are going to those who were leaders in this technology. Thanks to the negative treatment by the patent office, those having a greater entrepreneurial ability and a studied interest in this new technology have taken over the leadership from the "big boys" with their millions of R & D dollars but with little entrepreneurial spirit.

The end results of this many-faceted tale of progress are expected to be the following:

1. The Office of Patents and Trademarks will be severely reprimanded and will be reorganized to better serve new science.
2. The international community of scientists will become much more tolerant of new discoveries, especially when these new discoveries stem from highly capable scientists operating either in their own disciplines or in interdisciplinary research.
3. Major news media will be less inclined to trust those scientists who exhibit strong "it can't be done" attitudes.
4. Large segments of government funded research will be prevented from becoming the sole advisors to those departments providing research funds.

5. Publishers will take greater care in publishing the works of paid "hatchet-men authors."

6. Major universities will have to regain their credibility with the media and with the citizenry in general because of the strong efforts made by university lobbyists to destroy perceived competition.

7. The media will revisit the warnings of Eisenhower about the "government-industrial complex" but change to the "government-academic lobbyists complex" in vying for research funds.

8. A new and younger leadership in both academia and corporations will replace the older scientists and engineers who have been mired in the intellectual past.

9. The most important change will be the challenges, especially by younger scientists, to the outmoded models of atomic theory, low-energy nuclear reactions, and the empty ether.

10. New textbooks will be written with strong support for the means to overcome the Coulomb barrier, for low-energy transmutation, for an energetic ether, for the abandonment of the special theory of relativity, and suggesting a more open-minded approach to anti-gravity, biological transmutations, tapping space energy, and alternatives to the Big Bang hypothesis. Action at a distance will be replaced with forces in an energetic ether. Magnetism will be more intensely studied as an interaction between magnetic materials and space energy. Transmutation will no longer be denied but will be studied in research labs. A universal theory coupling electricity, magnetics, gravity, inertia, and the structure of matter will emerge from this intense activity.

**Isn't that worth the struggle?** The proponents of new energy science have won not just the battle but the war. To the victors belong the spoils. The Office of Patents and Trademarks will again serve inventors. Government management of new science will be restructured. The peer-review system will be revised. The cold-fusion scientists will be the new scientific leaders. Most of the thermonuclear scientists and engineers will join to develop this new science. Those who are incapable of accepting new science and new models will retire. In retrospect, what would you have changed?

In the slightly modified words of Thomas Gray:

No farther seek their merits to disclose,  
Or draw their frailties from their dread abode,  
(There they alike in trembling hope repose),

Retired to their models and their God.  
*Elegy written in a Country Churchyard*

#### D. THE THIRD RUSSIAN CONFERENCE ON COLD FUSION AND NUCLEAR TRANSMUTATION

Courtesy of Valery Sarkisov

The Third Russian Conference on Cold Fusion and Nuclear Transmutation (RCCF-3) took place in Dagomis near Sochy ("OLIMPISKY" tourist hotel) on October 2-7, 1995.

The Conference was organized by ERZION Scientific and Research Center of Physical and Technical Problems. It was held under the aegis of Russian Academy of Science, Russian Physical Society, International Nuclear Society (Moscow), State Committee for High Education of Russia and Moscow State University.

Forty participants took part on the RCCF-3. They represented Russia, Ukraine, Belarus, USA, France, Japan. The Conference was attended by the representatives of commercial corporations Mitsubishi, Honda (Japan) and OIC (USA).

Twenty-eight reports covering the results of theoretical (9) and experimental (19) works were presented on the Conference, and 4 reports concerned applied problems of CF.

In 15 works the nuclear products registration was reported. The experiments were carried out in gas and the neutron and gamma-rays as well as new chemical elements and isotopes were measured (the reports of A. Lipson, I. Savvatimova, A. Karabut, N. Samsonenko, T. Itoh and the others). The targets were either made of simple elements (Pd, Nb) or made up of compounds (stainless steel, ferroelectric, tungsten bronze).

It was for the first time that the reports devoted to sonoluminescence and cavitation were discussed on the Russian CF Conference (P. Goloubnichy, Yu. Bazhutov, Yu. Koldomasov). The latter announced such a large amount of He produced in the experiment that could correspond up to 20-fold excess heat.

Yuri Bazhutov showed the high reliability of getting the neutrons, tritium and radiocarbon, which is rather perspective as to using the internal nuclear energy in some specific hydraulic heat generators. The same problem was touched by K. Fukushima who tried to give the theoretical grounds for extremely high temperature (up to  $10^8$  K) of the gas in the bubbles of the cavitating liquid.

Only two reports were devoted to excess heat (M. McKubre, A. Karabut). This time Michael McKubre analyzed the reproducibility of the CF experiments as a result of combined influence of some input factors: the electrolysis current density, the degree of Pd-electrode deuterization and its rate of change.

The main theoretical reports concerned the models that aspire to completely describe CF and which were presented to the previous Conference: the Unitary quantum theory (Lev Sapogin), the auto-oscillatory quantum model (Victor Shadrin), the Erzion model of catalytical nuclear transmutation (Yuri Bazhutov). But now the reporters stressed the validity of their models to explain some natural phenomena including ball lightning. Valery Koretsky further developed (in the frame of the Erzion model) his rather important idea of burning out the most dangerous isotopes that are constituents of radioactive wastes.

The discussions were continued about the possible ways of nuclei overcoming the Coulomb barrier (N. Samsonenko, A. Buliga, T. Chubb, USA) and about the conditions for neutron-nuclear interactions in the crystal lattice (H. Kozima, Japan).

J-P Mollot (France) analyzed the present state of the art of research on CF in France. Then R. Smith, H. Kozima and V. Sepanov looked into detailed possible ways to increase the financing of CF researches on the basis of international cooperation.

Robert Smith (Oakton Int. Corp., USA) proposed establishing of an International Cold Fusion Research Organization (ICFRO) like International Atomic Energy Agency (Vienna, Austria) to "eliminate cold fusion chaos and become highly organized" and put forward a program of its initial activity.

On the closing meeting of the Conference, a general discussion took place that involved also the results of ICCF-5 in Monaco (Apr. 95).

Yuri Bazhutov  
Deputy Chairman of the Organizing Committee  
Valery Koretsky  
Coordinator of the Organizing Committee of RCCF

## E. A DIFFERENCE OF OPINION

### EDITOR'S INTRODUCTION

It is appropriate that the following two articles were published in the same issue of Fusion Technology. Both Miles and Shkish are brilliant, well educated, and careful

experimenters. In one paper, Miles et. al reports in detail how their experiment produced excess thermal energy. The other paper carefully shows that even the long-standing scientific understanding of electrolysis has some surprises. The second paper, regardless of the capability of its authors, shows negative results in obtaining excess thermal energy. Fortunately for the growth of the "new hydrogen energy" industry, the problems of replication have been solved, and **the amount of excess thermal energy is far above any experimental errors. If you observe the protocols, the Patterson Power Cell™ works every time. And the same is true for the light water electrochemical cells offered for sale by Jet Technology.**

### PENNSYLVANIA - HYDRINOS

Randell Mills and William R. Good (HydroCatalysis Power Corp., Malvern), "Fractional Quantum Energy Levels of Hydrogen," *Fusion Technology*, vol 28, no 4, Nov. 1995, pp 1697-1719, 19 ref, 15 figs, 10 tables.

### AUTHORS' ABSTRACT

Report is made of the detection of atomic hydrogen in fractional quantum energy levels below the traditional "ground" state - hydrinos - by X-ray photoelectron spectroscopy and by a reinterpretation of soft X-ray emissions for the interstellar medium. Hydrino formation occurs with the release of energy on nickel cathodes during the electrolysis of aqueous potassium carbonate. The detection of a new molecular species - the diatomic hydrino molecule - by high-resolution mass spectroscopy is also reported.

### AUTHORS' SUMMARY

Excess power and heat were observed during the electrolysis of aqueous potassium carbonate. Flow calorimetry of pulsed current electrolysis of aqueous potassium carbonate at a nickel cathode was performed in a single-cell Dewar. The average power out of 24.6 W exceeded the average input power (voltage times current) of 4.73 W by a factor  $> 5$ . The total input energy (integration of voltage times current) over the entire duration of the experiment was 5.72 MJ; whereas, the total output energy was 29.8 MJ. No excess heat was observed when the electrolyte was changed from potassium carbonate to sodium carbonate. The source of heat is assigned to the electrocatalytic, exothermic reaction whereby the electrons of hydrogen atoms are induced to undergo transitions to quantized energy levels below the conventional "ground state." These lower energy states correspond to fractional quantum numbers;  $n = 1/2, 1/3, 1/4, \dots$  Transitions to these lower energy states are stimulated

in the presence of pairs of potassium ions ( $K^+/K^+$  electrocatalytic couple) which provide 27.2-eV energy sinks.

We report the identification of the  $n = 1/2$  hydrogen atom, H ( $n=1/2$ ). Samples of the nickel cathodes of aqueous potassium carbonate electrolytic cells and aqueous sodium carbonate electrolytic cells were analyzed by XPS. A broad peak centered at 54.6 eV was present only in the cases of the potassium carbonate cells. The binding energy (in vacuum) of H( $n=1/2$ ) is 54.4 eV. Thus, the theoretical and measured binding energies for H( $n=1/2$ ) are in excellent agreement.

---

## MASSACHUSETTS - NUL RESULTS

Zvi Shkedi, Robert C. McDonald, John J. Breen, Stephen J. Maguire, and Joe Veranth (Bose Corp., Framingham, MA), "Calorimetry, Excess Heat, and Faraday Efficiency in Ni-H<sub>2</sub>O Electrolytic Cells," *Fusion Technology*, vol 28, no 4, Nov. 1995, pp 1720-1731, 15 refs, 5 figs, 5 tables.

### AUTHORS' ABSTRACT

Apparent excess heat is observed in light water electrolytic cells containing a variety of nickel cathodes, a platinum anode, and an electrolyte of K<sub>2</sub>CO<sub>3</sub> in H<sub>2</sub>O. High-accuracy calorimetric measurements show apparent excess heat in the range of 15 to 36% of input power if a 100% Faraday efficiency is assumed for H<sub>2</sub> and O<sub>2</sub> gas release. The H<sub>2</sub> and O<sub>2</sub> gases released during electrolysis are recombined in a vessel external to the cell, and the quantity of recombined H<sub>2</sub>O expected from 100% efficient electrolysis. The measured Faraday efficiency is shown to be significantly < 100%, and conventional chemistry can account for the entire amount of observed apparent excess heat to within an accuracy of better than 0.5%.

### AUTHORS' SUMMARY

Even though this research was not intended to test the validity of the Mills and Kneizys theory, the results obtained lead to a clear conclusion as to whether or not the postulated "hydrino" atoms or molecules were formed. If "dihydrino molecules that do not combine with oxygen" were to be formed as postulated by this theory, the gas monitor should have detected an anomalous increase in the overall gas volume of the cell/recombination-vessel system. That lack of any volume increase beyond the reported 0.6% of recombined inefficiency, combined with the fact that the overall energy input and output are balanced to within better than 0.5%, preclude formation of any such novel atoms or molecules in these cells.

The application of highly accurate and rigorous calorimetry as presented in this research combined with proper accounting for the actual Faraday efficiency clearly indicate that the apparent excess heat observed in these experiments is a result of neglected conventional chemistry. This conclusion is supported by the lack of any excess heat in the closed cells as well.

Finally, in the heavy water arena, we have performed many experiments involving the original Pd-D<sub>2</sub>O Fleischmann and Pons configuration. None of these experiments revealed the presence of excess heat, so no conclusions could be drawn regarding a reduced Faraday efficiency as a possible source of apparent excess heat in heavy water cells. Therefore, the following question still remains open: Are the conditions that give rise to apparent excess heat in heavy water cells the same conditions that cause an equivalent reduction in the Faraday efficiency? To find out whether excess heat in heavy water cells can also be explained by simple chemistry, all reports claiming the observation of excess heat should be accompanied by simultaneous measurements of the actual Faraday efficiency.

### EDITOR'S COMMENTS

The lesson to be learned may be: If you are going to experiment with cold fusion, start with a close working relationship with successful researchers in the field who use controls and have established successful protocols, such as Bush and Eagleton, Pons and Fleischmann, Mitchell Swartz, or James Patterson and Dennis Cravens.

---

## F. NEWS FROM THE U.S.

### COLD FUSION TIMES CONTENTS

Some of the articles included in the Fall issue (vol 3, no 3) of this magazine are:

"Japan Further Increases Investment in R&D," Japan has upped its ante in the cold fusion arena to more than \$90 million for the upcoming fiscal period. What will happen to the laggard U.S.

"GOP Leads U.S. Investigations into Cold Fusion" Although Congress is ready to slash the science budget by one-third, the House Science Committee's new head, Rep. Robert Walker (R, Penn.) said "I'm also especially interested in the so-called cold fusion area.... The hydrogen bill sets aside some monies to go into highly innovative research such as this."

"The Current Shift in Energy Generation" Hot Fission/Fusion are dying fields, with dwindling appropriations and staggering piles of "hot" refuse. The ITER facility in Europe has only three years use projection on its walls, before they become too radioactive to be used and must be replaced, resulting in another hundred tons of nuclear waste. Even the best output that the massively expensive facilities can do, has been exceeded (percentage-wise) by cold fusion. Congress is beginning to have a look at the "new" cold fusion results.

"Jed Rothwell's Recommended References on Cold Fusion" Jed Rothwell gives a list of papers, publications and media coverage that has looked at cold fusion in a positive light. Directed reading for the energy beginner. [He includes *FF*.]

"Some Experiments on the Variation of the Radioactivity of Tritium Absorbed by Titanium" by Otto Reifenschweiler, Netherlands.

"The Business of Cold Fusion" by Jed Rothwell. *Cold Fusion Times* winner for the Best ICCF-5 Report (excerpted in this *CFT* issue.)

"IEEE Endorses Fusion Research" Excerpts from the IEEE-USA Energy Policy Committee Entity Position Statement of Fusion Power. They say that their vision emphasizes energy efficiency and conservation, and a diversification of energy sources, including types usually labeled as renewables, and (of course, emphasized) nuclear energy.

---

## WASHINGTON D.C. - COLD FUSION LECTURE

Lecture: "Whatever Happened to Cold Fusion?" *Cold Fusion Times*, vol 3, no 3, Fall 1995, p 10.

David Nagel, Superintendent of the Condensed Matter and Radiation Sciences Division, U.S. Naval Research Lab. (NRL), scheduled a lecture on cold fusion at The Philosophical Society of Washington, on Friday, 20 October 1995. The Society took a quantum leap in its knowledge of this field in this second talk on the subject. The first had been a previous talk by Talbott Chubb.

Excerpts: "Cold Fusion is now ignored, disdained and even mocked by scientists and the public. This is due to a variety of mistakes by scientists and the government, and the unwillingness of journal, magazine and newspaper editors to pay attention to this topic. But, does this mean that nothing is being done, or should be done, in response to questions raised by work on cold fusion? Several hundred people worldwide are spending full or part time trying to get to the bottom on the mysteries which followed from the 1989

announcement by Pons and Fleischmann. The fifth international conference in Europe earlier this year attracted 200 people, half of them with industrial connections, mainly from Japan, Italy, France, and the U.S."

"There are active programs in Russia, India, and China. A framework for organizing work on cold fusion will be presented, along with some of the data which cannot, in the opinion of the speaker, be attributed to fraud or error. If correct, these data would strongly indicate that nuclear reactions are behind some of the observations."

"They do not support the view that such reactions are ordinary fusion; hence, "cold fusion" is merely a label and not an assertion of what is happening. It will be argued that government funding of work in this area would not be wasteful, since hydrogen science and technology are accepted fields of inquiry. They form the basis of a large and growing industry in the U.S. and abroad."

---

## CALIFORNIA - METAL HYDRIDE ANODES

Ratnakumar V. Bugga & Gerald Halpert (Caltech, for JPL), "Optimizing Misch-Metal Compositions in Metal Hydride Anodes," *NASA Tech Briefs*, Nov 1995, Vol 19, No 11, pg 51, 1 table, 1 fig.

### EDITOR'S SUMMARY

"Optimization of compositions promotes retention of charge and discharge capacities," is the one-line abstract. Work seeks to maximize charge/discharge cycles by finding optimum anode compositions. Misch metal (natural alloy of La, Ce, Nd, & Pr) alloyed with combinations of Ni, Co, Mn, and Al were studied. A table in the article shows that the storage capacities were smaller for anodes in which La content was relatively high. Best results for smaller amounts of La is explained by the decrease in equilibrium pressure upon the substitution of Ce for La in the alloys. Optimum contents appear to be in the range of 25 to 30 percent for La and 50 to 55 mole percent for Ce.

---

## CALIFORNIA - THERMOVOLTAIC MATERIALS

Tong Ong, et. al (Martin Marietta for JPL), "Low-Bandgap Thermovoltaic Materials and Devices," *NASA Tech Briefs*, Nov 1995, vol 19, no 11, pp 36-37, 1 table, 1 fig.

### EDITOR'S SUMMARY

This article proposes various alloys of gallium, arsenic, indium, antimony, and aluminum (the semiconductor compounds from the periods III and V of the periodic table). Descriptions of several alloys are given together with a discussion of the best various deposition techniques by which the proposed thermovoltaic devices can be made. The authors suggest that high efficiencies can be achieved at lower temperatures. This article may be of interest to those involved in systems proposed to produce electrical energy from "new hydrogen energy" devices.

---

### FLORIDA - MAGNETIC HEAT PUMP

Frank S. Howard (Kennedy Space Center), "Magnetic Heat Pump Containing Flow Diverters," *NASA Tech Briefs*, Nov 1995, vol 19, no 11, pp 81-82, 1 fig.

#### EDITOR'S SUMMARY

"Flows that mix heated and cooled fluid would be suppressed," is the one-line abstract. The basic concept is that a magnetic field in a heat pump is designed so that internal flows that tend to mix hot and cold portions of the pumped liquid would be suppressed. The details of the proposed pump mechanism is clearly displayed in the figure accompanying the article. No details are provided on anticipated efficiency of such a heat pump.

---

### INDIANA - OPTICAL THEOREM & NUCLEAR INTERACTION

Courtesy of Dr. Yeong Kim

Y.E. Kim and A.L. Zubarev (Dept. of Phys., Purdue Univ., IN), "Optical Theorem and Effective Finite-Range Nuclear Interaction for Low-Energy Nuclear-Fusion Reactions," *Il Nuovo Cimento*, vol 108 A, no 8, August 1995, pp 1009-1025, 37 refs.

#### AUTHORS' SUMMARY

We describe a new improved formulation of low-energy nuclear-fusion reactions based on the optical theorem. Our formulation is much less model dependent than previous theoretical approaches. We obtain an analytic formula for the cross-section,  $\sigma(E)$ , which exhibits explicitly the energy and charge dependence of  $\sigma(E)$ . The formula indicates that some of the anomalous effects observed in deuterated metals may be justified theoretically if the imaginary part of the effective nuclear interaction in the elastic channel has a very weak component with a long finite interaction range.

#### AUTHORS' CONCLUSIONS

Our improved formulation of low-energy nuclear reactions based on the optical theorem yields nearly model-independent and more rigorous description of nuclear-fusion cross-sections than the conventional formulations. In particular, we obtain an enhancement factor due to the finite-range interaction in the imaginary part of the effective potential in the elastic channel at low energies. If the interaction range is large, a near cancellation of the Gamow factor can occur yielding enormously enhanced cross-section for nuclear-fusion reactions at low energies.

If such a long-finite-range interaction with extremely weak strength exists, the conventional description of nuclear-fusion reactions at higher energies ( $\geq 1$  keV for  $d + d$  and  $\geq 1$  MeV for  $d + Pd$  and  $p + Pd$ ) is not altered, but enormous enhancement of the fusion cross-section can occur due to a near cancellation of the Gamow factor and leads to the surprising result that the fusion cross-section for nuclei with larger values of  $Z$  can be comparable or much greater than that for nuclei with smaller  $Z$ , contrary to the otherwise commonly accepted belief. The cold-fusion phenomena may be due to nuclear-fusion reactions involving heavy nuclei with high- $Z$  and small- $Q$  values. There may be many candidate nuclear-fusion reactions which fit to the above description and need to be investigated and sorted out as the experimental data become more reliable and reproducible at 100% level.

At present, we cannot prove nor rule out theoretically the existence of such a long finite-range interaction for the imaginary part of the effective potential in the elastic channel for nuclear-fusion reactions, although there are some other known examples of long-range interactions for the real and imaginary parts of the effective potential, such as for the cases of the electric (real part) and dynamic (imaginary part) polarization potentials and Efimov effect. If it turns out that such a long finite-range interaction for nuclear-fusion reactions exists in nature, it will open up a new scientific frontier in nuclear physics with important consequences. Therefore it is very important to investigate theoretically and experimentally the interaction range of the imaginary part of the effective potential in the elastic channel for fusion reactions.

[Note: A similar paper was presented at ICCF-5, see *FF*, May 1995.]

---

**NORTH CAROLINA - ELECTROSTATIC FORCE**

Charles Yost, R. Steven Hall (Electronic Spacecraft, Inc., Leichester), "Electrostatic Force Flow Visualization," *Electric Spacecraft J.*, issue 16, Oct 1995, pp 7-19, 36 figs.

**AUTHORS' INTRODUCTION**

Experiments with the Dynamic Systems, Inc. Holtz/ Wimhurst generator that provide flow visualization and microscopic details of electric forces. A fine, coherent thread of air motion emitting from a negatively-charged electrostatic point, has been discovered here using sensitive, Schlieren optical visualization techniques.

The thread emission remains stable for eight to 10" in length, and coherent within a 0.01" diameter. It resembles a tiny stream of water issuing from a small hole. It appears related to the phenomenon of "electric wind," differing, however, in that it is extremely coherent as a threadlike chain.

Microscopic examination of the emitting electrode suggests that the coherent stream is created and accelerated in a 0.001" dark gap (deep violet in color) between the aluminum point electrode and the bluish-red coronal brush.

[This editor suggests that these authors are visualizing a flow of high-density charge clusters (alá Ken Shoulders).]

**G. NEWS FROM ABROAD****AUSTRALIA - NO HEAT PRODUCTION**

*Chemical Abstracts*, vol 123, no 8

T.A. Green, T.I. Quickenden (Dept. Chem., U. Western Aust., Nedlands, WA, Australia), "Calorimetric Studies of Highly Loaded Deuterides and Hydrides of Palladium," *J. Electroanal. Chem.*, vol 389, no 1-2, 1995, pp 91-103.

**AUTHORS' CONCLUSION**

This study involved a search for excess heat production from palladium cathodes that had been highly loaded with deuterium. The major aim of this study was to attempt to verify the earlier findings of McKubre and coworkers and Hasegawa and coworkers, who have reported reproducible excess heat production when (amongst other conditions) the D/Pd loading ratio exceeds a threshold value of about 0.85-0.90. However, despite the achievement of D/Pd loading ratios in excess of 0.90 and the satisfaction of other requirements relating to the experimental duration and current density, no evidence for any excess heat production was found in any of the experiments within the estimated

experimental error of  $\pm 1.5\%$ . Therefore, it would appear that additional experimental requirements (not presently understood) may have to be satisfied before excess heat can be observed in the Pd + D system.

[Some Pd samples work, many do not. Ed.]

**HUNGARY - CONSTANT C?**

Courtesy of author.

László Gazdag (Janus Pannonium University, Pécs, Hungary), "Einstein's second postulate," *Speculations in Science and Technology*, Vol 18, 1995, pp 150-152, 1 fig.

**EDITOR'S SUMMARY**

Gazdag looks at Einstein's special theory of relativity, built on two postulates: 1) All motion is relative, and 2) The speed of light is constant in all inertial systems. The second postulate "goes against all reason." Gazdag cites the work of Piotr Kapica who insisted that physics needs to progress in 1) sources of energy & 2) low-energy condensed media. The first produced atom bombs, the second is yet to be properly explored. Kapica, by ingenious experiments, showed that there is no compensation of energy levels in superfluid liquid helium and "that particles, in various states of motion and independent of time, are found in it [superfluid helium]." Gazdag proposes that the ether exists and that it has a similarity to a superfluid wherein light [electromagnetic radiation] causes many states of motion with different propagation speeds. Gazdag suggests, "Let us assume that every observer can only see a wave from the spectrum which propagates with  $c$  velocity exactly at that moment in relation to himself. Michelson and Morley, therefore, did not observe the same waves during the two adjustments of the interferometer. This is only possible if we accept that the frequency spectrum of waves at different velocities is always the same using a given light source." By use of this model, Gazdag suggests that the ether exists, has characteristics of being super-fine (so bodies can move through it) and be able to transmit light like a solid transparent body (to support the transverse waves of light.) Gazdag has written a book, *Beyond the Theory of Relativity*, which has been published in Hungarian. He is looking for an English-language publisher for his book. In this book he develops his "hydrodynamic gravitation model based on superfluidity."

**INDIA- HIGH MULTIPLICITY BURSTS**

A. Shyam, M. Srinivasan, T.C. Kaushik, L.V. Kulkarni (Neutron Phys. Div., Bhabha Atm. Res. Ctr., Trombay,

India), "Observation of High Multiplicity Bursts of Neutrons During Electrolysis of Heavy Water with Palladium Cathode Using the Dead-time Filtering Technique," *"Cold Fusion,"* issue 14, 1995, pp 15-19, 3 refs, 6 figs, 2 tables.

#### AUTHORS' ABSTRACT

A series of experiments were carried out to detect production of neutrons from a commercial palladium-nickel electrolytic cell operated with 0.1 M LiOH or LiOD as the electrolyte at a current density of  $\approx 80$  mA/cm<sup>2</sup>. Neutron emission was monitored using a bank of 16 BF<sub>3</sub> detectors embedded in a cylindrical moderator assembly. A dead-time filtering technique was employed to detect the presence of neutron "bursts," if any, and characterize the multiplicity distribution of such neutron bursts. It was found that, with an operating Pd-D<sub>2</sub>O cell located in the center of the neutron detection setup, the daily average neutron count rate increased by about 9% throughout a one-month period, over the background value of  $\approx 2386$  counts/day indicating an average daily neutron production of  $\approx 2220$  neutrons/day by the cell. In addition, analysis of the dead-time filtered counts data indicated that about 6.5% of these neutrons were emitted in the form of bursts of 20 to 100 neutrons each. On an average, there were an additional six burst events per day during electrolysis with LiOD over the daily average background burst rate of 1.7 bursts/day. The frequency of occurrence of burst events as well as their multiplicity was significantly higher with D<sub>2</sub>O + LiOD in the cell when compared with background runs as also light water "control" runs.

#### INDIA - TRITIUM GENERATION FROM NICKEL

T.K. Sankaranarayanan, M.B. Bajpai, D.S. Gupta (Chem. Eng. Div.), M. Srinivasan (Neutron Phys. Div., Bhabha Atm. Res. Ctr., Trombay, India), "Evidence for Tritium Generation in Self-heated Nickel Wires Subjected to Hydrogen Gas Absorption/desorption Cycles," *"Cold Fusion,"* issue 14, 1995, pp 12-15, 10 refs, 3 figs, 2 tables.

#### AUTHORS' ABSTRACT

The loading characteristics of hydrogen gas in electrically self-heated nickel wires were investigated with a view to maximize hydrogen absorption and thereafter "trigger" it to generate anomalous excess heat, as reported by Focardi et. al, in early 1994. The nickel wires were found to absorb substantial quantity of hydrogen following several alternate cycles of absorption/desorption. But calorimetric studies conducted with the system so far indicate that we have not succeeded in triggering excess heat generation. However, on

dissolution and counting using standard liquid scintillation techniques, a number of hydrogen loaded nickel wires were found to contain tritium in the range of 3 Bq to 2333 Bq. This finding corroborates the detection of tritium in light water solutions electrolyzed by nickel cathodes reported by the authors first at ICCF-3, and again at ICCF-4, confirming the occurrence of anomalous nuclear reactions in nickel-hydrogen systems.

#### INDIA - LOADING/UNLOADING PROTOCOL

A.B. Garg, R.K. Rout, M. Srinivasan, A. Shyam, L.V. Kulkarni (Neutron Phys. Div., Bhabha Atm. Res. Ctr., Trombay, India), T.K. Sankaranarayanan (Chem. Eng. Div.), "Protocol for Controlled and Rapid Loading/Unloading of H<sub>2</sub>/D<sub>2</sub> Gas in Self-heated Pd Wires to Trigger Nuclear Events," *"Cold Fusion,"* issue 14, 1995, pp 9-12, 3 refs, 4 figs.

#### AUTHORS' INTRODUCTION

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

#### ROMANIA - ELECTRON SCREENING

Dan Chicea (Univ. Sibiu, Phys. Dept., Sibiu), "Electron Screening and Cold Fusion in Condensed Matter," *"Cold Fusion,"* issue 14, 1995, pp 2-3, 5 refs, 2 figs.

#### AUTHOR'S ABSTRACT

A very simple model for assessing the electron concentrations in metals due to the capacitor effect is developed. The electron over-concentrations on the grained surface of the metal which is the subject of a negative



electric voltage, are computed for several values of the grain dimensions, as reported in the literature.

A plasma-like way for describing the screening of the coulomb barrier is used. The probability of the screened coulomb barrier penetration, for several incident ion energies in a large range of electron concentrations, is presented.

The ampere force computation for a capacitor discharge on a solid fiber containing deuterium at high concentrations has been done and the energy increase of the ions trapped in the lattice caused by these forces has been estimated.

The nuclear fusion cross section, increased by strong electron screening in the presence of an ion acceleration mechanism cannot reach sufficiently high values to stand alone as an explanation for the heat reported in the cold fusion experiments, but can explain the low level of radiation and nuclear fusion "ashes" detected in some experiments.

---

## RUSSIA - GEOLOGIC COLD FUSION

G.V. Fedorovich (Rus. Acad. Sci., Theoretical Problem Dept., Moscow), "The Possible Nature of Cold Fusion in the Earth's Mantle," *Fusion Technology*, Nov 1995, vol 28, no 4, pp 1749-1762, 34 refs, 7 figs, 1 table.

### AUTHOR'S ABSTRACT

The effects that accompany mechanical deformations (intensive slip, crack, and break formation) of crystalline media are considered. Using the concept of parametric resonance in deuterium nuclear layers, the mechanism is shown whereby processes characterized by energies  $\leq 1$  eV can lead to effects that are characterized by energies  $\geq 100$  eV. These processes take place in a zone of concentration of shearing stress at the moment of the formation of a tangential break of the media movement. The electron-ion interactions provide an added source of ion heating. Electrons are heated in an oscillation force field in the same manner as ions. The effect can be outlined as the formation of the plasma-like state on the crack boundary under mechanical fracture of crystals. This can be a possible cause of deuterium-proton fusion at room temperature in crystalline media.

---

## RUSSIA - METHOD FOR NEUTRON GENERATION

*Chemical Abstracts*, vol 123, no 8

E.G. Fateev (Inst. Prikl. Mekh., UORAN, Russia), "Possibility of Establishing a Mechanism for Neutron Generation during Mechanical Action on Deuterated

Materials," *Pis'ma Zh. Tekh. Fiz.*, vol 21, no 10, 1995, pp 48-52, in Russian.

### AUTHOR'S ABSTRACT

A discussion is given of the possibility of establishing a mechanism of neutron emission developing at the moment of rheological rupture or rheological-like rupture processes during impact loading on deuterated substances.

---

## H. PATENTS GRANTED

### PONS-FLEISCHMANN PATENT

***ENECO Receives Notice of Intent of Patent Grant from European Patent Office on Original Pons-Fleischmann Cold Fusion Invention***

Salt Lake City, Utah, October 30, 1995 -- Fred Jaeger, President of ENECO, Inc., today announced, "The European Patent Office has issued a Notice of Intent of patent grant on the original Pons-Fleischmann cold fusion patent." ENECO acquired the exclusive world-wide license rights to the Pons-Fleischmann cold fusion technology from the University of Utah in November, 1993, and has been pursuing patents in the U.S. and abroad on these technologies.

"The notice of intent of grant of the European patent is a significant milestone on ENECO's path of commercializing cold fusion devices," says Jaeger. "A significant amount of private and governmental cold fusion research continues to be aggressively pursued throughout Europe. Once the European patents issue, ENECO plans to capitalize on the economic strength of the European community through the sale of research and development licenses that will evolve into manufacturing licenses. The Pons/Fleischmann patents will be the pioneering patents in the cold fusion field."

US 5,372,688 "System for electrolysis of liquid electrolyte;" James A. Patterson; 14 Dec 1994; 2 Dec 1993. An electrolytic cell and method of electrolyzing and heating water containing a conductive salt in solution. The electrolytic cell includes a non-conductive housing having an inlet and an outlet and spaced apart first and second conductive foraminous grids connected within the housing. A plurality of non-conductive microspheres each having a uniformly thick outer conductive palladium layer thereon are positioned

within the housing in electrical contact with the first grid adjacent the inlet. An electric power source is operably connected across the first and second grids whereby electrical current flows between the grids whereby electrical current flows between the grids within the water solution.

JP 95 120,574; "Apparatus for generating heat by occluding heavy hydrogen in hydrogen-occluding metal;" Takayuki Takeuchi (Matsushita Electric Ind. Co. Ltd.); 12 May 1995, 26 Oct. 1993. The apparatus contains a means to detect the quantity of heavy hydrogen occluded in the hydrogen-occluding metal. Optionally, the apparatus may contain a means to detect  $\geq 1$  of radiation and nonradioactive particles generated from the surface of the metal. The heat-generating reaction can be carried out stably.

JP 95 113,885; "Cold nuclear fusion;" Akira Oota, 02 May 1995, 15 Oct. 1993. Cold fusion comprises the steps of (1) nonuniform occlusion of heavy hydrogen in a material made of different elements and (2) collision on deuterons with the material at ordinary temperature. The different elements are made of  $\leq 1 \mu\text{m}$  particles. AC current is applied to the material. A temperature difference is established at 2 ends of the material. Cold fusion can be generated easily with the production of a large amount of heat.

JP 95 146,387; "Generation of excess heat by ac electrolysis of heavy water;" Noboru Koyama, Hiroshi Hirasawa, Keiji Kunimatsu (Tekunoba Kk); 06 June 1995, 25 Nov. 1993. In a method using an H isotope-occluding metal as the cathode and occluding the D generated from the electrolysis of heavy water at the cathode to generate excess heat, a sine-wave alternating current having a fixed amplitude is superimposed on the direct current applied during electrolysis so that the D occlusion ratio (D/Pd) is continuously varied. Excess heat can be generated in a stable manner over a long time.

WO 95 12,883; "Glow discharge apparatus and methods providing prerequisites and testing for nuclear reactions;" John Marshall (ENECO Inc.); 11 May 1995; 01 Nov 1993. A method and apparatus are given for experimenting and testing cold fusion or other solid state nuclear reaction processes by means of achieving high pressures of solubilized light fusion elements in solid metal lattices from the gas phase. The apparatus uses an anode and cathode positioned in a chamber receptive of the fusion element gases to produce controlled conditions compatible with postulated cold fusion for laboratory and reactor purposes. Two electrode embodiments are disclosed for use in a glow

discharge mode of operation. The electrodes are thoroughly scrubbed of impurities by heating and sputtering prior to experimenting on cold fusion processes. The results of cold fusion experimentation are then monitored and controlled.

US 5,449,989 "Energy conversion system;" Paulo N. Correa, Alexandra N. Correa; 12 Sep 1995; 15 Apr 1993. An energy conversion device includes a discharge tube which is operated in a pulsed abnormal glow discharge regime in a double ported circuit. A direct current source connected to an input port provides electrical energy to initiate emission pulses, and a current sink in the form of an electrical energy storage or utilization device connected to the output port captures a least a substantial proportion of energy released by collapse of the emission pulses. [See following article by Dr. Aspden.]

## I. SHORT ARTICLES

### ENERGY FROM A COLD-CATHODE DISCHARGE: A 30-YEAR SAGA

By Dr. Harold Aspden

The experimental discovery reported in U.S. Patent 5,449,989 (Inventors: Paul N. Correa and Alexandra N. Correa) affords me great personal satisfaction because it confirms my efforts on a related theme. *FF* readers may find the following reminiscences of interest.

30 and more years ago I was researching the connection between the force of gravity and electrodynamics and in 1966 was ready to report a significant advance in that research. I published in that year the second edition of my book The Theory of Gravitation with a concluding chapter on the 'Electrodynamic Law of Force'. It discussed the anomalous forces discovered in the cold-cathode arc discharge and though saying that a full discussion was beyond the scope of that book it justified reference to the topic by explaining that this was "because the law of electrodynamics has the most immediate practical implications and that these were as important to mankind as understanding gravitation."

I knew that the secret of linking gravity with magnetism was wrapped up with the anomalous energy activity that powered those very powerful anomalous forces. I also knew (as one can see by reading about mercury vapor lamps and discharge processes on pp. 6-59 to 6-61 of Condon and Odishaw's 1967 second edition of the Handbook of Physics) that such "discharge tubes have a negative current-voltage characteristic; hence the current will increase without limit

for a constant applied voltage and the tube will be destroyed unless some means are taken to limit the current."

From my onward reading I found that physicists did not really understand the processes underlying these discharge phenomena and in 1977 I became bold enough to express my revolutionary opinions on the subject in a paper which, after close referee scrutiny and extension upon revision, was published in the *IEEE Transactions on Plasma Science* (p. 159, September 1977). To back up that publication and merely to assure independent publication of certain further practical implications I filed a U.K. patent application on August 18th 1977 which was later published as GB Patent Application No. 2,002,953.

It showed how the anomalous electrodynamic action could be harnessed to generate heat in an ion discharge chamber to yield power and how ions could be accelerated in a 'free energy' electrical charging process. I was then employed by IBM and it was not appropriate for me to venture into such a controversial technological diversion, even in my private time and at my own expense, but my conviction took precedence on that occasion and I assured IBM that I was merely aiming at a publication in my own name for the public record.

I am glad I did this because later I heard of the experimental breakthrough by Geoffrey M. Spence (U.S. Patent No. 4,772,816, issue date September 20, 1988). He generated electric power on an 'over-unity' basis by using an ion accelerator that allowed an electrodynamic build-up of energy to grow as a space charge which was then tapped to draw electrical power output. The device in its broader sense accorded with one of the claims of my earlier 1977 patent application. Perhaps, Spence's research, though sponsored, may be in limbo owing to his problems of electrode burn-out after several hours operation of the devices he built.

Also, I was further encouraged when the Russian *Novosti Press Release* in 1989 (No. 03NTO-890717CM04) drew attention to Professor Chernetskii's discharge device which had been verified as generating 3 kilowatts of power with a 700 watt input. I have been awaiting further news on that Russian research, but that news release also stated that a one megawatt sub-station at the Moscow Aviation Institute was 'burned-out' when the discharge currents in a 'powerful plasma unit' reached criticality and set up a superstrong current that went back into the network. Maybe that has deterred onward research!

More probably, however, much of the difficulty with this subject vests in the question put in the summary of that news release: "Where does this mysterious energy come from?"

So now we are confronted with the Canadian breakthrough and I am mindful also of the recent reports on Dr. Win Lambertson's apparatus, which I see as quite closely related. Also I well recall the 1988 New Energy Technology symposium held by the Planetary Association for Clean Energy (Quebec, 1988), where I met Leon Dragone, now deceased, who I understood to be a college science teacher. He there described his experiments which demonstrated the energy anomalies of setting up an oscillatory discharge through an inductor connected to feed a load through an arc discharge, the anomaly being that of negative heating or cooling transferring energy into an enhanced current activity in the cool (white arc: anomalous oscillation) discharge but not in the blue (hot arc: no oscillation) discharge. Dragone, I know, did other research on an over unity electric motor, which I believe warrants special scrutiny in our onward efforts.

Unquestionably, on the gas discharge theme, over-unity energy generation by a gain factor well exceeding 3:1 is in evidence from these various independent research pursuits. At last I can, from the data in U.S. Patent 5,449,989, begin to match experiment with the theory disclosed in my GB Patent Application No. 2,002,953.

The relevant formula on page 3 of that specification shows that ions tap 'free energy' to become accelerated 'anomalously' to speeds which increase with ion current  $i$  but are  $10^7$  cm/s when  $i$  is of the order of 5 or so amps. A discharge carried by ions (mass of the order of  $10^{-23}$  gm) moving at such a speed and conveying the current  $i$ , would then represent power (as kinetic energy to be absorbed against a back EMF) increasing in proportion to  $i^3$ , but of kilowatt order at 5 amps. The data in the Correa patent fit well with this interpretation and I am indeed gratified to see that my theoretical work is referenced in the patent specification as highly relevant background support.

**I really believe that, after 30 years, the link between 'free energy' and gravitation is now emerging.**

That Russian news release included the words "What if vacuum energy shows the road at last to the long-awaited Grand Unified theory?" I really believe that, after 30 years, the link between 'free energy' and gravitation is now emerging. Meanwhile, however, let us focus on the primary task of exploiting the new energy resource.

Harold Aspden  
Sabberton Research  
P.O. Box 35, Southampton S016 7RB, England.

## MEETING THE ONE-WATT CHALLENGE

By Hal Fox

During his presentation at the Second Symposium on New Energy, Dr. Hal Puthoff made a succinct challenge to those working to create energy devices that will force changes to our current limited scientific models. Puthoff capsulized the problem in his challenge for any of us to demonstrate a device in which at least one-watt of excess energy is clearly produced by creating a system that will provide its input energy requirements and deliver at least one watt to an external load.

### THE PATTERSON POWER CELL™

Clearly, the **one-watt challenge** can be met by a Patterson Power Cell™ producing seventy (or more) times as much thermal energy output compared with the electrical energy input. However, we must power the pre-heater (when used in the electrolyte circuit) and we must power the pump that circulates the electrolyte. It is certainly easy to provide an electric heater and to use an electric motor for powering the pump. **However, it is a big challenge to design an efficient thermal-to-electric converter.** The current state of the art for thermal-electric devices, operating at the relatively low temperatures currently being produced, have conversion efficiencies of about three to twelve percent.

**We have defined a system in which only an estimated ten percent of the excess heat need be used for the heating of the electrolyte and the pumping of the electrolyte.**

**Consider the following approach:** First, it is assumed that with a pressurized cell, the temperature of the electrolyte can easily be modified by changing the flow rate of the electrolyte through the reactor bed of plated spheres. The lower the flow rate, the more the temperature of the electrolyte will be increased. Also, the design of the planned heat exchanger can be used to control the input temperature of the electrolyte. Removing less heat will provide a higher input temperature of the electrolyte and will increase the power amplification factor through the reactor. Second, instead of using electrical energy to power the electrolyte circulating pump, use a small closed-cycle turbine driven by thermal energy from the heat exchanger (such as a Sterling engine). Such use of thermal energy is more efficient than standard thermo-electric converters. Therefore, we have defined a system in which only an estimated ten percent of the excess heat need be used for the heating of the electrolyte and the pumping of the electrolyte. We still

require electrical input power to operate the cell. With a power amplification factor of one hundred, we can even use a highly-inefficient thermo-electric converter to provide the required small amount of input electrical power.

### OTHER NEW ENERGY DEVICES

**The Gibsonville Effect Circuit:** One unexpected class of small energy devices are the non-inductive coils made of shielded wire, connected to diodes, and tucked into a metal pipe as reported by Samuel Faile and Nick Reiter [*New Energy News*, Oct. 1995, pp 7-9]. First, it is surprising that a non-inductive coil could pick up electrical energy. Second, it is more amazing that the use of shielded wire would not prevent the pickup of electrical energy. Third, why does the coil work better in a metal pipe, which would be expected to shield the coil.

**The Shoulder's High-Density Charge Cluster Device:** Although the Shoulders' device has been patented and the extensive patent information is publicly available, no groups except Kenneth Shoulders and his son Steve appear to be working on this important technology. In the U.S. Patent 5,018,180, Shoulders reports that over 30 times as much output compared to input energy has been measured.

**The Magnetic Resonance Amplifier Tests:** We have received copies of two official reports from independent laboratories that show power out ranging from 1.6 to over 4 times the input power to a magnetic resonance amplifier. One of the important factors in this device appears to be the type of magnetic material used as the core of the transformer. The transformer appears to be the most important component in this unusual energy-amplifying circuit.

**The Lambertson Circuit:** Although we have no independent tests of Dr. Wynn Lambertson's special circuit using a cermet (ceramic-metal) device, the latest reports from Lambertson appear to be very favorable.

### TWO MAJOR ENERGY SOURCES

There is no longer any reason to continue to deny the potential of new energy sources by making statements that it is against the Law of Conservation of Energy. This law has not been violated. The hypothesis (or model) of an empty space has been violated. **If we accept the fact of the existence of an energetic space, then we need only to transform space energy into useful forms of energy. Therefore, one of the two major new forms of energy that is now becoming available to the world is tapping the energy of space (also known as vacuum space energy or zero point energy).**

The second major new source of energy is cold nuclear fusion or as labeled by Dr. Edmund Storms, chemically-assisted nuclear reactions. The Patterson Power Cell™ (PPC) appears to provide thermal power by the nuclear reactions of lithium and hydrogen (or some other form of new hydrogen energy). Regardless of the exact nature of the source of power from this new patented development, the PPC is properly of the class of cold fusion devices.

*It is remarkable that after generations of dependency on fossil-fuels as our energy sources, we have - in one decade - opened the door to two major sources of new energy.*

The impact that these discoveries and inventions will have on our way of producing and consuming energy is going to be enormous [1]. One class of devices (cold fusion) will be able to provide thermal energy for all types of processes where heat is required. The other class of devices (space energy transformers) will be able to provide direct electrical energy at any point on or off this spaceship earth.

**A new age has begun, the clean energy age.** Not only have we met the one-watt challenge but also we have taken the first steps to meet the megawatt challenge to provide clean, inexhaustible, and inexpensive energy for the future. This generation (especially in America) has been the greatest consumers of energy that the world has ever known. Rather than be reduced to the choices between polluting our planet or reducing our use of energy, we now have a completely rational choice: to provide our children and our grandchildren with the means to further enhance their standards of living with essentially unlimited energy. **The energy sources for the next millenium and beyond have been discovered. Now our task is to make these energy sources available to every nation, kindred, tongue, and people.**

[1] Hal Fox, *Cold Fusion Impact in the Enhanced Energy Age*, c1992, published by Fusion Information Center, Salt Lake City, Utah. (The book includes a diskette with over 2500 (current to 1995) references to new energy literature.)

## J. LETTERS FROM OUR READERS

### LETTER FROM DR. HAROLD ASPDEN

#### The 102 Factor and Room Temperature Superconductivity

On p. 13 of *New Energy News*, October 1995, Dr. Samuel P. Faile drew attention to the recent Russian discovery of a superconductor effective at 371°K, very nearly the boiling point of water. Its molecular composition is  $\text{YBa}_2\text{Cu}_3\text{Se}_7$  and readers may wonder whether this fits my supergraviton theory referred to on pp. 2 and 3 of the same *NEN* issue.

The theory holds up very well. Note that selenium has replaced the more familiar oxygen component of the warm superconductor molecule. Selenium has a boiling point lower than the melting point of Y, Ba or Cu and this implies a selection among the adsorbed Se isotopes which might nucleate the body of the superconductor. The main isotope is  $^{80}\text{Se}$  (49% of the composition) and a cluster of 14  $^{80}\text{Se}$  has a group mass of 1120 nucleons or 11(101.82). Y is a single isotope species and Ba is 72%  $^{138}\text{Ba}$ . Copper is 69%  $^{63}\text{Cu}$  and 31%  $^{65}\text{Cu}$ . The addition of Y, Ba and Cu in the right proportions doping the  $^{80}\text{Se}$  superconductive domains can develop two molecular sub-groups, one comprising the three atoms  $^{138}\text{Ba}$ ,  $^{89}\text{Y}$ , and  $^{80}\text{Se}$  which accounts for 307 nucleons, and one comprising five atoms  $^{138}\text{Ba}$ ,  $^{80}\text{Se}$ ,  $^{65}\text{Cu}$ , and two  $^{63}\text{Cu}$ , which accounts for 409 nucleons.

One can then see that three 102 amu supergravitons are involved with the first group and four with the second, and that two of each group type formed by blending with the 14  $^{80}\text{Se}$  group will have the composition of two molecules formulated as  $\text{YBa}_2\text{Cu}_3\text{Se}_7$ . The overall mass of this molecule will be that of 1116 nucleons or 11(101.45) but the 371°K superconductivity is reported in 'variations' of this compound and one wonders whether  $^{79}\text{Se}$  is involved in the sub-group compositions to give 306 and 408 nucleon forms, both being more closely resonant with the 102 supergraviton, while the 14  $^{80}\text{Se}$  groups having the 101.82 resonance exist as separate domain formations.

I believe my theory holds its ground in explaining the basis of warm superconductivity for this latest 371°K discovery.

Since writing "Cold Fusion is a Live Issue" (*FF*, p. 2, October 1995), I had occasion to look up some of my writings in *Speculations in Science and Technology* where I first published the 102 supergraviton proposition and argued its connection with cold fusion (vol. 12, pp. 179-186; 1989) after filing my U.K. patent No. 2,231,195. It was in this same periodical (vol. 13, no 4 issue; 1990) that a sequence of nine contributions on the new energy theme appeared, including articles by Hal

Puthoff, Don Kelly, Moray King and Bruce DePalma, for which I had accepted the role as Guest Editor. Browsing back to vol. 3 on p. 127, I noticed an article by Solomon Goldfein on biological superconductors, which had escaped my past attention; it having been filed away several years before the excitement of warm superconductor era. It contained an interesting comment referring to an earlier paper by Alfred A. Wolf and Ernest H. Halpern, (*Proc. IEEE*, pp. 357-359, 1976), which was that, in theory, cholesterol molecules might form locating channels in which they might combine with  $\text{Na}^+$  to form a structure superconductive at 350°K. That was speculation but what was not speculation were the experimental facts reported in that *Proc. IEEE* paper, where it was disclosed that six different bile salts were superconductive, sodium dioxycholate having the highest transition temperature of 277°K.

Here was room temperature superconductivity of record in 1976, ten years before the discovery of the 77°K warm superconductor was announced! Moreover, the action was in substances in living matter in which Na is believed to experience cold fusion by transformation into Mg, the subject discussed by Goldfein!

I had, therefore, to check my 102 theory, first by adding  $\text{Na}^+$  to a cholesterol molecule in substitution for  $\text{H}^+$ , which adds 22 amu to cholesterol's listed molecular mass of 386.66 atomic mass units and seeing how many such molecules might be needed to assure a near-to-102 mass resonance. To my very great surprise I found that each such single unit has a mass of 408.66, which is 4 times 102.15. This is as near to the perfect resonance predicted theoretically (102.173) as I could ever have hoped for.

When I then checked the Wolf and Halpern paper at the university library, I found that before Na substitution the formula for the 277°K superconductor sodium dioxycholate is given as  $\text{C}_{24}\text{H}_{40}\text{O}_2$ , which has mass 360.6 amu. Adding 23 for Na and removing 1 for H gives 382.6, and combinations of four such sodium dioxycholate molecules in a group structure to form an ionic conductor channel has a mass of 1530.4 amu, which is 15 times 102.03. Again the case is proved!

With such background, to be discovered - not in mainstream physics journals - but in speculative publications and engineering publications, one wonders how many other discoveries pertaining to cold fusion and the new energy theme are buried deep in the published literature not read by physicists. It is indeed curious that the U.S. Patent Office accepted the proposal by the President of the USA to confer special status on patent applications relating to superconductivity as part of the drive forward on the new energy front, but has reacted contrary to the spirit of that proposal by

adopting an incredible posture of opposition on the cold fusion theme.

The developing situation will become quite hilarious in the eyes of future historians when events reveal that both warm superconductivity and cold nuclear fusion are a recognized part of the energy machine of the human body and that such facts were clearly expressed and are of published record in the 1974-1980 period in scientific papers or government reports authored by Solomon Goldfein (Material Technology Laboratory, Dept. of Army, Fort Belvoir, Virginia) and by Alfred A. Wolf and Ernest H. Halpern (David W. Taylor Naval Ship R&D Center, Annapolis, MD).

Harold Aspden  
Sabberton Publications P.O. Box 35,  
Southampton S016 7RB, England

---

### LETTER FROM DR. POSITIVE, JAPAN

31 October 1995

Der Nackte König

"Patterson Power Cell" would be a transparent gown for our respectable King, I fear...

[If] estimation of excess heat were a tricky magic by a demon, the demon might hide some extra energy behind the input:

- a) Heat due to exothermic reaction of absorption of hydrogen in spheres.
- b) Heat due to recombination (burning) of dissociated oxygen and hydrogen from water by catalytic reaction of sphere surfaces.
- c) Input power of pump and heater for circulating water.

Anyway, it can be called a kind of heat generator as well as a platinum pocket heater (a portable body warmer) which needs no power during operation. Behind the magic gown, the real situation should be revealed.

Who is the brave knight to tell the fact to der Nacket König and the Tailors?

Dr. Positive

---

### LETTER FROM ROMANIA

from Dr. Peter Glück

...The Potapov business was interrupted due to the bad results of Scott Little and Gene Mallove (which I believe) and of some others (which I doubt!). Chris Tinsley was at St. Petersburg, but the actual tests will come only some weeks

later. Communication is rather difficult, here the Internet is rapidly expanding but there are a lot of problems with the phone lines.

Yuri Potapov has invited me to join him when he will travel to the U.S. as his helper, translator and friend, but this seems to be impossible due to lack of money and to the bad situation with the tests. Anyway, I am firmly convinced that the Yasmars are overunity and Potapov has other, even more efficient devices.

I am very discontented with the situation in the field of cold fusion, there is no coordination, no strategy, perhaps you personally [the editor] could organize a more efficient form of conference where real discussions are possible. The participation of theorists should be very restricted, only the really realistic and clever ones should be invited. You know that I am convinced that NOW no 'hard' theory is possible and the correct way is that of Potapov and Patterson -- to construct a working device, improve it, and find an explanation later. There's no other way to cope with the situation, even if by some miracle, everybody will accept cold fusion. What is your opinion?

/s/ Dr. Peter Glück

[Peter, I agree. Ed.]

## Commercial Column

The following companies (listed alphabetically) are commercializing cold fusion or other enhanced energy devices:

### COMPANY: PRODUCT

**American Cold Fusion Engineering and Supply:** Information and troubleshooting for the fusion research and development industry. Sacramento, California. The president, Warren Cooley, can be reached at 916/736-0104.

**CETI** (Clean Energy Technologies, Inc.): Developers of the Patterson Power Cell™. Dallas, Texas. Voice 214/458-7620, FAX 214/458-7690.

**ENECO:** Portfolio of intellectual property including over thirty patents issued or pending in cold nuclear fusion and other enhanced energy devices. Salt Lake City, Utah. Contact Fred Jaeger, Voice 801/583-2000, Fax 801/583-6245.

**E-Quest Sciences:** Exploring The Micro-Fusion™ process. Seeking qualified research partners for their sonoluminescence program. Contact Russ George, FAX 415/851-8489.

**Hydro Dynamics, Inc.:** Hydrosonic Pump, heat-producing systems using electrical input with thermal efficiencies of 110 to 125 percent. Rome, Georgia. Contact James Griggs, Voice 706/234-4111 Fax 706/234-0702.

**JET Technology:** Offering working cold fusion systems, calorimeters, electrodes, and other fusion research needs. Phone 617/239-8383.

**Nova Resources Group, Inc.:** Design and manufacture ETC (Electrolytic Thermal Cell); EG (commercial power cogeneration module); and IE (integrated electrolytic system). Denver, Colorado. Call Chip Ransford, Phone 303/433-5582.

**UV Enhanced Ultrasound:** Cold Fusion Principle being used for an ultrasonic water purifier. Hong Kong. FAX 852/2338-3057.

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

*"Cold Fusion"*, monthly newsletter, edited by Wayne Green, 70 Route 202N, Petersborough, NH 03458.

*Cold Fusion Times*, quarterly newsletter published by Dr. Mitchell Swartz, P.O. Box 81135, Wellesley Hills MA 02181.

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

*Fusion Facts* monthly newsletter: Salt Lake City, UT 801/583-6232, also publishes Cold Fusion Impact and Cold Fusion Source Book. Plans on-line database access for later in 1995.

*Fusion Technology*, Journal of the American Nuclear Society publishes journal articles on cold nuclear fusion. 555 N. Kensington Ave., La Grange Park, IL 60525.

*Infinite Energy*, new bi-monthly newsletter edited by Dr. Eugene Mallove (author of Fire from Ice), P.O. Box 2816, Concord, NH 03302-2816. 603-228-4516.

*New Energy News* monthly newsletter, edited by Hal Fox, Salt Lake City, UT 801/583-6232

*Planetary Association for Clean Energy Newsletter*, quarterly, edited by Dr. Andrew Michrowski. 100 Bronson Ave, # 1001, Ottawa, Ontario K1R 6G8, Canada.

*Space Energy Journal*, edited by Jim Kettner & Don Kelly, P.O. Box 11422, Clearwater, FL 34616.

*21st Century Science & Technology*, P.O. Box 16285, Washington, D.C., 20041. Includes cold fusion developments.

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

**FUSION FACTS STAFF & CORRESPONDENTS**

Hal Fox..... Editor-in-Chief  
 Robyn Harris..... Circulation  
 Dineh Torres..... Publication

**Technical Correspondents:**

Dr. Robert W. Bass, Registered Patent Agent,  
 Thousand Oaks, California  
 Dr. Dennis Cravens, Vernon, Texas  
 Dr. Samuel P. Faile, Cincinnati, Ohio  
 Avard F. Fairbanks, Resident Sr. Engineer  
 V.A. Filimonov, Minsk, Belarus  
 Dr. Peter Glück, Cluj-Napoca, Romania  
 Prof. Xing Zhong Li, Beijing, China  
 Dr. Takaaki Matsumoto, Hokkaido U., Japan  
 Jed Rothwell (Japanese Translations), Chamblee,  
 Georgia  
 Dr. Bruno Stella, Rome, Italy

**Fusion Facts Subscription Office**

P.O. Box 58639  
 Salt Lake City, UT 84158

Phone:  
 (801) 583-6232 **NEW FAX: (801) 583-2963**

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

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

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

**FUSION FACTS SINGLE ISSUES**

CURRENT ISSUES EACH..... \$ 30  
 3 MONTHS OR OLDER ISSUES EACH..... \$ 10

All back issues available.

**SUBSCRIPTION REQUEST**

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

Send *Fusion Facts* to:

NAME: \_\_\_\_\_

COMPANY: \_\_\_\_\_

PO BOX, DEPT: \_\_\_\_\_

CITY: \_\_\_\_\_

STATE: \_\_\_\_\_ ZIP \_\_\_\_\_


Please pay with a check in U.S. dollars drawn on a bank located in the U.S. or with a Postal Money Order.

Send check or money order with order and receive one extra issue free. Make checks payable to *Fusion Facts*.

**COLD FUSION TIMES**

*The Journal Of The Scientific Aspects Of Loading  
 Isotopic Fuels Into Materials*

ISSN# 1072-2874  
 published quarterly ©



Want to keep up with the latest advances in material and technological developments in cold fusion? **COLD FUSION TIMES** has the greatest signal to noise and density of information about material science. Use it to keep ahead with the razor sharp advantage of **COLD FUSION TIMES'** material, patent, business, science, and engineering columns.

Annual subscription rate \$120.00  
 Single issues \$40.00. Postage and handling charge of \$5.00 per order outside of the United States.

P.O. Box 81135 Wellesley Hills, MA USA 02181