FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

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

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A. ENERGY FOR BELARUS

During the week of November 7-11, 1994, an energy conference was held in Minsk, Republic of Belarus. Belarus is the country that suffered the most from the Chernobyl disaster that occurred in 1986. This country produces only 17% of its energy fuels, the rest has to be imported. The cost of such energy fuel is an enormous economic burden to Belarus. The following article was written to answer the question by a Belarussian energy official, "What is your opinion about our energy conference?" Our editor, Hal Fox, gave the keynote new energy speech and was also asked to address the conference on "Private Financing of Energy Utilities in America." Hal wrote the following as both a conference report and a tutorial on market forces. This was Hal Fox's tenth trip to member states of the former USSR.

Comments on the Minsk Energy Conference
By Hal Fox

In the recent Minsk Energy Conference (week of November 7, 1994) there were many speakers ranging from the Minister of Energy to representatives of private companies who provide energy products or services. The topics of the speakers ranged from statistical descriptions of Belarussian energy problems to proposed partial solutions including the use of wind, solar, hydrothermal, and biomass energy. Except for a few carefully-selected sites, none of these proposals can compete financially with the use of oil or natural gas at today's international market prices. The wind is not dependable, the sun does not shine at night, earth's heat is deep in Belarus, and biomass is limited and expensive. What is needed are new sources of energy such as cold nuclear fusion or extracting energy from the all-pervasive energetic ether (aether). [Fox, "New Types of Energy for the Near Future", paper presented at Minsk Energy Conference, Nov 8, 1994]

Except for the Fox paper, no speakers discussed the need for new sources of energy. Here are some of the partial solutions proposed by various speakers:

1. We need legislation.
2. We need to set up study committees.
3. We need to change the tariffs (prices) on energy.
4. The rich should pay for the power for the poor.
5. We need to change industry from energy-intensive to labor-intensive.
6. We need to conserve energy.
7. We need to establish new regulations.
8. We need to use alternative energy (wind, solar, biomass, geothermal.)

All of the solutions could be classed as "Let the government do it." None of the solutions, except for some energy-conservation suggestions, proposed to "Let the people do it." None of the speakers showed a true understanding of the **market forces in a free-market economy**.

Let me give some examples: About three decades ago, the international oil cartel increased the price of oil by 400%. This action was an economic shock to Americans who have been the world's most extravagant users of energy. Because America has long enjoyed a **free-market economy**, the immediate response was the increase of the sales price of energy to cover the increased price of oil. The market forces (the collective action of millions of consumers) responded by the people adapting to the higher prices. Some switched from oil-based energy to natural-gas energy (which is plentiful in America). Some changed from oil to coal. Many reduced their consumption of oil. Many insulated their houses. The energy industry responded to the market forces and the result was an expected rise in energy prices of natural gas, coal, and electricity. If oil is expensive and many change to natural gas, then the market forces are going to increase the price of natural gas. If more people start using their fireplaces to burn wood or coal, then the cost of wood (even though little used in the U.S.) and coal will increase. These are the most fundamental principles of economics that are understood by U.S. children in elementary schools.

The U.S. government, in its ponderous way, gradually became involved in wasteful and costly government programs to encourage conservation, to study the problem, to stockpile oil, to argue about legislation, to set up study groups, to fund the study of alternative energy sources, etc. But it was not government action, **it was the action of the people - the market forces - that did most to solve the energy crisis.** Finally, the government made an intelligent achievement (this event is unlikely in America) by passing legislation requiring the electrical utility companies to buy electrical power from any source at a price not less than the cost to the utility company of their power production. Companies were immediately formed, capital was invested, and a variety of electrical-producing energy systems were designed, installed, and used to produce and sell electric power to the power companies. The most successful of these new energy companies were based on the use of undeveloped hydro-electric power (even from streams having only a few feet of elevation difference between source and turbine.) Other successes, especially in large rural areas far from major electrical power plants, used natural gas or local oil to operate internal-combustion engines to run small to medium-size electrical generators.

When oil prices quadrupled, it was not the government that solved the problem. It was the people: **the combined action of millions of people adapting to a change in the market that resolved (or adapted to) the energy crisis.** These market forces (the sum or the results of the free market actions by the people) are the most effective way of solving problems. A sign (bumper sticker) on an American automobile bumper advised our U.S. government, "Defend the Borders. Deliver the Mail. Get off our Backs!" This is good advice for any country where people cherish their freedom.

During the energy conference, no speaker said, "Our people in Belarus deserve to have just as high an energy standard of living as Americans." No one said, "We cannot compete with one billion Chinese for cheap labor, we need energy-intensive, high-technology industry." No one said, "Let's establish joint ventures to develop the new sources of energy that have recently (within the past five years) been discovered". No one said, "Let the free market economy solve the problems." **No one appeared to understand the power of the free market to solve problems.**

The task to use free market forces in Belarus will not be easy. It has not been easy for the people in America, but we have at least a seventy-year history of learning more about free-market forces while the people of the former USSR have been the worker/servants of a nomenclature that had little interest in a free market. [Editor's Note: The nomenclature was the secret organization that was the ruling class behind the Communist Party. An excellent book is Nomenklatura, The Soviet Ruling Class, by Michael Mosbacher, Doubleday, New York, c1984. The members of the former nomenklatura have either fled the former USSR with their obtained wealth, have joined the new government to make a success out of the free market economy, or have become the "mafia" that has killed over 20 bank presidents in Russia during 1984 and that have taken over the "management" of many cash-flow industries, such as the free markets that now provide most of the food and imported items to the member states of the Commonwealth of Independent States.]

My typical home in America has three meters that are periodically scanned. There is a meter for each of the incoming water, the natural gas, and the electrical power. **It is my responsibility as to how I use these utilities and my**

responsibility to pay for them. Therefore, I helped solve the energy crisis by improving the way my home was insulated, by turning down the thermostat (which controls the temperature in my home), by conserving hot water, heat, and the use of electricity. We would say, "When not in use, turn off the juice."

If the heat delivered to my friend's apartment in Minsk were metered **and if he had a valve to control the hot water supply**, he would not open the window to cool his apartment, he would shower instead of having a hot-tub bath, he would improve the insulation in his apartment and he would fix his leaking water tap. If the apartment building were privatized, the glass in the front door would be repaired, the doors would close properly to keep out the cold, and there would probably be an apartment-owners' committee formed to consider ways in which they, the people, could improve their apartment building and their standard of living. The people in an apartment building might even become friends and start speaking to each other. They might find, as I have found, that the people of Belarus are charming, friendly, concerned for their country, love their families, and will work hard to make Belarus the great country that it can become. That might be the best end result of such a privatization.

B. NEWS FROM THE U.S.

21ST CENTURY - PEROVSKITES REPORT

Carol White, "Cold Fusion Experiments with Perovskites," *21st Century Science & Technology*, vol 7, no 3, Fall 1994, pp 79 - 81+.

SUMMARY

Because perovskites are good proton conductors and absorbers, they were early recognized as candidates for use in cold fusion. Perovskites are oxides formed of two different cations plus an oxygen ion. They are piezoelectric, ferroelectric and can be fluorescent. They will tend to develop oxygen vacancies, or as in the case of those used in cold fusion experiments, cation vacancies which can absorb hydrogen or deuterium.

Recently, Tadahiko Mizuno of Hokkaido University in Japan, and Jean Paul Biberian at the University of Marseilles, have been experimenting with perovskite ceramic oxides and have observed what appear to be significant temperature rises in samples loaded with deuterium. Mizuno, with a background in hydrogen embrittlement and corrosion and assisted by a collaborator experienced in weak neutron fluxes, began working with cold fusion soon after Pons and Fleischmann made their historic announcement.

Early in 1991, Mizuno's experiments had yielded a significant amount of tritium, but they had also witnessed the phenomenon that Pons and Fleischmann were later to name the "life after death" effect. In May 1992, he decided to substitute a ceramic sample for palladium, in effort to duplicate the experiments done by Eichi Yamaguchi who used oxide coating on a palladium electrode and found significant neutron flux and detected helium-4.

The perovskite sample Mizuno used was pressed from a powder and heat treated, then coated with a thin film of porous platinum. In a closed cell with deuterium atmosphere, he expected to test for neutron flux, but his first sample became so hot that it melted. In each case, there has been some temperature rise, but it is greater when pure deuterium is used in the cell. The melted sample suggested that the temperature in the cell was higher than the melting point of the tungsten, 1,500°C.

In a June experiment, Mizuno fixed a ceramic sample in a holder, with a 0.5 mm thin aluminum insulator, in a low vacuum environment. The sample was heated to 500°C. Pure deuterium was introduced into the vessel, and some time later he heard an explosive noise, but could detect no changes in the apparatus, from the outside (it was covered by a platinum peice) and no change in pressure on the gauge. When he decided to remove the sample from the apparatus, he discovered the holder was extremely hot. As he uncovered the sample itself, not only was the sample completely melted, but it had mixed with the insulating aluminum.

Mizuno believes that the reaction probably happened before the deuterium had sufficient time to diffuse through the whole sample, and he considers what occurred to be a near-surface phenomenon. In later experiments he used this assumption and introduced a varied electric field to the surface. A example of the cell design is given in Fig. 1. the thermocouples are coated with stainless steel to isolate them. The sample is coated with platinum and an electric field is applied through the nickel plates to the sample.

Although his earlier estimate of excess heat was higher, his present estimate is 9 watts on average [Fig. 2]. Because excess heat depends on such factors as estimates of the variation of the gas pressure and well as temperature change, calibration presents a serious problem.

Currently John Bockris at Texas A&M and Richard Oriani at the University of Minnesota are now testing samples provided by Mizuno to reproduce his experiment. Both report significant temperature rise, but are still working on the calorimetry.

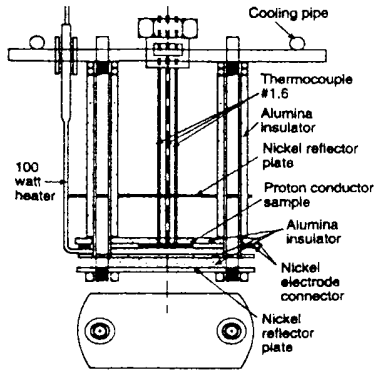

Figure 1
MIZUNO'S COLD FUSION CELL WITH A PEROVSKITE PROTON CONDUCTOR
In his latest cold fusion experiments using a perovskite proton conductor, Mizuno uses nickel plates to hold the perovskite sample and a 100-watt heater is in contact with the bottom plate. The sample is coated with platinum, and an electric field is applied through the nickel plates. Excess power is 9 watts on average.

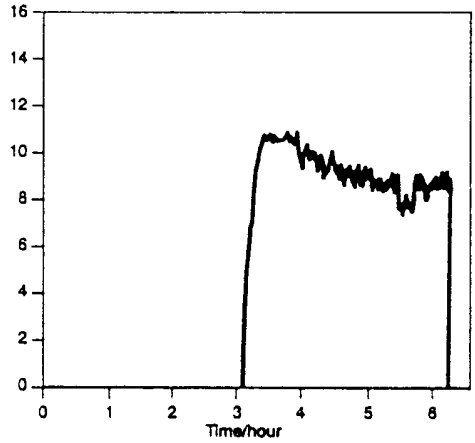

Figure 2
EXCESS POWER IN MIZUNO'S CELL
Mizuno obtains 9 watts of excess power on average, after 3 hours have elapsed. He uses a resistance heater to calibrate temperature rise to power production.

Jean Paul Biberian has conducted a series of experiments using a ceramic oxide target developed by the French chemist F. Forrat. He has recently visited California where he has attempted using Forrat's material to demonstrate cold fusion. The Forrat sample is a lanthanum-aluminum oxide single crystal from which 5% of the lanthanum is removed and the vacancies are filled with deuterium. The sample has a perovskite structure. Since lanthanum is trivalent, it takes three deuterium atoms to replace one lanthanum vacancy. For this reason, Forrat hypothesized that this would allow a very close packing of deuterons, close to liquid deuterium densities.

In the form of thin sliced foil [1 cm^2 x 1-2 mm thick], the sample is prepared to create the lanthanum vacancies, and is placed in an evacuated chamber to which deuterium gas is added and then heated to 800°C. Deuterium loading will average from low to high with locally quite dense regions. Gold electrodes are placed on both sides of the crystal sample and a voltage of around a few hundred bolts per mm is introduced. With thermocouples in place on the top and bottom of the sample, the unit is calibrated to resistance heat as current flows through the sample at various temperatures before it reaches the 300° temperature when proton conductivity is observed.

Previous to the deuterium loading, the material itself is an intrinsic semiconductor with electron conductivity. With the addition of deuterium it becomes a proton conductor when heated to between 300° to 400°. This is detected by an increase in current of a given voltage. The crystal becomes red and glows like an LED. Like Mizuno, Biberian had found calibration difficult, but has observed very high temperature increases. However, these have however also occurred in some of the control cells, indicating the presence of some electronic artifact in some cases.

The importance of proton mobility has been noted by cold fusion pioneer Martin Fleischmann, along with the need for high loading. The 1929 experiments of Alfred Coehn, established that protons loaded into a palladium needle, to which an electric field was applied, diffused through the needle. Further research with variants of this experiment are being considered by Pons and Fleischmann and their Italian associate, Giuliano Mengole.

CALIFORNIA - MILLENNIAL ENERGY

R.T. Bush (Phys. Dept., Cal-State Polytechnic Univ., Pomona, CA), "Cold Fusion: Scientific Curiosity or Millennial Energy Prospect?" *J. Scientific Exploration*, vol 8, no 3, 1994, p 427.

AUTHOR'S ABSTRACT

Nearly hidden in the fading away of the clamorous troubled beginnings of "cold fusion" following the initial claims by Fleischmann and Pons in March of 1989 has been the fact that solid scientific work has since established the reality of the excess heat effect achieved by Fleischmann and Pons with an electrolytic cell employing a palladium cathode and a heavy water based electrolyte. Even less well-known is the fact that an excess heat effect achieved with a light water (ordinary water) based electrolyte and a nickel cathode by Mills (1991) has led to essentially a revolution within a revolution. Thus, the author's CAF ("Cold Alkali Fusion") hypothesis seeking to unify these two effects as cold nuclear effects has found support in the form of an electrolytically induced shift in the abundance ratio of Sr-86 to Sr-88 (light water based rubidium carbonate electrolyte) as determined from SIMS and ICP-mass spectrometry. Various developments suggest the possible

emergence of a new field of science; viz., the Nuclear Physics of Condensed Matter. Of greatest interest are the implications of the two excess heat effects for mankind's future energy resources. Thus, theoretical work seeking to understand "cold fusion" in order to harness the excess heat effects such as the author's TRM ("Transmission Resonance Model") and the LANT Model ("Lattice Assisted Nuclear Transmutation") will be touched upon, as will the author's more recent ECFM ("Electron Catalyzed Fusion Model"). The latter is related to SED ("Stochastic Electrodynamics") work by H. Puthoff and seeks to explain the excess heat effect as genuine cold fusion indirectly catalyzed as a result of an interaction with the zero point field.

CALIFORNIA - DIRECTIONS FOR REPRODUCTION

Edmund Storms (Los Alamos Nat. Lab., retired), "How to Produce the Pons-Fleischmann Effect," to be published in *Fusion Technology*, 1995, 17 mss pages, 55 refs.

AUTHOR'S ABSTRACT

Conditions required for producing excess energy in PdD created in an electrolytic cell are described and reasons for their importance are discussed. This difficult to accept effect can now be produced with a high probability for success using the described procedures.

MASSACHUSETTS - WATER BURNING ENGINE
Courtesy of Steve Roen

"Engine to Burn Water," *Mechanics Illustrated*, Tech Update, Dec. 1994, p 32.

Dr. Keith Johnson of MIT has proposed water as a storage device for hydrogen. In a electrolytic (cold fusion) system, Johnson has designed a combustion engine that burns hydrogen that it separates out of water, utilizing the heat provided by a nickel cathode. He attributes the excess heat, not to a nuclear reaction, but to a well-documented chemical reaction. The water engine uses nickel to free hydrogen fuel.

MASSACHUSETTS - CF BY MIT GRAD STUDENT
Courtesy of Eugene Mallove

Alice Waugh (News Office), "Graduate Student Envisions Power for Spacecraft from Cold Fusion," *MIT Tech Talk*, Wednesday, Nov. 9, 1994.

SUMMARY

Aeronautics and Astronautics grad student Ray Conley, of MIT, has applied for a patent on a process for producing heat from cold fusion, hoping some day to apply it to spacecraft power. His interest in cold fusion began as a result of his work in nuclear propulsion. Although an engineer, not a chemist, he has been able to reproduce excess heat results from his experiments. His aspirations are to build an apparatus that could produce 5,000 watts of power from a one-liter container, and to have it commercially viable in two years.

Despite the controversy that has raged, sometimes viciously, over cold fusion, Conley says "that doesn't concern me as much as the experimental evidence that the effect is real. It's a brand-new source of power that's going to be really useful." He has entered his idea in this year's BF Goodrich Collegiate Inventors Program contest. He doesn't think what he has produced is cold fusion, but instead adheres to Randall Mills theory that the hydrogen atom can exist in fractional quantum states. In this theory, a hydrogen atom can be shrunk when its electron goes from a quantum state of one to a state of one-half, releasing energy in the process.

Conley is using a light-water potassium carbonate cell and nickel and platinum electrodes. He said that the problems researchers are having in reproduction of the cold fusion effect come from not building their equipment correctly, or from seemingly minor deviations, such as minute contaminations in some part of the cell or electrode.

This research has been funded by the MIT Space Grant Program.

[Editor's comments: In Psalms, chapter 8, verse 2, is the oft repeated phrase, "Out of the mouth of very babes...", which is appropriate here. MIT, that noble bastion of truth, sometimes housing tenured and unrepentant pathological skeptics, has produced a young scientist who is not quailed by the vociferous denial of reality out of the Plasma Physics Laboratory. We commend this young scientist and are presenting him with a free one-year's subscription to *Fusion Facts*.]

NEW JERSEY - LIFE AFTER DEATH

Eugene F. Mallove (Director, Cold Fusion Technology Publishing and Research Organization, Peterborough, NH), "Cold Fusion: Life After Death," *Frontier Perspectives*, Vol. 4, No. 1, Fall, 1994, pp 14-18, 6 refs.

AUTHOR'S INTRODUCTION

It is difficult to imagine a more profound reversal of scientific fortunes than what has been emerging in the "cold fusion"

field. One of the most reviled, disputed anomalies in the history of science is painfully, but inexorably heading toward acceptance by the scientific community.

NEW YORK - $BaCeO_3$ SOLID ELECTROLYTE

Jacob Jorné (Univ. Rochester, Dept. Chem. Engr., Rochester), "Neutron Emission Studies During the Electrolysis of Deuterium by using $BaCeO_3$ Solid Electrolyte and Palladium Electrodes," *Fusion Technology*, vol 26, no 3, pp 244-247, 7 refs, 4 figs.

AUTHOR'S ABSTRACT

The deuterium loading of palladium by electrolysis in the gas phase is achieved by using $BaCeO_3$ at 600 to 800°C. The electrochemical cell (-) D_2 (1 atm), Pd\$BaCeO_3$\Pd, D_2 (1 atm) (+) enables the establishment of a large overpotential on the porous palladium cathode. The emission of neutrons, beyond the background level, is searched by 20 ^{3}He neutron counters, radially mounted and shielded around the electrolysis cell. No sustained increase in neutron counting is observed. Several bursts of about twice the background level are detected, especially during the period of high temperature when a large current (8 to 160 mA/cm^2) is flowing through the cell, and are attributed to an anomaly of Poisson's distribution of the neutron background.

UTAH - RADIATION SAFETY

Igor Goryachev (Fusion Information Center, Salt Lake City), "Energetics of Cold Nuclear Fusion and the Problem of Radiation Safety," Book of Abstracts, VI Russian Sci. Conf. on Rad. Shielding of Nucl. Instl., Obninsk, Sept. 20-23, 1994, pp 243-244.

AUTHOR'S ABSTRACT

Despite the obstacles on the part of the scientific community and in spite of all the doubts of skeptics, the further evaluation of the problem of cold nuclear fusion is being carried on throughout the world.

According to moderately optimistic prognosis of specialists, and provided that the appropriate funding of research and development in this field is maintained, one can expect by the end of 1994 or beginning of 1995 the appearance of 10 to 20 kW commercial samples of thermal energy generators based upon heavy water electrolytic cells; and in 1995 the appearance of 1 to 10 kW generators based upon light water electrolytic cells. Generators of equal power based upon using the phenomenon of cold fusion in gas discharge process can be designed by the end of 1997. By that time generators based upon molten salts technique may reach the power of 50 kW.

Now it can surely be stated that the energy promise of cold nuclear fusion will come true. In this connection it seems to be timely to assess the problems of radiation safety related to this technology.

Among all of the effects related to the phenomenon of cold nuclear fusion, the emanation of neutrons has been investigated best of all. Neutron radiation is being observed in all eight different kinds of cold fusion initiation techniques so far. In most cases, generation of neutrons with energies in the range of 2.45 MeV, 4 MeV, and 6 MeV has been discovered; experimental data are available on neutron registration in the range of 10 to 17 MeV of energy.

In general, the intensity of neutron radiation from cold fusion reactions is characterized as being low. The yield of neutron radiation per the unit of thermal energy release is much lower as compared with the known processes of deuteron-deuteron interactions in regular hot fusion reactions. Moreover, a new direction of searching for the possibility of producing thermal energy in radiationless nuclear reactions of cold fusion has been recently developed.

It can be stated now that the problem of neutron radiation protection is not going to be a difficult one with respect to cold nuclear fusion energetics.

In most cases, gamma radiation from the cold fusion devices could be referred to as generated from neutron interactions with the components of experimental installations (water or other). Nevertheless, in reality the gamma energy spectra registered in experiments make such an assumption doubtful. In many experiments they detected gamma radiation in the range of up to 10 MeV of energy. One group of experiments disclosed the phenomenon of generating narrow directed beams of 200 keV gamma-radiation in a glow discharge cold fusion experiments.

Discovery of the phenomenon of cold nuclear fusion creates the basis for development of a brand new approach toward the problem of making radioactive waste harmless based on using the phenomenon of low energy nuclear transmutations in solids.

The theory of low energy nuclear transmutations postulates that in the process of nuclear transmutation that takes place in the environment close to that of cold nuclear fusion, it is possible to make radioactive waste harmless by means of radioactive nuclides being transformed into stable elements. The probability of element transformations in the process of low

temperature nuclear transfers has already been experimentally confirmed.

According to the prognosis of American specialists, the industrial technology of chemical element transformation and rendering radioactive wastes harmless can be developed by the end of 1997 if supported by from 5 to 10 million dollars of investment.

C. NEWS FROM ABROAD

BELARUS - MINSK REPORT

David Thompson (consulting chemist, Reading, UK), "A Cold Fusion Symposium in Minsk," *21st Century Science & Technology*, vol 7, no 3, Fall 1994, pp 76-78, 82.

A very thorough overview of the International Symposium on Cold Fusion and Advanced Energy Sources, May 24-26 is presented here. It covers the presentations of reviews, ongoing experiments and new theories in many fields of new energy research. The development of a set of parameters that enable reproduction of cold fusion experiments is a major point made in this article's conclusion.

BRITAIN - FACT OR FANTASY

Courtesy of the author

Douglas Clarkson, "Cold Fusion - Fact or Fantasy?" *The Maplin Magazine Electronics*, vol 13, no 80, August 1994, pp 3-9.

SUMMARY

"In spite of indifference and official antagonism, there is no doubt in the mind of many scientists that work on cold fusion research is providing valid findings -- not perhaps in the full gaze of national physics laboratories funded by taxpayers, but in independent and commercial laboratories around the world." So starts a thorough and well written article on the history and current affairs of the phenomena of cold fusion.

From its first stages of difficult replication and apparent defiance of physical "laws," cold fusion has come a long way. There were clues in the past that pointed to the anomalous phenomena to come, though. In the 1920s two German scientists, Paneth and Peters, claimed to have formed Helium from Hydrogen using a Palladium catalyst. At that time the interest was in Helium as a replacement for Hydrogen in Zeppelin airships. Their research was not successful and they retracted their discovery in 1927. [They may have had a valid experimental observation but quailed under the pressure of unbelieving peers. Ed.] (Palladium's ability to absorb very large volumes of Hydrogen had been previously researched in depth by Scottish physical chemist Thomas Graham in the 19th century.) Paneth and Peters' work prompted a Swedish scientist, John Tandberg, to investigate using a Palladium electrode to fuse Hydrogen to make Helium. When Deuterium was discovered in 1932, Tandberg quickly decided to try to use this in his high voltage circuit to fuse Deuterium. Thus cold fusion was "anticipated" but never resolved into specific research; perhaps some anomalous phenomena were observed but unreported because they could not be replicated.

In the 1970s Pons and Fleischmann were intrigued by the properties of Deuterium-loaded Palladium. A "coherence" effect in the interactions of large numbers of Deuterium atoms in close proximity was predicted. And the possibility of effects not anticipated by standard quantum theory were considered.

On a foundation laid by theoretical discoveries in the 1940s by Andrei Sakharov of the U.S.S.R. and F.C. Frank of Britain, muon-induced fusion was demonstrated at the University of California at Berkeley in 1956. Steven Jones, who would later be involved with early cold fusion at Brigham Young University in Utah, was extensively involved in researching this concept as an alternative to hot fusion. The work of George Chambers at the Naval Research Laboratory also produced surprising results when Deuterium ions were fired into a titanium-foil target, and gave off charged particles at about 5 to 9 MeV. But at that time such results could not be explained.

Explanations are made of glow discharge research of Yan R. Kucherov and colleagues in Russia, which would appear to indicate some rather large gaps in present day quantum theory, and seemed to point to the possibility that cold fusion phenomena covered more area than previously thought. These experimental results were confirmed by the Shell Corporation in France.

Next is the research of Bruce Liebert and Bor Yann Liaw at the University of Hawaii, using molten salts in the electrolytic solution which produced far higher levels of excess power than ever before. Up to 600W per cu/cm have been obtained. This particular permutation is still unexplained, and extremely difficult to replicate.

The past problems of cold fusion are discussed, including the Coulomb barrier, hot fusion interpretations of cold fusion particle emission (or lack thereof). Finally "present observations are being interpreted on the basis of radically different mechanisms being involved in the fusion process."

Virtual neutrons and coherent deuterons are new theories that enable cold fusion to exist in spite of the Coulomb barrier. Scientists are becoming increasingly aware of the quantum behavior of individual atoms -- how they can have characteristics of both particles and waves.

Tritium production has been one of the great controversies, both because of its variability of detection and because most experiments detecting it have been without excess heat. [The lack of excess heat is a controversial conclusion. Ed.] This is a problem for theorists.

The Deak Sonoteck company is researching the use of sonic and ultrasonic waves to trigger cold fusion by the process of cavitation in liquids. The `Sonactor' cold fusion reactor is being developed by David Deak and primarily uses the effects of cavitation taking place on the surface of the cell electrodes to trigger cold fusion.

Normal light water experiments are also noted, but in a non-fusion form proposed by Randall Mills of HydroCatalysis Power Corporation. The `Mills Cell' has achieved instances of heat production around 500%, without the evidence of neutrons, gamma rays or tritium. Researchers at the Catalysis Research Center, of Hokkaido University in Japan, are attempting to explain the cold fusion light-water phenomena of protons fusing with potassium (in the potassium carbonate electrolyte) to form calcium.

In his conclusion, Clarkson reiterates the phenomena of research itself, that breakthroughs **do not** normally come from big government or corporation laboratories, but from the small laboratories. The ending caveat is that "big" science and the entire scientific community should now take the cold fusion group of phenomena much more seriously, both in consideration and in funding. He comments that "certain elements of the scientific community have been behaving in a most unscientific way."

FRANCE - 20 YEARS OF NUCLEAR ENERGY

Bertrand de Galassus (Nuclear attaché, French Embassy, Washington D.C.), "Nuclear Energy in France and the U.S.," *21st Century Science & Technology*, vol 7, no 3, Fall 1994, pp 19-21.

SUMMARY

One of the things France and the U.S. have in common is nuclear energy. What they don't have in common is the energy policy they use in relation to it. France's energy policy rests on four main principles: increase domestic energy production, diversify sources and suppliers of energy, encourage conservation and efficiency, and last, provide reliable low-cost energy. This doesn't change. The U.S. on the other hand, seems to have a different program with each new administration.

One reason France is so entrenched in an energy policy is because they consume 2.5 percent of the world's energy, only produce 1 percent, and only have 0.1 percent of the world's energy reserves. France imports 100 percent of its oil, 24 percent of its natural gas and 70 percent of its coal. In contrast, the U.S. is a relatively energy rich country [and the highest percapita user] and imports only 50 percent of its oil, and 9 percent of its natural gas. The U.S. is a net exporter of coal.

Since the first oil shock in 1973, France decided to react in favor of becoming much more energy independent since it was at that time 80 percent reliant on foreign sources. The two major policies that went into effect then were highly conservative usage and using nuclear energy to replace the country's dependence on foreign oil - as much and as rapidly as possible. In 1973 France consumed 127 million tons of oil, continuing that trend by 1993 it would have used 193 million tons. But the 1993 consumption was only 90 million tons, attributed to one third conservation and two thirds nuclear power plants. Their energy independence rose from 20 percent to about 48 percent, more than double.

The change-over was not cheap, costing about $600 billion, but in the long run France has come closer to self-sufficiency. In January 1993 France produced over 80 percent of its electrical power from its 56 nuclear power plants. The U.S. in contrast, has 109 nuclear plants but only 22 percent of its power comes from them. When France built its nuclear plants, they were built in series and standardized. For almost 75 percent of this program the construction duration was 5 years or less. Nuclear plus hydro energy in France produce 90 percent of the total power generation, considered clean sources of energy. The U.S. relies on 70 percent fossil sources to generate electricity, which are considered to be polluting sources.

France doesn't ignore the waste problem in its figuring, but has a longer view of it as a manageable problem. Low-level waste is reprocessed as much as possible, and the remainder is provided for storage since it decays in the relatively short period of 300 years. In France, where some live in 300 year old houses and castles, and use much older Roman bridges, 300 years is not viewed as an inordinately long time. High-level solid waste is another story, and France (like the U.S.) is researching ways of safely storing the toxic waste which remains radioactive for 10 to 20 thousand years.

At present, technological solutions are either direct disposal or reprocessing of spent fuel, vitrification of the high level waste,

and the storage of canisters of vitrified waste. But they know better solutions will be forthcoming in the future, for both types of waste.

France is very sure that their choice of nuclear power production was the best decision, in terms of energy supply, economics (balance of payments) and environmental quality.

Summary by D. Torres

INDIA - HEAVY WATER SYNTHESIS

Courtesy of the author

C.S. Upadhyay (Dept. Elec. Engr., M.R.E. College, Jaipur), "Heavy Atom Water Synthesis System - Cold Fusion, a Possibility (Heavy Water Lens)," 1991, presented at the 78th Indian Science Congress, Indore, 1 June 1991, 7 mss pages, 8 refs, 7 figs.

AUTHOR'S ABSTRACT

The paper describes results of some consistent experiments on electrically synthesizing heavy water by a "Strong Ionic Orbital Focusing Electron Optical System" as shown in figures. These "Orbital Systems" obey Schelinkunoff's Symmetrical Maxwell Equation. The paper discusses the results and potentialities. It is found that in a test sample about 66% D_2O formation is indicated, as obtained by spin electrolysis of distilled water. This fact is established by measuring density (about 1.2 gms/cm^3-) pH value (7.36), Infra-red spectrum, and mass spectrum (obtained from I.I. Sc. Blore, & C.D.R.I. Lucknow) and hence confirms Ionic Cold Nuclear Fusion/Cold Fusion. The process is suitable for Mass Production of Heavy Water. Two types of heavy water are observed in the end product, one with reduced hydrogen atom radii and the other with normal hydrogen atom radii.

Cold Fusion has also been reported by Pons & Fleischmann, and also by Iyengar, Srinivasan et al. at BARC, recently [in 1991]. The method described by the author appears much simpler, efficient and rapid. It may have applications in the development of bulk non-conventional energy sources and isotope development. It will be highly interdisciplinary subject and very good peaceful atomic energy use. With quick Spectroscopic testing facilities many more experiments could be performed and technique could be improved.

INDIA - ANOMALOUS IRON

M. Singh, M.D. Saksena, V.S. Dixit, V.B. Kartha (Bhabha Atomic Research Center, Bombay, India), "Verification of the George Oshawa Experiment for Anomalous Production of Iron from Carbon Arc in Water," *Fusion Technology*, Vol. 26, Nov. 1994, pp 266-270, 4 refs, 1 fig, 3 tables.

AUTHORS' ABSTRACT

A direct current arc was run between ultrapure graphite electrodes dipped in ultrapure water for 1 to 20 hrs. The graphite residue collected at the bottom of the water trough was analyzed for iron content by a conventional spectrographic method. It was found, in the first few experiments, that the iron content in the graphite residue was fairly high, depending on the duration of the arcing. The experiment was repeated initially six times, and the results showed large variations in iron content [50 to 2000 parts per million (ppm)] in the carbon residue. In the second series of experiments, which were done with the water trough fully covered, the amount of iron in the carbon residue decreased significantly (20 to 100 ppm). Here also, there were large variations in the iron concentration in the residue, although the experiments were performed under identical conditions. Whether iron is really being synthesized through transmutation from carbon and oxygen as suggested by George Oshawa or is getting concentrated to different degrees though some other phenomenon is not currently clear. The iron in the carbon residue was also analyzed mass spectrometrically for the abundance of its various isotopes, and the results were more or less the same as that of natural iron. Besides iron, the presence of other elements like silicon, nickel, aluminum, and chromium was also determined in the carbon residue, and it was found that the variation of their concentrations followed the same pattern as that of iron.

AUTHORS' CONCLUSIONS

It was found that the iron concentration in the carbons residue was as high as 2000 ppm in the beginning and dropped to lower values (20 ppm) in the later experiments, which were done by taking more precautions. However, even the lower values cannot be accounted for on the basis of the preconcentration of the carbon powder alone. Whether iron is really being synthesized through transmutation from carbon and oxygen, as suggested by the experiments of Oshawa, or by some other phenomenon is not currently clear. We have shown that iron is detected only in small amounts and not in large amounts as claimed by Monti and Oshawa. Second, it has been mentioned that the iron so produced is different from the natural iron. The mass spectrometric analysis, done three times for the samples, gave the results that the isotopic abundances are the same as those in the natural iron. We recommend that since the results, especially of the last four experiments, which were done under identical conditions and also with the fully covered trough, are not sufficiently reproducible and the values are differing, such experiments should preferably be very carefully done in a completely dustproof laboratory, to say with certainty that the marginal

increase in the iron content in the graphite residue by transmutation of carbon and oxygen is a myth or a reality.

INDIA - MORE ANOMALOUS IRON

R. Sundaresan, J.O'M. Bockris (Texas A&M Univ., Dept. Chem., TX), "Anomalous Reactions During Arcing Between Carbon Rods in Water," *Fusion Technology*, vol. 26, Nov. 1994, pp 261-265, 21 refs, 2 figs, 4 tables.

AUTHORS' ABSTRACT

Spectroscopically pure carbon rods were subjected to a carbon arc in highly purified water. The arc current varied from 20 to 25 A and was passed intermittently for several hours. The original carbon contained ~2 parts per million (ppm) iron, and the detritus contained up to 286 ppm of iron. The carbon rods remained cool to the touch at >2cm from their tips. Adsorption of iron from water or the surrounding atmosphere was established as *not* being the cause of the increase of iron. There is a weak correlation between the iron formed and the time of passage of current.

When dissolved O_2, was replaced by N_2 in the solution, no iron was formed. Hence, the mechanism

$$2\ {}_6C^{12} + 2\ {}_8O^{18} \rightarrow {}_{26}Fe^{56} + {}_2He^4$$

was suggested as the origin of the iron. The increase in temperature of the solution was consistent with expectation based on this reaction.

ITALY - PALLADIUM PREPARATION

Courtesy of Dr. Bruno Stella

F. Celani, A. Spallone, P. Tripodi, A. Petrocchi, D. Di Gioacchino, M. Boutet (INFN, Labor. Naz. di Frascati, Italy), M. Diociaiuti (Instituto Superiore di Sanita, Roma), Pl Marini, V. Di Stefano (Skitek-IRI, Pomezia, Roma), "High Deuterium Loading (x > 1.) of Palladium Plates by Pulsed Electrolysis, and Reproducible Heat Excess," presented at the 80th Conference of the Italian Physical Society, Lecce, Sept. 26 - Oct.1 1994.

AUTHORS' ABSTRACT

We have achieved high values of x = D/Pd ratio by introducing a pulsed current (up to 100 Amperes) electrolysis, with pulses of a few μs's width. We have studied several different Pd plates specifically prepared (cold worked) and surface treated (oxidation plus metallic compounds). Plates without surface treatment have shown $0.92 < x < 1.$ and no relevant excess heat. With surface treatment we have achieved $1.0 < x < 1.2$ and got excess heat (up to 30%) not to be referred to absorption enthalpy. The velocity of absorption of deuterium is found to be the physical parameter discriminating the dynamics of the absorption processes between differently treated plates; the registered heat excess seems to be correlated to this parameter. Some of the studied plates, belonging to the same processing batch, have given the same results, confirming the functionality of the technique and the goodness of the used physical parameters.

We have obtained results of a study started in February 1993 (after the Rome workshop), on 0-20% heat excess promoted by the electromigration phenomenon (as to say, increasing with time, up to 10 days), due to electrolysis with fast current pulses on 20 cm long wires (500, 250, 100 μm thickness). When accounting for the skin effect, the longitudinal current density achieved values as high as $2 \times 10^5 A/cm^2$. In order to have heat excess associated with electromigration, we seem to need a voltage drop of 10 volts at least (after loading with x > 0.8).

ITALY - FERMI UPGRADE

Courtesy of Dr. Bruno Stella

F.F. Kayumov, B.N. Lomonosov, G.I. Merzon, D.I. Minasyan, V.A. Tsarev (P.N. Lebedev Physical Inst., Russian Academy of Sci., Moscow, Dipart. di Fisica Univ. di Roma, Italy), A. Asmone, M. Corradi, F. Ferrarotto, B. Stella (INFN Roma, Italy), F. Celani, A. Spallone, P. Tripodi (Lab. Naz. INFN, Italy), "Upgrade of the Fermi Apparatus with Detection and Identification of Charged Hadrons in the Few MEV Region," presented at the 80th Conference of the Italian Physical Society; Lecce, Sept. 26, - Oct. 1, 1994.

AUTHORS' ABSTRACT

The FERMI apparatus is mainly a neutron moderator-detector developed for cold fusion research, situated in the Gran Sasso INFN underground laboratory. It has 40% detection efficiency for neutrons in the range 1 KeV-20 MeV (25% at 2.5 MeV), low background, pulse shape acquisition and good time resolution for neutron bursts; it also allows us to perform a good reconstruction of the average original neutron energy. Gamma rays are revealed mostly by a complementary low background NaI detector with 26% solid angle coverage. The performances are controlled by a full MC simulation, experimentally tested.

A specially designed electrolytic cell with thin Pd cathode/wall is inserted into the central axial gap. Aside, close to the Pd sample, there are two multiwire proportional counters and a CsI scintillator, providing charged particles detection with

dE/dx and E measurement. A threefold coincidence with very low background drives the data acquisition.

The system allows to identify protons in the energy region around 3 MeV and low mass hadrons in the range 1-10 MeV. A collimator reduces the angular spread. The performances are tested and calibrated continuously with α particles from a ^{241}Am source and protons diffused from a mylar window (having ~3 MeV end point energy): the two calibrations allow for an energy reconstruction with a final resolution of < 4%.

Once assembled together, the FERMI system will have the possibility to detect multiple time correlation's of neutrons, gamma's, protons, alpha particles, tritium, thermal effects and deuterium loading, as well as unexpected low mass hadrons.

JAPAN - 3000+ HOURS OF ENERGY
Courtesy of Jed Rothwell

Yoshiaki Arata (Welding Research Inst., Arata Hall, Osaka Univ.) and Yue-Chang Zhang (Shanghai Jiao Tong Univ., Shanghai), "New Energy Generated in Double-Structured Cathode Using Palladium Black," Proc. Japan Acad., vol 70, Ser. B (1994), p 106+, (received Sept. 12, 1994).

AUTHORS' ABSTRACT

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

ARATA ARTICLE SUMMARY
Translation and summary by Jed Rothwell

Osaka University Newspaper reported this cold fusion research on Sept. 20, 1994, in a front page article:

100% REPRODUCIBLE COLD FUSION PROVED
Big step towards practical applications, 3000 hour continuous heat generation verified.

[Lead Paragraph]

Emeritus Prof. Yoshiaki Arata, former head of the Welding Engineering Research Inst. at this university, announced 100% reproducible cold fusion reactions in a paper presented at a conference in Tokyo on September 12, 1994. Up until now, [some] scientists have considered the existence of cold fusion indefinite because of irreproducibility, so this announcement may come as a shock. The paper, titled, "New Energy from a Double Structured Cathode Employing Palladium Black," reports the following comparison: the total potential chemical energy in the experimental cell was approximately 4 kilojoules, yet the researchers verified that the cell produced 50 to 100 kilojoules per hour in a continuous reaction lasting over 3000 hours, adding up to more than 200 megajoules.

Fifty to 100 KJ/h equals a 14 to 28 watt power level. Here are some more details from the article. Like many other leading cold fusion scientists in Japan, Arata is a former top hot fusion scientist. He made one of Japan's first hot fusion reactors in the late 1950's. He developed a new type of cold fusion cathode in 1990, he tested a large number of configurations, and he has been making steady progress.

The newspaper article does not have much technical detail. We at now trying to get copies of the paper he has presented, in English if possible. The copy we received was faxed, and Japanese characters do not fax well, i.e. only partially legible. Arata is a practical, results-oriented engineer. He says he is determined to follow through and make a practical, larger scale device.

JAPAN - FUSION SCIENCE FUTURE?
Translation by Jed Rothwell

Manabu Yoshikawa (Science Now & Future writer), "A Steep Road Ahead for Fusion, After gigantic expenditures research still done by trial and error," *Mainichi Shimbun* `Daily Newspaper,' Tokyo, (date wasn't included, sometime in September 1994.)

SUMMARY

Beginning with a recap of the general course of hot fusion research, the article questions whether hot fusion is really making progress or just discovering new and more difficult obstacles to becoming commercially viable. A few areas of the research are still trial and error, dealing with controlling of plasma, according to their sources. The article discusses ITER, the joint Japanese, U.S., European EC and Russian research venture in hot fusion, which hasn't yet agreed upon a site for its reactor. **It is pointed out that with all the time and**

money that has been and is being sunk into hot fusion, is it any wonder researchers are getting anxious about their future when cold fusion appears on the scene; it is simpler, cheaper and gaining support.

Since its inception in 1989, cold fusion has been controversial, but "If there is even the possibility of unlimited energy, the research is worth doing," say MITI and NEDO (New Energy Development Organization, who have involved Japan in the cold fusion research race. They established the New Hydrogen Energy Verification Research Center in Sapporo in 1993, where they have begun to work on the problems of cold fusion, or "New Hydrogen Energy" as they more flexibly call it.

One hot fusion physicist, Dr. Akito Arima, Director of the Inst. of Physics and a leading member of the opposition to cold fusion, is quoted as having a small change of heart. He now calls cold fusion "small scale science," saying "It is an approach to the problem from a completely different direction, in a kind of guerrilla warfare tactic. That is not a bad way to do science." Arima admits the problems hot fusion is having, and although he claims no solution is in sight to hot fusion's engineering problems, he says that remarkable progress has been made, problems will be resolved.

The article concludes with this line: "This quest for new energy -- a groping search in the dark -- will continue for a long time."

RUSSIA - COLD FUSION AND TRANSMUTATION

The Second Russian Conference on Cold Fusion & Nuclear Transmutation

By Yuri N. Bazhutov and Valeri P. Koretski

The Second Russian Conference on Cold Fusion & Nuclear Transmutation (RCCF-2) took place in the environs of Sochy, the "Bourevestnik" holiday hotel of Moscow State University (MSU) on September 19-23, 1994.

The Conference was organized and financed by ERZION Scientific and Research Center of Physical and Technical Problems, Kaliev Enterprise Inc. and TIR Scientific and Production Firm. The Conference was held under the aegis of Russian Academy of Science, Russian Physical Society, State Committee for High Education and MSU. The VENT Science and Technical Center that published the Proceedings of the RCCF-I (Abrau-Durso, Sept.-Oct. 1993) took up publishing the Proceedings of the RCCF-2.

Organizing Committee of the Conference was made up of the main Russian CF specialists who lead the experimental and theoretical investigations on CF in Russia. Academicians Yakov M. Kolotirkin and Alexey N. Baraboshkin were the co-chairmen of the Conference.

Fifty-two participants took part on the RCCF-II. They represented Russia, Ukraine, Belarus, USA, Italy, Japan. Attendees geographic distribution in the RCCF-2 varied more widely then that on the previous Conference: 23 participants came from Moscow, 3 from Podolsk, 1 from Doubna (both towns are in Moscow region), 1 from Obninsk (Kaluga region), 2 from Arzamas, 9 from Ekaterinburg (Ural region), 1 from Tomsk (Siberia), 1 from Volgodonsk (South of Russia). Ukraine was represented with Kiev (1), Kharkov (1), Odessa (1), and Belarus with Minsk (1).

The RCCF-II Secretariat has received greetings from colleagues in USA, France, Spain, Japan, India, from Chief Editors of *Cold Fusion,* USA, *21st Century, Science & Technology,* USA, *Business Match,* Russia, as well as from the President of Teknova Corp., Japan. Wishes of success came from Ministry of Fuel and Energy of Russia, from the International Nuclear Society (CIS) and from the Union of Manufacturers and Businessmen of Russia.

Thirty reports covering the results of theoretical (10) and experimental (20) works were submitted to the Conference. Most of the works have not previously been reported.

The theoretical works submitted by Vladimir Beliaev (United Institute of Nuclear Research, Doubna), Lev Sapogin (Moscow Road Transport Institute), Nikolai Samsonenko (Russian Friendship University (RFU), Moscow), Dr. Talbot Chubb (Oakton International Corp., USA) show possible ways of penetrating the Coulomb barrier. The first author suggests that "Efremov effect" should be used which enables researchers to change the short-range nuclear forces for long-range ones and to increase thereby the probability of the light nucleus's synthesis. In the second report it is shown that taking into consideration the phase of the particle wave function allows an increase in the probability of the particle travelling through the potential barrier. The author has advanced an idea of the experiment to test the validity of the CF unitary quantum theory. In the Samsonenko's report the possible influences of electromagnetic and light interaction, as well as the solar neutrino, on the CF processes are considered. Dr. Chubb proposed the theoretical model for deuteron interactions that are taking place in the Pd crystal lattice.

Viktor Shadrin (Tomsk Polytechnic Institute) looked at a rather unconventional scheme of cold fusion in the frame of Rodimov's new auto-oscillatory quantum model.

Yury Bazhutov (ERZION Center) provided an explanation for great number of experiments on nuclear transmutation (10 expts.) on the basis of the erzion model.

The theoretical models proposed by Alexander Krivoshein (TIR Center, Obninsk), Gennady Shipov (VENT Center) and Mara Meerovich (Ukrainian Academy of Ingenious Ideas, Odessa) were actively discussed at the Conference.

Most of the experimental works reported on at the Conference (6 rpts.) concerned the CF investigation in the process of electrolysis. A number of reports presented the results of nuclear products registration in glow discharge (4 rpts.), in ferroelectrics (4 rpts.) and in the gas saturation experiments (2 rpts.).

Anatoly Samgin (Institute of High-Temperature Electrochemistry, Ekaterinburg) reported the neutron registration in the solid ceramics and considerable thermal output, though at low absolute milliwatt level. His colleague Dr. Khokhiov's report was devoted to calorimetric measurements during the electrolysis of the molten salts.

Kabir Kaliev and Ben Filimonov (Ekaterinburg, Minsk) supported the high reproducibility of nuclear reactions in the tungsten bronze structures.

A number of reports (that of Andrey Lipson, Gennady Fedorovich (Russian Academy of Science) and Valery Dougar-Zhabon (RFU) concerned the nuclear products registration in ferroelectrics. The Lipson group was the first to observe the increasing of neutron flow and to record hard gamma rays in experiments of this kind.

Yury Bazhutov for the first time reported the high statistic reliability (up to 9 sigma) of hard gamma-ray registration in the process of electrolysis with Ti and Ni cathodes.

In Dr. Ramodanov's work (LUTCH S&D Organization, Podolsk) the highest rate of tritium production for Z-pinch devices was recorded (up to 15 atoms/s). A great body of information on nuclear products registration in glow discharge in an atmosphere of deuterium and argon was submitted to the Conference by Alexander Karabut and Irina Savaatimova (LUTCH S&D Org.).

Victor Serov and Yury Savin (Arzamas S&R Institute of Experimental Physics) reported the positive results of neutron and tritium registration on Pd and Ti gas saturated cathodes.

Possibly the most dramatic paper was submitted by Reiko Notoya (Hokkaido University, Japan). She reported registration, in the process of electrolysis in light water with Ni cathode, both the high heat output (up to 400%) and the nuclear transmutation -- new isotopes (Na^{24}, Ca^{40} and Cu^{64}) were produced.

Antonio Spellone (Laboratori Nazionali di Frascatti, Italy) presented the unique procedure that enables one to reach the high saturation of Pd with deuterium during electrolysis under a high-powered pulsed current. 80% excess heat over the heat input was registered in the process.

Some concepts concerning the practical use of CF phenomenon were proposed by Valery Koretsky (ERZION), Vitaly Ramodanov and Alexander Titenkov (MSU). The first author reported the method of burning away the radioactive wastes (in the frame of the erzion model of nuclear transmutation) and advanced the idea of an experiment on burning away one of the most long-lived decay products -- Cs^{137}. The second author investigated the conditions to achieve high energy output for reactions in condensed matters. Al Titenkov suggested that erzions, the hypothetical particles catalyzing the CF process, should be looked for in the space rays directly.

During the closing meeting of the Conference and unofficially, the rather high scientific level of most of the submitted reports was noted. In the opinion of some foreign guests (Dr. Talbot Chubb, Oleg Finodeyev, USA) the scientific level of the reports was not lower than that of the reports presented on the ICCF-4 (Hawaii, Dec. 1993). In spite of the fact that the CF researchers in Russia had practically no financial backing from the government, many results were achieved in a year since the RCCF-1 (Abrau-Durso, Sept.-Oct., 1993). In 14 experimental papers the authors reported the nuclear products registration (neutron or gamma radiation, tritium, new elements and their isotopes), some of them carried out the positive calorimetric measurements. A distinguishing feature of the RCCF-2 was the great number of the unconventional theoretical works reported by well-known physicist-theorists who had tried to give adequate descriptions of the CF phenomenon. The Conference was excellent evidence in favor of an important role of Russian science in CF research. The Conference participants expressed their unanimous opinion both on the importance that these works to be continued and of the necessity of organizing the RCCF-3 in 1995.

Summary provided by Deputy Chairman of the Organizing Committee of the RCCF-2 -- Yuri N. Bazhutov and Coordinator of the Organizing Committee of the RCCF-2 -- Valeri P. Koretsky

RUSSIA - RADIOACTIVE WASTE TREATMENT

Translated by Igor Goryachev

Y.N. Bazhutov, et al. (Scientific Research Center of Physical and Technical Problems "Erzion," Moscow Region), "Project

of Development of Methods of Treating Radioactive Waste Based on Utilization of the Phenomenon of Nuclei Transmutation," Project "Kataliz," private communication, 1 fig, 12 refs.

TRANSLATOR'S SUMMARY

The problem of transforming long-lived radioactive waste elements into short-lived or stable ones became apparent soon after the introduction of first nuclear reactors. Because of the fast expansion of world nuclear energetics and worsening of the ecological situation throughout the world, this problem is urgent.

At present, several techniques of treating radioactive waste are known, specifically: by using fast reactors or accelerators of charged particles. Nevertheless, none of these techniques has yet been used practically because of high cost and not being commercially perfected. An alternative method of treating radioactive waste is being proposed by the authors of this paper, based upon utilization of the phenomenon of catalytic transmutation of nuclei. The author's theoretical model ("Erzion" model) of cold nuclear fusion explains most of the experimental results obtained so far and is capable of predicting the results of possible experiments. Utilization of this model may facilitate acceleration of the development of a new treatment for radioactive waste.

The process of catalytic transmutation of nuclei can be done under a number of conditions: the availability in the host material of donor nuclei (those donor nuclei are supposed to be the bearers of transmutation catalysts) in definite relation with fuel nuclei (which participate in the reactions of transmutation), as well presence of some triggering mechanism to initiate the reactions. The authors of this project have been carrying out an investigation of the likely channels of creating these reactions for all known stable and radioactive isotopes. This investigation resulted in the disclosure of donor isotopes and fuel isotopes, as well as convertor isotopes providing closed cycles of nuclear reactions. The triggering mechanism of these transmutations can be the radiation of the radioactive waste elements themselves.

The experimental and calculational investigations completed made it possible to elaborate the basic principle of practical utilization of the phenomenon of transmutation for treating radioactive waste. They include the following steps:

1. Fractioning isotopes (for the initial phase of the project realization);

2. Preparation of the fuel (a homogenous mixture of each isotope with a definite amount of donor elements and convertor elements);

3. Loading the fuel into a nuclear catalytic reactor followed by controlled processes of transmutation and heat utilization.

4. Unloading of low-level radioactive treated fuel from the reactor into a stock container for further utilization.

At a later phase of the project realization it is possible to bypass the step of fracturing isotopes. The preliminary survey allows the possibility of forced transformation of the whole set of long-lived radioactive nuclides into stable or short-lived isotopes. This technology can be fitted at existing nuclear chemical enterprises without major reconstruction.

The additional advantage of using the process of catalytic transmutation of nuclei is the absence of the need to consume considerable amounts of energy from an outside source. On the contrary, it makes possible the use thermal energy released in the process of treating radioactive waste, which can be converted into electric energy. Above all, the process of catalytic transmutation of nuclei can be used to manufacture some stable and radioactive isotopes which are of commercial value.

This project is aimed at confirming the principle of catalytic transmutation of nuclei for a number of long-lived products of fission (during the first year of running the project) and subsequently we plan to optimize the methods of transmutation using an active installation (during next two years). The project contains the following steps:

1. Investigation of the possibility of transmutation of several long-lived products of fission (Th^{99}, I^{129}, Cs^{137} and others). Running a demonstration experiment.
Term: 1 year. Cost: $40-50 thousand.

2. Development of industrial technology for radioactive waste transmutation.
Term: 1 year

3. Creation of industrial (commercial) installation for radioactive waste deactivation by means of transmutation.
Term: 1 year

The cost of the steps 2 and 3 can be determined after having the first step completed.

The outlook for the utilization of the results of this project:

1. Creation of industrial installations based on existing nuclear chemical enterprises or atomic power plants for deactivation of solid and liquid radioactive waste of nuclear energetics. The time needed for the complete elimination of the radioactive nuclides will amount to 4 months, accompanied with specific heat generation of 10 W/cm^3, provided that (contrary to the

technology of radioactive waste treatment in fast reactors or accelerators) no limit is given to the volume of the waste material being treated.

2. Creation of energy generators with specific thermal power capabilities up to 1 Kw/cm^3, with further conversion of thermal energy into electricity using standard techniques.

3. Creation of energy saving installation to manufacture commercial radioactive isotopes, as well as stable elements (used, for example, as admixtures in manufacturing semiconductors).

RUSSIA - CF IN MOLTEN METALS
Translated by Igor Goryachev

G.S. Soloviev, A.S. Gontar (Scientific and Industrial Association "Luch", Moscow, Russia), "Cold Nuclear Fusion in Molten Metals," private communication, 4 refs.

AUTHORS' ABSTRACT

The reactions of cold nuclear fusion were many times observed at saturation of Pd, Ti and some other metals with deuterium as well as when using more complicated solid compounds. Though the outcome of the reaction, especially along neutron channel, is pretty small (amounting from single events to hundreds of events per second), nevertheless, it was determined that the rate of reaction was influenced by the structure of the host compound and especially by the molecular dynamics of host material under critical conditions, for example, under the conditions of solid phase transformations. In the opinion of the authors of this paper, the most significant increases in the reactions of cold nuclear fusion can be achieved in molten metals.

Really, in order to initiate a cold nuclear fusion reaction, two deuterons must approach each other as close as atomic distances. In a metal lattice such situation can appear when one of the deuterons chances to make a diffusion jump toward another one through the potential barrier between them. The probability of this event is equal to:

$$W \sim c^2 \exp[-Q/KT] \qquad (1)$$

where Q is the energy of deuterium diffusion activation, ~0.5V;
C is atomic concentration of deuterium in the metal.

In a liquid metal, except for short distances, a dispersion of internal pores is available. Deuterium in large internal pores (the portion of which amounts to tens of percent) unite, according to the theory of the authors, in quasi-molecules. This process is facilitated by retained (though expanded) quasi-atomic electron orbits around deuterons in the metallic lattice with high densities of free electrons. Hence, the concentration of the quasi-molecules in the molten metal will be equal to ~ c/2. Taking into account formula (1) it is easy to determine that the reaction of cold nuclear fusion in a molten metal can be described by an accelerating factor *f*:

$$F \sim c^{-1} \exp[Q/KT] \qquad (2)$$

The estimates made with the use of formula (2) indicate that the rate of cold nuclear reactions in molten metals can be accelerated by a factor *f* equal to 10-12 orders of magnitude. The required concentration of deuterium in the molten media is provided by the environmental atmospheric pressure.

It is worth to noticing that the fluctuation of decay of the large internal pores into small pores, and the reverse process that takes place in molten material, create nonequilibrium conditions for deuterium quasi-molecules which facilitates additional acceleration of cold nuclear fusion reactions. These special conditions for high efficiency cold nuclear fusion reactions appear to be the metal's melting temperatures.

RUSSIA - COMMERCIAL DEVICES
Translated by Dr. Igor Goryachev

V.A.Romodanov, V.I.Savin, Scientific and Industrial Association "Luch", Podolsk, Moscow Region, Russia. "Development of Demonstration and Commercial Devices for Nuclear Fusion in Condensed Media", private communication.

TRANSLATOR'S SUMMARY

Two types of cold nuclear fusion devices have been developed. The first one (which is the simplest one) is assigned to be used for home needs (furnaces, irons, heaters). When powered from an external power supply they can give out from 2 to 5 W of thermal power per one watt of electric power consumed. One loading of tritium (approximately 20 liters) would be enough to provide one year of continuous work. Those generators of thermal energy are supposed to be ecologically clean because of the nuclear radiation emission is expected to not exceed the natural background. The expected electric power output is from 0.1 to 1.0 kW.

Taking into consideration that the traditional fuels are getting more and more expensive in the industrially developed countries, it would save from $200 to $2,000 per device per year.

The second project supposes creation of a powerful demonstration apparatus of an industrial cold fusion installation

to generate both heat and all kinds of by-products, namely: neutrons, gamma-quanta, protons, and tritium, as well as accumulating various isotopes. The expected output electric power is 100 kW.

The inventors are searching for a one hundred thousand dollar investment for the first project and/or a one million dollar investment for the second one. They are also looking forward to developing power generators for vehicles and vessels. The exclusive rights for commercial use of the inventions, in case of positive results of their tests, are to be transferred to investors.

D. SHORT ARTICLES

TECHNOBABBLE

USING NON-TECHNICAL LANGUAGE

Advice to those who write, by Hal Fox

In the brochure announcing the *Journal of Consciousness Studies* it is claimed that the journal covers this broad field by:

○ Presenting serious peer-reviewed scientific and humanistic papers in *non-technical language.* ...

In the next paragraph is the following:

"This first issue includes a number of papers debating the relationship between mind and brain. On the one hand we have the standard reductionist view that consciousness is an epiphenomenon of neural and computational processes. By contrast, the contemplative traditions focus on the transformation of consciousness from some very differing viewpoints. Some of the papers extend the debate as to whether macroscopic properties of consciousness like the unitary sense of self and 'free will' can be described by quantum-mechanical principles."

We derive a rule from this example that non-technical language means the way I write in my specialty. Technical language is the way you write if your specialty differs from mine.

John Dryden said, "Learn to write well, or not to write at all."

Thomas Moore related, "Though an angel should write, still 'tis devils must print."

That prolific author Anonymous admonished, "Do right and fear no man. Don't write and fear no woman."

Or one can suggest that writers should, "Elucidate your verbiage with guileless specificities."

I doubt that this short instruction on language would survive a "jeer review" process.

E. LETTERS FROM OUR READERS

LETTER FROM WAYNE GREEN

How could you publish a "Statement on the status of *Cold Fusion* magazine" without bothering to check the facts? ...*Cold Fusion* is continuing on a monthly basis. Other than the "resignation" of Tinsley, Forsley, and Rothwell, Gene's ...paid columnists (and not editors), no editors have departed. To the contrary, the new tech editor is John Kane, who has a distinguished background in nuclear physics. He is also a ham operator, AB3C. The newest advisors include Milo Wolff and Chris Illert, both with excellent backgrounds, and both with books published in the field of nuclear physics.

Excellent material is being submitted and new subscriptions are continuing to be received. There have only been two requests for refunds as a result of the new format so far. I expected more. To the contrary, the readers seem to feel that the change in editorial staff has been beneficial. The end of the vilification of the cold fusion naysayers has been applauded. Ditto the soft pedaling of the wonders of a cold fusion world. The publication is now down to business and pursuing the original goals I set of helping researcher and theoreticists cope with this new technology.

Between Kane, Wolff, Illert, and a few other willing helpers, all unpaid (including me), we'll accomplish our goal. The new format has put the publication on a sound financial footing.

Hal, I can't say how disappointed I was to hear about what you've printed.

Wayne Green

[On the same subject is the following,

"On *Cold Fusion* Magazine," *21st Century Science & Technology*, vol 7, no 3, Fall 1994, p 5.

SUMMARY

In a comment on the demise of *Cold Fusion* Magazine, this publication quotes Charles Becker, the main financial contributor to the magazine, on what his viewpoint on the situation was, supporting Eugene Mallove's account of the problem (*FF*, Sept. 1994, p 1). Mr. Becker adds that there were circumstances at work (the outstanding commercial and tax debts of Wayne Green Inc.) before the magazine came on

the scene, unbeknownst to the investors. Despite counseling to the contrary, the company set up several insurmountable obstacles to the magazine's success: a $98 subscription price, $10 cover price, and more financial problems. Mr. Becker extended his promised financial share even after it became apparent that Wayne Green Inc. was unable to keep their end of the agreement. After being unable to attract another investor in the publishing industry, due to who they were affiliated with, and to severe disagreements between Green and the editorial staff, the business agreement was terminated. The concept of a cold fusion magazine was as good one, and the editorial staff is seeking to resurrect the idea, with completely new players. Cold fusion is being vindicated as a viable technology, and the proposed new magazine will probably be a commercial success with a knowledgeable and competent publisher.

LETTER FROM INDIA

Sirs,

I am herewith sending you the reprint (photo copy) of my paper "Heavy Atom Water Synthesis-Cold Fusion a Possibility," from "What Physics for the Next Century" International Conference, Italy, 29th May to 1st June, 1991. This is for abstraction and record in Fusion Information Center. My present project is extension of this work. Now, I get deuterium & tritium lines in the mass spectrum from ordinary distilled water under some conditions. I feel it is an important step towards "BULK" Controlled Cold System Fusion and will be a highly beneficial impact on Nuclear Power Engineering, with prospects of further improvement.

Thanking you for kind necessary action and early reply.

Yours faithfully,
C.S. Upadhyay

F. MEETINGS & MISCELLANEOUS

Second Announcement

CALL FOR PAPERS

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

We are pleased to announce that the Fifth International Conference on Cold Fusion (ICCF-5) will be held from 9 April (Sunday evening) - 13 April, 1995 (Thursday) in Monte Carlo, Monaco.

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

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

Format of the Conference: 9-13 April, 1995

9 April, Sunday - Registration and Welcome Reception
10 April, Monday to 13 April, Thursday -
Presentations in the following subject areas:

- Demonstration Devices and their Characterization
- Calorimetry
- Improved Precision Calorimetric Techniques
- Excess Power Generation
- Materials and Fundamentals
- Electrochemical Studies of Deuterated Metal Systems
- Nuclear Measurements
- Solid State Theory
- Solid-State Physics of Metal Matrices
- Behavior of Gas-Metal Systems
- Safety Issues
- Coherent Processes
- Scientific Equipment and Supply Exhibition

CALL FOR ABSTRACTS

One-page abstract due: 1 January 1995

Accepted contributions will be presented either as poster sessions and/or oral presentations. The authors will be notified by the Advisory Committee as soon as the abstracts have been reviewed.

Submit three copies of a one-page abstract in English giving the title of the presentation, name of contact author, and affiliation to:

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

FINAL REGISTRATION

Registration fees and form due: 1 January 1995

A copy of the final registration form is included in this issue. Please complete and return it to the address above by 1 January 1995. The registration fee for conference participants is 2,600 French Francs [approx. US$461.50] which is due along with the abstract(s) for presentations and hotel reservation forms. We encourage you to return your registration forms as soon as possible due to unavoidable mail delays over the Christmas holidays. The registration fee includes a copy of the conference proceedings, coffee breaks, the Conference banquet and the welcome reception.

The registration fee for accompanying persons is 1,000 French Francs [approx. US$177.50] which includes the welcome reception, coffee breaks, the Conference banquet and a sightseeing tour.

HOTEL RESERVATIONS

Hotel reservation due: 1 January 1995

A copy of the hotel reservation form is enclosed with this Announcement. Due to seasonal demand in Monte Carlo, it is strongly recommended that you make your hotel reservation as early as possible because of possible space limitations. In any event the deposit of 1,150 French Francs must be received by the deadline of 1 January 1995 in order to guarantee the rate.

The conference program will be mailed to attendees and inquirers with the Final Announcement together with other materials and information. If you need further information concerning the Conference, please contact Mr. Payet at the address above.

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