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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COMING IN MARCH 1992

Cold Fusion Celebrates Third Anniversary!

A. DAVID & GOLIATH REVISITED

BACK OFF GOLIATH & LET'S COOPERATE!

Dr. Peter Glück, our Romanian correspondent, suggests that David and Goliath (cold and hot fusion) could accomplish more if they cooperate. Thanks to Pons and Fleischmann, the scientists of the world have a new vista on nuclear reactions. It is time that all scientists and

engineers began to cooperate in the understanding and application of what little we know about the fundamental nature of nuclear reactions in condensed matter and how to learn more.

Led by officers of the American Physical Society, some scientists at MIT, Yale, Cal Tech, CERN, Harwell, etc. with support from a pseudo-scientific media whose experts fail to read or understand the scientific literature, cold fusion has been damned with faint praise. The worst case of gross interference and miscarriage of true science was the phone call "from Washington, D.C." to at least one department of the University of Utah warning that "even one graduate student working in cold fusion could curtail ANY grants from Washington."

WHAT IS THE SCORE?

Hot Fusionists: After an estimated expenditure of $20 billion: about 12% energy out/energy in for about 2 seconds. Commercial energy production in 2020 or later.

Cold Fusionists: After an estimated expenditure of $25 million: about 400% excess heat for days and weeks on a steady basis. Commercial energy production by mid-1990s.

WHAT IS THE NEXT PLAY?

The commercialization of cold fusion has begun (see column 2.) Corporate America has pledged over $25 million to the development of cold fusion. There is little need for taxpayer funds except in the normal support of tax-payer funded academic research, and the funding of specialized applications for the military and for NASA.

Research into hot fusion should continue. Some scientific research is so expensive that only governments or consortia of governments can afford to support it. Just as the space program has had commercial fallout, so also will there be commercial applications of new discoveries in the study of hot fusion. Hot fusion research should continue and should incorporate the new discoveries concerning nuclear reactions in condensed matter and the exciting findings of nuclear reactions in cluster impact fusion.

On a national government level, departments of energy world-wide should modify national energy policies to take advantage of the new promise for clean, cheap energy from cold fusion. The advisors to departments of energy should become aware of the rapid developments being made in cold fusion and honestly brief the bureaucrats. Chiefs of national energy departments must have the truth presented to them so that national energy policies can reflect the early promise by cold fusion of inexpensive, non-polluting energy.

So back off Goliath and let's cooperate!

B. $25 MILLION PLEDGED FOR COLD FUSION DEVELOPMENT

With a release time of 12 noon, Saturday, February 22, 1992, it has been announced that a consortium of Utah and Washington corporations have pledged over $25 million over the next few years for the development of cold fusion energy systems. The participating corporations include two Utah corporations and one Washington corporation. Fusion Energy Applied Technology, Inc. (FEAT), Fusion Information Center, Inc. (FIC), and Eden-Barn Industries, Inc. joined to make the announcement.

It is appropriate that business men in the State of Utah, where cold fusion began at BYU and the University of Utah, should be among those involved in the commercialization of cold fusion.

FEAT and FIC are Utah corporations that have been involved in cold fusion from their inception. FIC is the publisher of *Fusion Facts*, which has become one of the best sources of information about cold fusion research and development. FEAT was organized to aid in the commercialization of cold fusion energy systems. FEAT has acquired exclusive rights to several cold fusion patent applications and plans to help in the development of a commercial cold fusion heating system by the end of 1992. Hal Fox, a native Utahn, is the CEO of FEAT.

Eden-Barn Industries is a growing national marketing organization. Mr. Frank Stempfer is chief executive officer of Eden-Barn. He is establishing a nation-wide marketing organziation that will be prepared to help market commercialized cold fusion products as soon as they are available.

FEAT is an unusual organization because voting control of the corporation is vested in over ten U.S. scientists who have been working in cold fusion research. Collectively, this group of scientists have made some of the major developments in cold fusion; have published several papers, and have filed several patent applications. These scientists together with their knowledge and inventions are the primary asset of FEAT.

The goal of this consortium of American corporations is to begin immediately to commercialize cold fusion and have the first manufacturing prototype completed by the end of 1992.

For further information concerning this group write to **COLD FUSION CONSORTIUM**, P. O. Box 58639, Salt Lake City, Utah 84158.

WHEN SHOULD COMMERCIALIZATION BEGIN?

The commercialization of cold fusion should begin when any entrepreneur or group of entrepreneurs can acquire technological rights and obtain funding. The earlier the start the greater the risk. However, with the proper mix of technology, capital, innovation, and management, the return versus risk potential can be enormous.

WHO ARE THE CURRENT PLAYERS?

Commercialization of cold fusion has begun and currently, three main groups have been identified as potential strong players. These three are the following:

1. HydroCatalysis Power Corporation, Lancaster, Pennsylvania.

This group, led by Dr. Randell Mills denies that their products are based on cold fusion but rather on a new chemical reaction where energy is obtained from hydrogen electron shells collapsing below their normal ground state. It is reported that a 1,000 watt electrochemical cell is operating and is being developed for early commercial applications.

2. Electric Power Research Institute (EPRI), Menlo Park, California.

This group has planned a five-year research and development program funded by U.S. electrical power companies. The reported goal is to produce a multi-megawatt cold fusion demonstration plant within five years. Currently, it is reported that 400% excess heat in a modified Pons-Fleischmann electrochemical cell has been achieved.

3. The Cold Fusion Consortium, Utah & California.

This group has acquired both technology and assets. Their most important asset is their Scientific Advisory Board that includes some of the finest U.S. cold fusion scientists. This consortium plans to support both research and development and expects to have their first commercial product developed to a manufacturing prototype stage by the end of 1992.

All three of these pre-commercialization groups have been cautious in making public announcements of their development plans. It is expected that there are at least a dozen other groups in the U.S., Japan, Italy, and other countries that are well along in plans for the commercialization of cold fusion.

WHAT ARE THE ECONOMIC FACTORS?

If the world were to enjoy the level of per-capita energy use that is typical of the United States and other industrialized countries, it would require the burning of ten times as much fossil fuels as is now consumed. The earth's atmosphere would not tolerate the pollution and still sustain life as we know it. **This is the most compelling factor in the commercialization of enhanced energy systems.**

An estimated one-fourth of the cost of the world's total goods and services are energy costs. The total value of the world's delivered goods and services is estimated at $20 trillion ($20,000,000,000,000) annually. Therefore, the total energy market is about $5 trillion per year. **Tapping such a large market is the second most compelling factor and the primary economic incentive for the rapid development and marketing of enhanced energy systems.**

It is estimated that either the Pons-Fleischmann technology [1], the Mill's technology [2], or the Bush-Eagleton technology [3] can form the basis for the delivery of low-heat (under 700 F) energy at one-fourth of the present cost of similar low-level heat energy. **This factor is the most compelling marketing incentive for the commercialization of enhanced energy systems.**

WHO SHOULD BE INVOLVED?

Any corporation or company that is involved in the manufacturing of devices and/or equipment that consumes energy should evaluate the potential impact of cold fusion on their product line [4]. The groups that should be involved are all of those corporations that are not troubled with the NIH (not invented here) syndrome.

All corporate managers should become aware of the potential impact of cold fusion on their company. For some companies the impact may be only reduced energy costs. The impact may be a major potential gain (or loss) of market share. The first entity in a group of competitors to utilize cold fusion energy systems appropriately may become the market leader among that group. Fortunes may be made (or lost) from the decisions that are made.

It is appropriate to ask if the federal government should be involved. In the United States, it would be difficult to find an example of any product or service that has been or that would be improved by being owned and operated by the federal government. Therefore, the government should not be involved except in terms of facilitating the coming revolution in energy systems. For example, the Nuclear Regulatory Commission should declare that any new energy system which does not produce harmful radiation, is not within the purview of the NRC. The

Department of Energy should become informed about the reality of cold fusion, should inform the President of the United States, should contribute to a new national energy policy, and should cut down on needless and expensive alternative energy funding (such as for wind, tides, biomass, etc.) The Department of Commerce should ensure that the U.S. Patent and Trademark Office ceases to use articles from the N.Y. Times as a basis for denying patent protection to cold fusion inventors. It is now almost three years since the first cold fusion patent applications were filed. None have issued. The Department of Labor should be involved. The increasing use of cold fusion energy systems will cause the greatest disturbance in the work force in the United States since World War II. Many jobs will disappear, many jobs requiring new skills will be created, enormous amounts of retraining will be required.

WHAT EVENTS ARE FORECAST?

Big corporations will fail to act quickly. Small groups of entrepreneurs will provide most of the initial developments and many will later be acquired by large corporations. An historic example was the development of built-in kitchen stoves. These built-ins were developed, manufactured, and marketed by small companies. These companies were later purchased by the large appliance manufacturers.

Big government will fail to act quickly. Forward-looking small community governments, some larger cities, and possibly one or more governments of economically distressed states will foresee the coming changes and work to attract new energy industries.

Big energy companies can act quickly. However, there will be no concerted acts to squelch the development of cold fusion. The oil companies know that there is barely enough oil to make the transition from fossil-fuel use to the use of new energy sources and still have some left to supply the growing demand for chemical feedstocks. Most of the big oil companies have or will become involved in the development and use of cold fusion energy systems. The electrical power industry through independent funding and with the future-seeking leadership of EPRI will be thoroughly involved in the development and use of cold fusion energy systems.

The U.S. has the opportunity to emerge as one of the major suppliers of cold fusion energy systems to the world. The use of imported oil will stabilize and then gradually decline. The U.S. will begin to experience a favorable balance of payments. The U.N. may sponsor the use of cold fusion energy systems to solve some of the problems of hunger, disease, and poverty in the third-world countries.

The media will gradually embrace the cold fusion revolution and find excuses or ignore their previous negative coverage. Critics of cold fusion will gradually disappear and many former detractors will say, "I knew it was real all the time." Random House will not publish the attack against cold fusion that it funded. Backpedaling will become a favorite exercise at DoE, CERN, MIT, Harwell, Cal Tech, Purdue, and other places. Pons and Fleischmann will emerge as heroes of the energy revolution.

REFERENCES

[1] M. Fleischmann, S. Pons, and M. Hawkins, "Electrochemically induced nuclear fusion of deuterium." *J. Electroanal. Chem.*, 261, pp 301-308, and erratum, 263, p187 (1989).

[2] Randell L. Mills, Steven P. Kneizys, "Excess Heat Production by the Electrolysis of an Aqueous Potassium Carbonate Electrolyte and the Implications for Cold Fusion'", *Fusion Technology*, **Aug 1991**, Vol 20, No 1, pp 65-81, 10 refs.

[3] Robert T. Bush, "A Light Water Excess Heat Reaction Suggests that 'Cold Fusion' is 'Alkali-Hydrogen Fusion'," *Fusion Facts*, Dec 1991, page 1. To be published in *Fusion Technology*, scheduled for May 1992.

[4] Hal Fox, Cold Fusion Impact, 2nd Edition, published by Fusion Information Center, Salt Lake City, Utah, c1992, 85 pages, illustrated.

C. NEWS FROM THE U.S.

VACUUM MATTERS

Courtesy of Dr. Samuel Faile

Hans Christian Von Baeyer, "Vacuum Matters," *Discover*, March 1992, pp 108-112.

LEAD-IN COMMENTS

The world, modern physics tells us, can no longer be divided into matter and empty space. The world is a single, seamless whole. The universe is mostly vacuum. In the remote regions between galaxies, you would be lucky to find a single atom in a space the size of the Louisiana Superdome. The atoms are packed more densely in our own world of solids and liquids and gases, but even here it is not as crowded as you might think. A close-up of an atom would reveal that the nucleus, which carries 99.9 percent of the weight, hovers in the center of the atom like a BB suspended in the Superdome; except for a few electrons that waft about the stadium like

ghostly gnats, the rest is empty space. ... Shouldn't they [scientists] be worrying instead about the nature of the vacuum, which is by a wide margin the major constituent of the universe.

[This article discusses some of the interesting aspects of zero-point energy. Ed.]

ARIZONA - ZERO EMISSIONS VEHICLE
Courtesy of Dr. Samuel Faile

Matthew L. Wald, "Cars That Whirrr And Burn Rubber," *The New York Times*, Section F, page 10, February 2, 1992.

EDITOR'S COMMENTS

For our readers who consider cold fusion as a possible future aid to transportation, this article will be of interest. A box section discusses "Why Not Use Solar Cells?" and states that at 55 miles per hour, the General Motor's experimental electric car would use a 28-hour solar charge in just over two hours. The article lists the lead-acid battery energy storage merit at 35 watt-hours per kilogram. The sodium sulfur batteries provide about 100 watt-hours per kg. and the lithium iron disulfide battery about 165 watt hours per kg. As another way to consider the energy storage capability of gasoline, 900 pounds of batteries will run the G.E. electric car about as far as could be traveled with 1.5 gallons of gasoline. Obviously, this electric automobile is light weight and gets lots of "miles per gallon equivalent."

CALIFORNIA - COLD FUSION DEATH UPDATE
Courtesy of many callers/writers

An official investigation is in process to determine the cause of the explosion that killed Dr. Andrew Riley on January 2, 1992. The results of that investigation will be reported in *Fusion Facts* in the first issue after the report becomes available. Many of you have written, called, and faxed in an attempt to help, to learn, or to offer condolences. *Fusion Facts*, is most grateful for your concern and especially for your concern for the safety of all CF workers. Dr Martin Fleischmann stated: "We are much concerned about safety (we always have been, but our warnings were consistently ignored) and I would therefore very much appreciate it if you could let me have any information which may be available to you." (See *Fusion Facts*, January 1992, page 5, we quoted the warning that Pons and Fleischmann gave in their first paper.) Even lead-acid batteries explode under electrolysis - so friends, please use suitable safety precautions!

At this time, with only sketchy information, it appears that the device being used experienced a rapid change of operating conditions that caused the explosion. Many of us think it is logical to suspect a nuclear reaction that progressed rapidly. Even if the investigation comes to a different conclusion, there is sufficient evidence for **possible runaway nuclear reactions** that it is imperative that all experimenters treat their cells with due respect. Assume that a cold fusion experiment can "blow up," and be prepared ahead of time by using proper safety precautions.

Among reports received were the following:

Rudy Baum, "Cold fusion experiment blast kills chemist," *Chemical and Engineering News,* Jan 13, 1992, page 4-5.

David P. Hamilton, "A Lethal 'Cold Fusion' Blast," *Science*, Vol 255, No. 5041, 10 Jan 1991, pg 153.

"Explosion in Lab Kills Cold-Fusion Scientist," *The New York Times,* January 4, 1992, page 6 Y.

CALIFORNIA - FLEISCHMANN AT CALTECH
Courtesy of Dr. Sam Faile and Dr. Melvin H. Miles

Gary Taubes (a writer in Santa Monica), "A Cold Fusion Deja Vu at Caltech," *Science*, 13 December 1991, Vol 254, p 1582.

EDITOR'S COMMENTS

Gary Taubes writes disparagingly about cold fusion and comments about Dr. Martin Fleischmann's talk at the California Institute of Technology. After some negative comments (e.g., "the audience tepid response...serious interest in the subject faded a year or so after Fleischmann and Pons...Fleischmann listed only one group, at the Stanford Research Institute, that still purports to confirm it. ... he cited only an ambiguous 2-year-old result from Bhabha [BARC] ...) Taubes cites the work with cold fusion at the Naval Weapons Laboratory at China Lake (done by Dr. Melvin H. Miles et al.).

DR. MILES RESPONSE

In a letter dated 17 Jan 1992 addressed to the editor of *Science*, Dr. Miles makes the following points:

In Gary Taubes' report on Martin Fleischmann's cold fusion seminar at the California Institute of Technology, he states that "similarly researchers working with the China Lake group have said that those observations . . . could be explained by helium-4 contamination from the ambient atmosphere." We are basically a two-man group with respect to cold fusion research at China Lake and

neither of us has made such a statement. To my knowledge, neither has anyone else at China Lake made any such statement. Scientific reporting, if it is to serve any useful purpose, should be based on facts - not fiction. Gary Taubes earlier suggestions of fraud in the tritium measurements by Professor Bockris and co-workers at Texas A&M (*Science*, 15 June 1990, pp 1299-1304) was apparently also based mostly on fiction.

Regarding our report of time-correlated measurements of excess heat and helium, the simple yes or no detection of helium-4 in 8 of 8 experiments producing excess heat, and the absence of helium-4 in 6 of 6 control experiments not producing excess heat implies a chance probability of only 1 in 16,384. ... Furthermore, the experiments at China Lake producing the greater amounts of excess enthalpy yielded the larger amounts of helium-4. Our control experiments show that atmospheric contamination is a highly unlikely explanation for our results.

Martin Fleischmann certainly had valid reasons for wanting to examine the negative cold fusion data collected by the Caltech scientists. The two publications by N. Lewis et al. were a major factor in turning the scientific and public opinion against cold fusion. Ignoring any debate about cold fusion, there are apparently major flaws in the calorimetric experiments reported by N. Lewis et al. that have been brought to my attention by Dr. V. Noninski [See *Fusion Facts*, June 1990, p 20-22.] For fairness and accuracy, these errors by Lewis and coworkers need to be presented to the scientific community.

[After an analysis of the N. Lewis paper/data, Dr. Miles concludes with the following:]

Finally, the 1 p.p.m. detection limit for helium measurements in the effluent gases reported by N. Lewis et al. is far too insensitive to measure the helium-4 yield from the [deuterium] fusion reaction. Assuming an excess power of 1 W/cm^3 (Pd volume was 0.31 cm^3) would yield only 0.043 p.p.m. of helium-4 in the effluent gas for the N. Lewis study at 64 mA/cm^2. Our report of helium-4 in the effluent gases from cells producing excess power employs more sensitive analytical methods.

[Dr. Miles letter will probably meet the same fate at *Science* as an article from six Ph.D.'s who replied to Gary Taubes unfair attack on the tritium measurements at Texas A&M. It will not be published. We are pleased to publish extracts here. In contrast to *Science, Fusion Facts* is devoted to the **advancement of science** not to the curtailment of cold fusion. Ed.]

COLORADO - PRODUCING H IONS

Courtesy of Dr. Samuel Faile

Q. Lj. Petrovic, B.M. Jelenkovic, and A.V. Phelps (Univ of Colorado), "Excitation by and Surface Reflection of Fast Hydrogen Atoms in Low-Pressure Hydrogen Discharges," *Phys Rev Letters*, Vol 68, No 3, pp 325-28, 2 figs, 16 refs.

AUTHORS' ABSTRACT

Fast excited H atoms produced in collisions of fast H atoms with H_2 and observed by Doppler spectroscopy and quantitative radiometry are the dominant H alpha source in low-current, low pressure H_2 dc discharges. For heavy-metal cathodes, backscattered fast H atoms from incident H and H^+ atoms and H_2 and H_2^+ molecules excite most of the H alpha. For graphite cathodes, backscattering is small and H alpha is produced by electrons and by approaching fast H atoms produced by charge transfer in H^+ - H_2 collisions and dissociation in H_2^+ - H_2 and H_2 - H_2 collisions. Excitation of H alpha by ion collisions with H_2 and the cathodes is small.

[We believe that this paper may be valuable to those working in gas-plasma environments. Ed.]

INDIANA & CALIFORNIA - 2 PAPERS

Courtesy of Dr. Mario Rabinowitz

Y.E. Kim*, M. Rabinowitz (EPRI), Y.K. Bae (SRI International), G.S. Chulick*, and R.A. Rice* (* = Dept of Physics, Purdue Univ), "Cluster-Impact Nuclear Fusion: Shock-Wave Statistical Analysis," *Modern Physics Letters B,* Vol 5, Nos 14&15, pp 941-959, 6 figs, 25 refs.

AUTHORS' ABSTRACT

Cluster-impact nuclear fusion is analyzed via a shock-wave model. We show that shock waves can be generated by clusters. Energy loss mechanisms are considered, and the conditions when they are not negligible are determined. Our theoretical model indicates that shock-wave enhanced fusion temperatures are possible with molecular size clusters impacting upon hydrogen isotope targets, somewhat as envisioned by Winterberg and Harrison for macro-projectiles. Our theory explains and reproduces the yields from known target and cluster compositions, as a function of cluster size and energy. Predictions are made, and new tests proposed. We show that contaminants are an unlikely artifact in the experimental data.

AUTHORS' CONCLUSIONS

The shock-wave cluster-impact theory presented here can explain and predict D-D fusion rates for [clusters of ionized heavy water, light water, and deuterium] cluster beams impacting on deuterated targets. The model is expressed in the form of a universal scaling equation with two physically reasonable parameters: nu(n) and tau(n), which are the fraction of projectile cluster and target D atoms reaching high-temperature, and the temperature enhancement factor, respectively. Fitting these parameters to the experimental data for [ionized heavy water clusters] impacting of a [deuterated carbon] target results in nu = 0.75×10^{-2} and tau = 9.7. The fusion yields calculated for other targets, such as TiD and $ZrD_{1.65}$ from the universal scaling equation with these values agree with the experimental data. The model also implies that the temperature enhancing mechanism requires heavy atoms, such as O, in the projectile clusters; thus, it explains the null results of the experiment with the [ionized D gas] clusters.

It was previously thought that macroscopic projectiles are necessary to produce shock waves. We are the first to show that atomic or molecular clusters can produce shock waves due to inertial confinement of the compressed fluid. In addition, we have demonstrated that energy loss mechanisms such as radiation, thermal conductivity, and adiabatic expansion do not significantly limit the fusion yield. Our analysis has determined that unless the contaminant levels are much higher than has been experimentally ascertained, contamination of the cluster beams cannot produce the experimental results. In summary, our shock-wave theory does an excellent job of accounting for and explaining the experimental data, as well as predicting new results.

Y.E. Kim, J.-H. Yoon, and R.A. Rice (Dept of Physics, Purdue) & M. Rabinowitz (EPRI, Palo Alto, Calif.), "Impact fusion and Effective Deuteron Temperature," *Physical Review Letters,* Vol 68, No 3, 20 Jan 1992, pp 373-376, 2 figs, 25 refs.

AUTHORS' ABSTRACT

Temperature and kinematic line broadening are the primary contributions to the width of the proton energy spectrum measured in cluster-impact fusion experiments. By ascertaining these two contributions, we have determined an effective temperature for the high-velocity deuteron component that is responsible for the measured fusion yield. The extracted effective temperature is substantially higher than conventional estimates, and implies that cluster-impact fusion is hot fusion on a atomic scale. The proton spectrum rules out contaminants in explaining the high yield.

AUTHORS' CONCLUSIONS

When a cluster hits the bottom of a crater, the leading edge of the projectile cluster creates upon impact a plasma consisting of target and cluster atoms (ions) and electrons which is partially trapped in the microcrater of several Angstroms in size between the target cavity surface and the trailing cluster atoms. When the trailing cluster atoms move through this plasma, a high-velocity tail may develop for a fraction nu(n) of projectile cluster and target deuterons due to mechanisms (yet to be investigated and understood) such as (a) multiple backscattering of deuterons between target and projectile heavy atoms, (b) pinch instability heating due to magnetic confinement (which favors a one-dimensional velocity distribution), (c) other collective effects due to electron degrees of freedom, etc.

Low-energy (<20 keV) resonances are expected to yield much narrower FWHM [Full Width Half Maximum - curve measuring method to get value] than the data (delta E_p = approx 320 keV) for the proton energy spectrum, ruling out theoretical models based on them. Thus proton spectral broadening can be used to test theoretical models for CIF [cluster impact fusion] in addition to discriminating the effect of possible contaminants. Thus, it is important to measure both the total proton yield and the proton energy spectrum simultaneously in future CIF experiments.

EDITOR'S COMMENTS

Fusion Facts is grateful to Dr. Rabinowitz for sending copies of his papers. In his note, Dr. Rabinowitz rightly claims, "We are particularly proud of our paper, **Cluster-Impact Nuclear Fusion: Shock-Wave Statistical Analysis**. In it we were the first to demonstrate that CIF is Hot Fusion on a small atomic scale. We are also proud of our enclosed *Phys Review Letters* paper. We are looking at the possibility that Cold Fusion may also (like CIF) be hot fusion on an atomic scale. However this would require the branching ratio [neutrons/tritium production] to be close to 1. **Is there a possibility that the large amount of tritium [as compared to neutrons] that has been seen, might be an artifact due to tritium contamination as some have suggested?**" Readers, how do you respond?

In a conversation with Dr. Rabinowitz, he said that theoreticians owe a lot to the experimentalists and in turn good theory provides good direction for further experiments. We strongly agree. The sad part is that too many scientists have been ignoring the literature of cold fusion rather than seeking to add to their understanding of nuclear reactions in condensed matter. We strongly congratulate Dr. Rabinowitz, Dr. Yeong Kim, et al. for their excellent theoretical contributions to cold, warm, and

hot fusion. *Fusion Facts* would like to challenge them to carefully review the experimental evidence on alkali-metal, light-water, excess heat production and help us to understand the nature of the excess heat.

[For problems in shock-wave experiments, see GERMANY - SHOCK-WAVE FUSION on page 10, this issue. Ed.]

MASSACHUSETTS - FLEISCHMANN QUOTED
Courtesy of Dr. Samuel Faile

"Cold Confusion," *Science*, 17 January 1992, page 283.

EDITOR'S COMMENTS

In spite of enormous advances made in cold fusion, *Science*, published by the American Association for the Advancement of Science, still reports nothing of significance in cold fusion. This latest short note merely makes light of Dr. Fleischmann's important presentation at MIT in December, 1991.

MAINE - FUSION POLITICS

W.D. Kay (Political Science, Northeastern Univ, Boston), "The Politics of Fusion Research," *Issues in Science and Technology*, Vol VIII, No 2, Winter 1991-1992, pp 40-46, 8 refs.

AUTHOR'S INTRODUCTION

[Hot] Fusion research is complex and costly. It has been under way for decades and has decades more to go before a commercial power plant is ready to come on line. Progress depends on the construction of a progressive series of major experimental reactors, some costing billions of dollars. Federal funding, however, has waned for the past 10 years, and private-sector support is virtually non-existent.

Editor's highlighted capsules include the following:

Since we are unwilling to bear the costs necessary to make fusion energy a success, it is better that we not go on.

It is extremely wasteful for Congress to promise budgetary support for fusion one year and then withdraw it the next.

We should accept our losses and devote fusion resources to less expensive and more politically manageable energy technologies.

AUTHOR'S CONCLUSION

The EC [European Community] and Japan seem committed to continuing their work. By all means, we should wish them well, and monitor their progress. For us, however, the most prudent course would be to acknowledge the inevitable, accept our losses, and begin devoting fusion resources to smaller, less-expensive, and shorter-term energy technologies that are more manageable politically. Some benefits to science might be lost if the fusion program is killed, but that is what comes with making a tough choice. Again, a scaled-back program will be of little use to fusion scientists. To paraphrase President Kennedy, then, since we are not prepared to do the work and bear the burdens to make fusion energy a success, it is better that we not go on.

EDITOR'S COMMENTS

It is always difficult to determine if tax-payer funded research is for the primary purpose of supporting research, supporting a researcher, or supporting an institution. If it can be shown that hot fusion funds are being used for the advancement of science and **not for the destruction of competing technologies**, then *Fusion Facts* believes that hot fusion deserves tax-payer support. Hot fusion funds in the United States, England, and in most of the CERN countries has appeared to be the sponsor of much of the attack on cold fusion. The end result is that there has been a dearth of cold fusion development in those countries. Some scientists at Harwell (England), MIT (Massachusetts), California Institute of Technology, and CERN have spent much time and money to denigrate cold fusion. This action may be acceptable political science but is unacceptable physical science. The initial result has been less progress and less funding for good science. The end result may be a loss of faith in institutionalized research, a political reaction, and possibly the beginning of the end for hot fusion funding, but we hope not.

MARYLAND - PLASMA ION IMPLANTATION
From Chem Abstracts, Dec 30, 1991

Han S. Ulm, W.M. Lee (Naval Surf. Warfare Cent., Silver Spring, MD), "High concentration of deuterium in palladium from plasma ion implantation," *Phys. Fluids B*, **1991**, vol 3, no 11, pp 3188-93, in English.

AUTHORS' ABSTRACT

Based on a theoretical calculation, a new scheme to increase D diffusion in Pd over its initial value is presented. This D enrichment scheme makes use of plasma ion implantation. A cylindrical Pd rod (target) preloaded with D atoms, coated with a diffusion-barrier

material, is immersed in a D plasma. The Pd rod is connected to a high-power modulator which provides a series of negative-voltage pulses. During these negative pulses, D ions fall into the target, penetrate the diffusion barrier, and are implanted inside the Pd. For reasonable system parameters allowed by present technology, it is found from theoretical calculations that the saturation D diffusion after prolonged ion implantation can be several times the Pd atomic number diffused. Assuming an initial D diffused, $n_O = 4 \times 10^{22}$ cm^{-3}, the D diffused in Pd can triple its original target size. Because of the small diffusion coefficient in Pd, the incoming ions do not diffuse quickly inward, thereby accumulating near the target surface at the beginning of the implantation.

NEW YORK - BOOKS REVIEWED
Courtesy of Dr. Samuel Faile

Trevor Pinch, "Cold Fusion Fiasco," *Chemical and Engineering News*, pp 28-29.

EDITOR'S COMMENTS

A book reviewer on cold fusion should also read the increasing literature on cold fusion. Had Prof. Pinch done so he may have written a different review of Frank Close's "Too Hot to Handle", and Eugene Mallove's "Fire From Ice: Searching for the Truth Behind the Cold Fusion Furor." Pinch maintains that "Unfortunately, both books, rather than clarifying matters, muddy the waters further. As I shall argue below, both have an inadequate understanding of the nature of scientific controversies." Pinch states later, "We follow the swings of belief as scientists rode the cold fusion roller coaster. We learn of the chemists' Woodstock (the April 1989 American Chemical Society meeting in Dallas) where Pons was lauded as a hero, and the physicists' Altamont (the May 1989 American Physical Society meeting in Baltimore) where cold fusion was all but destroyed." Prof. Pinch completely ignores the increasingly positive literature on cold fusion. *Fusion Facts*, sent Prof. Pinch a short note with a copy of the January 1992 issue and suggested, "Your knowledge of current developments in cold fusion appears outdated." It is amusing that Professor Pinch would pontificate about the nature of science when he had not done the expected scientific review by reading some of the current literature.

OHIO - BINARY ALLOY PHASE DIAGRAMS
Courtesy of Dr. Samuel Faile

Thaddeus B. Massalski (Editor in Chief), Binary Alloy Phase Diagrams (in two volumes), Published by American Society for Metals, Metals Park, Ohio 44073.

EDITOR'S COMMENTS

Dr. Faile has been referring *Fusion Facts* to this publication for a variety of metals and alloys as these alloys appear to be important to researchers in cold fusion. Now that nickel appears to be a promoter of nuclear reactions in cold fusion electrochemical cells, experimenters may want to look at some of the available phase diagrams. Specifically, Dr. Faile calls our attention to Volume 1, pages 728-9 for the Ni-Ce Phase Diagram and to Volume 2, pages 1769 and 1771 for the U-Ni Phase Diagram.

D. NEWS FROM ABROAD

AUSTRIA - HYSTERICAL HOSTILITY AGAINST COLD FUSION EXPLAINED
Courtesy of Dr. Peter Glück

S. Freud (U. of Vienna) "Adam's complex - forbidden fruit insufficiency - as primary cause of cold-fusion phobia," *Zietschr. Niergendwoische Psychiatrie,* Vol 291, No 6, 1991, pp 223-8; in English, 3 refs. [Probably appeared in the April 1st issue. Ed.]

ABSTRACT

The discovery of cold fusion has marked an acute gap and break in the every repeating cycle: scientific discovery - explanation - new discovery suggesting that the very limits of human mind's capacity to comprehend the complexity, nonlinearity and internal contradictions of nature have been attained. The new science is interpreted as a proof that our first ancestor has paid too high a price compared to the quantity of forbidden fruit eaten up and this idea causes an instinctual over-reaction of rejection. The author is convinced that this is a case of false alarm and that Adam's action despite its unpardonable character, has a long residual efficiency. **In other words, cold fusion is normal science for normal people.**

[Editor's Note: I have often stated that cold fusion is the greatest discovery since Adam's Rib. Now I understand the reason. But this abstract is a little bit obscure. I'm not sure if it is too much or too little of the apple that is the problem.]

CHINA - NEW MECHANISM
From Chem Abstracts, Dec 30, 1991

Jiefu Yang (Dept Physics, Hunan Norm. Univ., China), "A new fusion mechanism," *Hunan Shifan Daxue Ziran Kexue Xuebao,* **1991**, vol 14, no 2, pp 126-32, in Chinese.

AUTHOR'S ABSTRACT

The nuclear fusion of d-d can not be accomplished at room-temperature, so the phenomena of the cold fusion in experiments may be from a new fusion mechanism. Based on 2 basic hypotheses, the author expounds the physics fundamentals, and uses this new mechanism to explain experimental phenomena that is incomprehensible in normal d-d fusion. Furthermore, the author suggests a series of experiments to check the fusion mechanism.

CHINA - REVIEW OF NICKEL PLATING

Guozhu Liang, Shaolin Kuang (Guangzhou Municipal No. 2 Light Industry Inst., Canton), "Electrodeposition of nickel - mechanism and additives," *Diandu Yu Tushi* **1991**, vol 10, no 1, pp 2-9, in Chinese.

ABSTRACT

A review with 22 references is given. The mechanism of electrodeposition of nickel is reviewed. The new viewpoint proposed by Hoare that boric acid acting as a catalyst in nickel plating baths was introduced. Effects of cathodic current density on both the adsorption and the consumption of additives are discussed. Also, essential ingredients for nickel plating additives are described.

ENGLAND - TRANSMUTATION IN PdD

I.M. Chapnik (Dept of Physics, Univ of London), "Possibility of electrochemically induced transmutation in PdD," *Physics Letters A*, Vol 161, No 2, 23 Dec 1991, pp 111-113, 2 tables, 2 figs, 8 refs.

AUTHOR'S ABSTRACT & INTRODUCTION

New data are discussed in connection with a previously unpublished article by Kühne on the possibility of induced beta radioactivity in PdD. The observation of nuclear radiation from a PdD cathode is usually attributed to fusion reaction or some conventional processes. Less known is a reaction based on the Oppenheimer-Phillips process: tunnelling of neutrons from D to Pd, emission of gamma rays, beta particles and protons, while neutron emission is suppressed. Similar reaction have been considered in ref 3 [I.M. Chapnik, *J.Radioanal.Nucl. Chem. Lett.*, **146**, (1991), 273). The total released energy has been calculated in both articles [ref 3, and M. Ragheb & G.H. Miley, *Fusion Technology,* **16**, (1989) p 243.]

[Nothing in this article provides data that would explain the degree of nuclear reactions observed in many cold fusion experiments. The references cited should be consulted. Ed.]

GERMANY - MASSIVE Pd EXPERIMENT

From Chem Abstracts, Dec 30, 1991

M. Bittner, A. Meister, D. Ohms, E. Paffrath, D. Rahner, R. Schwierz, D. Seeliger, K. Wiesener, P. Wuestner, P. (Physics Dept, Dresden Univ of Technology, Germany), "Emission of DD-fusion neutrons from a massive palladium cylinder during electrolytic infusion of deuterons into the metal," *Isotopenpraxis* **1991**, vol 27, no 6, pp 274-880, in English.

ABSTRACT

A weak emission of fast neutrons during the electrolytic long-term loading (736 hours) of a massive Pd cylinder with D was observed. This is discussed in terms of a plasma-like model of nuclear fusion in condensed matter. A fusion rate per interaction pair of 10^{-44} per second was evaluated.

GERMANY - SHOCK-WAVE FUSION

From Chem Abstracts, Dec 30, 1991

R. Timmermann & R Plaga (Max-Planck-Inst, Heidelberg), "Search for shock-wave-induced nuclear fusion," *Phys. Rev.* A **1991**, Vol 44, No 7, pp 4412-17, In English.

AUTHORS' ABSTRACT

We search for nuclear fusion in the impact of macroscopic high-velocity Fe particles on deuterated Ti and heavy-water targets. The consequences of upper limits on proton and gamma-ray emission for an explanation of the cluster-impact fusion observed in recent experiments are discussed. Our results constrain any explanation of cluster-impact fusion in terms of solid-state or shock-wave effects.

[See the review of 2 theory papers by Kim, Rabinowitz, et al. under News from the U.S. on page 7. Ed.]

GERMANY - SPECIFIC HEAT

Courtesy of Dr. Samuel Faile

M. Robrecht, J. Hasse, E.W. Scheidt, & K. Lüders (Univ. Postfach & Freie Univ., Berlin), "Specific heat of amorphous U-Fe, U-Co, & U-Ni-alloys," *Z. Phys. B - Condensed Matter*, Vol 85, No 2, Nov 1991, pp 249-253, 2 figs, 2 tables, 15 refs.

AUTHORS' ABSTRACT

Alloys of U-X with X = Fe, Co, Ni were prepared by rapid quenching in the concentration range between 50

and 83 at % U. The samples were obtained in the amorphous state as determined by X-ray diffraction. Parts of the samples were used to measure the specific heat by the relaxation method. The calculated density of states is twice as large as that of transition metals like amorphous Zr-alloys. Therefore these results are discussed within the frame of the paramagnon model by taking into account values of the magnetic susceptibility and the superconducting transition temperature.

[This article has been cited because of the increasing interest in Ni as a cathodic material in the new cold fusion electrochemical cells. Ed.]

GERMANY - VOICE FROM THE PAST

Courtesy of Jed Rothwell

Werner Heisenberg, "Physics and Philosophy, The Revolution in Modern Science," from Chapter X, "Language and Reality in Modern Physics," Harper & Bros, New York.

Werner Heisenberg proposed quantum dynamics in 1925 and received the Nobel prize in 1932. In his more philosophical years he made the following statement:

Throughout the history of science new discoveries and new ideas have always caused scientific disputes, have led to polemical publications criticizing the new ideas, and such criticism has often been helpful in their development; but these controversies have never before reached that degree of violence which they attained after the discovery of the theory of relativity and in a lesser degree after quantum theory. In both cases the scientific problems have finally become connected with political issues, and some scientists have taken recourse to political methods to carry their view through. This violent reaction on the recent development of modern physics can only be understood when one realized that here the ***foundation of physics have started moving****; and that this motion has caused the feeling that the ground would be cut from science. At the same time it probably means that one has not yet found the correct language with which to speak about the new situation and that the incorrect statements published here and there in the enthusiasm about the new discoveries have caused all kinds of misunderstanding.*

[History has a way of repeating. Ed.]

HUNGARY - WORLD FLASH 12

From Chem Abstracts, Dec 30, 1991

T. Braun (Eotvos Univ, Budapest, Hungary), "World flash on cold fusion No. 12," *J. Radioanal. Nucl. Chem.*, 1991, vol 155, No 3, pp 141-3, in English.

A review of current literature on cold fusion with a few references.

INDIA - D_2O ELECTROLYSIS

Courtesy of Dr. M. Srinivasan

Deoki Nandan, A.J. Singh, & R.M. Iyer (Chemistry Div, BARC), "Closed Configuration Isopiestic Cells for Long Term D_2O Electrolysis," Published by Bhabha Atomic Research Centre, Bombay, India as BARC/1991/E/008; 15 pages, 13 refs, 4 figs, in English.

AUTHORS' ABSTRACT

Five closed configuration electrolytic cells employing different moisture sensitive electrolyte coatings on parallel windings of Pd (wire) cathode and Pt (wire) anode were fabricated and operated to investigate their amenability for prolonged working and to enrich tritium, if formed through cold nuclear fusion, by continuous recycling of heavy water. The operating D.C. voltages were optimized to balance rate of electrolysis and the rate of water sorption by the hygroscopic electrolyte coatings. while three of the cells could function for short periods, the remaining two cells exhibited very satisfactory operational performance (80-108 days). In one of the latter cells, tritium build up of 23.24 Bq/ml of cell D_2O (blank 2.26 Bq/ml) was registered on the 24th day of operation.

AUTHORS' CONCLUSIONS

Present investigations have demonstrated the feasibility of long term operation of certain closed configuration isopiestic type of electrolytic cells comprising Pd-cathodes and Pt-anodes coated with moisture sensitive inorganic compounds and using an efficient catalyst for $D_2 + O_2$ recombination within the cell. One of the cells showed a tritium build up of over ten times the feed tritium concentration of D_2O for 24 days of cell operation. The data on tritium build up do not permit an unequivocal comment on the possibility of 'cold fusion' in the present electrolytic experiments.

EDITOR'S COMMENTS

This experimental data is typical of many cold fusion experiments in that only a few of the cells actually produced nuclear byproducts. The technique used by the authors is valuable because it shows that a small amount of D_2O can be electrolyzed and recombined (recycled) in an operating electrochemical cell. The amount of heavy water recycled was as high as sixteen times the initial volume. Copies of this paper can be obtained from Head, Library and Information Division, Bhabha Atomic Research Centre, Trombay, Bombay, India.

INDIA - NOT COLD FUSION

From Chem Abstracts, Dec 30, 1991

H.J. Arnikar (Dept Chem, Univ Poona, Pune), "Cold fusion - a misnomer," *Indian J. Chem. Sci.* **1990**, no 4, p 65, in English.

[A discussion with no references is given on cold fusion (in D_2O electrolysis with Pd cathode) which the author maintains should not be described as nuclear fusion or fusion.]

ISRAEL - HYDROGEN LOADING

Courtesy of Dr. Samuel Faile

N. Bronfman, J. Bloch, M.H. Mintz, D. Sarussi and I. Jacob (Ben-Gurion Univ of the Negev except Bloch with Nuclear Res Centre, Negev), "Kinetics of Hydrogen absorption in the intermetallic $Zr(Al_{0.2}Fe_{0.8})_2$," *Jrnl of Alloys and Compounds,* Vol 177, 1991, pp 183-91, 1 table, 6 figs, 10 refs.

AUTHORS' ABSTRACT

The hydriding kinetics of $Zr(Al_{0.2}Fe_{0.8})_2$ was studied at four different temperatures between 238 K and room temperature (298 K) and at an approximately constant pressure of 10 atm H_2. This compound is characterized by the largest hydrogen capacity in the $Zr(Al_XFe_{1-X})_2$ intermetallic system, which exhibits an interesting and anomalous hydriding behavior. The experiments were carried out with thin intermetallic pieces of definite thickness in order to facilitate the data interpretation. Special precautions were taken during the slicing of the brittle compounds. Visual and metallographic examinations of partly hydrogenated compounds imply a contracting envelope type of hydrogenation. A simple mathematical analysis of the time-dependent hydrogen absorption curves yields the interface velocity *u* of the advancing hydride. The derived values are approximately in the range 10^{-3} to 5 X 10^{-3} mm per sec for the investigated temperatures and pressure. An activation energy of about 0.14 eV (per H atom) {27 kJ per mol of H_2} was estimated for the hydrogenation process.

ITALY - COULOMB SCREENING

Courtesy of Dr. Samuel Faile

G. Stoppini (Univ Piazza Torricelli, Pisa), "Coulomb Screening in Superconducting PdH(*)," *Il Nuovo Cimento*, Vol 13D No 9, Sept 1991, pp 1181-88, 1 fig, 1 table, 12 refs, (in English).

AUTHOR'S SUMMARY

It is pointed out that the electron pairs stability in superconducting PdH(D) requires a superscreening of the proton (deuteron) Coulomb potential. This superscreening is evaluated and discussed. It is conjectured that it can have the effect of producing detectable DD nuclear fusion events in superconducting PdD.

AUTHOR'S CONCLUSION

Although pure Pd is not a superconductor if T > 0.8 K, hydrides such as PdH and PdD show superconductivity with transition temperature T_C as high as about 11 K. When $T < T_C$, the stability of the pair against Coulomb scattering with the protons (deuterons) suggests the existence of a particular screening mechanism of the proton Coulomb potential. This has to be ensured by the conduction electron. A superscreening can be achieved considering the interaction between the electron pairs and the protons. It should also decrease the activation energy for diffusion of protons inside the Pd lattice. From this picture, the possibility follows of detecting the effect of observing the DD fusion events produced in PdD when $T < T1_C$.

JAPAN - D-LOADING *IN VACUO*

Courtesy of S. Faile & Jed Rothwell

Eiichi Yamaguchi and Takashi Nishioka (NTT Basic Res Labs, Tokyo), "New method for inducing anomalous nuclear effects in deuterated palladium system," *Proceedings of ISEM - Nagoya, Int. Symp. on Nonlinear Phenomena in Electro Magnetic Fields,* Jan 26-29, 1992, 4 pages, 4 figs, 2 refs, in English.

AUTHORS' ABSTRACT

We report recent progress of our new technique for inducing anomalous effects in Pd:D (Pd:H) systems. This *"in vacuo"* method enables us to detect the charged particles emission and to perform the mass spectroscopy of released gases simultaneously. With 100% reproducibility in obtaining the excess heat evolution, explosive gas release, and rapid plastic deformation, we have found that these phenomena are induced by D(H) transport due to the temperature and strain gradients. We have also observed gigantic charged particles emission from Pd:D, where the maximum energy was approximately 3 MeV. The occurrence of the charged particles burst was strongly correlated to the excess heat evolution and gas release.

AUTHORS' CONCLUSIONS

We have reported recent progress of a new "in vacuo" technique for inducing anomalous effects in Pd:D (Pd:H) systems. In performing this method, we have found the optimal sample preparation condition to realize the 100% reproducibility in obtaining the excess heat evolution, explosive gas release, and rapid plastic deformation.

It has also been found these phenomena are induced by D(H) transport due to the temperature gradients. The following fact has suggested that the excess heat was not produced by nuclear reactions; namely, the same phenomena of excess heat generation etc., was easily occurred both on Pd:H systems and on Pd:D system even without detecting charged particles emission.

Nevertheless, we have observed **gigantic charged particles emission** [highlight mine. Ed.] The energy spectra has shown that the maximum energy was approximately 3 MeV. The occurrence of the burst was strongly correlated to the excess heat evolution and explosive gas release. Therefore, it is expected that the accumulated strain induces both D-D nuclear reaction and excess heat production in Pd:D systems.

POLAND - FACTS & OPINIONS

From Chem Abstracts, Dec 30, 1991

Jerzy Sobkowski (Chem., Univ Warszawski, Warsaw, Pol.), "Cold fusion - facts and opinions," *Wiad. Chem.* 1990, 44(7-8), 587-602, 15 refs, in Polish.

AUTHOR'S ABSTRACT

The very recent state of the so called cold fusion is presented and critically reviewed.

SWITZERLAND - MUONIC H ATOMS

Hubert Schneuwly & Francoise Mulhauser (Inst. Physics, Univ. Fribourg, Switzerland), "Ephemeral muonic hydrogen atoms," *Phys. Lett. A*, **1991**, vol 160, no 1, pp 71-6, in English.

AUTHORS' ABSTRACT

The unexpected experimental results on charge transfer from muonic H atoms to noble gas atoms and to molecules like SO_2 and SF_6 are unexplained yet. In systematic measurements performed in H_2 + SO_2 gas mixtures, the hypothesis of ephemeral muonic hydrogen atoms might save the principle of reproducibility of experimental data.

TAIWAN - CLUSTER IMPACT THEORY

From Chem Abstracts, Dec 30, 1991

Shin nan Yang, Yi chen Cheng, W.Y.P. Hwang, Shyh Tzong Lee, Chi I. Wu (Dept Physics, National Taiwan Univ, Taipei, Taiwan), "Cluster-impact fusion and warm atomic plasma," *Chin. J. Phys. (Taipei)* **1991**, vol 29, no 4, pp 385-94, in English.

AUTHORS' ABSTRACT

We propose a mechanism that may allow for understanding of the cluster-impact fusion experiment. When the cluster of D_2O molecules collides with the metallic surface, the cluster dissociates into a collection of D and O atoms, as caused by a large number of collisions due to the interaction between the cluster and the lattice. In the process, a significant portion of the translational kinetic energy of the cluster is converted to thermal energy, so that the system thermalizes to become a warm atomic plasma. The neutral D atoms in the warm atomic plasma then fuse with the D atoms in the lattice via direct scattering, without going through the doorway step of forming D_2 molecules. As a rough estimate for the fusion reaction rate, the velocity distribution of the thermalized D atoms is taken to be Maxwell-Boltzmann, leading to results in qualitative agreement with the experimental observations.

E. SHORT ARTICLES FROM READERS

COLORADO - APPLICATIONS OF COLD FUSION

Materials submitted by Steve Pike and Chip Ransford of Nova Resources Group, Inc. 2489 W. Quinn Ave., Littleton, Colorado, 80120.

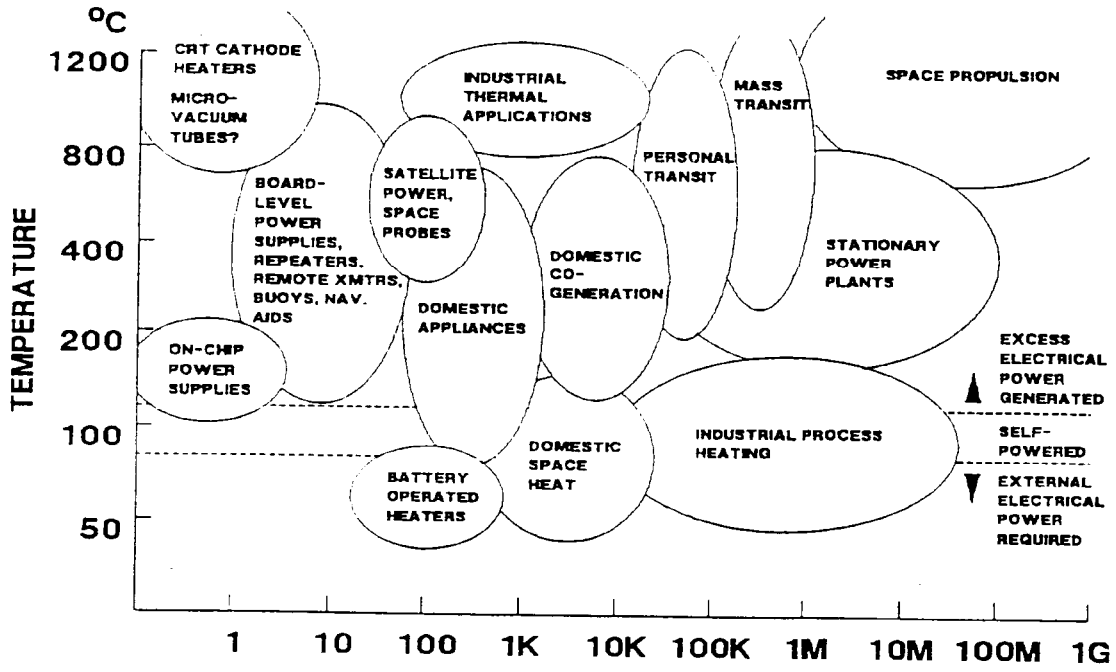
The applications of cold fusion is nicely summarized in the two charts shown below. These charts provide types of applications based on a combination of the thermal power and the temperature. For example, on the first chart (Cold Fusion Applications) the very low power level could be used for creating energy for on-chip power supplies. At the opposite (high power) end of the chart, industrial heating, stationary power plants, mass transit, and even space propulsion could be potential applications.

Depending on the efficiency of the cold fusion process (in terms of percent of excess heat generated per unit of input power) and the efficiency of the thermal-electrical energy convertor, the second chart provides a graphic display of possible applications of cold fusion. The displays in both charts are placed on the same Temperature (y-axis) Thermal Power (x-axis) grids. The typical electrochemical cell using a water-based electrolyte can conceivably produce heat at up to 700 F (371 C).

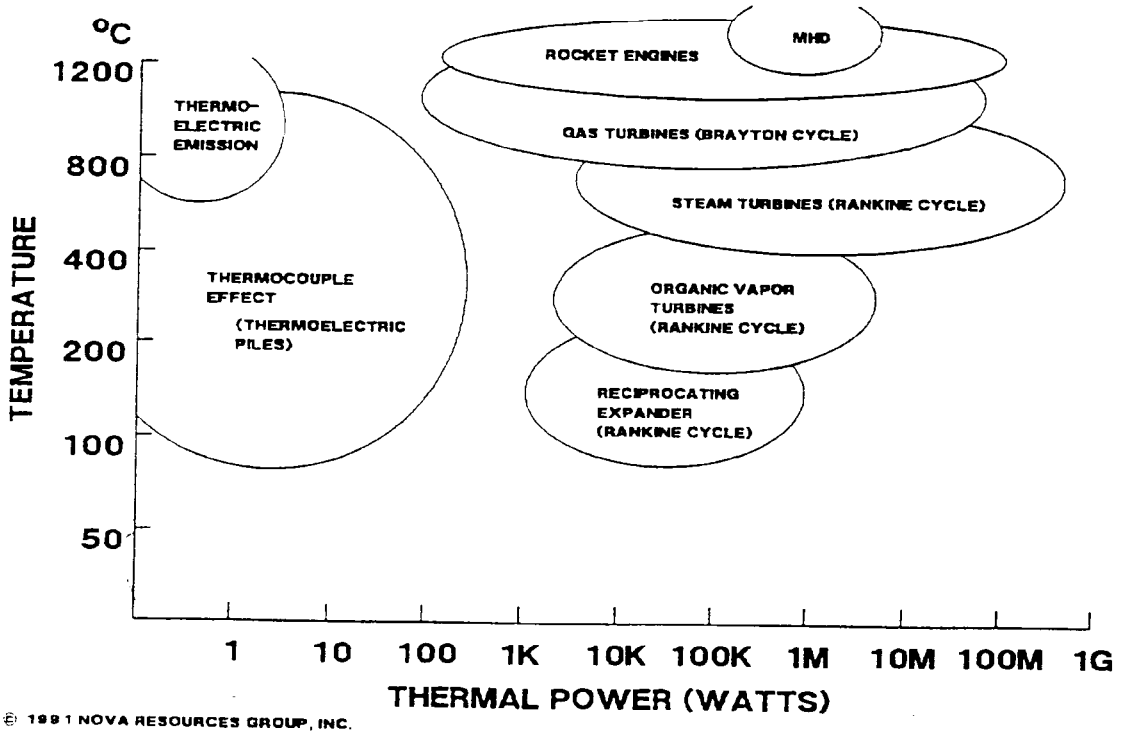
Above this temperature the liquid-vapor interface disappears and electrolysis at this level is not easily defined.

In the two charts the boundaries of the processes (such as **ORGANIC VAPOR TURBINES**) represent practical and economic limitations in addition to the physical processes involved. We hope that this presentation will stir you to innovative endeavors in finding novel applications for cold fusion energy systems.

COLD FUSION APPLICATIONS



THERMAL - ELECTRICAL ENERGY CONVERSION



MASSACHUSETTS - A HOW-TO LESSON

Eugene F. Mallove (Cold Fusion Research Advocates), "Protocols for Conducting Light Water Excess Energy Experiments," assembled from published and unpublished material. The full text is presented below.

{Note from Jed Rothwell, Cold Fusion Research Advocates: This document is intended to augment the *Fusion Technology* paper by Mills & Kneizys [1]. *Fusion Technology* is carried in many major libraries.}

PURPOSE: Many people have heard of the light water excess energy experiment reported by Mills and Kneizys in *Fusion Technology* [1]. By January, 1992, this excess energy effect had been reproduced by at least a half-dozen other groups. Even though the experiment is simple and apparently highly reproducible, many would-be experimenters might be deterred from trying it because of the well-known history of difficulties with the heavy water palladium-platinum approach of Fleischmann and Pons. Even though Mills, et al. do not think that their excess energy is due to "cold fusion" (they have an elaborate theory of shrinking hydrogen atoms to explain the excess power) their experiment **was** inspired by the Fleischmann-Pons announcement. The purpose of this brief collection of experimental protocols is to encourage others to try the Mills experiment and perhaps go beyond it in their investigations.

HOW TO BEGIN: The first order of business is to read the experimental part of the Mills-Kneizys paper in *Fusion Technology* to familiarize yourself with the basic approach. Don't try any fancy pulsed input power in the beginning. Stick with continuous (DC) input power. Don't be concerned either about the exotic theory of Mills and Kneizys. Their theory may be wrong or right, but it's the validity of the experiment that's important at the moment. Other theories -- including "convention" cold fusion mechanisms working with the trace amount of deuterium -- might be invoked to explain the excess energy in this light water experiment. [Also see the Abstract of Dr. Robert T. Bush's forthcoming paper in *Fusion Facts*, Dec 1991, page 1.]

CONDITIONS THAT SHOULD BE EMPLOYED:

1. The volume of solution could be from 100 ml to 1,000 ml in a vacuum-jacketed glass Dewar cell. Note: Some people have tried a non-Dewar cell (a heavily insulated glass beaker with plastic materials to give the same insulating Dewar effect.) The cell should be closed at the top with a tapered rubber stopper.

2. The electrolyte should be: 0.6 M aqueous K_2CO_3 of high purity.

3. The electrolyte should be stirred continuously with a magnetic stirring bar to ensure temperature uniformity.

4. The nickel cathode does not apparently have to have the exact configuration of the "spiral wound" sheet described by Mills-Kneizys [1] in their paper. It could be just a flat sheet of nickel, but the ratio of the **total surface area** (i.e. both sides) of the nickel cathode to the surface area of the platinum anode should be no less than 20/1.

5. The anode is of platinum wire, 1 mm diameter. Mills and Kneizys used a spiral-shaped piece 10 cm long.

6. Above all, avoid impurities and contamination of the cell materials, whether in handling or in environmental conditions. Particularly insure that no organic contaminants are in the cell or on the electrodes. (Don't forget that remnant soap film could be a problem!)

7. Dr. V.C. Noninski, who has replicated this light water work [2], recommends:

"Before starting the experiment, mechanically scour the platinum anode with steel wool, soak overnight in concentrated HNO_3, and then rinse with distilled water. Remove the nickel cathode from its container with rubber gloves, and cut and bend it in such a way that no organic substances are transferred to the nickel surface. Preferably, dip the nickel cathode into the working solution under an electrolysis current, and **avoid leaving the nickel cathode in the working solution in the absence of an electrolysis current.**"

8. Before attempting to run the cell to demonstrate excess energy, reverse the cell polarity for about one hour to anodize the nickel cathode. However, Professor John Farrell of the Mills group has said that 1/2 hour of this treatment is adequate. He says this "electropolishes the Ni."

9. Use distilled H_2O.

10. There have been claims and counter claims about whether the experiment will work in "closed-cell" mode with a catalytic recombiner. Begin your work without a recombiner to be on the safe side. Professor Farrell and, independently, Dr. Noninski have measured the oxygen and hydrogen evolution in the absence of a recombiner and find these gases in the expected quantities, i.e. unsuspected recombination is **NOT** causing the excess power effect.

11. The current density on the cathode should be on the order of **one milliamp per square centimeter**. This is very low compared to the Pons-Fleischmann heavy water experiments.

12. To calibrate the cell, introduce a pure resistance heating of known power by using a 100 ohm precision resistor encased in teflon tubing.

SIMPLE ANALYSIS: The basic goal of the experiment is to demonstrate that significantly more heat emerges from the cell under electrolysis than the joule heating of the cell. This is how the basic analysis works:

The cell has a particular heating coefficient (HC), which can be determined by employing (in the absence of electrolysis) **pure resistance heating** by an ordinary precision resistor with an applied voltage. One might find, for example, that the HC of a particular cell is, say 25 C/watt. This means that for a watt of input power, the temperature of the liquid contents of the cell should rise 25 C above ambient. In this regard, keeping the ambient temperature stable is important; this is a source of possible error in the experiment.

The heat input to the cell that would ordinarily be expected from electrolysis (the so-called "**joule heating**" is given by the expression: (V - 1.48) I, where V is the voltage applied to the cell (in volts), and I is the current passing through (in amperes). The "I x 1.48" quantity here is the power lost by electrolytic production of oxygen and hydrogen. Because the cell is open to the atmosphere, this "power" in the form of potentially recoverable chemical energy simply escapes the cell.

If, for example, the current is 80 mA and the applied voltage is 2.25 volts, the joule heat input to the cell would be 61.6 mW. (An example used by Professor Farrell.) If the HC were 25 C/watt, the expected **temperature rise** of the cell due to the 61.6 mW input power would be 25 x 0.0616 = 1.54 C. If the temperature is observed to rise any more than 1.54 C, an unknown excess power source may exist in the cell. If, for example, the temperature were observed to rise 3.08 C, rather than only 1.54 C, this would represent 100% more heat than 61.6 mW coming from the cell, that is, 133.2 milliwatts.

Excess powers on the order of 100% to 300%, calculated in this manner, are said to be readily achievable. As Professor Farrell has said, "**We have never NOT gotten the effect.**" [With these general conditions.]

CAVEAT: This writeup has been prepared as a tutorial for beginners by someone who has not done the experiment himself, but who has talked to the people who have. You should be able to go off on your own now and find bigger and better ways to do this. You might begin by trying pulsed power input, which supposedly increases the output. If you are a cold fusion skeptic, you should really relish this experiment! If offers an easily reproducible effect. If you can find a **trivial** explanation for the excess power, think how famous you'll be! More likely, you'll become a "Believer" -- or at least a very frustrated skeptic -- so watch out!

REFERENCES:

[1] Randell L. Mills, Steven P. Kneizys, "Excess Heat Production by the Electrolysis of an Aqueous Potassium Carbonate Electrolyte and the Implications for Cold Fusion'," *Fusion Technology*, **Aug 1991**, Vol 20, No 1, pp 65-81, 10 refs.

[2] V.C. Noninski, "Excess Heat During the electrolysis of a Light Water Solution of K_2CO_3 With a Nickel Cathode," *Fusion Technology*, Accepted for publication, scheduled for March 1992 issue.

F. LETTERS TO THE EDITOR

LETTER FROM SRI LANKA

From Arthur C. Clarke, CBE
Colombo. (After receiving *Fusion Facts.*)

Dear Hal,
... Now cold fusion - I've been interested in this ever since my late friend Luie Alvarez sent me his autobiography, and of course, I was very excited by the recent Pons and Fleischmann's claims. First, I assumed they were mistaken, but then reading Mallove's book, I changed my mind. Now it seems 98% certain that there is something there. ... The implications are so enormous that it is hard to believe in the possibility, and I can well understand why the hot fusion boys are unhappy!

One's first reaction is: why wasn't this discovered years ago? A good answer to that is the case of the Fullerenes, which could have also been discovered 20 or 30 years ago (Incidentally, the last time I saw dear old Bucky was in this very room).

I'm passing on the newsletter to the local atomic energy people, and please keep me informed of future developments - though, if they proceed as you suggest, I'm sure they'll be on the cover of *TIME* magazine!

... All good wishes, /s/ Art

LETTER FROM DENMARK

From Professor Dieter Britz
Chemistry Department, Aarhus University

In Fusion Facts Vol 3, No 6, December 1991, your new Romanian correspondent, Dr. Peter Glück, makes some kind remarks about my bibliography and me. He also

quotes from some private correspondence between us. Now in writing a letter to a colleague, one is not quite so careful how one phrases things, and I am quoted as writing that I like Eugene Mallove's book, Fire from Ice, "better in fact than the one by Close." I have made such statements elsewhere, but whenever it was meant for publication, the words "in some ways" were added. This is my opinion still. The book is not better in all ways; clearly, it is better written, less repetitive, but does have the fundamental flaw of being written from a positive point of view - something Mallove, to his credit, makes clear right at the start. You might say the Close's book, Too Hot to Handle, has the opposite flaw of being written by a skeptic, which also he makes quite clear. The quote, as it stands is misleading and embarrassing to me.

Dr. Glück also quotes a comment I made about my paper in J. Radioanal. Nucl. Chem. Lett., (now out) but the correlation is not between temperature and **alpha** emission, but temperature and **gamma** emission.

/s/ Dieter Britz

[Note to Dr. Britz: Please blame *Fusion Facts* for the inadvertent transformation of **gamma** to **alpha**. Our sincere apologies for writing anything that would be embarrassing to you. That is not our intention. We are most pleased with the cautious but fair manner in which you have reported on and editorialized about cold fusion. *Fusion Facts*, after reviewing hundreds of positive papers, has adopted the policy of minimal reporting on negative papers because, optimistically, we believe that the negative reports are often statements of "I couldn't do it," and later could be embarrassing to the authors. Our goal is to share information and not to find fault (except maybe with political science advisors to the U.S. Dept. of Energy.) Hal Fox, Editor-in-Chief.]

LETTER FROM MADRID

Dear Hal,

We, the Cold Fusion Community, have often commented about the first time the expression **Cold Fusion** was used. One of my postgraduate students, Fermin Cuevas, has let me know that Julio Cortazar, a well known Argentinean international writer, used the Spanish expression **FUSION FRIA** (precise English translation is **COLD FUSION**) as early as 1970 in his book **Historia de Cronopios y de Famas**. I include a photocopy of the page of the book edited by Edhasa, Barcelona, Spain in 1970.

Sincerely, /C. Sanchez/

[Thank you Dr. Sanchez, we accept that piece of history. We look forward to hearing from you on your further experimental work in **Fusion Fria.** Ed.]

COLD FUSION RESEARCH ADVOCATES

Courtesy Jed Rothwell

The following letter was received via Cold Fusion Research Advocates through CompuServe:

"I would like to know if CF researchers are looking for low energy x-rays or not. Specifically, I would like to know (a) if they have ever looked for emissions at around 78 KEv (very soft) showing a characteristic Compton edge. If the answer to (a) is "no," then I would like to urge someone to do so; preferably someone who is already running a successful CF experiment.

"In addition, if people are seeing cold fusion with H_2O as opposed to D_2O, I would urge them to look for the 511 KEv annihilation gamma, which should NOT be present with similar reactions involving D_2O.

"I suspect a quantum **tunnel effect** with the isotope 105 Pd. This reaction could yield about 7 MeV with most of the energy being taken up as recoil energy of the products - that is, heat energy in the Pd lattice. Tritium and/or helium would be a third-order byproduct (very little). Hydrogen (protium) would be the first order byproduct - but it is very hard to look for hydrogen under the conditions of CF. This reaction should yield neutrinos (hard to detect) plus a VERY characteristic 78 Kev gamma ray (x-ray, really) showing a Compton edge."

From Norman L. Reitzel, Jr., B.W.V.Engineering.

[Do any of our readers have any comments? If so, please write, fax, or phone. Ed.]

FUSION RESEARCH ADVOCATES - PETITION

Courtesy of Jed Rothwell

Jed Rothwell sent information showing that about 300 scientists and engineers (as of Jan 9, 1992) had signed the petition to the U.S. Congressional Energy Committee to encourage a public hearing on cold fusion. We commend Jed and Gene Mallove for their efforts and all of you who have signed the petition.

Jed also sent a copy of a cartoon of a scientist working in his lab and complaining to an associate: "I'm on the verge of a major breakthrough, but I'm also at that point where chemistry leaves off and physics begins, so I'll have to drop the whole thing."

COLD FUSION PATENT APPLICATIONS

Courtesy Dr. Peter Glück

(See *Fusion Facts*, December 1991 for list of first 52.)
[Entries: List No.; Patent Application No.; Title; Applicant; Date of publication; Priority date; Comments.]

53. JP 91 025,392; "Nuclear Fusion and Plants"; Hitachi; 4 Feb 1991; 23 June 89; Nuclear fusion is caused by immersing a D-adsorbed material in liquid D. A nuclear fusion plant may include a means to repeat the introduction of the D-adsorbed material into a low-temperature or boiling heat-transferring medium, causing nuclear fusion, and reimmersing the material in liquid D.

54. JP 91 025,393; "Nuclear Fusion Fuel Elements"; Hitachi; 4 Feb 1991; 23 June 1989; A fuel element for nuclear fusion consists of a solid material (e.g., Palladium) with a body-centered cubic structure, and a H isotope(s) adsorbed by the material. A nuclear fusion plant contains the fuel element, a coolant to remove heat generated by nuclear fusion inside and/or on the fuel element, and a means to generate steam from the coolant.

55. JP 91 51,794; "Cold Nuclear Fusion Apparatus"; NEC Corp; 6 Mar 1991; 19 Jul 1989; The apparatus, equipped with a device for heavy-water electrolysis, is characterized in that the cathode of the device is formed at a graphite-alkali-metal interlayer compound (e.g. C_8K.)

56. JP 91 53,194; "Power generators based on cold nuclear fusion"; Matsushita Electric Industrial Co., Ltd.; 7 Mar 1991; 21 Jul 1989; A power generator based on cold nuclear fusion utilizes heavy water, a Pt anode, a Pd cathode and an electric power source, is characterized in that the Pd cathode is porous.

57. JP 91 53,195; "Power generators based on cold nuclear fusion"; Matsushita Electric Industrial Co., Ltd.; 7 Mar 1991; 21 Jul 1989; A power generator based on cold nuclear fusion, which utilizes heavy water, a Pt anode, a Pd cathode, and an electrical power source, is characterized that the Pd cathode is porous, and it is under vibration.

58. JP 91 160,397; "Preliminary treatment of hydrogen holder"; Canon K.K.; 25 Mar 1991; 4 Aug 1989; Before adsorbing D (for cold nuclear fusion), a H holder (for example, Pd) is either heated or placed in vacuum. The process can expel H from the H holder and adsorb highly pure D.

59. JP 91 160,395; "Cold nuclear fusion in solids, and apparatus therefor"; Nagoya Univ; 10 Jul 1991; 18 Nov 1989; The process includes: (a) evaluating a reaction chamber; (b) activating a solid body (e.g., Pd) which adsorbs a nuclear-fusion-causing gaseous material (e.g. D); (c) supplying a predetermined amount of the gaseous material; and (d) allowing the body to adsorb the gaseous material close to saturation. The surface of the solid body may be cleaned in short time by glow discharge. An application for the process includes means to take out heat caused by the nuclear fusion.

60. JP 91 160,396; "Cold nuclear fusion in solids: Nagoya Univ; 10 Jul 1991; 18 Nov 1989; The process includes: (1) allowing a solid to adsorb a nuclear-fusion-causing material (as an eutectic element) to almost saturation; and (2) exciting the solid (by, for example, electric discharge) to cause sudden supersaturation, which creates high local concentration of the material.

61. JP 91 160,397; "Forming elements by cold nuclear fusion in solids."; Nagoya University; 10 Jul 1991; 18 Nov 1989; The process includes: (a) evacuating a reaction chamber; (b) activating a gas-adsorbing body (for example, Pd) in the vacuum chamber; (c) supplying a nuclear-fusion-causing gaseous material into the chamber; (d) allowing the body to adsorb the gaseous material to saturation; (e) causing nuclear fusion by the material adsorbed in the body; and (f) recovering the fusion product.

62. WO 91 06,959; "Media for solid state fusion," Mass. Inst. of Technology; 16 May 1991; 25 Oct 1989; Apparatus for electrochemical as well as thermochemical fusion are provided. Material systems consisting of D storage intermetallic compound, transition metal/rare earth metal intermetallic compound, and elemental material cathodes are combined with compatible electrolytes including solid deuteride electrolytes, cryogenic electrolytes, and supercritical deuterium in electrochemical fusion apparatus wherein a magnetic field may be provided to enhance fusion initiation in the cathodes. The invention enables the operation of these electrochemical and thermochemical fusion apparatus over a wide range of temperatures and pressures which may be adjusted to optimize the efficiency of the solid state fusion reaction.

[We wish to thank Dr. Glück for sending us these latest patent applications.]

LETTERS FROM ROMANIA (EXCERPTS)

From Dr. Peter Glück

December 10, 1991

"We, Romanian researchers, are encouraged to seek international collaboration. But this is both good and bad news: good because we are free to collaborate, and bad because our work, skills, experience cannot be properly used here [due to economic conditions]. ... I have sustained a strong campaign for cold fusion - eight

conferences, many speeches at the local radio. These have contributed to a somewhat better public image of cold fusion here, and **I got funding from our Geophysical Institute.** We have a typical riddle here: What is small, dirty, black and is knocking at the door? The answer: **The future.** ... As Rutherford has said, "We have no money, therefore we must think."

Dr. Glück discusses the importance of convincing many scientists in many fields of the reality of cold fusion. He suggests using the David & Goliath simile: "Please consider cold fusion as a slingless David confronting Goliath (hot fusion). This David and this Goliath don't have to fight. On the contrary they must be good friends for their mutual advantage. Goliath is a slow moving giant who has a lot to learn from David. David is this clever little guy who has much to tell." [See page 1, this issue. Ed.]

In a discussion of a logical presentation, Peter suggests: "logic is a sure solid path between two swamps."

For those of us (especially in the U.S.A.) who can buy a desk-top computer for the equivalent of one- or two-weeks pay consider Peter's comments: "It is my dream to have a computer of my own. I could share it with my daughter who is learning chemistry at the University. She will continue my work including cold fusion. The greatest computer memory in our town is 86 megabytes."

January 9, 1992 letter:

Dr. Glück writes: "It is wonderful to know in advance of publication, what is the message of such crucial papers like that by Dr. Robert Bush. ... The two papers by Dr. Cravens are excellent, every sentence is the product of thousands of hours of work and experience - this is genuine cold fusion **engineering** - elements of know-how never to be found in books or papers. It is very stimulating to see that he has demonstrated by a very creative (and simple) method that cold fusion is **spotty**, given that I am convinced that this is an essential feature of this phenomenon. ... As further regarding cold fusion engineering, I am sending you the new patents (ten) for our list, including the abstracts. These 62 patents represent a total of 1056 pages (the largest is Mills with 216 pages!). ... A genius can be almost everybody but we need now people able to process enormous quantities of information. I believe that we shall soon be the victims of an informational flooding as soon as the scientific community will accept cold fusion as normal science (mid '92)."

Dr. Glück likens some of the problems of cold fusion understanding to the six blind men of Indostan, each of who got to feel some part of an elephant: "And so these men of Indostan disputed loud and long, Each in his opinion exceeding stiff and strong; Though each was partly in the right and all were in the wrong."

Dr. Peter Glück, in looking forward, gives this admonition: "In the case of cold fusion, the greatest efforts and attention are now directed toward the central battlefield (electrochemical + gas/metal fusion - energetical implications) but for a correct transdisciplinary image we have to equally consider such more remote and less definite subfields as chemofusion or atmospheric fusion. ..."

In commenting favorably about Jed Rothwell's and Eugene Mallove's petition drive, Peter observes: "demonstrates excellent diplomatic talents including in his [Rothwell] polemic with *Scientific American.* [Rothwell] seems to know well Ben Johnson's advice, 'The dignity of truth is lost with much protesting.' and for this reason 'I believe that in the end the truth will conquer.' [John Wycliff]."

Peter wisely observes: "Truth will conquer if we are well organized. ... I know that people - important or not, responsible or not, friendly or hostile, less or more clever/honest, etc.; are the same everywhere. My pro cold fusion campaign here was a success, the idea is generally accepted, funds are completely missing but if we have had funds, cold fusion could be a priority." Dr. Glück states that we need: An **association** including both radicals and moderates... A **center of coordination and information** ... A **Strategy, both scientific and political** ... Established **relations** with neighboring areas of research..." Peter quotes Martin M. Starr, "The rules for a successful publicity campaign are no more obvious than those for writing a good symphony."

[Dr. Glück is a witty, dedicated scientist. We thank him for his letter and his thoughtful suggestions. For another facet on scientists affected by recent events see the following letter from Dr. Bockris. Ed.]

HIRE THE SOVIET SCIENTISTS

Letter from Dr. John O'M. Bockris, Texas A&M

"I draw attention to the situation in countries arising from the former Soviet Union.

I have been approached by several Russian colleagues particularly from Institutes of the Academy of Sciences. It appears that the Academy has told its members that the fate of their Institutes in uncertain and that this impacts the reliability of their salaries so that they have been advised to seek jobs elsewhere, particularly abroad.

There must be more than 1,000 scientists involved in this lamentable breakup of Russian scientific activity much of

which, particularly on the fundamental side, was of high caliber.

It seems that there are two reasons why we should be very concerned with these happenings, and indeed make some effort to strike a positive stance with respect to them.

1. A number of the scientists who are out looking for jobs are those having critical defense secrets and knowledge, held very narrowly and pertaining to extremely dangerous weapons systems. One can well imagine agents of Sadam Hussein may be very much in the market for people of this type. Would it be wise for us to let them migrate to countries such as Iran, Iraq, Libya? Five years down the road, we might feel threatened by the results of such migrations.

2. There may be many Soviet scientists whose re-appointment in the United States could be to our advantage. Thus, American science was without doubt greatly aided by Hitler and the movement of Jews away from Germany; and another wave of scientists from Germany, in particular, who came to our shores at the end of World War II.

It might well be that some of these Russians (all of them speak adequate English) could be recruited both by corporate, government, and even University sources.

It may be well to make a national effort in, for example, the National Science Foundation which might consider a "Russian office" to deal with the next few year of immigration to the United States from Russia."

Sincerely, /s/ John O'M. Bockris

[According to a 2/17/92 radio news report, the U.S. has pledged $25 million to help Russian nuclear physicists. Ed.]

LETTER FROM CINCINNATI - ZERO SPIN

The following two notes were sent by Dr. Samuel Faile, who is one of our most active correspondents in helping to find and bring new published papers to our attention. Sam presents two interesting ideas:

"February 9, 1992

Transmuter Could be Name for Cold Fusion Products

A name for cold fusion products that may sell is one with a nice quaint old connotation rather than being identified with the scary modern aspects of atomic energy. The word would be **transmuter** which would imply an updated alchemy process rather than an explosive bomb-like invention [as implied by the word fusion.] The operation could be described as the transmutation process. To identify with an old attempt to produce gold has a nicer implication."

"February 10, 1992

Are Electron Spins Balanced Out During Electron Bead Formation?

The Shoulders-Puthoff work with EV [electron bead] entities, U.S. Patent 5,018,180, produced electron beads with 10^9 to 10^{11} electrons per bead. In forming this condensed state during vacuum arc discharge, could there arise changing quantum potential waves that would couple with a spin-destroying mechanism? Perhaps something far more collective occurs than is found for Abrikosow vortices (where electrons pair up in strands.) Previously, I have speculated the occurrence of a nuclear-spin destroying mechanism coupled with an altered vacuum state with waves of changing quantum potential involving cohered virtual pairs such as vortices containing electron-positron pairs. In a similar manner there could be conditions that favor the balancing out of spin in a gas plasma resulting in electron bead formation.

[We suggest that Hal Puthoff may have some ideas about this speculation. Ed.]

G. CONFERENCES, PAPERS & MISC.

2ND ANNUAL CONFERENCE PROCEEDINGS

Tullia Bressani, Emilio Del Giudice, Giuliano Preparata, Editors, VOLUME 33 - THE SCIENCE OF COLD FUSION, Conference Proceedings published by Societa Italiana di Fisica, 46 figs, 528 pages, ISBN 88-7794-045-X.

Three years after the first announcement by Martin Fleishcmann and Stanley Pons, it is possible to make a balanced appraisal of the discovery of cold fusion. This book contains the *Proceedings of the Como Conference.* Through the language of science, hints are presented of the subtle and fascinating mechanism by which an enormous amount of energy is stored inside matter and the difficulties met in trying to unlock this treasure.

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THIRD ANNUAL COLD FUSION CONFERENCE

We have included in this mailing of *Fusion Facts* a separate sheet telling about the Nagoya conference and providing our readers with a form to use for papers and/or attendance.

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Brief **Letters to the Editor** are also welcome. Topics of interest include latest business developments related to cold fusion, patent information, and your constructive criticism of any cold fusion concepts. We especially welcome news of any **enhanced energy devices** that have been reduced to practice.

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