

FUSIONfacts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

ISSN 1051-8738

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

VOLUME 5 NUMBER 3

FUSION FACTS

SEPTEMBER 1993

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A. EXTRACTING ENERGY AND HEAT FROM THE VACUUM

By Harold Puthoff

Quantum theory tells us that empty space is not truly empty, but rather contains an enormous amount of untapped electromagnetic energy known as the *zero-point energy* or ZPE. (The adjective "zero-point" signifies that such energy exists even at a temperature of absolute zero where no thermal effects remain.) Such energy can be traced to radiation from the fluctuating quantum motion of charged particles distributed throughout the universe (see "Where does the zero-point energy come from?" *New Scientist*, December 1989). The ZPE is responsible for such diverse phenomena as the van der Waals forces of chemical attraction at absolute zero, the perturbation of atomic spectral lines known as the Lamb Shift, and the Casimir effect, a unique attractive quantum force between closely-spaced metal plates.

The energy associated with the ZPE is known to be essentially inexhaustible and ubiquitous, so a question that arises in the mind of the technologist is whether such energy can be "mined" for practical use - and thereby constitute the "Holy Grail" of energy research. At first thought, it would only be natural to assume that any attempt to extract energy from the background ZPE might violate energy conservation laws, or at least thermodynamic constraints, as in the misguided attempts to extract energy from a heat bath under equilibrium conditions.

Although deferring for the present any technological considerations for actual application and use, Daniel Cole of IBM in Essex Junction, Vermont, and Harold Puthoff of the Institute for advanced Studies in Austin,

**Russian Conference on Cold Fusion
in Abrau-Durso
Sept. 28-Oct. 2**

Hal Fox will be attending this conference and reporting on it for October's issue.

Texas, have addressed this issue in a recent article entitled "Extracting Energy and Heat from the Vacuum." Writing in *Physical Review*, these researchers critically examine the underlying energetic and thermodynamic processes involved in such a concept and come to the conclusion that, yes, in principle, proposals to extract energy from vacuum fluctuations do not violate any fundamental precepts (*Physical Review E*, vol 48, p 1562).

For those interested in detail, the model proof-of-principle ZPE extraction technique they examine is the Casimir effect. This attractive force, typically between closely-spaced metal or dielectric plates, can be shown to derive from an imbalance in radiation pressure from the background ZPE. Specifically, waveguide cutoff effects reduce the number of modes, and hence the associated radiation pressure, between the plates, with the result that the plates are driven together by the overriding exterior radiation pressure. If unchecked, the plates accelerate toward each other with an inverse fourth law force as additional modes are rejected by the closing geometry. In this process energy conserved as vacuum energy associated with the disappearing modes is converted first into kinetic energy and then into heat as the plates collide. Continuous energy generation by such a process would require a continuous supply of plates as "fuel" which, being discarded after use, would be analogous to the "exhaust products" from gasoline engines or the "waste" from nuclear fuel. Although clearly impractical in this mechanical embodiment, the authors reference other work involving potentially more practical approaches based on the generation of Casimir pinch effects in charged plasmas.

Practical considerations aside, however, what has been shown is that the basic concept of the conversion of vacuum energy to other potentially useful forms is a legitimate and viable physics principle. What remains, as with solar and thermonuclear energy, is the matter of engineering and demonstration as to whether vacuum energy conversion can be developed to the point that it constitutes a significant energy resource.

NEWTON VERSUS EINSTEIN, A BOOK REVIEW

by Hal Fox

Every questioning mind of that minority of persons who think about man's laws of Nature's physics have puzzled over the concept of gravity. In reading a splendid new book by Peter and Neal Graneau [1] I was surprised to find that I had not properly questioned the physical concept of inertia.

The concept of gravity as being "action at a distance" and, in gravity between celestial bodies, **action through a vacuum of nothing**, had never been intellectually satisfying. Ken Shoulders put that concept of gravity in the proper perspective by labeling the **moon-earth attraction as bodies mutually throwing fish hooks**. As a youth I was informed that Einstein has solved the problem of gravity but only ten people in the world could understand it. In a blaze of over-confidence I determined to become the eleventh. During my college years, interrupted by World War II, I read every book that Einstein wrote (at least those in the U/Utah library.) I failed to internalize the Einsteinian view of the universe. Thanks to the tremendous accumulation of data provided by the Graneaus' book, I have learned that Einstein, himself, was not too sure of the reality of his total view of the universe.

Graneaus' book has triggered the following intellectual exercise concerning gravity and inertia: Begin with the following empirical evidence and its challenges:

1. Space energy permeates everywhere.
2. Space energy interacts with physical matter.
3. Discard **nothing** along with **action at a distance**.
4. The magnitude of the interaction of space energy and matter is about 10^{40} times the magnitude of the interaction of charged particles.

First, one should at least read about gravity as explained by Harold Puthoff [2] using mathematics that are incomprehensible to most of us. He does make the statement that space energy can only be sensed (perceived, felt, measured, tapped) from an accelerating frame of reference. High-density charge clusters are deemed to be highly accelerated, probably

with toroidal motion, and are, by Puthoff's definition, candidate entities to sense or tap space energy.

Second, accept the empirical evidence of Shoulders [3] who has shown that we can tap **space energy**, it should be easy to dispense with **nothing**.

Now, using the above evidence, start thinking about how gravity, inertia, etc. can be understood. A group of bright scientists, using the latest experimental evidence, should produce an acceleration (no pun intended) of understanding about the nature of matter, space, and energy. This intellectual process is the hoped for result of Graneaus' book.

While the above discussion has been related to gravity and inertia, the Graneaus have provided even more of an intellectual challenge to our understanding of electricity and magnetism. After reading this informative book, you will (if you haven't already) be less receptive of our current **received doctrine** of the laws of electrodynamics. Peter Graneau has long sought for the inclusion in our university teaching of some of the experimental evidence to show that our current equations explaining electromagnetism do not explain everything. The Graneaus' book provides us with many intellectual challenges that should cause us to think more deeply about our concept of physics.

This challenging process does not diminish the tremendous progress that has been made in scientific discovery, in engineering, nor in the impact of science on society. Instead, reading the book should cause us to consider how much more progress we could make if we would modify, change, improve, our understanding of the physical world in which we live and work. As well stated by the book (page 143, "The muddy ideological conflict between far-actions and field-contact actions is unlikely to be resolved by polemics and mathematics. **Nature communicates with us through experiment, not via equations.**

Most of us, especially those who have been involved in cold fusion or space energy projects, recognize the difficulty of promoting new science. We recognize that we may have to wait while the members of **the Ostrich Clan grow old and die because they are**

astoundingly eloquent even with their heads in the sand.

Thought Note: Empirical evidence would suggest that we add to our models of physics the ability of massive, moving bodies to distort or entrain the nearby **space energy** along their line of travel so that we can then understand the failure of the Michelson-Morley experiments to detect the **ether** by measuring changes in the speed of light. However, we should accept Stefan Marinov's demonstration that measures the absolute velocity of the earth [4,5].

References:

[1] Peter Graneau and Neal Graneau, Newton versus Einstein. How Matter Interacts with Matter, Carlton Press, c1993, 219 pages, 135 refs, indexed, \$14.95.

[2] Harold Puthoff, "Gravity as a zero-point-fluctuation force," *Phys Rev A*, Vol 39, No. 5, March 1, 1989, pp 2333-2342, 33 notes and references. The model discussed in the paper details an electromagnetic basis for gravity.

[3] Kenneth R. Shoulders, "Energy Conversion Using High Charge Density," U.S. Patent 5,018,180, May 21, 1991, 80 pages, 97 figs, 42 claims.

[4] Stefan Marinov, Divine Electromagnetism, East-West Publ., Graz, Austria, c1993, 289 pages, Illus.

[5] Stefan Marinov, The Thorny Way of Truth, Part II, 3rd Edition, East-West Publ., Graz, Austria, c1984.

C. NEWS FROM THE U.S.

ILLINOIS - EDITOR'S COMMENTS

George Miley (Editor, *Fusion Technology*), Editorial, *Fusion Technology*, vol 24, no 2, 1993.

EXCERPT FROM "COMMENTS"

... Technical notes on Cold Fusion ...deserve comment. At the last *FT* Editorial Advisory Board

meeting, board members recommended continuing cold fusion notes while ensuring that a high standard of review is maintained. When these notes started some four years ago, reviewers were instructed to consider the fact that cold fusion research was in its infancy, so speculation could be accepted, as long as the basic logic was sound. As the field has matured, however, it is now expected that speculative aspects should have substantial factual foundation. Consequently, reviewers of cold fusion notes are now instructed to use the same rigorous standards that apply to regular technical papers. In addition, a conscientious effort is made to include reviewers from outside the circle of cold fusion researchers.

The underlying question about including cold fusion notes in *FT* is whether or not this research can lead to a nuclear power source. If so, the notes are obviously appropriate for *FT*. If not, they should be in a different journal. Despite more than four years of research in this area, the answer to this question is still not clear!!! Until it is answered, *FT* policy is to continue the notes on the basis that they provide a unique channel for open communication of important and exciting research on fundamental aspects of fusion and solid-state physics and technology. *Fusion Technology* remains a primary vehicle for this important interchange since other journals have chosen to avoid the controversy of this subject. It remains my judgement that they have made a mistake -- the prime purpose of scientific journals is open interchange of new research.

FF EDITOR'S COMMENTS

George Miley is to be strongly commended for providing one of the few world forums for articles on cold fusion. Over the past four years *Fusion Facts* has reviewed many articles published in *Fusion Technology*. This combination has been helpful in maintaining a world-wide interest in the new science of cold fusion. We applaud Miley's comments on the reluctance of many other publications to publish cold fusion articles.

INDIANA - HOT PLASMA MODEL

Chemical Abstracts, August 23, 1993

Y.E. Kim, M. Rabinowitz, J.H. Yoon, R.A. Rice (Dep. Phys., Purdue Univ., Indiana), "Hot Plasma Model for Cluster Impact Fusion," *Laser Interact. Relat. Plasma Phenom.*, 1992, vol 10, pp 649-662.

AUTHORS' ABSTRACT

Line broadening for the proton energy spectrum from the D-D fusion reaction is used to extract the effective D temperature in the recent cluster-impact fusion experiments. The two primary contributions to the proton line width are due to temperature and kinematic broadening. By deconvoluting these contributions, the authors have determined a temperature of about 20 keV for the D-D fusion reaction. This is substantially hotter than conventional estimates. The proton spectrum is an additional diagnostic tool that can rule out high energy monoenergetic contaminants in explaining the unexpectedly high yield. Furthermore, the proton spectrum indicates that the high temperature results from a one-dimensional rather than a 3-dimensional velocity distribution.

LOUISIANA - SEPARATION FACTORS

Gary R. Boucher, Frank E. Collins, and Rex L. Matlock (Dept. Chem. and Phys., Louisiana St. Univ.), "Separation Factors for Hydrogen Isotopes on Palladium," *Fusion Technology*, vol 24, no 2, 1993, pp 200-201, 4 refs, 1 fig, 1 table.

AUTHORS' ABSTRACT

A mathematical model of the separation of deuterium from tritium in an electrolytic cell containing D₂O and T₂O to which lithium was added for ion production is described. The model is compared with the experimental results obtained by measurement of the tritium concentration in the cell and in the recombined off gases. The model yields results that are well within the experimental error. Experimenters can use the model to determine accurately whether any increase in tritium concentration in the cell is due to electrolytic

isotope separation. The ratio of the tritium in the cell to the tritium in the recombined off gases was found to be 2. This is in agreement with other work.

AUTHORS' INTRODUCTION

Following the first announcement of deuterium fusion inside palladium cathodes under electrolysis, experimenters have reported abnormal amounts of tritium in the cell. In this work, we have modeled mathematically the process of gas production at the cathode including the sampling process and the replenishing of the D_2O in the cell. Because of the electrolytic separation of deuterium and tritium at the cathode, this method increases the concentration of tritium in the cell if the concentration of T_2O in the replenishing solution is the same or greater than the concentration in the original D_2O in the cell.

NEW YORK - BAD & UGLY REVIEW

Courtesy of Dr. Samuel P. Faile

Nicholas Wade (Science Editor of New York Times), "The good, bad and ugly," *Nature*, Vol 364, 5 August 1993, pg 497, review of Gary Taubes book.

FF EDITOR'S COMMENTS

In this non-objective book review, Nicholas Wade claims: Pons & Fleischmann found "nothing" in their cold fusion experiments; the Utah state legislature and the Electric Power Research Institute have wasted ten of millions of dollars; Pons & Fleischmann refused to be interviewed; the experimental work finding excess heat at Texas A&M was caused by a thermometer acting as a second cathode; Pons & Fleischmann and other chemists failed to protect themselves from intense radiation (which Wade says that their experiments **should have generated if successful**), and young researchers might usefully study it since the book provides compelling witness to propensity for self-delusion. Few science writers, to our knowledge, are more deluded on the subject of cold fusion than Nicholas Wade. We would be most pleased to have him attend the 4th Annual Conference on Cold Fusion (Hawaii, December, 1993) where he can observe, in

full, that "even now the rubble has not completely ceased to jitter."

One would expect Wade to question why Taubes ignores about three years of successful experiments including the careful measurements of excess neutrons, tritium, gammas, X-rays, and heat. One would expect a "science editor" to be familiar with the more than 1,000 peer-reviewed positive papers published on cold fusion. One would expect some comments about the several methods by which nuclear reactions are produced in other types of cold-fusion experiments. One final question, "Mr. Wade, are you as far outdated with other scientific literature as you are with the peer-reviewed literature on cold fusion?" Please note that Wade is **fighting the neutron straw man** in the mistaken belief that the only nuclear reactions that can occur must produce neutrons. Any good text on nuclear reactions will show that there are dozens of nuclear reactions that do not produce neutrons. Critics are still attacking the supposed $d + d$ nuclear reaction, ignoring what Pons and Fleischmann stated (in their first peer-review paper, *Jrnl. Electroanal. Chem.*, April 10, 1989) "The most surprising feature of our results however, is that reactions (v) and (vi) [$d+d$ reactions] **are only a small part of the overall reaction scheme and that the bulk of the energy release is due to an hitherto unknown nuclear process or processes (presumably again due to deuterons).**" Perhaps Pons and Fleischmann could be criticized for saying "unknown" rather than "unidentified".

WASHINGTON D.C. - Li RADIOACTIVITY

Chemical Abstracts, August 9, 1993

C. Young, D.V. Rose (Plasma Phys. Div., Nav. Res. Lab., Washington D.C.), "Survey of Radioactivities Induced by Lithium Ions," *Report* 1992, NRL-MR-4770-92-6974; Order No. DE92017333, 19 pp., available NTIS from *Energy Res. Abstr.* 1992, vol 17, no 10, Abstr. No. 30092.

AUTHORS' ABSTRACT

Li-induced nuclear reactions which lead to radioactivities are surveyed for application to

experiments with intense Li-ion beams from pulsed power generators. Positive Q-value reactions for ${}^7\text{Li}$ ions of up to MeV on C, Al, steel, brass, and Ti alloy targets are identified. For each radioactivity, the half-life and decay products are tabulated. Reaction yields are dominated by the Coulomb barrier, and the scaling of the barrier penetration with ${}^7\text{Li}$ energy is evaluated for each target element.

TEXAS - ENERGY AND HEAT FROM VACUUM

Harold E. Puthoff (Inst. Adv. Studies at Austin, Texas) and Daniel C. Cole (IBM Corp., Essex Junct., Vermont), "Extracting Energy and Heat for the Vacuum," *Phys. Rev. E*, 1993, vol 48, no 2, pp 1562-1565, 9 refs, 2 figs.

AUTHORS' ABSTRACT

Relatively recent proposals have been made in the literature for extracting energy and heat from electromagnetic zero-point radiation via the use of the Casimir force. The basic thermodynamics involved in these proposals is analyzed and clarified here, with the conclusion that, yes, in principle, these proposals are correct. Technological considerations for actual application and use are not examined here.

D. NEWS FROM ABROAD

BELARUS - D + T COLLISIONS

Chemical Abstracts, August 9, 1993

S.E. Chigrinov, K.K. Gudima, A.I. Kievitskaya, V.A. Petlitsky (Radiat. Phys. Chem. Probl. Inst., Minsk, Belarus), " π -meson and Nucleon Yields from Light Targets of 1 GeV/nucleon," *Hyperfine Interact.*, vol 77, no 1-2, 1993, pp 149-159.

AUTHORS' ABSTRACT

A model of calculation with respect to the interactions of high-energy nuclei with matter is presented. Based on this model, results were obtained on energy and angular spectra of the n and π -mesons produced in

collisions of deuterium and tritium nuclei at energies $T_d = 1$ GeV/nucleon with light targets such as Li, Be. The authors have various radii, as well as the mean energies of these particles. The lithium target of radius $R = 10^{-12}$ cm for which the energy cost $\epsilon\pi$ to produce one π -meson is estimated as 6.7 GeV/ π for a deuteron beam and 5.3 GeV/ π for a triton beam is the most preferred pion-production target.

FRANCE - COLD FUSION BY SPARKING

Jacques Dufour (Shell Research S.A., Grand-Couronne, France), "Cold Fusion by Sparking in Hydrogen Isotopes," *Fusion Technology*, vol 24, no 2, 1993, pp 205-228, 25 refs, 27 figs, 6 tables.

AUTHOR'S ABSTRACT

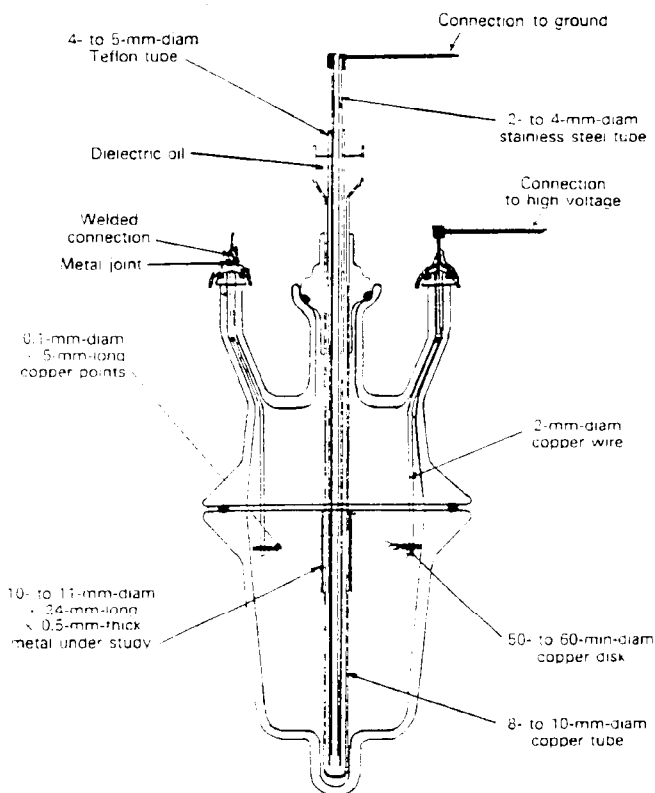
Excess energy production, well above the background and in amounts of the same order of magnitude as the input energy, has been measured that has been caused by sparking in hydrogen isotopes between electrodes made of metallic hydride-forming metals (palladium and stainless steel). This excess energy production is stable over long periods (several weeks) and is observed with both hydrogen and deuterium. Only extremely low levels of neutrons and tritium have been detected, many orders of magnitude below what would be expected from the excess energy production measured. On the contrary, copious emission of low-energy radiation (likely to be beta rays) has been observed.

A class of hypothetical nuclear reactions, based on the action of the weak electronuclear force, is proposed that accounts for all the experimental facts observed.

CONCEPT USED AND MAIN RESULTS

A concept different from electrolysis is used: the action of a high transient electrical field on hydrogen isotopes concentrated in the surface layer (few micrometers) of a metal in contact with a gaseous mixture containing hydrogen isotopes. The transient field is created by sparking through the gas between two dissymmetrical electrodes, in which the surface layer of hydrogen

Fig. 1. Reactor



isotopes is built. The accumulation of these species in a surface layer of the metal used as the electrode can be explained by known properties of sparks and of hydrogen isotopes in metals.

Precise and repeated energy balances show that excess energy is generated in the system, in a fully reproducible way. The amount measured on a steady-state basis (several days) excludes chemical or physical explanations. This excess energy production is observed with both hydrogen and deuterium and with various metals, even those forming unstable hydrides (iron, nickel), indicating a surface reaction. On the basis of electrical energy input to the reactor, energy breakeven has been obtained (taking into account an efficiency of 50% for electricity generation). Excess energy production of up to 2.5 W has been measured.

AUTHOR'S CONCLUSIONS

Sparking in hydrogen isotopes (H_2 and D_2) between electrodes of various metals (palladium, stainless steel) yields, in the setup we have used, an excess energy production that is fully reproducible and stable over very long periods. No systematic errors have been found that could explain the statistically significant excess energy production we have measured in comparison with reference experiments.

A possible explanation of the facts we have observed is a hypothetical class of cold fusion reactions between hydrogen isotopes. The application of the principles of quantum mechanics to the three-body collision of two hydrogen isotopes and one electron shows that this system can end up in the state of one neutron-rich hydrogen isotope and a neutrino, with an observable probability, through an indirect transition (virtual neutron - neutrino state of the system). The direct transition is, of course, forbidden by the Coulomb barrier. These reactions occur at room temperature and imply the action of the weak electronuclear force.

The rate at which these reactions can occur is, of course, strongly dependent on the probability of three-body collisions of nuclear size. This probability is extremely low in the sun's plasma despite its very high density (mean distance between particles is 0.3 Å). This can be explained (in an elementary way) by the very high thermal energy of the particles, which prevents the Coulomb forces from deviating their trajectories, in this way increasing the collision cross section. Moreover, most of these improbable collisions are inefficient because the contact time is too low for the weak nuclear force to act. Low-temperature plasmas (3000 K) are also very inefficient for favoring three-body collisions: In that case, the thermal energy is low, but the distance between particles is so high (70 Å) that deionization is the dominant process. In contrast, the periodic nature of the host metal, the high concentration of low-thermal-energy protons and electrons in it, at a mean distance of ~2 Å, and the motions of these particles induced by the transient electrical field are likely to increase considerably the probability of three-body collisions, in the case of cold fusion in metals. Moreover, the contact time of these collisions can be estimated (in an elementary way) to

be $\sim 10^{-12}$ to 10^{-14} s, which is the order of magnitude of the characteristic time of the weak nuclear force.

It is our objective to gather more experimental evidence to support our hypothesis on cold fusion reactions occurring under our experimental conditions, to measure the rate at which these reactions occur, and to identify precisely their byproducts (radiation, ^4He , etc.).

This effort will show whether cold fusion triggered by sparking in hydrogen isotopes has a future in the field of energy production.

EDITOR'S COMMENTS

The above excellent paper by Dufour is one of the few positive cold fusion papers to come from Europe during the past four years. We commend Dufour in his careful work and look forward to reporting to our readers the results of his follow-on investigations.

GERMANY - SUBTHRESHOLD RESONANCE

Chemical Abstracts, August 9, 1993

K. Czerski, H. Bucka, P. Heide, T. Makubire (Inst. Strahlungs-Kernphys., Tech. Univ. Berlin, Germany), "Subthreshold Resonance Effects in the Mirror Reactions $^6\text{Li}(d,p)^7\text{Li}$ and $^6\text{Li}(d,p)^7\text{Be}$," *Phys. Lett. B*, vol 307, no 1-2, 1993, pp 20-24.

AUTHORS' ABSTRACT

The observed charge symmetry violation in the $^6\text{Li}(d,p)^7\text{Li}$ and $^6\text{Li}(d,p)^7\text{Be}$ mirror reactions at sub-Coulomb energies is explained with the influence of the broad 2+ subthreshold resonance state in the compound nucleus ^8Be .

GERMANY - MOLECULAR SYSTEMS

Chemical Abstracts, August 9, 1993

Walter Greiner (Inst. Theor. Phys., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany), "Cluster Phenomena in Nuclear Physics," *Spectrosc. Struct.*

Mol. Nucl., Proc. Int. Symp. 1992, pp 87-109. 52 refs., pub. by World Science, Singapore.

AUTHOR'S ABSTRACT

A unifying approach of a large variety of nuclear and atomic phenomena, including asymmetrical, superasymmetrical, bimodal and cold fission [sic], cluster radioactivity, giant and superheavy nuclei, is presented based on the general idea of molecular systems. By using the 2-center shell model, one can describe not only the initial and final nuclei, but also the dynamical evolution of different processes. The first experimental signature of a molecular resonance has been observed in the scattering of ^{12}C on ^{12}C . During the collision, an intermediate metastable state has been formed, as a result of a local minimum in the potential energy surface. The role of the nuclear Landau-Zener effect, enhancing transitions between molecular levels is exemplified on the $^{17}\text{O} + ^{12}\text{C}$ system. The theory of fragmentation provides the tools for description of fission and fusion phenomena in a wide range of mass-asymmetry. Recently obtained theoretical results, in the field of cluster radioactivities, are considered and new methods have been developed to study extremely asymmetrical fission dynamics in a multidimensional space of nuclear deformations. The experimentally determined half-lives for C, O, Ne, Mg, and Si radioactives are in good agreement with theoretically predicted values within the analyzed superasymmetrical fission model.

ITALY - SHADOW PROPERTIES

A. Scalia (Dip. di Fisica, Univ. di Catania and Ist. Naz. di Fisica Nucleare, Italy), "'Shadow' Properties in Sub-barrier Fusion," *Physical Review C*, vol 47, no 3, pp 1247-1250, 3 refs, 5 figs.

AUTHOR'S ABSTRACT

At energies below the Coulomb barrier the fusion process can be described as the shadow of the Rutherford scattering, but at very low energies it is not valid. However, if we define an effective Coulomb

potential, the fusion can be described as the shadow of the elastic scattering relative to this effective potential. Then light systems at very low energy show an anomalous behavior and the effective Coulomb potential is a way to describe it.

AUTHOR'S CONCLUSIONS

[The author restates the above and adds:] ...moreover, some general properties defined as "shadow properties" are defined at very low energies by using this effective Coulomb potential. From the above arguments it follows that light systems at very low energies show an anomalous behavior and the effective Coulomb potential is a way to describe it. Finally, we believe that it will be of interest in the future to investigate processes as nuclear fusion or elastic scattering at very low energies by using experimental procedures or theoretical analyses to obtain information on anomalous behavior of light systems.

ITALY - THEORY ON SUBBARRIER FUSION

Chemical Abstracts, August 23, 1993

C. Signorini (Dip. Fis., Padua, Italy), "Subbarrier Fusion." *Conf. Proc. - Ital. Phys. Soc.*, 1993, vol 38 (Perspectives in Heavy Ion Physics), pp 101-112, 18 refs.

AUTHOR'S ABSTRACT

Subbarrier fusion data are presented and discussed for 3 typical cases: the light system $^{32}\text{S} + ^{64}\text{Ni}$, the heavy systems $^{64}\text{Ni} + ^{92,96}\text{Zr}$ and the very well established system $\text{Ni} + \text{Ni}$. In particular, recent results about average compound nucleus angular momentum measurements are presented. The theory, based on the approximate coupled channel approach, reproduces reasonably well in the light systems all the experimental results but fails for the heavy and the asymmetrical systems particularly in reproducing the average angular momentum data in the subbarrier region. This suggests more complex reaction mechanisms.

JAPAN - REVIEW WITH ECONOMICS

Chemical Abstracts, August 23, 1993

R. Matsushita (Kyoto Univ., Japan), "Cold Fusion Experiment," *Kyoto Daigaku Genshiro Jikkensho* [Tech. Rep.], 1992, KURRI-TR-371, pp 35-55, in Japanese.

A review with several references is presented on cold fusion experiments, experimental techniques, and economic evaluation.

JAPAN - LIGHT WATER FUSION

Reiko Notoya (Catalysis Research Center, Hokkaido Univ., Japan), "Cold Fusion by Electrolysis in a Light Water - Potassium Carbonate Solution with a Nickel Electrode," *Fusion Technology*, vol 24, no 2, 1993, pp 202-204, 5 refs, 4 figs.

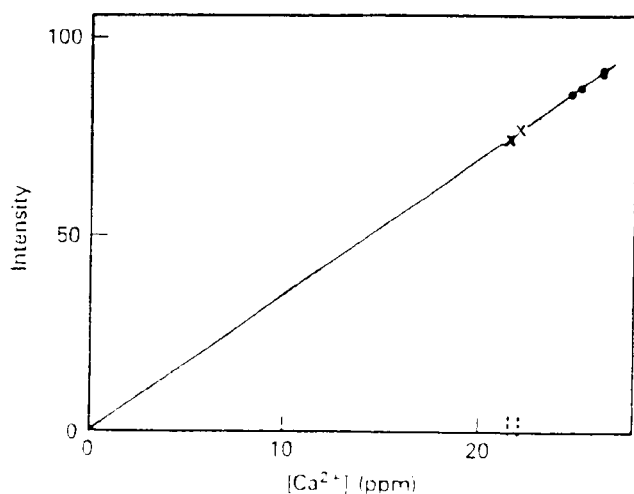
AUTHOR'S ABSTRACT

The evolution of a large amount of heat, unexplainable by ordinary chemical reactions, was observed in an electrolytic cell with a nickel cathode and a platinum anode in a potassium carbonate-light water solution. The nickel cathode had a specially designed porous structure, based on fundamental knowledge concerning the active hydrogen electrode in alkaline solutions. An increase in the concentration of calcium ions was observed in the electrolyte, which seems to be the result of potassium-hydrogen cold fusion.

DISCUSSION

After the electrolysis, the electrolytes were analyzed by flame photospectrometry (Shimazu AA-630) with an accuracy of 0.02 ppm. The calibration line of the intensity of the spectrum for calcium plated against calcium concentration is shown in Fig. 4. By the use of this line, the concentration of calcium in the electrolytes after electrolysis was determined.

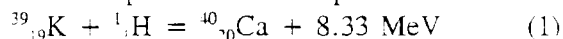
The potassium carbonate solution used in determining the background values was subjected to all the same conditions except electrolysis during the experimental



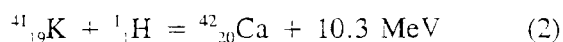
Intensities of flame photospectra of calcium with concentrations of calcium ions in the electrolytes after electrolysis (●) and in electrolytes put into a cell without electrolysis (x). The solid line is the calibration line for the calcium ion concentration.

observation of the excess heat, and the background values were found to be 21 or 22 parts per million by weight (wppm). The increase of calcium concentration in the electrolytes due to electrolysis was 4.4 or 3.6 wppm. This amount of calcium is comparable with that of the excess heat calculated within the same order of magnitude.

Dr. Robert Bush proposed the following nuclear reactions between potassium and a proton:



and



In this work, it was not clear which reaction, (1) or (2), was predominant in this system. To verify this, further study is being conducted.

JAPAN - FRACTURE FUSION

Chemical Abstracts, August 9, 1993

Toshiaki Shirakawa, Masami Chiba, Masatoshi Fujii, Keisuke Sueki, Shinya Miyamoto, Yuki Nakamitsu, Hideyuki Toriumi, Torahiko Uehara, Hiroaki Miura, et al. (Fac. Sci., Tokyo Metrop. Univ., Hachioji,

Japan). "A Neutron Emission from Lithium Niobate Fracture," *Chem. Lett.* vol 5, 1993, pp 897-900.

AUTHORS' ABSTRACT

We studied neutron emission from a crushing process of a Lithium-Niobate (LiNbO_3) single crystal in deuterium gas atmosphere. We observed excess neutron 3 counts/h with a confidence level of 99.95% that correspond 120 neutrons/h emission from process.

RUSSIA - HEAT TO MECHANICAL ENERGY

Albert Victorovich Serogodsky (Moscow Central Aerological Lab.), inventor, reported in *Planetary Association for Clean Energy Newsletter*, vol 6, no 4, July 1993, p3.

PROTEK, a Russian organization that is a government/private company, is working to protect innovative technologies. One of the things they are promoting is a free-energy device designed by Dr. Albert Victorovich Serogodsky (Moscow Central Aerological Lab.) Presented recently at a conference in St. Petersburg, "Practical and Theoretical Problems of Non-traditional Energetics," the device works with a mixture of a gas and a vapor (steam). It is somewhat similar to another thermal device designed by Rudolf Doczekal of Austria. Serogodsky's invention is reported to "transform" heat energy into mechanical energy without requiring a cooler, which makes it theoretically able to work off of "environmentally available heat" or energy systems that produce heat. It was reported to produce 18 kW of mechanical energy, but the input range was not specified. It has been demonstrated, but a Swedish company is said to have negotiated a prohibition against further non-Russian demonstrations.

E. SHORT ARTICLES FROM READERS**THE INERTIAL MYSTERY OF THE HYDROGEN ISOTOPE**

By Harold Aspden

Introduction

Physicists have a way of ignoring experimental evidence if it conflicts with what they have been taught to believe. They are all too ready to scorn claims to discovery challenging established physics. Proof, independent verification, and peer review are demanded and all too often research avenues are closed by circumstances that characterize human nature in the scientific community.

The 'cold fusion' saga and the claim that deuterons adsorbed into the crystal lattice structure of palladium may combine in a nuclear fusion process to produce heat is, however, holding ground. In spite of scorn and ridicule, plus the attempts to suppress something that should not be ignored, the research on this subject is moving forward.

It may be, therefore, that nuclear physicists will soon have to come to terms with the reality that deuterons can fuse in a nuclear sense without emitting neutrons.

'Cold fusion' has virtually become the subject of open warfare between those who have an open mind and do see science as advancing, albeit by occasionally backtracking on cherished beliefs, and those who insist on building progressively on established ideas without even the occasional survey of old foundations. There are, however, other fields where those barriers to progress are quite firm and effective but yet the occasional voice is heard telling us that the 'impossible' has become 'possible.' Antigravity is one such theme.

Now, as might be expected, given a whole spectrum of dissident scientific opinion, once a crack opens in the dam which holds back the flow that forces a change, consequent and related breakthroughs can be expected on many fronts.

It is even possible that one might find that the 'cold fusion' situation will have a spin-off in that elusive 'anti-gravity' domain.

With this in mind there is purpose in drawing attention to something that was discovered in the early spectrographic research of Aston but which was duly ignored because the implications of the discovery were too difficult to digest at the time.

The discovery pertained to an anomaly in the different inertial and gravitational mass properties of the hydrogen isotope.

Matter and the Lattice of Space-Time

As a brief background showing why the author took interest in this anomaly, in the 1950's, it is noted that the author had developed a theory of gravitation based on the interpretation of the vacuum as being a medium having structural lattice form. Its properties were seen as those of a liquid crystal which could form lattice structure nucleated by matter. Thus the physical displacement of a molecular body would carry that vacuum structure with it through what was a fluid aether and if two bodies were to collide the structure could dissolve until reformed on a composite or segregated matter system.

The theory posed an interesting issue concerning gravitation. If the vacuum contains something of electrical form that can be grouped to define a lattice, do these lattice elements have a mass property? If so, there was reason to suspect that a proton in an atomic nucleus, for example, might replace such an element at a lattice site in the underlying vacuum. Then, if that proton were to come free from the lattice, there might be a discrepancy as between gravitational mass and inertial mass in measure represented by the mass of that vacuum element.

The author had, by 1959, developed and published a comprehensive analysis of the properties of such a vacuum model. Dirac had suggested that the vacation of vacuum sites by electrons would create 'holes' representing positrons. However, this author took this idea a stage further in adding structure and form and then showing that the mass of those vacuum elements

was not that of the electron. In deriving the fine-structure constant from this vacuum model, the mass of those elements, as manifested dynamically in a quantized orbit, was 3.714×10^{-29} gm.

However, their effective mass for translational displacement is probably twice this, as verified by later research which further established their energy content, the latter corresponding to a mass of 7.428×10^{-29} gm. in terms of the $E=mc^2$ relationship.

The reader should now reflect on the point at issue in this 1959 text, which was that the hydrogen isotope under scrutiny in a mass spectrograph could travel as a free particle through that lattice vacuum. Then, owing to the counterflow, by displacement of a lattice element, this could exhibit an inertial/gravitational mass discrepancy. Normally, when molecules and composite material bodies move through space, they carry that lattice with them and, as the space substance has the uniformity of a plenum, this precludes detection of its linear motion by change of linear momentum. However, a free hydrogen isotope in motion through a host lattice can cause that displaced vacuum element to reveal its existence anomalously either in energy terms or as a mass-discrepancy.

The Cold Fusion Connection

In 'cold fusion' research we find that a deuteron, as the second isotope of hydrogen, is caused to migrate through the material crystal lattice of the metal palladium. The structure of that palladium will nucleate the local vacuum lattice in the space occupied by the metal. Therefore, the isolated positive charge forms of the deuterons will necessarily travel through that vacuum lattice and this must activate the 'hole' occupancy activity of vacuum lattice elements in counterflow.

Such a mass discrepancy, as between the gravitational and inertial mass property arising from such free motion of a hydrogen isotope through a background lattice, has interesting implications in general energy terms. One can wonder about actions by which energy might be released, even by tapping the universal source that powers gravitation. Or one can wonder if those lattice elements in counterflow involve a leptonic

Q.E.D. type field background which may mean sporadic energy fluctuations. Here the mutual annihilation of positive and negative charges become unpaired owing to that hydrogen isotope jumping between different vacuum lattice sites. However, these thoughts involve too much speculation at this stage and more experiments are needed before such ideas can be probed further.

Accordingly, the author will conclude by simply drawing attention to reporting on Aston's observation.

Quoting from page 25 of this author's text 'The Theory of Gravitation' (privately published 1959):

"An important question concerning gravitation is, 'Does all mass gravitate?' Mass has inertial and gravitational properties, but is the inertial mass of a body exactly equal to its gravitational mass? The Theory of Relativity requires the answer to this question to be definitely affirmative and, indeed, this conclusion was reached as early as 1891 by Eotvos. However, in accepting this as an established fact, those who attempt to explain gravity by a relativistic approach are ignoring a discrepancy found in highly accurate experiments by Aston (Ref: F.W. Aston, "Mass-spectra and Isotopes," 1st Ed., pub. Arnold in London 1933, pp 101-102.)

"These experiments have pointed to a difference between the ratios of the inertial masses and gravitational masses of the preponderant isotopes of hydrogen and oxygen. Aston detected a difference of 0.00004 ± 0.00002 between the mass number and chemical atomic weight of hydrogen on the oxygen scale and wrote, "This is a serious discrepancy... It must be concluded that the discrepancy between the isotopic weights of hydrogen and oxygen is at present unaccountable and further work upon the matter is desirable."

In 1959 this author suspected that a proton 'on the fly,' as it were, through the vacuum lattice, and not at rest in its molecular chemical form, behaves anomalously in exhibiting additional mass connected with a vacuum energy quantum. This suspicion has been reinforced by the reported discovery of anomalous heating in cold fusion experiments where the unitary charged deuteron

migrates through the lattice defined by the host metal. Note that any atomic ion other than a hydrogen isotope devoid of its atomic electron will have a distributed charge form able to define [specify] a multi-site occupancy and secure a double-lock on a vacuum lattice structure. This mass discrepancy problem is therefore unique to hydrogen isotopes.

DOLING OUT PORK

Feds Fatten Energy Providers

How much does the Federal Government spend to make energy look cheaper than it really is?

In 1985, when Rocky Mountain Institute did the first comprehensive study, government subsidies to energy providers were 59.5 billion (in 1989 \$), equivalent to \$670 per household per year. A tax reform bill passed in 1986 was expected to reduce this drain on the Treasury and, according to a new study by Doug Koplou and the Alliance to Save Energy, it has.

Now for the bad news. The government is still dumping \$36 billion a year into the subsidy trough. Worse, the current grab-bag remains nearly as lopsided as it was in 1984, when the most favored technologies (nuclear, coal) received 200 times as much subsidy per unit of energy provided as did energy efficiency and renewables.

The current variety of subsidies would boggle a CPA. Oil and gas producers write off exploration and development costs. The nuclear industry profits from accident liability caps, "under-accrual for nuclear plant decommissioning," and something called the Uranium Enrichment Enterprise -- which last year alone got \$9 billion of Treasury debt forgiven.

Although some subsidies are defensible -- miners' black lung benefits ought to be tax-exempt -- the habit as a whole isn't. Energy subsidies inflate the deficit, encourage energy waste, steer investment dollars into bad buys, and contribute to unnecessary air pollution due to over-consumption of energy. By tilting the playing field in favor of depletable fuels, they retard

the evolution of a cleaner, cheaper energy future based on energy efficiency and renewables.

It's time to get the government out of the energy business. Congress should eliminate all subsidies, except perhaps some narrowly targeted *inexpensive and short-term* incentives to bring emerging efficiency and sustainable technologies to market faster. A sensible energy policy would take economics seriously, get prices right, and focus on meeting people's needs for energy services in the most cost-effective way. Rather than doling out pork and subsidizing boondoggles, the government should enable Americans to choose the best buys first.

Reprinted from Rocky Mountain Institute Newsletter
1739 Snowmass Creek Road
Snowmass, CO 81654-9199

F. LETTERS TO THE EDITOR

QUESTION FROM DR. JOHN KENNY

Please ask your readers: The ratio of deuterium to hydrogen in earth water is about 1 to 6,000. This ratio is several times the cosmic D/H ratio. It has been found that the atmosphere of Venus has a D/H ratio about 120 to 150 times higher than that found on earth. Why?

Dr. John Kenny, Physics Department, Bradley University, Peoria, Illinois.

LETTER FROM COLD FUSION RESEARCH ADVOCATES

The American Physical Society looks at Cold Fusion (and does not like what it sees)

From the "Whatsnew" electronic newsletter published by Robert Park, of the American Physical Society, "What's New" for May 28, 1993:

DO YOU EVER MISS FLEISCHMANN AND PONS? WELL, THEY'RE BACK! They still can't seem to get the hang of calorimetry, and the editor of Physics Letters A would not allow them to use the word "fusion," but they continue to claim that "explanations in terms of chemical changes must be excluded." That much is probably true--which leaves error and fraud. A good case can be made for both. They are still trying to use an open system, which they justify with a solemn warning about "possible consequences" in closed systems. This is powerful stuff! Meanwhile, an Italian newspaper referred to F&P as "scientific frauds," which it compares to "fornicating priests." They are suing the paper.

From "When the Lights of Reason Go Out -- Francis Slakey ponders the faces of fantasy and New Age Scientists," September 711, 1993 issue of *New Scientist*, p. 49, by Francis Slakey, who is identified as the "Science Policy Administrator for the American Physical Society" and an Adjunct Professor of Physics at Georgetown University:

"The scientists, lawyers, and accountants were captivated by Koresh's ideas. They became Davidians and switched off their reason. The lights went out. All that remained was faith in Koresh and the dark fantasies he preached. Then they lit a match to guide them to where they were going.

"Sometimes the faithful don't completely turn off their reason. They become captive to a fantasy they hear in one ear, but listen for science with the other ear. So begins a deterioration that dims the wits but leaves a zealous heart beating -- the result is a cult of fervent halfwits. Some of them believe the Universe is only 6000 years old. Some sing praises to satellites. Some claim to fuse hydrogen in a jar.

"Cloistered in southern France are the cold fusion team of Martin Fleischman [sic] and B. Stanley Pons. While every result and conclusion they publish meets with overwhelming scientific evidence to the contrary, they resolutely pursue their illusion of fusing hydrogen in a mason jar. They warn of fireballs that will be hurled from closed cell experiments. They promise to produce an energy

source by the end of the year that can power a home for 10,000 years. And a few scientists, captivated by the team's fantasy and exile, pursue cold fusion with Branch Davidian intensity."

G. MEETINGS AND MISCELLANEOUS

RUSSIAN CONFERENCE ON COLD FUSION

Yury N. Bazhutov and Valery P. Koretsky are Vice-Chairman and Coordinator respectively, of the Russian Conference on Cold Fusion (RCCF), which is going to take place in Abrau-Durso (on the shore of the Black Sea near Novorossiisk) from September 28 - October 2, 1993.

The program of the Conference include the following subjects:

1. Experimental researches of Cold Fusion with the different scientific methods and instruments,
2. Cold Fusion theoretical models,
3. Cold Fusion applied technologies and devices.

A registration fee of \$400 covers the conference proceedings, breakfasts, luncheons, dinners, room rate and way from Moscow to Abrau-Durso and back. They will meet attendees in Moscow on the 24 or 25 of September.

Contact them at Ap. 182, 8 Verhnija Maslovka Street, "Erzion" Center, 125083 Moscow, Russia; Phone (095)-939-38-97 or (095)-212-04-90; Fax (095)-292-65-11 Box 6935 Erzion.

4th INTERNATIONAL CONFERENCE ON COLD FUSION December 6-9, 1993 Hyatt Regency Maui, Hawaii

Participation is open to all interested scientists and technologists. In particular, the following are encouraged to attend: nuclear and solid-state theoreticians, advanced energy technologists and long

range utility planners. There will also be an exhibit of scientific instruments and supplies by various manufacturers.

The proposed agenda is as follows: Morning sessions will be devoted to one keynote presentation and a number of shorter, invited presentations. Afternoon presentations will be divided into a number of subject-organized parallel sessions. Papers reporting the results of simultaneous measurement of different kinds are particularly encouraged. Subject areas to be covered include: Materials and Fundamentals, Calorimetry, Nuclear Measurements, Solid-state Theory, Electrochemical Studies, and Safety Issues.

CALL FOR PAPERS

Those wishing to present papers should submit two copies of an abstract containing the title of the presentation, contact author, affiliation(s), etc. to S.Crouch-Baker, SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025. Mark these submissions "ICCF-4 Abstract." Two-page abstracts are due by Sept. 10, 1993. Author notification by Oct. 10, 1993.

Abstracts should be no more than two pages including figures and tables; 10-point type, single-spaced. A bound volume of abstracts will be produced for distribution to attendees at the conference, so abstract submittal in magnetic form is encouraged. (Mac users: Word 4.0 +, sys. 7; PC users: Word 4.0+ is preferred, but will accept other w.p. programs or ASCII.) Be SURE to include two hard copies.

Poster sessions will be used to supplement presentations and discussions. Presenters are encouraged to prepare a poster of 3' x 6' maximum size.

The co-chairs are Dr. T.O. Passell (EPRI) and Dr. M.C.H. McKubre (SRI) who can be reached at (415) 855-2070 and (415) 326-6200 respectively, for technical information.

The registration fee of \$300 covers conference proceedings, continental breakfasts, three luncheons, and an evening reception. To register, contact Linda Nelson, Conference Coordinator (EPRI) at (415) 855-2127 or Fax (415) 855-2041. Hotel reservations can be made with the Hyatt Regency Maui (mention ICCF-4 conference to obtain the special group rate), call for information: (808) 661-1234 or Fax (808) 667-4499. Reservation deadline Nov. 6, 1993.

INTERNATIONAL FORUM ON NEW SCIENCE October 13-17, 1993

The International Association for New Science, the sponsors of the conference, purpose to bring together scientists, professionals and lay people to promote research in the areas of New Science as well as education. New Science includes topics and phenomena which cannot be explained by traditional science and yet may have the potential for significant benefit to the health and conditions for humanity and the planet Earth.

Scholarly papers were invited on any topic related to New Science. These papers included one or more of the following: theories, hypotheses, research designs, research results and analyses.

Please send for registration information to the International Forum on New Science, 1304 S. College Avenue, Fort Collins, CO 80524.

CALL FOR PAPERS - RUSSIAN & ENGLISH

A bilingual international conference on new energy systems (emphasis on cold fusion) is scheduled for May-June 1994. This notice is an advanced call for papers. The organizers of the conference include several noted academicians from the CIS (Commonwealth of Independent States). The conference will be held in Minsk, the capital city of the Republic of Belarus and the location of the internationally recognized A.V. Luikov Heat and Mass Transfer Institute of the Academy of Sciences of

Belarus. The proceedings will be printed in both English and Russian.

Fusion Facts has agreed to handle the organizing of the English-language proceedings. Hal Fox, Editor-in-Chief of *Fusion Facts* has agreed to be a co-chairman of the conference. One of the major objectives of the conference is to display working devices and systems. It is believed that the May, 1994 date will allow for the culmination of several efforts being made to demonstrate the commercial potential for new energy systems.

Abstracts of proposed English language papers should be sent to Hal Fox, P.O. Box 58639, Salt Lake City, Utah 84158-8639. Theory papers should be based on published experimental data. Papers that describe all pertinent details for the replication of the production of excess heat are solicited. Engineering design papers that provide current technical information on heat transfer, thermal-to-electric conversion, and other important engineering design considerations for the commercialization of enhanced energy systems are expected to be prepared in conjunction with groups providing actual working devices or reactors.

Space is expected to be available for commercial/scientific exhibits. Exhibits showing actual working reactors, or with high-quality motion pictures of such working reactors are solicited. Cost details will be completed in the near future.

For further information call Hal Fox at (801) 583-6232 in the U.S. Russian contacts will be published in the October issue of *Fusion Facts*.

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