FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

ISSN 1051-8738 • University of Utah Research Park •

ISSN 1051-8738

VOLUME 2 NUMBER 12 FUSION FACTS JUNE 1991

CONTENTS FOR JUNE 1991

A. DR. MALLOVE RESIGNS FROM MIT.

Dr. Eugene F. Mallove, Chief Science Writer for the MIT News Office, and lecturer in science journalism, has submitted his resignation to the MIT News Office.

Dr. Mallove is the author of **Fire from Ice --Searching for the Truth Behind the Cold Fusion Furor**. Recently released by John Wiley & Sons, New York, this book documents the scientific ambition, professional rivalry, political intrigue, and hard science that has been the rocky road of cold fusion development. [See May 1991 issue of *Fusion Facts* for a review of Mallove's book.]

Gene Mallove called the office of *Fusion Facts* during the summer of 1989 with the statement, "I am a seeker of Truth. What is going on in Utah?" Mallove has remained faithful to his own sense of integrity, truth, and sense of justice. His book is the latest book on cold fusion and is best characterized for being the most complete, objective, and well-written book on the subject. Mallove's seeking and studying of the peer-reviewed published papers and his attendance at various cold fusion conferences has led him to state, "I would say that the evidence is *overwhelmingly* compelling that cold fusion is a real, new nuclear process capable of significant excess power generation."

It is a sad commentary on U.S. science, especially at universities and government energy laboratories, that the search for Truth is subjected to calumny by leaders of scientific organizations or groups of scientists who feel threatened by a new science. The emotional public statements by officers of the American Physical Society, the unfair report given by the DoE Cold Fusion Panel, the diatribes by *Nature* and *Science*, and the traveling attacks on cold fusion by Dr. Frank Close (Too Hot to Handle), and by Dr. D.R.O. Morrison (pathological science) have greatly diminished the role that U.S. science will play in the world-wide development of cold fusion.

The final act of this unnecessary scientific melodrama is about to be played. First India, then Japan and China, and now the USSR (who have made cold fusion a national priority) and Spain are funding cold fusion. The United States scientific community, the DoE, and, most important, the financial community in the United States will have a last opportunity to determine the future of cold fusion. This group will not be able to control the development of cold fusion, but merely whether the development is to be accomplished in the United States or abroad.

COMING IN JULY 1991: REPORT ON COMO

The July 1991 issue will mark the beginning of the third year of publishing Fusion Facts and will summarize the papers presented at the Second Annual Conference on Cold Fusion being held at Como, Italy June 29 through July 4, 1991.

The Editors of *Fusion Facts* believe that the combination of Eugene Mallove's book, Fire from Ice and the Second Annual Conference on Cold Fusion will provoke sufficient attention to ensure that cold fusion is recognized as new science.

This issue is provided FREE to all attendees at the COMO, ITALY cold fusion conference. - Courtesy of *FUSION FACTS.*

B. SURVEY OF COLD FUSION SUCCESSES

Compiled by Michael Dehn, Assoc. Editor

The following is a complete summary of positive cold fusion results reported to date from our sources. We have noted potential errors and inconsistencies in previous tabulations.

We may have made errors and omissions and we apologize for these inaccuracies, and ask that you inform us of any corrections and additions. Please note that these reports vary greatly in quality and results, and their accuracy must be judged accordingly.

Some confusion exists because of the growing number of cold fusion researchers with the same last names working at two or more institutions (e.g. Bush, Hawkins, Huang, Kim, Lewis, Lin, Matsumoto, Oyama, Park, Srinivasan, Taniguchi, Takahashi, Tian, Wang, Zhang, etc.), and by variant spellings (e.g Zelenskii/Zelensky, Deryagin/Derjaguin, Kluyev/Klyuev/Kluev, etc.).

We thank Dr. Edmund Storms of Los Alamos for a very helpful preprint of his paper, "Review of Experimental Observations About the Cold Fusion Effect," to be published in *Fusion Technology.* Some of the tritium totals given below, as well as occasional neutron and other data, are taken from Storms' paper.

Papers are listed by country. References are listed later, alphabetically and are shown within [square brackets].

ARGENTINA

U Nacional de Cuyo,Rio Negro [GRA-1,GRA-2,GRA-3]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD or LiD (sic), Pd cathode (wire and plate), Pt anode, pulsed current: alternating 0 and 30-90 mA/cm^2.
NEUTRONS: 2 X background of approximately 10^{-3} counts/sec (= 0.3 neutrons/sec), in multiple runs in 4 of 4 cells; 6 sigma above background for combined signal; using 18 ^{3}He counters with paraffin moderator (efficiency = 17.5%). Some correlation with electrolysis conditions.

BRAZIL

Inst. Pesqui. Energ. Nucl., Pinheiros [COE]
CONDITIONS: electrolysis - D_2O, Pd cathode.
NEUTRONS: (8.2 ± 2.9) X 10^{-3} neutrons/sec per g Pd.

U of Sao Paolo [Misc-2]
NEUTRONS: yes.

BULGARIA

LEPGER [NON]
CONDITIONS: electrolysis - D_2O, 0.01 M K_2SO_4, Pd cathode (5 mm diam.), Pt anode, 20-80 mA/cm^2.
HEAT: 20-25% excess, up to 2.6 W (41.4 W/cm^3 Pd); using isoperibolic calorimeter, closed cell.

CANADA

Electrofuels [DAU]
CONDITIONS: electrolysis.
HEAT: ?. Apparent temperature elevation.

Ontario Hydro [DAU]
CONDITIONS: gas loading of Pd + Ti + U.
NEUTRONS: ?. Preliminary report: above background, using ^{3}He detector.

U of Manitoba [MCK-1]
CONDITIONS: ion implantation of Pd and Ti, using 60 KeV D and D_2.
NEUTRONS: rising to 2500-3000/sec, with energies 1 1/2 to 5 MeV using scintillation detector; confirmed by neutron activation.
COMMENTS: unclear whether yield can be accounted for by thermonuclear fusion.

U of Ottawa [ADA, CRI]
CONDITIONS: electrolysis - D_2O, 0.2 M LiOD, Pd cathode (6 mm diam.), Pt anode.
HEAT: Burst, 24% excess**.**
ISOTOPIC RATIO CHANGES?: possible slight change in ^{6}Li/^{7}Li ratio.
COMMENTS: has been previously tabulated as positive for tritium.

CHINA, PEOPLE'S REPUBLIC OF

Academia Sinica, Beijing [JIN]
CONDITIONS: electrical discharge between Pd electrodes in D_2 gas.
NEUTRONS AND CHARGED PARTICLES: 2-3 X 10^5/sec; using CR-39 track detector and BF_3 counter, in D_2 but not H_2.

Beijing Normal U [ZHO]
NEUTRONS: in each of 5 runs, intermittent.
TRITIUM: in each of 5 runs.

Chengdu Science & Technology Inst. [GOU-1, GOU-2]
CONDITIONS: electrolysis - D_2O, Pd and Ti cathodes.
HEAT: yes.
HELIUM: yes (masses 3 and 4 elevated).

China Engineering Physics Institution [GAD]
NEUTRONS: yes.

China Inst. of Atomic Energy [JIA]
CONDITIONS: temperature cycling of gas loaded Ti.

NEUTRONS: bursts of > 0.2 n/sec in 6 of 8 sample batches, including burst of 482 counts = 75 sigma above background; using ^{3}He detector (background 7 X 10^{-5}/sec in coincidence mode).

Chinese Academy of Science [CAI]
HEAT: yes.
NEUTRONS: yes.

Institute of Chemistry, Chinese Academy [ZHA-2]
CONDITIONS: electrolysis -D_2O, 0.1 M LiOD, 2 mA.
HEAT: 1-hour elevation.

Institute of Physics, Chinese Academy of Sciences [HAW]
CONDITIONS: electrolysis - D_2O, Pd cathodes.
GAMMAS: 50% increase to 5 X 10^{-4} Gray/hour in storms.

Nanjing U, Nanjing [WAN]
NEUTRONS: yes.
GAMMA RAYS: yes.

Nuclear Energy Instit., Qinghua U, Beijing [ZHA-1, Misc-3] (probably several groups, e.g. D.Z. Din, Hu Ren-Yong, Dong Shi-Yuan, and others).
NEUTRONS: yes.
TRITIUM: yes.
COMMENTS: Comparisons of different listings for the Nuclear Energy Institution and Qinghua (or Qinhua) U suggest these are the same. Wang Da-lum (positive for neutrons and tritium) may also be from Qinhua. Finally, it is unclear whether this is the same as Tsinghua U.

Southwest Nuclear Phys. & Chem. Inst., Shichuan [XIO]
NEUTRONS: yes.

Tsinghua U, Beijing [LI]
CONDITIONS: temperature cycling of gas loaded Pd
PARTICLES: track density on plastic detectors much higher for deuteride samples than hydrides and sample areas covered by .2 mm Al.
RADIATION: possible X rays reported (also present in H controls; using CaF_2 and thermoluminescence detectors.
COMMENTS: note that a university of similar name also exists in Taiwan.

Xiamen U [TIA]
NEUTRONS: yes.

CHINA, REPUBLIC OF TAIWAN

National Tsing Hua University, Hsinchu [YAN, LIN-2]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (e.g. 5mm diam.), Pt anode, various currents (e.g. 64-320 mA/cm^2).
HEAT: up to 100% excess, 10 W.
NEUTRONS: bursts up to 30 X background of 0.017/sec, lasting several hours; using ^{3}He counter.
TRITIUM: approx. 10-100 X increases in 6 of 6 cells.

Inst. of Nuclear Energy Research [CHI]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathodes, Pt anodes, total current up to 2 A.
TRITIUM: up to 1200 X backgnd, > 10^7 dpm/ml (40 uCi) versus over 10^4 dpm/ml background, in 3 of 26 cells.
TIME COURSE: constant production inferred in one experiment, beginning after several hours. In another, production estimated to have continued for up to > 1 month. Tritium decreasing after burst also reported. Some correlation with voltage.

CZECHOSLOVAKIA

Inst. of Nucl. Physics & Inst. of Inorganic Chem., Czechoslovak Acad. of Sci. [BEM]
CONDITIONS: electrolysis - D_2O, LiOD, TiT cathode.
NEUTRONS: 3-8 X background of 0.9 counts/hour at 14 MeV, corresponding to up to 1300 n/hour; using a stilbene scintillator.
COMMENTS: one of the few experiments to have tested for d-t fusion.

FRANCE

U Paris - Sud [CHE]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (1 mm diam.), Pt anode, 100-450 mA/cm^2.
TRITIUM: approx. 1.2 X blank of approx. 1 count/sec per ml (= 0.0005 uCi); no increase for H control.

GERMANY

Dresden U of Technology [SEE, BIT-1, see also BIT-2]
CONDITIONS: electrolysis - D_2O, 0.1-3 M LiOD, Pd cathode (slab and 22.6 mm diam.), Pt anode, 50 mA/cm^2.
NEUTRONS: max. 20 counts/hr above background of approximately 50/hour for 12 hrs at 2-3 MeV; by scintillation (effic. approx. 3-5%). Calculated production approx. 0.1 n/sec. (Background reported lower in another tabulation).

U of Kiel [ALQ]
NEUTRONS: yes.
TRITIUM: yes.

INDIA

Bhabha Atomic Res. Ctr. (BARC) [IYE-1, IYE-2, SRI-1, SRI-1, ROU, KAU] (several groups)
CONDITIONS #1: electrolysis - D_2O, 5 M NaOD, Pd cathode (16 tubes, 3 mm diam.), 200 mA/cm^2. (In earlier tabulation we incorrectly reported electrolyte as LiOD.)
NEUTRONS: calculated production 4X10^7 in 4 hrs; using 3 BF_3 counters with paraffin moderator (0.06% effic.) and 1 scintillator (0.4% effic.), also 3 ^{3}He counters with

paraffin moderator for background measurements. Latter also showed slight increased count rate during burst consistent with their distance from the cell. Max. 300 X background of 0.2/sec on BF_3 counter (60 counts/sec), and 40 X background of 2/sec on scintillator (85 counts/sec).
TRITIUM: 1.5 uCi/ml = 20,000 X background in 72 hours, 190-380 uCi total; by scintillation. (Total tritium tabulated in the paper appears to be incorrect.)
TIME COURSE: Multiple neutron bursts, beginning within 1 hr. Small burst also reported 2 days after cell turned off. 10-25% of neutrons in groups of 100 or more. Tritium decreasing after bursts.

CONDITIONS #2: electrolysis - D_2O, 5 M LiOD, 5 Pd-Ag cathodes (each 78 cm^2 X 0.1 mm sheet), Ni anode, approx. 650-750 mA/cm^2.
NEUTRONS: max. burst of 39,000 counts/100 sec = approx. 125-150 X background on each of 2 detectors, with estimated total production = $4\text{-}5X10^6$ neutrons (based on calibration source); using same counters as #1.
TRITIUM: $4X10^{15}$ atoms = > 3500 X excess after 50 hrs.
TIME COURSE: neutron burst after 4 hours.

CONDITIONS #3: electrolysis - D_2O, 5 M LiOD, Ti cathode (22 mm diam. X 15 cm), stainless steel anode, < 600 mA/cm^2.
NEUTRONS: max. 2-1/2 X background (max. 59 counts a sec vs 24/sec bkg), calculated total production = $1.3X10^7$ neutrons; using 3 BF_3 and scintillation counters as in #1.
TRITIUM: approx. 10^3 X excess after 8 hrs ($1.3 X 10^{14}$ atoms).
TIME COURSE: no sharp neutron bursts. Neutron production declined immediately (but only most of the way to background) when the cell was turned off.

CONDITIONS #4 (3 groups): electrolysis - D_2O, 0.1 M LiOD, Pd (various shapes), Pt anode, 60-170 mA/cm^2 including pulsed currents.
NEUTRONS: calc. up to approx. $10^{4.5}$/sec with total production $1.8X10^8$; using up to 24 ^3He counters with paraffin moderator (effic. 8.6%) and scintillation.
TRITIUM: up to $4X10^{14}$ atoms = 1.25 X 10^4 X blank = 170 dpm .
GAMMA RAYS: using NaI(Tl), also secondary gammas due to neutron capture by Ge(Li) and HPGe detectors.
TIME COURSE: neutron bursts lasting 14-20 min over 40 hrs, possible correlation with gamma bursts.

CONDITIONS #5: temperature cycling of gas loaded Ti and Pd alloys (several), with and without evacuation.
NEUTRONS: up to 200 counts/sec without evacuation and 2500 counts/sec with evacuation, versus 1.5/sec background; using 24 ^3He counters with paraffin moderator (effic. approx. 10%).
TRITIUM: 4 of 1000 Ti chips treated in liquid nitrogen contained MBq levels of T (30 uCi to near milliCi); by autoradiography, scintillation, and Pd X-rays excited by T betas. Max. T/D ratio estimated at $10^{-3\text{-}4}$, and total amount of T 10^5 X total in reactants. Also 0.007-0.03 uCi for Ti taken to 900 C, 0.07 uCi for Pd-Ag taken to 600 C.
TIME COURSE: in experiment in which TiD was placed in vacuum, neutron bursts lasting up to 45 min., within 15 min. of evacuation.

CONDITIONS #6: plasma focus bombardment of Ti.
TRITIUM: up to 392 microcuries, localized (at least 10^9 times the neutron yield and thus the maximum thermonuclear production).
COMMENTS: high neutron and T production in several experiments, correlated in several cases. Unusually large amounts of Pd and Ti used in several experiments. Neutron/tritium branching ratios typically 10^{-7} to 10^{-9}.

<u>Indira Gandhi Centre For Atomic Research</u> (IGCAR), Kalpakkam [MAT-1, Misc-3]
CONDITIONS: electrolysis - D_2O, Pd cathode, Pt anode, several hundred mA/cm^2.
HEAT: possible, but not quantified.
NEUTRONS: 1.4 X background of 0.1 count/sec; using ^3He detector (1% efficiency).
COMMENTS: other groups have been tabulated as Kishan (heat and neutrons) and Palamalai (neutrons).

<u>Tata Institute</u> [SAN]
CONDITIONS: electrolysis - D_2O, 1 M NaCl, Pd and Ti cathodes, Pt anodes, 33-63 mA/cm^2.
HEAT: 48% with Pd, 17.6% with Ti (1.5 and 0.3 W). Cumulative excess 1.2 and 0.2 MJ/cm^3.
TRITIUM: 48% above background with Pd.

<u>Variable Energy Cyclotron Center</u> (VECC) [SIN]
CONDITIONS: electrolysis - D_2O, Pd and Ti cathodes, 15-40 mA/cm^2.
NEUTRONS: bursts (approx. 5 minutes), 4-6 X background of .003/sec; using ^3He detector.

ISRAEL

<u>Ben Gurion U & Hebrew U</u> [SHA]
CONDITIONS: gas loaded Pd.
NEUTRONS: 0.01 counts/sec at 2.5 MeV when sample irradiated with neutrons, < 2 X background.
COMMENTS: also a weak effect for D_2 gas. Interpretation unclear.

ITALY

<u>Casaccia</u> [MAZ]
CONDITIONS: gas-loaded Ti.
NEUTRONS: burst, 1 minute after reheating from 500 to 1000 deg. C.

<u>Catania</u> [AIE, BER-1, BER-2]
CONDITIONS # 1: gas loaded Pd (1 cm^2 X 1 mm).
CHARGED PARTICLES: 100 excess counts in 16 hrs with charged particle Si surface barrier detector, eff. 2.3% for >1

MeV protons). Maximum in energy spectrum at 1.8 MeV consistent with original proton energy 3.0 MeV.

CONDITIONS #2: electrolysis - D_2O, complex electrolyte used initially by Jones, Ti cathode, Au anode.
NEUTRONS: 1.3 X background of 0.055-0.16/sec, 2.5 MeV; by scintillation (4% effic.). Moving cell in front of background detector caused it to register.
TIME COURSE: max. neutrons after 1 hour, returned to background after 3 hours, in 3 runs.

CISE, Milano [SON, see also SCA]
CONDITIONS #1: electrolysis - D_2O, 2-3 M LiOD, Pd cathode (50-80 X 15 X 0.4-1.0 mm), 300-1000 mA/cm^2 , Pd and Pt anodes.
NEUTRONS: up to 4 X background of 0.0013/sec (4/hr) for several hours; using BF_3 counter with polyethylene moderator (.019% effic.)
TRITIUM: slight excess in 2 of 12 cells; by scintillation. Calculated neutron/tritium ratio 2 X 10^{-6} to 10^{-7}.
COMMENTS: also, in the early 1950's, neutrons were repeatedly measured while passage of deuterium through Pd-Ag alloy in an adjoining laboratory.

CNR, Corso Stati, Padova and U di Padova [MEN-1]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathodes (0.5-5 mm thick), Pt and Ni anodes, various constant and pulsed currents (e.g. 50-750 mA/cm^2).
TRITIUM: up to 12 X initial 40 dpm/ml by scintillation; confirmed by beta spectrum.
GAMMA RADIATION: 1.15 X increase (= 0.25 counts/sec) in 1 electrode; using GE detector.
OTHER: poisoning also tested.

Frascati Res. Ctr. [CEL-1, CEL-2, DAM, DEN-1, DEN-2, DEN-3, DEN-4, PER]
CONDITIONS #1: electrolysis - D_2O, 0.1 M LiOD, Pd (8 mm diam.) and Ti cathodes, 60 mA/cm^2, in some cases occasionally switched on and off.
NEUTRONS: bursts 5-16 X background; using ^{3}He detector (1% effic.).
GAMMAS: Pd gave 7 bursts, Ti 1 burst; up to 10 X background, largest with 7250 excess counts, 100-500 KeV; using NaI(Tl) detectors.
TIME COURSE: 6-7 gamma bursts of > 4 X background in a few weeks, lasting up to 15 min, 1 correlated with neutrons.

CONDITIONS #2: temperature cycling of gas loaded Ti and Ti alloys.
NEUTRONS: 17 bursts in 19 runs (2100 hrs), up to 25 counts in 100 microsec bursts; vs. 2 of 9 counts in controls; using 15 ^{3}He counters (15% eff.). Later series of bursts (15-32 counts in low background experiment (vs. no bursts of 2 counts in 2-3 weeks for background).

TRITIUM: in 5 tests, up to 4X backgnd (= 1.3X10^{10} T); by scintillation. Autoradiography also showed hot spots.

CONDITIONS #3: electrolytically generated Pd and Ti deuterides removed and heated using high currents.
NEUTRONS: bursts up to 5 X background of 0.03/sec (2/min.), after approx. 2 minutes; using ^{3}He detector.

CONDITIONS #4: temperature cycling of gas-loaded high-temperature superconductor.
NEUTRONS: up to 10 counts, with background of 1 count/hr; using duplicate ^{3}He detectors (0.6% effic. each).
TIME COURSE: emission decreased in successive temperature cycles.

Istit. di Ing. Nucl. del Politecnico di Milano, [PAR-1]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd (3-4 g) and Ti cathodes, Pt anode, pulsed current (max < 350 mA/cm^2.
NEUTRONS: in 2 of over 100 runs, bursts to 13 X background of 0.07/sec (4/min); using 4 ^{3}He counters with paraffin moderator (3.75% effic.). During above burst, count rate on detector further from cell also 2-1/2 sigma above background.
OTHER: 1 neutron burst at time of deformation of Pd.

U of Rome ("La Sapienza") [GOZ-1, GOZ-2, GOZ-3]
CONDITIONS: electrolysis - D_2O, 0.1-0.2 M LiOD, Pd cathode (5 X 5-6 X 20-25 mm) prepared from sintered powder, Pt anode, 200-500 mA/cm^2.
HEAT: in one episode, cathode temp. reached 150 C.
NEUTRONS: Bursts up to > 10 X background of 0.03/sec (2/hour); using ^{3}He counter with polyethylene moderator (effic. 0.005%) Unusual pulse shapes suggested counts were not due solely to neutrons. In earlier experiments, 4 minute burst up to 180 X background of 3.0/hr (estimated production 720,000 neutrons, 3000/sec); neutron energies up to 7 MeV.
TRITIUM: approx. 400 dpm/ml increases (up to 2 X 10^{11} T atoms, 0.01 uCi); by scintillation. Spot contamination of cathode ruled out, and tritium had not previously been used in laboratory. Calculated n/t ratio 3-4 X 10^{-6}.
TIME COURSE: simultaneous heat and neutrons after 150 hrs, neutron and tritium correlations also reported. Burst episodes up to 6 hours.
COMMENTS: in previous tabulations, De Maria has occasionally been listed separately.

U of Torino [IAZ, BRE]
CONDITIONS: gas loaded Ti.
NEUTRONS: slight excess, 2-3 and 6-7 MeV.

JAPAN

Aoyama Gakuin U [MAT-2, MAT-3]
CONDITIONS: electrolysis - D_2O, 0.5 M D_2SO_4, Pd cathodes.

NEUTRONS: possibly elevated (approx. 50%); using induced fission track method.
TRITIUM: possibly elevated (approx. 20% or 8 dpm).

Chubu U [IKE-2]
NEUTRONS: yes.

Hitachi [OZA, IZU]
CONDITIONS: temperature cycling of gas loaded Ti.
NEUTRONS: >3 sigma above background (= 1-10 n/sec calculated) in bursts at -20 deg. C; using ^3He (0.017/sec background, 0.5% effic.) and BF_3 (0.0028/sec background, 0.02% effic.) counters.

Hokkaido U [MAT-4, MAT-5, MAT-6]
CONDITIONS #1: electrolysis - H_2O, 3% NaCl, Pd cathode (50 mm diam.), 1 A total current, Pt anode.
GAMMAS: increase in intensity at energies < 130 KeV; using Ge(Li) detector.
TIME COURSE: effect began after 11 days, max. at 15, ceased at 17.
COMMENTS: Effect reported in absence of deuterium. Occasionally erroneously tabulated as neutrons.

CONDITIONS #2: electrolysis - D_2O, Pd cathode (5 mm diam. X 5 cm), 3% NaCl, 0.7A total current, Pt anode.
PARTICLES: autoradiography showed unique ("iton") particle tracks after 21 days. None in control. Report of similar tracks in H_2O to be published. Circular features on emulsions also noted.

Hokkaido U [MIZ]
CONDITIONS: electrolysis - D_2O, 0.5 M LiOD, Pd cathode (3 mm diam.), Pt anode, 200 mA/cm^2.
NEUTRONS: av. 10 X background, max 20 X background (1140 n/hr), at energy approx. 2.5 MeV, over 18 days; by scintillation.

JAERI [TAC]
NEUTRONS: yes.

Kinki U and Osaka U [ARA-1,ARA-2, ARA-3, ARA-4]
CONDITIONS: electrolysis - D_2O, dilute LiOD, Pd (up to 20 mm diam.) and Pd-coated Ni cathodes, Pt anode, up to 500 mA/cm^2. Cell temperature near 90 C or pulsed current.
NEUTRONS: bursts, calculated production rate up to > 10^8 n/sec, over 10^{13} total neutrons in 1 of 2 cells, but only several times background in other; using 2 BF_3 and 1 ^3He counter (background 5-40 counts/hr).
TIME COURSE: 10 groups of n bursts in 1 month, lasting 1/2 to 40 hrs, up to 10^{13} n each, after several days.
COMMENTS: Especially high neutron production. Rapid changes in deuterium loading. Occasionally tabulated as positive for heat, as electrode temperature oscillated, but a chemical cause is suggested.

KURRI [MAE]
NEUTRONS: yes.

Kyushu U [FUK]
NEUTRONS: yes.

Matsushita [TAN-1, GAM]
CONDITIONS #1: gas loaded Ti.
RADIATION: 30-600 X background during desorption. (NE213 scintillation counter, possibly gamma radiation.)

CONDITIONS #2: electrolysis - D_2O, various electrolytes (0.1 M LiCl + 0.1 M $NiCl_2$ or $FeCl_2$, 0.1 M LiOD + 0.1 M H_2SO_4), various cathodes (cylindrical, strip or cylindrical), various anodes (Pt, Ni), constant or pulsed current: 10 to at least 100 mA/cm^2.
NEUTRONS: 10 X background of 0.013/sec with crystalline $TiZn_2$, increased with crystalline and amorphous $ZrV_{0.5}Ti_{1.5}$; using BF_3 and ^6Li scintillator detectors. Also 2-10 X background of 0.7/sec after 336 hours.
TRITIUM: 5 X blank of 1500 dpm/ml with crystalline $TiZn_2$, 10 X blank with crystalline $ZrV_{0.5}Ti_{1.5}$, 4.5 X with amorphous Ti_2Ni, 10 X increase with amorphous $ZrV_{0.5}Ni_{1.5}$; by scintillation.

CONDITIONS #3: electrical discharge between gas loaded electrodes.
NEUTRONS: 1000 X background with D_2 but not H_2.
GAMMA RADIATION: yes.

CONDITIONS #4: temperature cycling of gas loaded alloys.
NEUTRONS: 10-4000 X background.

Nagoya U [WAD]
CONDITIONS: 12 KV discharge between gas loaded Pd electrodes in D_2.
NEUTRONS: 2 bursts of 20,000 X background of 2/hr (11-14 counts/sec for up to 63 sec, estimated total 10^{5-6} neutrons); using BF_3 counter. Neutrons correlated with stimulations.
COMMENTS: Especially high neutron production, rapid changes in deuterium loading. Thermonuclear production still under discussion.

NFSI [IKE-1]
NEUTRONS: yes.
TRITIUM: ?

NTT Basic Research Labs, Tokyo [YAM-1, YAM-2]
CONDITIONS: gas loaded Pd coated with Au on 1 side, Mn and O on other, then placed in vacuum. Current application also tried.
NEUTRONS: bursts of up to 10^5 X background, = 1-2X10^6 neutrons/sec for 2-3 sec; using BF_3 detector.

TIME COURSE: largest burst, rapid bending, gas release and heat pulse occurred 3 hours after pressure was reduced.

COMMENTS: Especially high neutron production, rapid changes in deuterium loading. Occasionally tabulated as positive for heat; however, during deformation, both samples and Pd hydride controls heated to several hundred C, suggesting a chemical cause.

Osaka Prefecture Radiation Research Institute (OPRRI) [TAN-2, TAN-3]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD or LiCl, Pd cathodes (22 mm diam. foil and coatings), Pt and Au anodes, pulsed current up to 100 mA/cm^2 .
CHARGED PARTICLES: Average rate up to 10 X background of < 0.017/sec (1/hr); using Si surface barrier detector (38% effic.); energy consistent with proton energies 3 MeV and less . Also bursts up to > 10^2 X background (> 100/hr) in 6 of 30 runs (vs none in H_2O).
TIME COURSE: bursts after several hours to several days, lasting up to several days.
COMMENTS: occasionally tabulated as positive for neutrons, affiliation occasionally listed as OPRRT. Apparently a separate group from Arata & Zhang, and from Takahashi et al.

Osaka U [TAK-1, TAK-2, TAK-3]
CONDITIONS: electrolysis - D_2O, 1 M Li_2SO_4 or 0.2-1 M LiOD, Pd or Pd-Ag cathode (both 10 mm diam. rod and disk), alternately 200-500 and 500-1400 mA total current.
NEUTRONS: to approx. 1 1/2 X background of 0.017/sec (1/min) at 2.5 MeV and several tens of times background at approx. 5 MeV; using ^{3}He and scintillation counters.
TRITIUM: 3X background; n/t ratio 10^{-5}.
TIME COURSE: neutrons correlated with electrolysis conditions, also some correlation with tritium.

PRC [WAK]
TRITIUM: yes.

Shizuoka U [KOZ]
CONDITIONS: electrolysis - D_2O, LiOD, Pd cathode (plate), Pt anode.
NEUTRONS: 6 X 10^{-3}/sec per cm^3 Pd; using neutron dose rate meter.

Tokai U [SAK]
NEUTRONS: yes.

Tokohu U - Niimura [NII]
NEUTRONS: yes.

Tokohu U - Yagi [YAG-1, YAG-2, see also MEY]
CONDITIONS: temperature cycling of SiO_2 and of Ti exposed to D_2.
NEUTRONS: 3 sigma above background; by scintillation.
COMMENTS: subsequent statistical analysis has suggested an error.

Tokyo Institute of Technology (TIT) [SAT]
CONDITIONS: electrolysis - D_2O, 1 M LiOD, Pd cathode, Pt anode, 20 mA/cm$_2$.
NEUTRONS: bursts to 3-4 X background of 0.025/sec, = >3 sigma on each of 3 detectors; using ^{3}He counter.
COMMENTS: Takagi has also been tabulated as positive for neutrons; unclear if separate group. Okamoto and Sato, however, appear to be the same group.

Tokyo U of Ag. & Tech. [OYA]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd. cathodes (2-6 mm diam.), Pt anodes, 60-300 mA/cm^2
HEAT: 13-42% excess (up to 0.5 W, 2W/cm^3).

KOREA, South

Seoul Nat'l U [PAR-2]
CONDITIONS: electrolysis - D_2O.
NEUTRONS: 11 in 2 hours inferred from 2.2 MeV gammas.

MEXICO

Mexican Institute of Petroleum [MAL]
TRITIUM: 25 X excess (2200 dpm/ml, vs 85 dpm/ml background) after 90 hrs in 1 of 3 cells.
TIME COURSE: tritium appeared after 20 hours.
COMMENTS: occasionally tabulated as Morales, U of Mexico.

POLAND

Institute of Plasma Physics [SZU]
CONDITIONS: electrolysis - D_2O, Pd cathode.
NEUTRONS: bursts of 10^5 neutrons, after 106 hours; using 2.5 MeV neutron spectrometer, scintillation counter and track detector methods.

ROMANIA

Inst. of Phys. & Nucl. Engineering, Bucharest [DUD]
CONDITIONS: electrolysis - D_2O, Pd and Ti cathodes, Pt cathodes.
NEUTRONS: yes (greatest with Pd); using NE213 scintillator.

SPAIN

University of Madrid [SAN-1, FER]
CONDITIONS: electrolysis - D_2O, Li_2SO_4, Ti cathode (15 X 15 X 1 mm sheet), Pt anode.
NEUTRONS: 3000-4000 X background of 0.00056/sec (1-2/hr),= 3 X 10^5 neutrons in 7.59 hours; using BF_3

counter. Count rate repeatably dropped when cell was removed and climbed when cell was returned.
TRITIUM: 8 X increase to 100 dpm; by scintillation. Previously, also increase from approx. 1050 to 1450 cpm in 700 hrs, not seen in control experiment with no neutron generation. (0.03 uCi.).
GAMMA: bursts a few times background, 2-2.3 MeV (ex. 38.5 cpm vs. 15.5 cpm background).
TIME COURSE: neutrons in bursts; required 2 hours to drop to background after cell turned off. Some correlation of n, tritium, gamma, electrolysis conditions.

SWEDEN

Manne Siegbahn Inst. of Phys., Stockholm [EMM]
CONDITIONS: electrolysis - D_2O, Pd cathode
NEUTRONS: 10 X background after 4 hours, remaining elevated for 4 hours.

Royal Institute of Technology [Misc-2]
NEUTRONS: yes.

Studsvik Energy & Uppsala U [LEW]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (3 X 3.5 X 55 mm), Pt anode, 84-115 mA/cm^2.
HEAT: 70% (1 W) excess over 30 hours; by flow calorimetry.
NEUTRONS: bursts 2-10 X background of 0.2/sec (5-40 sigma), some spurious; using ^{3}He counter (8% effic.).

TURKEY

Hacettepe U, Ankara [BIR]
CONDITIONS: electrolysis - D_2O, LiOD, Pd cathodes.
HEAT: bursts to 150% excess.
GAMMAS: bursts correlated with heat.

UNITED STATES OF AMERICA

AT&T [Misc-3]
NEUTRONS: ?. Raghavan occasionally tabulated as positive, but original results presented were negative.

Brigham Young U [JON-1, JON-2, JON-3, JON-4, JON-5, JON-6, JON-7, HAR]
CONDITIONS #1: electrolysis - D_2O, Pd and Ti cathodes, complex mixture of inorganic salts, up to 500 mA total current.
NEUTRONS: up to 5 sigma above (3-1/2 X) background of 10^{-3}/sec at 2.5 MeV in 11 of 14 runs (total 200 excess counts in 14 runs = 2/hr or 4.1+/-0.8 X10^{-3}/sec, = 10^{-23} fusions/d-d pair/sec); approx. 2.5 MeV; using scintillation and ^{6}Li capture (effic. 1%). (Calculated average rate 3.4 n/sec, 2400 total source neutrons.) Neutrons also reported after cell turned off.

CONDITIONS #2: temperature cycling of gas-loaded Ti and Pd.
NEUTRONS: 15 counts/hour (> 5 sigma) above bckgnd; using independent ^{3}He detectors. Also bursts.
CHARGED PARTICLES: apparently H isotopes, energies up to 5 MeV, for up to several hours.

CONDITIONS #3: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (6 mm diam.), Ni anode, low current density.
NEUTRONS: up to 4 1/2 sigma above background for 1 1/2 hours; estimated emission 150 neutrons/hour.

CONDITIONS #4: electrolysis - D_2O, Pd cathode.
NEUTRONS: bursts lasting up to 3 hours and peaking at 90 sigma above background, after from 1 to 8 hours.

CONDITIONS #5: electrolysis - D_2O, Pd cathode, 3 M LiOD.
NEUTRONS: 3 X background of 0.002/sec; also bursts of approximately 100 neutrons; using ^{3}He counter (0.53% effic.).

CONDITIONS #6: gas-loaded high-temperature superconductor plus Ti, compressed.
NEUTRONS: burst of approximately 300 counts.

Brookhaven Nat'l Lab. - Beuhler et al. [BEU-1,BEU-2]
CONDITIONS: cluster impact of D_2O on deuterated Ti, Zr and polyethylene. 150-325 KeV per 20-1300 D_2O molecules.
CHARGED PARTICLES: Several thousand counts representing up to 1 fusion per 10^9 cluster impacts; using Si solid state detector. Max. for 150 D_2O/cluster; none below 20 D_2O/cluster; significant fusion rates even at 1000 D_2O/cluster. Particles identified as ^{1}H, ^{3}H and ^{3}He.
COMMENTS: Branching ratio consistent with conventional d-d fusion, but at rates tens of orders of magnitude higher than predicted. Interpretation still under discussion.

Brookhaven National Laboratory - McBreen [MCB]
HEAT: yes.
TRITIUM: 4X10^5 dpm/ml.

California Polytechnic [BUS-2, BUS-3, BUS-4, BUS-5, EAG]
CONDITIONS #1: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (2.5 mm diam.), Pt anode, up to 500 mA/cm^2.
HEAT: up to 6 W excess; average up to 2 W for 173,000 sec; cumulative excess up to 0.35 MJ; by various calorimeters, closed cell.
OTHER: plots of excess heat versus current density showed a fractal structure.

CONDITIONS #2: electrolysis - D_2O, 0.1 M LiOD, Pd thin film cathode.

HEAT: 20-34% excess for > 5 weeks, = > 2 KJ/cm^3; cumulative excess > 15 MJ.

Case Western Reserve [ADZ-1 ADZ-2, LAN]
CONDITIONS #1: electrolysis - D_2O, 0.1-1 M LiOD, Pd cathode (0.5-4 mm diam.), Pt and Ni anodes, up to 400 mA/cm^2.
HEAT: 5-10% excess.
TRITIUM: Up to 50 X background, = 1730 dpm/ml, in 6 cells; by scintillation; confirmed by 3 other labs.
TIME COURSE: tritium occurred after several weeks, levels dropped afterwards.

CONDITIONS #2: electrolysis - D_2O
NEUTRONS: bursts.

Colorado School of Mines [CEC-1, CEC-2, CEC-3]
CONDITIONS #1: ion implantation in Pd foil, up to 8000 mA/cm^2.
CHARGED PARTICLES: 30 excess counts/day, 3-5 MeV; using surface barrier detector.

CONDITIONS #2: temperature cycling of gas loaded Ti, plus current (100 mA/cm^2)in some cases.
CHARGED PARTICLES: up 10^{2-3} X background = 10 counts/sec; using surface barrier detector. Energy range 1-10 MeV; some particles tentatively identified as tritons up to 4.2 MeV. 24 bursts, lasting seconds to hours, from 12 of 26 samples, decreasing in successive temp. cycles.

Engelhard Industries [WER]
HEAT: yes.
COMMENTS: affiliation occasionally tabulated as Engelhart.

Idaho State U [FAL]
CONDITIONS: gas-loaded Ti.
NEUTRONS: 0.003/sec.

Los Alamos National Lab. - Claytor [CLA-1, CLA-2, CLA-3]
CONDITIONS: gas loading of alternating Pd (up to 105.5 g pressed powder or thin film) and Si layers, pulsed current (up to 3000 V, generally 1 W). Ti (300 g) also tried.
NEUTRONS: In early work with powder, up to 2.5/sec, = calculated production of up to 9.5X10^6 neutrons; using 15 ^{3}He counters with polyethylene moderator (effic. 1.3%). In later work with foils, max. 100 counts in 10^4 sec = 3 1/2 to 4 sigma above background.
TRITIUM: Powder, 10^8 - 10^9 dpm = 170,000 nCi = max. 1300 X T conc. in gas, in 96 hrs. Foil, 56-214 nCi.
OTHER: upper limit on n/t branching ratio 3X10^{-9}. Some correlation of neutrons and tritium. Addition of 5% H_2 was possibly helpful.
COMMENTS: High tritium production in 1 early (powder) cell.

Los Alamos National Lab. - Menlove [MEN-2, MEN-3, MEN-4, MEN-5, see also PAC-1]
CONDITIONS #1: temperature cycling of gas loaded Ti (chips and sponge, up to 300 g, or Ti+Pd).
NEUTRONS: In earlier report, 0.05-0.2 counts/sec (11 sigma above background over 12 hours, plus bursts of 10-300 neutrons; detector effic. 19-34%. In follow-up experiment, 5-10X background for many hours (calculated emission rate .001/sec); using up to 51 ^{3}He counters in polyethylene moderator (total effic. 3.6-44%, background 0.67/hr). Moving sample to different counters caused their count rate to increase. In latest 8 experiments, 7 or 8 gave long-term average over 1/2 to 6 weeks which were 3-12 sigma above background (0.68/hour), with no > 2 sigma periods for controls. Also bursts of up to several thousand counts, especially at approx. -30 C.
TIME COURSE: became active after 3 weeks, remained active for several days. Usually 1-10 n per burst, occasionally 20-200, in < 200 microsec.
OTHER: cycled to liquid nitrogen temp. and back. In an earlier test, more n per burst at -30 C.

CONDITIONS #2: electrolysis - D_2O, Pd, Ti and V cathodes.
NEUTRONS: 3 sigma above background.

Los Alamos Nat'l Lab. - Storms [STO-1, STO-2, STO-3]
CONDITIONS: electrolysis - D_2O, 0.1-0.2 M LiOD, Pd alloy cathodes (coins, strips, 1-2 mm diam. rods), various anodes (Pt, Ni, st. steel).
TRITIUM: 1.5-80X enrichment (max. 1.1-1.2X10^4 dpm/ml, 0.06 uCi, after 10 days, vs 20 dpm/ml background) in 13 of over 150 cells (> 1500 measurements); by scintillation.
TIME COURSE: tritium steady or in bursts, sometimes decreasing levels afterwards; similar cells sometimes started and stopped producing T after similar elapsed times.
OTHER: Tested up to 10% alloying with Li, C, S, B, Be; tested poisoning and surface treatments.
COMMENTS: occasionally tabulated as positive for heat.

Mills Technologies, Lancaster PA [MIL-5]
CONDITIONS: electrolysis - H_2O, 0.57 M K_2CO_3, Ni foil cathode, voltage varied (2.2, 2.75 V).
HEAT: up to 3766% excess, dependent on voltage variation; none with Na_2CO_3.
COMMENTS: one of very few positive reports with hydrogen, and without uptake by lattice. Mills' theory explains results as chemical not nuclear.

Mississippi State U [GU]
CONDITIONS #1: gas loaded Pd.
NEUTRONS: possibly 2 X background but not quantified.

CONDITIONS #2: ion bombardment of Pd foil and bulk, deuteron energy 1 KeV; control: nitrogen ions.

NEUTRONS: approx. 10 X background of 0.033/sec; using BF_3 detector with paraffin moderator. Required several minutes to reach background again after beam off.

National Cold Fusion Institute / U of Utah [FLE-1, FLE-2, PON-1, PON-2, BYR, GUR, TIA-1, Misc-4, see also MOR, WOR-1, PON-3] (several groups)
CONDITIONS #1: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (including sheet, 1-8 mm. rod, cube) and also Ti and Zr, Pt anode, up to 1024 mA/cm^2 .
HEAT: Up to at least several W (> 60-100 W/cm^3 Pd) excess, typical cumulative excess hundreds of MJ/cm^3 over 3 months; by heat loss calorimetry and others. Also bursts to approximately 4000% excess and lasting up to > 10 days, cumulative excess 16 MJ.
NEUTRONS: yes.
TRITIUM: 100 X background in 1 cell, low level production in others; by scintillation, confirmed by energy spectrum.
HELIUM: results inconclusive due to very high backgrounds, but possible 3-10X increase in ^4He (10^{13}-10^{14} atoms) in electrolyzed Pd vs unused, by 5 labs, in ETEC/Rockwell-organized test.

CONDITIONS #2: gas loading
TRITIUM: major amounts in 1 cell, smaller amounts in others.

CONDITIONS #3: Pd and Ti gas loading with electrical discharge (see also Wada).
NEUTRONS: yes.

CONDITIONS #4: electrodeposition of Pd deuteride (see also Szpak).
TRITIUM: up to 10 dpm/ml (several sigma) increases.

Naval Ocean Systems Center, San Diego [SZP, see also TIA-1]
CONDITIONS: electrodeposition of Pd deuteride from D_2O with 0.05 M $PdCl_2$, 0.3 M LiCl, on inert cathode, Pt anode.
HEAT: est. up to 40% excess; cumulative excess 10 KJ.
TRITIUM: average 200-270 dpm/ml, versus 27-30 background, confirmed in analysis by NCFI.
X/GAMMA RAYS: photographic film fogged; in one instance clear images of the electrode mesh were formed; soft X-rays suspected.
TIME COURSE: excess heat began after 20 minutes.
COMMENTS: a novel method with the potential for giving results in 12-hour experiments or shorter.

Naval Research Laboratory - Rolison [ROL-1, ROL-2]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD or Li_2SO_4, Pd cathode (foil), Pt anode.
OTHER: possible 100% and 45% enrichments of ^{106}Pd on Pd surface; also depletion of ^{105}Pd and ^{108}Pd?; not seen in blank using H_2O; using time-of flight secondary-ion mass spectrometer.
COMMENTS: Possible ZrO interference in one ^{106}Pd analysis, but believed insufficient to account for the change.

Naval Research Laboratory - Chambers [CHA-1,CHA-2]
CONDITIONS: very low energy ion bombardment of Ti and Pd at various temperatures, using 0.3-1 KeV deuterium ions.
CHARGED PARTICLES: several sigma above background of 5 counts/day; using silicon detector. Also bursts. Some particles tentatively identified as tritons with up to 5 MeV energy. Continuing up to 6 minutes after beam off.

Naval Weapons Center / U of Texas Austin [MIL-1, MIL-2, BUS-1]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathodes (6.35 mm diam.), Pt anodes, 100 mA/cm^2.
HEAT: up to 30% excess for several days in 5 of 6 cells. Average excess up to 18% (0.39 W/cm^3 Pd) over 9 days. Cumulative excess to 110 KJ. However, smaller unexplained excess in H_2O controls.
RADIATION: fogging of X-ray film.
HELIUM: large ^4He peaks in several samples, vs no helium above detection limit in nearly all blanks; by mass spectrometry. Amounts correlated with excess heat.
COMMENTS: He analyzed in evolved gases, rather than cathode as in other experiments. Amounts roughly comparable to measured heat. Presumably a surface process is indicated.

Novatek [HAL]
HEAT: average 5.35%, maximum 16.3% excess.

Nytone Electric, Utah [BAL]
HEAT: 10% excess.

Oak Ridge Nat'l Lab. - Scott [SCO-1, SCO-2, SCO-3, SCO-4]
CONDITIONS: electrolysis - D_2O, 0.1-1.0 M LiOD, Pd cathode (2.8-5.8 mm diam.), Pt anode, 100-800 mA/cm^2.
HEAT: 5-10% excess for several hundred hours, bursts up to 50% excess (4 W) for several hours and 9 W (3 W/cm^3). Cumulative excess 3 MJ. By flow calorimetry, open and closed cells.
NEUTRONS: few X background of 10^{-3}/sec (= 3 1/2 sigma), for up to 350 hrs; by scintillation (0.15% effic.).
TRITIUM: in earlier report, up to 25 X increase.
GAMMAS: max. approx. 1.2 X background of 0.2/sec up to 300 hrs, only in 2.64-3.12 MeV channel and channels below 2.12 MeV; by scintillation (effic. $5.75X10^{-3}$%).
TIME COURSE: 3 n and 3 gamma events, lasting tens to hundreds of hrs, in 2000 hrs. Some correlation of neutrons, perturbations, heat, gammas. When replaced with LiOH-H_2O, took well over 100 hrs to return to

background. Tritium produced in 2-3 hr burst within 2 days, level declined afterwards.
COMMENTS: occasional tabulations also listing Blencoe as positive for neutrons may be erroneous.

Oak Ridge Nat'l Lab. - Hutchinson [HUT-1, HUT-2]
CONDITIONS: electrolysis - D_2O, 0.2 M ^{6}LiOD, Pd cathodes (6.35-12.7 mm), Pt anodes.
HEAT: 20% excess, 2-9 W, for total of 1500 out of 1800 hours in 5 of 7-8 cells; by heat loss calorimetry.

Oregon State U [ZAH, KLE]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathodes (4 mm diam.), Pt anodes, 15-300 mA/cm^2.
HEAT: 7 bursts lasting up to 364 hours; 7% excess in latter, cumulative excess 2240 Watt-hours; by heat loss calorimetry.

Portland State U [DAS]
HEAT: yes.

Sandia National Laboratory [SAN-2]
CONDITIONS: ion bombardment of Pd.
COMMENTS: 3 X increase in fusion rate with particular crystallographic orientations. Test suggested by William E. Wells (Miami U at Oxford).

SRI (Formerly Stanford Research Institute) [MCK-2, MCK-3, BAE]
CONDITIONS #1: electrolysis - pressurized D_2O, 0.1 M LiOD, Pd cathode (.04 mole, 4 cm^2), Pt anode, up to 600 mA/cm^2.
HEAT: bursts lasting up to tens of hours, up to approx. 60% excess (several W). Cumulative excess up to 300 KJ (7.45 MJ/mole Pd); by flow calorimetry, closed cell.
RADIATION: autoradiography showed hot spots but not determined if tritium; no controls.
CONDITIONS #2: D_2O cluster impact on deuterated polyethylene (135-225 KeV, 1-150 D_2O/cluster).
CHARGED PARTICLES: yields comparable to Beuhler et al., with H_2O yields 5% those for D_2O.
COMMENTS: occasionally tabulated as positive for tritium, and affiliation listed as SRT.

Stanford [SCH-3, SCH-4, BEL-1, BEL-2]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (coin shape), Pd or Pt anode.
HEAT: up to 7% average (several watts/g Pd); also 56% excess in 30 minute burst. Cumulative excess 23 MJ/mole Pd. By heat loss calorimetry, open and closed cells.

Texas A&M - Appleby et al [APP, SRI-3, SRI-4]
CONDITIONS: electrolysis - D_2O, 0.1M LiOD and other electrolytes, Pd cathodes (0.5 - 1 mm diam.), Pt anodes, up to 1000 mA/cm^2.
HEAT: up to 31.5% excess (25 W/cm^3). Cumulative excess up to 4 MJ. NaOD inhibited effect, no difference between ^{6}Li and ^{7}Li. Using Seebeck microcalorimeter.

Texas A&M - Bockris et al [BOC-1, PAC-2, KAI-1, KAI-2, LIN-1, see also BOC-2]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathodes (1-6 mm diam.), Pt and Ni anodes, 50-500 mA/cm^2.
HEAT: average up to 18% excess for 32 days, maximum at least 28%. Cumulative excess > 1.5 MJ.
TRITIUM: 10^2 to 10^{5-6} X background, = 10^4 to 10^{7-8} dpm/ml (340 uCi), in 15 of 53 cells, including 9 of 13 with 1 mm rods; by scintillation; confirmed by beta spectrum and by Argonne, Batelle, Los Alamos & GM.
TIME COURSE: T in bursts after hours, days or months; bursts lasting 5-50 hours with declining levels afterwards. Possible correlation of T and heat but in 1 case tritium began 10 days after heat.
OTHER: > 4 mm rods continued negative up to 6 months. Also tested poisoning.
COMMENTS: High tritium production.

Texas A&M - Wolf et al, [WOL-1, WOL-2, WOL-3; see also BOC-2, WOL-4]
CONDITIONS #1: electrolysis - D_2O, 0.1 M LiOD, Pd (0.5-6.0 mm diam.) and Ti cathodes, Ni anodes, up to 500 mA/cm^2.
NEUTRONS: Up to 7 sigma above background for 4 hours (2 counts/min). Also burst of 100/minute. In earlier report, several bursts 3-9 X background of 0.8 counts/min (= calculated emission rate 50 n/hr); by scintillation (5% effic.); energy consistent with 2.5 MeV. $1/r^2$ test and duplicate cells run simultaneously showed signal was from cell.
TRITIUM: up to 10^5 dpm/ml, 7 uCi; by scintillation; confirmed by energy spectrum. However, tritium also reported in controls.
OTHER: when neutron burst died down, wiping the wire could cause another burst.

U of CA, Santa Barbara [MIL-4]
CONDITIONS: electrolysis - D_2O, LiOD, Pd cathode (0.1 mm diam.), Pt anode.
HEAT: yes.
NEUTRONS: bursts; using 6 ^{3}He counters.

U of Florida [SCH-1, SCH-2]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, various cathodes, various anodes (cup-shaped, below cathode).
HEAT: up to at least 150% excess for Pd with average up to at least 61% for 58 days; by flow calorimetry. Also 47% excess for Zr over 14 days, 30% for Ti over 4 days.
TRITIUM: 20-25 X increase (from 2000 counts/min) in 70 hours, 5 X (10^5 dpm/ml) increase in another cell.
RADIATION: 5 X background of approx.90/sec, presumed gamma radiation.

COMMENTS: some tabulations also indicate neutron emission.

U of Hawaii [LIA, HOF, HUA]
CONDITIONS #1: electrolysis - molten salts (LiD in LiCl/KCl, >350 C), Pd and Ti anodes, Al cathode, up to 700 mA/cm^2.
HEAT: For Pd, 600-1500% excess for 4 days, maximum 25.4 W (600 W/cm^3), cum. excess 6.26 MJ/mole D_2. 100% excess for Ti but poor statistics. Heat loss calorimetry.
HELIUM-4: up to 14 standard deviations above background; by mass spectrometry. 4 samples yielded 0.6, 0.6, 0.8 and 2.8 X 10^9 atoms, versus 0.2-0.3 X 10^9 for the blanks and 0.1-0.7 X 10^9 for the background. Total for entire electrode estimated as 4 X 10^{10} atoms above background. However, amounts still several orders of magnitude smaller than heat.

CONDITIONS #2: electrolysis - D_2O, Pd cathode (0.25 cm^3 pellet).
HEAT: excess began after 40 days, eventually ceased after water added.

U of Minnesota [ORI]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathode (1 mm diam.), Pt anode, up to 2 A/cm^2.
HEAT: up to 50% excess, 3.6 W (>60 W/cm^3 Pd). Up to 74 KJ cumulative excess. Using Seebeck calorimeter.

U of Mississippi [PRE]
CONDITIONS: deuterium ion bombardment of Pd.
NEUTRONS: reported as inconclusive; episodes 2-5 X background; by BF_3 and scintillation counters.

U of Rochester [JOR-1, JOR-2, JOR-3]
CONDITIONS #1: heating of gas loaded Pd.
NEUTRONS: 3-4 X background of 0.03/sec near 300 C; using 2 scintillation detectors (1% effic.).
GAMMAS: 8 counts/sec above background of 73/sec, some correlation with neutron emission.
CONDITIONS #2: hybrid gas loading/electrolytic. Gas-loaded Pd cathode and anode, alumina electrolyte, 250 C.
NEUTRONS: bursts several times background of 0.02 counts/sec.
COMMENTS: Jordon occasionally also tabulated as positive for neutrons, possibly a separate group. Jorne affiliation also occasionally tabulated as Case Western.

Vernon Regional College [CRA]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd-plated Ti cathode.
TRITIUM: yes; by autoradiography.

Weber State Univ. [MON]
CONDITIONS: gas-loaded Pd + current (2-4 A).
NEUTRONS: 10-day increase, plus 2 bursts of 8 counts in 15 sec, in 3000+ hours.

Other [DRO-1, DRO-2]
CONDITIONS: electrolysis - D_2O, 0.1 M LiOD, Pd cathodes (2 mm diam.), Pt anodes, several hundred mA/cm^2.
HEAT: 4% excess (4 W/cm^3 Pd) over hundreds of hours; by Peltier effect calorimeter. Ceased 35 hours after replacement with H_2O.

U.S.S.R.

(Note: some duplication between reports with unknown affiliations and those with unknown researchers is possible)

All-Union Institute, Monocrystals [SEM]
TRITIUM: yes.
HELIUM: ^{3}He.

Byelorussian U [Misc-3]
HEAT: yes.

Fiz.-Tekh. Inst. im. Ioffe, Leningrad [KAR-2]
CONDITIONS: electrolysis - D_2O, HBr and KI, Pd cathodes.
NEUTRONS: yes.

Institute of Nuclear Physics (INP), Novosibirsk [ARZ-1, ARZ-2, see also DAN]
CONDITIONS #1: dissolution of LiD crystals in D_2O.
NEUTRONS: up to 20-30 counts per 30 seconds, versus 0-10 for background; = a few tens of neutrons/gram.
COMMENTS: a novel type of experiment.
CONDITIONS #2: oxidation-reduction chemical reactions of deuterated Pd and Pt salts.
NEUTRONS: yes.

Institute of Physical Chemistry, Academy of Science of the USSR, Moscow [DER-1, DER-2, DER-3, LIP-1, LIP-2, LIP-3, KLU, WOR-2]
CONDITIONS #1: Ti chips fractured in D_2O + LiOD.
NEUTRONS: yes.
TRITIUM: yes.

CONDITIONS #2: LiD + D_2O crystals fractured by impact (sum of 75 experiments).
NEUTRONS: 2 1/2 X background, = 0.34 ± 0.10 excess counts per impact, consistent with 2-3 MeV energy.

CONDITIONS #3: friction between TiD_2 and deuterated polymer and D_2O.
NEUTRONS: 6-7 X 0.05/sec background, continue up to 8-10 minutes after mill stopped, less in successive cycles.

CONDITIONS #3: ultrasonic cavitation- Ti, Zh, Hf, V in D_2O.

NEUTRONS: 2-3 X background (= 1 n/sec/g); using proportional counter (effic. 1%).

Karpov Inst. [Misc-3]
HEAT: yes.
COMMENTS: conceivable this is actually the Kharkov Inst.

Kharkov Inst. [ZEL-1, ZEL-2, Misc-3]
CONDITIONS #1: temperature cycling of gas loaded Ti.
NEUTRONS: bursts.

CONDITIONS #2: temp. cycling of ion implanted Ti.
NEUTRONS: 1-3 counts/sec at approx. -30 and 600 C.
TRITIUM: yes.

CONDITIONS #3: ?
CHARGED PARTICLES: yes.
X/GAMMA RADIATION: yes.

Lebedev Physical Inst., Moscow [TSA, GOL]
CONDITIONS: electrolysis - D_2O, 0.1 M $LiClO_4$, Pd cathode, up to 200 mA/cm^2.
NEUTRONS: 6 bursts of approx. 100 neutrons, > 10 X background of 5 X 10^{-3}/sec; using coincidence between ^{3}He and scintillator detectors (effic. 3%). In a later experiment, 42 neutron counts correlated with acoustic emissions = 7 X background.
TIME COURSE: bursts followed thermal and cryo-shocks; also correlation with radio emission.

Metal Phys. Inst., Kiev [KOS, Misc-3]
CONDITIONS: ion bombardment of Ti (500 cm^2) with deuterium, 9 KeV, up to 1 A total current.
TRITIUM AND/OR ^{3}He: suggested by mass spectrometry.

Moscow State U [KUZ]
HEAT: yes.
NEUTRONS: yes.
TRITIUM: yes; by autoradiography.

O.Yu. Schmidt Inst. of Earth Physics [YAR-1, YAR-2, YAR-3]
CONDITIONS: freezing and thawing of D_2O ice and D_2O/salt solutions; fracture of rocks with D_2O.
NEUTRONS: yes.

Odess. Gos. U [RUS]
CONDITIONS: electrolysis - D_2O+T_2O, Pd-Ag-Au cathode, 10 mA/cm^2 , 200 V.
NEUTRONS?: rare > 10 MeV events; using track detector.

Perm State U [ALI]
TRITIUM: yes.

Scientific Indus. Organization "Lutch", Podolsk [KAR-1]
CONDITIONS: ion (glow) discharge, Pd, Ti and Zr electrodes in D_2 gas.
HEAT: 20-50% excess, cumulative 500-1000 J.
NEUTRONS: bursts to 10^8 X background of 0.01-0.1/sec; using ^{3}He counter (5% effic.). Correlated with heat.

Topchiev Petrochemical Synthesis Research Inst., Moscow [GOV]
CONDITIONS: heating of gas loaded Pd-Sm and Pd-Ru alloys (2 g powder).
NEUTRONS: short bursts at 500 deg. C in both (2.8-2.9 ± 0.3 X background); using 12 ^{3}He counters with moderator (10.5% effic.).

Unknown [BAS]
CONDITIONS: electrolysis - H_2O and D_2O, various cathodes.
NEUTRONS: bursts on both ^{3}He and scintillator detectors for Pd, Ti and Au cathodes, greater with D_2O but also above background for H_2O.
COMMENTS: very atypical results, given emission from H_2O and without lattice uptake.

Unknown - Gorodyetski, Buichin [WOR-2]
CONDITIONS: electrolysis - molten LiD, 170-1000 C, Ti, Zr, W and Ta electrodes.
NEUTRONS: bursts (50 sec) up to 20 X background (Ti), possibly = up to 2 X 10^4 neutrons, lower levels continuing after current off.
GAMMAS: up to 7 X background, 1.5-2.5 MeV.
OTHER: reportedly reproducible.

Unknown - Tsvyetkov [WOR-2]
CONDITIONS: gas loaded Ti heated by laser to 750 C.
NEUTRONS: 18 X background, = >200 n/sec for < 1/2 sec; using 2 detectors.
OTHER: reproducible (100 experiments).

Unknown - Yukhimchik [WOR-2]
CONDITIONS: temperature cycling of gas loaded V.
NEUTRONS: bursts, typically approx. 10/sec vs 0.074/sec. background; using scintillation counter and ^{3}He counter (7% effic.). 2 bursts on heating to 400 C followed by 2 bursts during cryo-cooling.
TRITIUM: yes.

Unknown - Krijanski [WOR-2]
CONDITIONS: electrolysis - D_2O, Pd (5.6 g).
NEUTRONS: many bursts, up to 40 X background of 200 n/min, after 1 week in 2 of many experiments. Sample removal and reinsertion confirms sample as the source. Correlated with current, some continuing after current off.
TRITIUM: preliminary result, 5 X increase.

Unknown - Perekrestenko [WOR-2]
CONDITIONS: electrolysis - D_2O, 30% D_2SO_4 or 7% LiOD, Pd cathode (80 g).
NEUTRONS: 6 bursts lasting up to 15 minutes, decreasing in size; using 6 ^{3}He tubes.

Unknown - Gujovski [WOR-2]
CONDITIONS: electrolysis - D_2O, LiOD, Pd and Ti cathodes.
NEUTRONS: 10-100/sec (10^5 total), versus 0.02/sec background, for 2 of many Pd runs, and > 6 sigma above background for a few of 10 Ti runs. Using 12 ^{3}He tubes (effic. 20%).
TRITIUM: 250-4000 X background (= 4 X 10^{12} - 2.5 X 10^{13} atoms). N/t ratio approx. 10^{-8}.

Unknown - Chernov [WOR-2]
CONDITIONS: electrical discharge (500-1000 V) between Pd electrodes in D_2 gas.
NEUTRONS: 7-55 X background of 0.012/sec for 6-7 minutes, starting after 5 minutes, in 5 of 5 runs; using scintillation detector (effic. 4%).

Unknown - Romodanov [WOR-2]
CONDITIONS: electrical discharge in D_2, using Y,Er, Nb and Ta electrodes.
TRITIUM: 2-260 X background of 2-4/sec, up to 10^7 atoms (Nb, Ta), in D_2 but not H_2; by scintillation.

YUGOSLAVIA

Boris Kidric Inst. of Nuclear Sciences [JEV, MIL-3]
CONDITIONS #1: temperature cycling of gas loaded Ti and Pd.
NEUTRONS: up to 3-6 X background of 0.00055/sec over 1.5 hours, only after first cycle, in 2 samples; using BF_3 and scintillation detectors.

CONDITIONS #2: electrolysis - D_2O, Pd cathode.
NEUTRONS: 3-4 X background of 0.0077/sec; using scintillation counter.
TRITIUM: possible tritium suggested by mass spectrometry.
COMMENTS: report in [Misc-1] giving affiliation as Ruder Boskovic Institute may be incorrect, given negative presentation by Blagus at Santa Fe conference.

REFERENCES
(ALPHABETICALLY BY FIRST AUTHOR)

[ADA] William A. Adams, Ernest E. Criddle, and V.S. Donepudi, "Exploratory Experiments Concerning Anomalous Thermal Effects in the Palladium-Deuterium System", Paper presented at 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[ADZ-1] Radoslav Adzic, D. Gervasio, I. Bae, B. Cahan, and E. Yeager, "Investigation of Phenomena Related to D_2O Electrolysis at a Palladium Cathode." Paper presented at the 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[ADZ-2] R. Adzic, D. Gervasio, I. Bae, B. Cahan and E. Yeager, "Investigation of Phenomena Related to D2O Electrolysis at a Palladium Cathode", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 261-271.

[AIE] Sebastiano Aiello, Enrico De Filippo, Gaetano Lanzano, Salvatore Lo Nigro, and Angelo Pagano, "Nuclear Fusion Experiment in Palladium Charged by Deuterium Gas," *Fusion Technology* **18(1)**, August 1990, pp 115-119.

[ALI] Alikin, tabulated by Will/Bockris/Fox, but published reference not known.

[ALQ] R. Alquasmi, K. Albertsen, H.G. Chotka, and H.J. Schaller, "Neutrons and Tritium From Cold Fusion in Pd-D." Paper presented at the 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[APP] A. John Appleby, Young J. Kim, Oliver J. Murphy and Supramanian Srinivasan, "Anomalous Calorimetric Results During Long-Term Evolution of Deuterium on Palladium from Alkaline Deuteroxide Electrolyte," Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 32-43.

[ARA-1] Y. Arata and Y.C. Zhang, "Achievement of Intense 'Cold' Fusion Reaction", *Proc. Japan Acad., Ser. B* **66(1)**, 1990, pp 1-6.

[ARA-2] Y. Arata and Y.C. Zhang, " 'Cold' Fusion Caused By A Weak 'On-Off Effect'", *Proc. Japan Acad., Ser. B* **66(2)**, 1990, pp 33-36.

[ARA-3] Y. Arata and Yue-Chang Zhang, "Corroborating Evidence for 'Cold' Fusion Reaction," *Proc. Japan Acad., Ser. B* **66(6)**, 1990, pp 110-115.

[ARA-4] Yoshiaki Arata and Yue-Chang Zhang, "Achievement of an Intense Cold Fusion Reaction," *Fusion Technology* **18(1)**, August 1990, pp 95-102.

[ARZ-1] A.V. Arzhannikov et al., Inst. Nucl. Physics (Novosibirsk) report INP 89-144, 1989.

[ARZ-2] A.V. Arzhannikov et al., Inst. Nucl. Physics (Novosibirsk) report INP 89-152, 1989.

[BAE] Y.K. Bae, D.C. Lorents, S. Young and K.R. Stadler, "Confirmation of Cluster-Impact Fusion," Bull. of the Am. Phys. Soc. **36(4)**, April 1991, p 1334.

[BAL] Baldone, tabulated by Will/Bockris/Fox, but published reference not known.

[BAS] Yu.A. Bashkirov, R.Kh. Baranova, B.G. Bazanin and V.M. Kazakova, "Neutron Emission in Electrolysis of Heavy Water," *Pis'ma Zh. Tekh. Fiz.* **16(19)**, 1990, pp 51-55 (in Russian).

[BEL-1] A. Belzner, U. Bischler, S. Crouch-Baker, T.M. Gur, E. Lucier, M. Schreiber and R.A. Huggins, "Two Fast Mixed-Conductor Systems: Deuterium and Hydrogen in Palladium - Thermal Measurements and Experimental Considerations," presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989.

[BEL-2] A. Belzner, U. Bischler, S. Crouch-Baker, T.M. Gur, G. Lucier, M. Schreiber and R.A. Huggins, "Recent Results of Mixed Conductors Containing Hydrogen or Deuterium," *Solid State Ion. Diffus. React.* **40-41**, 1990, pp 519-524.

[BEM] P. Bem, I. Paseka, I. Pecina, V. Presperin, O. Spalek, M. Vomacka and J. Vondrak, "Search for Neutrons from DT-Cold Nuclear Fusion," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[BER-1] Antonio Bertin, M.Bruschi, M. Capponi, S. DeCastro, U. Marconi, C. Moroni, M. Piccinini, N. Semprini-Cesari, A. Trombini, A. Vitale, and A. Zoccoli, J.B. Czirr, G.L. Jensen, S.E. Jones, and E.P. Palmer, "Experimental Evidence for Cold Nuclear Fusion in a Measurement Under the Gran Sasso Massif", presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989 and published in *J. Fusion Energy* **9(2)**, p 209.

[BER-2] A. Bertin, M. Bruschi, M. Capponi, S. De Castro, U. Marconi, C. Moroni, M. Piccinini, N. Semprini-Cesari, A. Trombini, A. Vitale and A. Zoccoli, "Experimental Evidence of Cold Nuclear Fusion in a Measurement Under the Gran Sasso Massif," *Il Nuovo Cimento* **101 A**, 1989, pp 997-1004.

[BEU-1] R.J. Beuhler, G. Friedlander, and L. Friedman, "Cluster-Impact Fusion," *Physical Review Letters* **63(12)**, Sept 18, 1989, pp 1292-1295.

[BEU-2] R.J. Beuhler, G. Friedlander and L. Friedman, "Deuteron-Deuteron Fusion by Impact of Heavy-Water Clusters on Deuterated Surfaces," *J. Phys. Chem.* **94**, 1990, pp 7665-7671.

[BIR] Ozgen Birgul, Serdar Celebi, Ahmet Ozdural, Kadir Pekmez, Attila Yildiz and Yuda Yurum, "Electrochemically Induced Fusion of Deuterium Using Surface Modified Palladium Electrodes," *Doga: Turk Muhendislik Cevre Bilimleri Derg.* **14(3)**, 1990, pp 373-380.

[BIT-1] M. Bittner, A. Meister, D. Ohms, E. Paffrath, D. Rahner, R. Schwierz, D. Seeliger, K. Wiesener, P. Wustner, "Method for Investigation of Fusion Reactions in Condensed Matter," *Fusion Technology* **18(1)**, August 1990, pp 120-130.

[BIT-2] M. Bittner, A. Meister, D. Ohms, E. Paffrath, D. Rahner, R. Schwierz, D. Seeliger, K. Wiesener and P. Wustner, "Evidence for the Production of DD-Fusion Neutrons During Electrolytic Infusion of Deuterons into a Palladium Cylinder," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[BOC-1] J.O'M. Bockris, G.H. Lin, R.C. Kainthla and N.J.C. Packham, "Does Tritium Form at Electrodes by Nuclear Reactions?", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 137-148.

[BOC-2] John O'M. Bockris, Guang H. Lin and Nigel J.C. Packham, "A review of the Investigations of the Fleischmann-Pons Phenomena," *Fusion Technology* **18(1)**, August 1990, pp 11-31.

[BRE] T. Bressani, seminar presented at the National Cold Fusion Institute, Salt Lake City UT, November 1990, and reported in *Fusion Facts*, January 1991, pp 12-13.

[BUS-1] B.F. Bush, J.J. Lagowski, M.H. Miles and G.S. Ostrum, "Helium Production During the Electrolysis of D_2O in Cold Fusion Experiments," *J. Electroanal. Chem.* **304**, April 1991, pp 271-278.

[BUS-2] Robert T. Bush, "Isotopic Mass Shifts in Cathodically-Driven Palladium Via Neutron Transfer Suggested by a Transmission Resonance Model to Explicate Enhanced Fusion Phenomena (Hot and Cold) Within a Deuterated Matrix," Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 213-228.

[BUS-3] Robert T. Bush, "The TRM (Transmission Resonance Model) for Cold 'Fusion' Fits Calorimetric Data on the Pons-Fleischmann Effect and Suggests Solutions to Nuclear 'Anomalies'," Proceedings of the Special Symposium on Cold Fusion, World Hydrogen Energy Conference #8, Honolulu HI, July 22-27, 1990, pp 109-151.

[BUS-4] Robert T. Bush, "Cold Fusion: The Transmission Resonance Model Fits Data on Excess Heat, Predicts Optimal 'Trigger' Points, and Suggests Nuclear-Reaction Scenarios," *Fusion Technology* **19(2)**, March 1991, pp 313-356.

[BUS-5] personal communication with Hal Fox, June 14, 1991.

[BYR] J.G. Byrne, S. Guruswamy, J. Lee and M.E. Wadsworth, Proceedings of the EPRI/NSF Workshop on Cold Fusion Phenomena, Washington DC, October 18, 1989.

[CAI] Cai, tabulated by Will/Bockris/Fox, but published reference not known.

[CEC-1] F. Cecil, D. Ferg, T. Furtak, C. Mader, J.A. McNeil, and D. Williamson, "Study of Energetic Charged Particles from Thin Deuterated Palladium Foils Subject to High Current Densities", presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in *J. Fusion Energy* **9(2)**, p. 195.

[CEC-2] F.E. Cecil, H. Liu, D. Beddingfield and C. Galovich, "Observation of Charged Particle Bursts from Deuterium Loaded Ti Thin Foils," Bulletin of the Am. Phys. Soc. **36(4)**, 1991, p 1335.

[CEC-3] F.E. Cecil, H. Liu, D. Beddingfield and C. Galovich, "Observation of Charged Particle Bursts from Deuterium Loaded Ti Thin Foils," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[CEL-1] Francesco Celani, Antonio Spallone, Sandro Pace, Basilio Polichetti, Aniello Saggese, Lorella Liberatori, Vitorio di Stefano and Paolo Marini, "Further Measurements on Electrolytic Cold Fusion With D_2O and Palladium at Gran Sasso Laboratory," *Fusion Technology* **17(4)**, July 1990, pp 718-724.

[CEL-2] Francesco Celani et al., "Measurements in the Gran Sasso Laboratory," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[CHA-1] G.P. Chambers, J.E. Eridon, K.S. Grabowski, B.D. Sartwell and D.B. Chrisey, "Charged Particle Spectra of Palladium Thin Films During Low Energy Deuterium Ion Implantation," presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in *J. Fusion Energy* **9(2)**, pp 281-285.

[CHA-2] George Chambers, Graham Hubler and Ken Grabowski, "Search for Energetic Charged Particle Reaction Products During Deuterium Charging of Metal Lattices," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[CHE] J. Chene and A.M. Brass, "Tritium Production During the Cathode Discharge of Deuterium on Palladium," *J. Electroanal. Chem.* **280**, 1990, pp 199-205.

[CHI] Chung-Ching Chien and T. Chen Huang, "Tritium Production by Electrolysis of D_2O," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[CLA-1] Thomas N. Claytor, P.A. Seeger, R.O. Rohwer, D.G. Tuggle, and W.R. Doty, Technical Information Release LA-UR-89-3946 and Proceedings of the EPRI/NSF Workshop on Cold Fusion Phenomena, Washington DC, October 18, 1989.

[CLA-2] Thomas N. Claytor, personal communication (May 31 and July 31, 1990), reported in *Fusion Facts*, June 1990, p 6.

[CLA-3] T. Claytor, "Tritium Generation in Pd-Si Systems; Gas and Liquid Analysis Facilities for Detection of Tritium," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[COE] Paulo R.P. Coelho, R.N. Saxena, Spero P. Morato, I.D. Goldman, A.G. De Pinho and I.C. Nascimento, Inst. Pesqui Energ. Nucl. (05499 Pinheiros, Brazil) report IPEN 297, 1990, 10 pp.

[CRA] Dennis Cravens, personal communication.

[CRI] Ernest Criddle, reported in *Fusion Facts*, June 1990, pp 6-7.

[DAM] F. D'Amato, A. De Ninno and F. Scaramuzzi, "Search for Nuclear Phenomena by the Interaction Between Titanium and Deuterium,", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 170-174.

[DAN] M. Danos (NIST), reporting for A.V. Arzhannikov and G.Ya. Kezerashvili, Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[DAS] Dash, tabulated by Will/Bockris/Fox, but published reference not known.

[DAU] Donald P. Dautovich, reported during panel discussion at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in "Cold Fusion: What Do We Know? What Do We Think?," *J. Fusion Energy* **10(1)**, 1991, pp 111-124.

[DEN-1] A. De Ninno, A. Frattolillo, G. Lollobattista, L. Martinis, M. Martone, L. Mori, S. Podda, and F. Scaramuzzi, "Neutron Emission from a Titanium-Deuterium System", presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989.

[DEN-2] A. De Ninno, A. Frattolillo, G. Lollobattista, L. Martinis, M. Martone, L. Mori, S. Podda and F. Scaramuzzi, "Emission of Neutrons as a Consequence of Titanium-Deuterium Interaction," *Il Nuovo Cimento* **101 A**, 1989, p 841.

[DEN-3] A. De Ninno, A. Fratolillo, G. Lolobattista, L. Martinis, M. Martone, L. Mori, S. Podda and F. Scaramuzzi, "Evidence of Emission of Neutrons from a Titanium-Deuterium System," *Europhys. Lett.* **9**, 1989, pp 221-224.

[DEN-4] A. De Ninno, C. Pontorieri, F. Scaramuzzi and P. Zeppa, "Emission of Neutron Bursts from a Titanium-Deuterium Gas System in a High-Efficiency Low-Background Experimental Setup," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[DER-1] B.V. Deryagin, V.A. Klyuev, A.G. Lipson, and Y.P. Toporov, "Possibility of Nuclear Reactions During the Fracture of Solids", *Colloid J. of the USSR*, 1986, pp 8-10. Translated from *Kolloidnyi Zhurnal* (USSR) **48(1)**, January-February 1986, pp 12-14.

[DER-2] B.V. Deryagin, A.G. Lipson, V.A. Klyuev, D.M. Sakov, and Y.P. Toporov, "Titanium fracture yields neutrons?", *Nature* **341**, 12 October 1989, p 492.

[DER-3] B.V. Derjaguin, V.A. Kluev, A.G. Lipson and Yu. P. Toporov, "Excitation of Nuclear Reaction Under Mechanical Effect (Impact) on Deuterated Solids," *Physica B* **167**, 1990, pp 189-193.

[DRO-1] Lee John Droege and Thomas F. Droege, "A Zero Gradient Calorimeter for the Measurement of Anomalous Heat from the Electrolysis of Deuterated Metals," Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 229-242.

[DRO-2] T.F. Droege, "A Discussion of an H_2O Run Which Followed Operation with D_2O," Environmental Optics Corp. SMATN-90-2 April 1990.

[DUD] D. Dudu, M. Molea, I. Pascalau, I. Piticu and I. Vata, "Nuclear Effects in the Electrolysis of Heavy Water," *Rev. Roum. Phys.* (Romania) **34(2)**, 1989, pp 229-232.

[EAG] Robert D. Eagleton and Robert T. Bush, "Calorimetric Experiments Supporting the Transmission Resonance Model for Cold Fusion," to be published in *Fusion Technology*.

[EMM] B. Emmoth, I. Gudowska, W. Gudowski and M. Jandel, "Transient Emission of Neutrons from Deuterated Palladium," Conference Proceedings Vol. 24. Understanding Cold Fusion Phenomena, Varenna, Italy, Sept. 15-16, 1989, to be published in *Physica Scripta*.

[FAL] Kenneth Faler and Stanley Veagors, personal communication, March 24, 1990

[FER] F. Fernandez, J. Sevilla, B. Escarpizo and C. Sanchez, "Nuclear Effects in Electrolytically Deuterated Ti and Pd," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[FLE-1] M. Fleischmann, S. Pons, and M. Hawkins, "Electrochemically Induced Nuclear Fusion of Deuterium." *Journal of Electroanal. Chem.* **261**, 1989, pp 301-308, and erratum, **263**, 1989, p 187.

[FLE-2] Martin Fleischmann, Stanley Pons, Mark W. Anderson, Lian Jun Li and Marvin Hawkins, "Calorimetry of the Palladium-Deuterium-Heavy Water System," *J. Electroanal. Chem.* **287**, 1990, pp 293-348.

[FUK] Fukada, tabulated by Fritz Will/Bockris/Fox, but published reference not known.

[GAD] Guo-tong Gad et al, reported in [ZHA-1].

[GAM] Takaharu Gamo, Junji Niikura, Noboru Taniguchi, Kazuhito Hatoh and Kinichi Adachi, "Apparatus for Cold Nuclear Fusion," European patent application 90107987.1, April 16 1990.

[GOL] P.I. Golubnichii, V.V. Kuz'minov, G.I. Merzon, B.V. Pritychenko, A.D. Filonenko, V.A. Tsarev and A.A. Tsarik, "Correlated Neutron and Acoustic Emission from a Deuterium-Saturated Palladium Target," *JETP Lett.* **53(2)**, pp 122-125. Translation of *Pis'ma Zh. Eksp. Teor. Fiz.* (USSR) **53(2)**, January 25 1991, pp 115-118.

[GOU-1] Qing-Quan Gou, reported in [ZHA-1].

[GOU-2] Qingquan Gou, Zhenghe Zhu and Qingfu Zhang, "Possible Mechanism of Cold Fusion and Experimental Research," *Yuanzi Yu Fenzi Wuli Xuebao* **7(3)**, 1990, pp 1491-1495 (in Chinese).

[GOV] B.V. Govorov, V.M. Gryaznov, N.V. Eremin, A.N. Karavanov, N.R. Roshan, A.F. Tulinov and I.V. Tyapkin, "Neutron Emission from Palladium Alloys Saturated with Deuterium", *Russian J. of Phys. Chem.* **64(2)**, pp 287-288. Translated from *Zh. Fiz. Khim.* (USSR) **64(2)**, 1990, pp 539-540.

[GOZ-1] D. Gozzi, P. Cignini, L. Petrucci, M. Tomellini, and G. De Maria, "Nuclear and Thermal Effects During Electrolytic Reduction of Deuterium at a Palladium Electrode", presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in *J. Fusion Energy* **9(3)**, p 241.

[GOZ-2] D. Gozzi, P.L. Cignini, L. Petrucci, M. Tomellini, G. DeMaria, S. Frullani, F. Garibaldi, F. Ghio, M. Jodice, "Evidences for Associated Heat Generation and Nuclear Products Release in Palladium Heavy-Water Electrolysis", *Il Nuovo Cimento* **103A**, 1990, pp 143-154.

[GOZ-3] D. Gozzi, P.L. Cignini, S. Frullani, F.Garibaldi, F. Ghio, M. Jodice and G.M. Urcioli, "Neutron and Tritium Evidences in the Electrolytic Reduction of Deuterium on Pd Electrodes," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[GRA-1] J.R. Granada, R.E. Mayer, G. Guido, P.C. Florido, A. Larreteguy, V.H. Gillette, N.E. Patino, J. Converti, and S.E. Gomez, "Thermal Neutron Measurements on Electrolytic Cells With Deuterated Palladium Cathodes Subjected to a Pulsed Current," *J. Nucl. Science & Tech.* **27(3)**, March 1990, pp 222-229.

[GRA-2] J.R. Granada, R.E. Mayer, P.C. Florido, V.H. Gillette, and S.E. Gomez, "Neutron Measurements on Electrolytic Cells (Pd-D_2O) Perfomed Under Very Low Background Conditions," *J. Nucl. Science & Tech.* **27(4)**, April 1990, pp 379-381.

[GRA-3] J.R. Granada, R.E. Mayer, P.C. Florido, G. Guido, V.H. Gillette, S.E. Gomez, N.E. Palino and A. Larreteguy, "Neutron Measurements on (Pd-D_2O) Electrolytic Cells Under Pulsed Current Conditions," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[GU] Albert G. Gu, Robert K. F. Teng, Mark S. Miller, and Wayne J. Sprouse, "Preliminary Experimental Study on Cold Fusion Using Deuterium Gas and Deuterium Plasma in the Presence of Palladium," *Fusion Technology* **16(2)**, September 1989, pp 248-250.

[GUR] Sivaraman Guruswamy and Milton E. Wadsworth, "Metallurgical Aspects in Cold Fusion Experiments," Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 314-327.

[HAL] H. Tracy Hall Jr., Vance I. Fryer and David R. Hall, "Observation of Excess Heat Production of LiOD-D_2O Solution on a Palladium Cathode," Novatek report, August 22, 1989.

[HAR] John N. Harb, William G. Pitt and H. Dennis Tolley, "Statistical Analysis of Neutron Burst Size and Rate During Electrolysis of LiOD Solutions," *Fusion Technology* **18(4)**, December 1990, pp 669-677.

[HAW] N. Hawkins, S. Sh. Yi, X. Zh. Qi, X.D. Li, L. Wang, Q.X. Zu and X. Zhi. Li, "Investigations of Mechanisms and Occurrence of Meteorologically Triggered Cold Fusion at the Chinese Academy of Sciences," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[HOF] Nathan Hoffman (Rockwell), reported at the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[HUA] Ning Huang, "Effect of Light Water Additions on Excess Heat Generation of Palladium Deuterium System," Proceedings of the Special Symposium on Cold Fusion, World Hydrogen Energy Conference #8, Honolulu HI, July 22-27, 1990, p 43.

[HUT-1] D. Hutchinson et al., Proceedings of the EPRI/NSF Workshop on Cold Fusion Phenomena, Washington DC, October 18, 1989.

[HUT-2] D.P. Hutchinson, C.A. Bennett, R.K. Richards, J. Bullock IV and G.L. Powell, "Initial Calorimetry Experiments in the Physics Division at ORNL," presented at the First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT.

[IAZ] F. Iazzi et al., "Neutrons Detected Using TOF," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[IKE-1] Ikegami, personal communication tabulated by Will/Bockris/Fox, but published reference not known.

[IKE-2] Ikezawa, tabulated by Will/Bockris/Fox, but published reference not known.

[IYE-1] P.K. Iyengar and M. Srinivasan, "Overview of BARC Studies in Cold Fusion", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 62-81.

[IYE-2] P.K. Iyengar et al., "Bhabha Atomic Research Centre Studies in Cold Fusion," *Fusion Technology* **18(1)**, August 1990, pp 32-94. [Published originally in India as BARC-1500.]

[IZU] Tatsuo Izumida, Yoshihiro Ozawa, Kunio Ozawa, Shigeru Izumi, Shunsuke Uchida, Tomohiko Miyamoto, Hisao Yamashita and Hiroshi Miyadera, "A Search for Neutron Emission from Cold Nuclear Fusion in a Titanium-Deuterium System," *Fusion Technology* **18(4)**, December 1990, pp 641-646.

[JEV] N. Jevtic, S. Miljanic, S. Pesic, J. Dobrosavljevic and J. Pupezin, "The Change in the Isotope Ratio and a Spectroscopic Analysis of the Gas from Gas Load Experiments," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[JIA] He Jianyu, Zhu Rongbao, Wang Xiaozhong, Lu Feng, Luo Longjun, Liu Hengjun, Jiang Jincai, Tian Baosheng, Chen Guoan, Yuan Yuan, Dong Baiting, Yang Liucheng, Qiao Shengzhong, Yi Guoan, Guo Hua and Ding Dazhao, "Experimental Study on Anomalous Neutron Production in Deuterium/Solid System," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[JIN] Shang-Xian Jin, Fu-Xiang Zhang, De-Cheng Yiao, Qi-Bang Wang and Bai-Lu Wu, "Anomalous Nuclear Effects During the Gas Discharge of Pd/D System," to be presented at the Second Annual Conference on Cold Fusion, Como, Italy, June 29-July 4, 1991.

[JON-1] Steven E. Jones, E.P. Palmer, J.B. Czirr, D.L. Decker, G.L. Jensen, J.M. Thorne, S.F. Taylor, and J. Rafelski, "Observation of Cold Nuclear Fusion in Condensed Matter," *Nature* **338**, 1989, pp 737-740.

[JON-2] S.E. Jones, E.P. Palmer, J.B. Czirr, D.L. Decker, G.L. Jensen, J.M. Thorne, S.F. Taylor and J. Rafelski, "Anomalous Nuclear Reactions in Condensed Matter: Recent Results and Open Questions," presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in *J. Fusion Energy* **9(2)**, 1990, p 199.

[JON-3] Steven E. Jones, "Investigation of Nuclear Reactions in Metal/Deuterium Systems," Proceedings of the Special Symposium on Cold Fusion, World Hydrogen Energy Conference #8, Honolulu HI, July 22-27, 1990, p. 45.

[JON-4] S.E. Jones, D.B. Buehler, J.B. Czirr, G.L. Jensen, E.P. Palmer, J.M. Thorne, S.F. Taylor, J.C. Wang and H.O. Menlove, "Recent Results in Cold Fusion Experiments," Bulletin of the American Physical Society **35(7)**, July/August 1990, p 1672.

[JON-5] Steven E. Jones, E. Paul Palmer, J. Bart Czirr, Daniel Decker, Gary Jensen, James Thorne, Stuart Taylor, Douglas Bennion, William Pitt, John Harb, Dennis Tolley, J.C. Wang, Russel Hunter, David Buehler, Howard Menlove, Michael Paciotti and Peter Jeschovnig, "Investigation of Anomalous Particle Emissions in Solid/Deuterium Systems," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[JON-6] S.E. Jones, J.B. Czirr, E.P. Palmer, J.M. Thorne, J.C. Wang and H.O. Menlove, "Anomalous Neutron Emission Studied Far Underground in Segmented Neutron Counters," Bulletin of the American Physical Society **36(4)**, 1991, p 1335.

[JON-6] S.E. Jones, D.B. Buehler, J.B. Czirr and G.L. Jensen, "Results from the BYU Charged-Particle Spectrometer," Bulletin of the American Physical Society **36(4)**, 1991, p 1336.

[JOR-1] Jacob Jorne and J. Toke, "Search for Cold Fusion of Deuterium in Palladium." Paper presented at the 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[JOR-2] Jacob Jorne et al., "Neutron Emission from Palladium Deuteride Under Supercritical Conditions," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[JOR-3] Jacob Jorne, "Neutron and Gamma-Ray Emission from Palladium Deuteride Under Supercritical Conditions," *Fusion Technology* **19(2)**, March 1991, pp 371-374.

[KAI-1] R.C. Kainthla, O. Velev, N.J.C. Packham, L. Kaba, and J. O'M. Bockris, Proceedings of the EPRI/NSF Conference on Cold Fusion Phenomena, Washington, D.C., October 18, 1989.

[KAI-2] R.C. Kainthla, O. Velev, L. Kaba, G.H. Lin, N.J.C. Packham, M. Szklarczyk, J. Wass and J.O'M. Bockris, "Sporadic Observation of the Fleischmann-Pons Heat Effect," *Electrochimica Acta* **34(9)**, 1989, pp 1315-1318.

[KAR-1] A.B. Karabut, Ya.R. Kucherov and I.B. Savvatimova, "Cold Fusion Observation at Gas-Discharge Device Cathode," presented at the Anniversary Specialist Conference on Nuclear Power Engineering in Space, May 15-19, 1990, Obninsk USSR.

[KAR-2] S. Yu. Karpov, Yu. V. Kovalchuk, V.E. Myachin and Yu. V. Pogorelskii, "Possible Mechanism of Cold Nuclear Fusion," *Pis'ma Zh. Tekh. Fiz.* **16(5)**, 1990, pp 91-94 (in Russian).

[KAU] T.C. Kaushik, A. Shyam, M. Srinivasan, R.K. Rout and L.V. Kulkarni, "Preliminary Report on Direct Measurement of Tritium in Liquid Nitrogen Treated TiD_x Chips," *Indian J. of Technology* **28**, December 1990, pp 667-673.

[KLE] A.C. Klein, L.L. Zahm, S.E. Binney, J.N. Reyes Jr., J.F. Higginbotham, A.H. Robinson, M. Daniels and R.B. Peterson, "Anomalous Heat Output from Pd Cathodes Without Detectable Nuclear Products," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[KLU] V.A. Kluyev, A.G. Lipson, Yu. P. Toporov, B.V. Deryagin, V.J. Luschikov, A.V. Streikov and E.P. Shabalin, *Sov. Tech. Phys. Lett.* **12,** p 551. Translation of *Pis'ma Zh. Tekh. Fiz.* (USSR) **12**, 1986, p 1333.

[KOS] A.A. Kosyachkov, V.S. Triletskii, V.T. Cherepin, and S.M. Chichkan, "Detection of Helium-3 and Tritium Produced as a Result of Ion Plasma Saturation of Titanium by Deuterium," *JETP Lett.* **49(12)**, pp 744-746. Translation of *Pis'ma Zh. Eksp. Teor. Fiz.* (USSR) **49(12)**, June 25 1989, pp 648-651.

[KOZ] Hideo Kozima, Sumio Oe, Kunihiko Hasegawa, Hideo Suganuma, Masaharu Fujii, Takami Onojima, Kunio Sekido and Masaharu Yasuda, "Experimental Observations of the Electrochemically Induced Nuclear Fusion," *Rep. Fac. Sci., Shizuoka U.* **24**, 1990, pp 29-34.

[KUZ] R.I. Kuzmin, Moscow State U Report, October 1989.

[LAN] U. Landau, W.M. Lynes, D. Roha, R. Saini, and S. Rochel-Landau, "Experiments in Search of Electrochemically Induced Cold Fusion." Paper presented at the 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[LEW] Derek Lewis and Kurt Skold, "A Phenomenological Study of the Fleischmann-Pons Effect," *J.Electroanal. Chem.* **294**, 1990, pp 275-288.

[LI] Xingzhong Li, Shiyuan Dong, Keli Wang, Yueying Feng, Lee Chang, Chengmo Luo, Renyong Hu, Pingli Zhou, Dawei Mo, Chongli Song, Yintang Chen, Minyan Yao, Chuang Ren and Qiankun Chen, "The Precursor of 'Cold Fusion' Phenomenon in Deuterium/Solid Systems," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[LIA] B.Y. Liaw, P-L. Tao, P. Turner and B.E. Liebert, "Elevated Temperature Heat Production Using Molten-Salt Electrochemical Techniques," Proceedings of the Special Symposium on Cold Fusion, World Hydrogen Energy Conference #8, Honolulu HI,July 22-27, 1990, pp 49-60.

[LIN-1] G.H. Lin, R.C. Kainthla, N.J.C. Packham, O. Velev and J.O'M. Bockris, "On Electrochemical Tritium Production," *Int. J. Hydrogen Energy* **15**, 1990, pp 537-550.

[LIN-2] T. Lin and C. Liu, "Cold Fusion Experiments at Department of Nuclear Engineering, National Tsing-Hua University," *J. Fusion Energy* **9(4)**, 1990, pp 487-490.

[LIP-1] A.G. Lipson, V.A. Kluev, Yu. P. Toporov, B.V. Deryagin and D.M. Sakov, "Deuterium-Deuterium Fusion Initiation by Friction in the System Titanium-Deuterated Polymer," *Pis'ma Zh. Tekh. Fiz.* (USSR) **15(17)**, 1989, pp 26-29.

[LIP-2] A.G. Lipson, V.A. Klyuev, B.V. Deryagin, Yu.P. Toporov, D.M. Sakov, "Anomalous Beta-Activity of the Products of Mechanical Action in the System Titanium-Deuterated Compound," *Pis'ma Zh. Tekh. Fiz.* (USSR) **15(19)**, 1989, pp 88-90 (in Russian).

[LIP-3] A.G. Lipson, D.M. Sakov, V.A. Klyuev, B.V. Deryagin and Yu.P. Toporov, "Neutron Emission During the Mechanical Treatment of Titanium in the Presence of Deuterated Substances," *JETP Lett.* **49(11)**, pp 675-678. Translation of *Pis'ma Zh. Eksp. Teor. Fiz.* (USSR) **49(11)**, June 10 1989, pp 588-590.

[MAE] Maeda, tabulated by Will/Bockris/Fox, but published reference not known.

[MAL] Jose Maria Malo Tamayo, Jesus Morales Rivas, Blanca Zamora Celis, Francisco Pablo Ramirez Garcia and Octavio Novaro Penaloza, *Rev. Inst. Mex. Pet.* **22(1)**, 1990, pp 42-47 (in Spanish).

[MAT-1] C.K. Mathews, G. Periaswami, K.C. Srinivan, I. Gnanarsekatan, S. Rajan Babu, C. Ramesh, and B. Bhavagarajan, "On the Possibility of Nuclear Fusion by the Electrolysis of Heavy Water", *Indian Journal of Technology* **27**, May 1989, pp 229-231.

[MAT-2] Osuma Matsumoto, Kan Kimura, Yuko Saito, H. Oyama and Tsuyoshi Yaita, "Tritium Production Process," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[MAT-3] Osuma Matsumoto, Kan Kimura, Yuko Saito, Haruo Uyama and Tsuyoshi Yaita, "Detection of Neutrons in Electrolysis of Heavy Water (D_2SO_4-D_2O) Solution by Means of Fission Track Method," *Denki Kagaku* **58(2)**, 1990, pp 147-150.

[MAT-4] Takaaki Matsumoto, "Cold Fusion Observed with Ordinary Water", *Fusion Technology* **17**, May 1990, pp 490-491.

[MAT-5] Takaaki Matsumoto, "Observation of New Particles Emitted During Cold Fusion," *Fusion Technology* **18(2)**, September 1990, pp 356-360.

[MAT-6] T. Matsumoto, "Progresses of NATTOH Model and New Particles Emitted During Cold Fusion," Proceedings of the Anomalous Nuclear

Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[MAZ] Mazone and Vittori, reported in [DEN-1]

[MCB] J. McBreen, personal communication (May 23 and June 12, 1990), reported in *Fusion Facts*, June 1990, p 6.

[MCK-1] J.S.C. McKee, G.R. Smith, C.B. Kwok, H.L. Johnston, M.S. Mathur, J.K. Mayer, A. Mirzai, Y.H. Yeo, K.S. Sharma and G. Williams, "Neutron Emission from Low Energy Deuteron Injection of Deuteron-Implanted Metal Foils (Pd, Ti and In)," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[MCK-2] Michael C.H. McKubre, S.I. Smedley, F.L. Tanzella and R.D. Weaver, "Calorimetric and Kinetic Observation of D_2-Pressurized LiOD/D_2O/Pd Cells." Paper presented at the 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[MCK-3] Michael C.H. McKubre, Romeu C. Rocha-Filho, Stuart Smedley, Francis Tanzella, Jason Chao, Bindi Chexal, Tom Passell and Joseph Santucci, "Calorimetric and Electrochemical Studies of the Deuterium-Palladium System", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, Utah, pp 20-31.

[MEN-1] Giuliano Mengoli, Monica Fabrizio, Claudio Manduchi, Giorgio Zannoni, Lucia Riccardi, Fiorella Veronesi and Antonio Buffa, "The Observation of Tritium in the Electrolysis of D_2O at Palladium Sheet Cathodes," *J. Electroanal. Chem.* **304**, 1991, pp 279-287.

[MEN-2] H.O. Menlove, M.M. Fowler, E. Garcia, A. Mayer, M.C. Miller, R.R. Ryan and S.E. Jones, "The Measurement of Neutron Emission from Ti plus D_2 Gas", paper LA-UR-89-1570, also presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in *J. Fusion Energy* **9(2)**, 1990, p 215.

[MEN-3] H.O. Menlove, M.M. Fowler, E. Garcia, M.C. Miller, M.A. Paciotti, R.R.Ryan and S.E. Jones, "Measurement of Neutron Emission from Ti and Pd in Pressurized D_2 Gas and D_2O Electrolysis Cells," *J. Fusion Energy* **9(4)**, 1990, p 495.

[MEN-4] H.O. Menlove, "High Sensitivity Measurements of Neutron Emission From Ti Metal in Pressurized D_2 Gas", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 250-251.

[MEN-5] H.O. Menlove, T.N. Claytor, M.A. Paciotti, D.N. Tuggle and S.E. Jones, "Reproducible Neutron Emission Measurements from Ti Metal in Pressurized D_2 Gas," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, BYU, October 22-24, 1990.

[MIL-1] M.H. Miles, K.H. Park and D.E. Stilwell, "Electrochemical Calorimetric Evidence for Cold Fusion in the Palladium-Deuterium System," *J. Electroanal. Chem.* **296**, 1990, pp 241-254.

[MIL-2] M.H. Miles, K.H. Park and D.E. Stilwell, "Electrochemical Calorimetric Studies of the Cold Fusion Effect," Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 328-334.

[MIL-3] S. Miljanic, N. Jevtic, S. Pesic, M. Ninkovic, D. Nikolic, M. Josipovic, Lj. Petrovska, S. Bacic, T. Sutej and S. Matic, "An Attempt to Replicate Cold Fusion Claims," *Fusion Technology* **18(2)**, September 1990, pp 340-346.

[MIL-4] Roger C. Millikan, Paper presented at the 176th Electrochemical Society Meeting, Cold Fusion Session: October 19-20, 1989, Hollywood, FL.

[MIL-5] Randell L. Mills and Steven P. Kneizys, "Excess Heat Production by the Electrolysis of an Aqueous Potassium Carbonate Electrolyte and the Implications for Cold Fusion," to be published in *Fusion Technology*.

[MIZ] Tadahiko Mizuno, Tadashi Akimoto, and N. Sato (Hokkaido U, Japan), "Neutron Evolution from Annealed Palladium Cathode in LiOD - D_20 Solution", *Denki Kagaku* **57(7)**, July 1989, pp 742-743.

[MON] Jerry R. Montgomery, Rondo N. Jeffery, Farhang Amiri and Jack D. Adams, "Correlated Nuclear and Thermal Measurements in D/Pd and H/Pd Systems," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[MOR] John R. Morrey, Marc W. Caffee, Harry Farrar IV, Nathan J. Hoffman, G. Bryant Hudson, Russell H. Jones, Mark D. Kurz, John Lupton, Brian M. Oliver, Brian V. Ruiz, John F. Wacker and A. van Veen, "Measurements of Helium in Electrolyzed Palladium," *Fusion Technology* **18(4)**, December 1990, pp 659-668.

[NII] Niimura, tabulated by Will/Bockris/Fox, but published reference not known.

[NON] V.C. Noninski and C.I. Noninski, "Determination of the Excess Energy Obtained During the Electrolysis of Heavy Water," *Fusion Technology* **19(2)**, March 1991, pp 364-368.

[OKA] Okamoto, tabulated by Will/Bockris/Fox, but published reference not known.

[ORI] R.A. Oriani, John C. Nelson, Sung-Kyu Lee and J.H. Broadhurst, "Calorimetric Measurements of Excess Power Output During the Cathodic Charging of Deuterium into Palladium," *Fusion Technology* **18(4)**, December 1990, pp 652-658.

[OYA] Noboru Oyama, Takeo Ohsaka, Osamu Hatozaki, Yuko Kurusawa, Nobushige Yamamoto, Seiji Kasahara, Naoki Ohta, Yuko Imai, Yukio Oyama, Tomoo Nakamura, Tokushi Shibata, Mineo Imamura, Yoshitomo Uwamino and Seiichi Shibata, "Electrochemical Calorimetry of D_2O Electrolysis Using a Palladium Cathode - An Undivided, Open Cell System," *Bull. Chem. Soc. Japan* **63**, September 1990, pp 2659-2664.

[OZA] Ozawa, presented at Session for Cold Fusion, Japanese Atomic Energy Society, April 2-4, 1990, reported in *Fusion Facts*, May 1990, p. 15.

[PAC-1] N.J.C. Packham, K.L. Wolf, J.C. Wass, R.C. Kainthla, and J.O'M Bockris (Texas A&M), "Production of Tritium From D_2O Electrolysis at a Palladium Cathode," *Journal of Electroanal. Chem.* **270**, 1989, pp 451-458.

[PAC-2] M.A. Paciotti, H.R. Maltrud, H.O. Menlove, O.M. Rivera and S.E. Jones, "Sample Preparation for Reproducible Neutron Bursts," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[PAR-1] A. Foglio Para, V. Sangiust, P.L. Cavallotti, U. Dacati and P.F. Bortignon, "Neutron Monitoring and Related Measurements of Heavy Water with Palladium and Titanium Cathodes: Activity Report," *Fusion Technology* **18(1)**, August 1990, pp 131-135.

[PAR-2] Y.W. Park, C.O. Yoon, M.Y. Yoon and J.C. Kim, "The Observation of 2.2 MeV Gamma-Ray in Electrochemical Cell," *New Phys.* (S. Korea) **29(2)**, April 1989, pp 231-232.

[PER] P. Perfetti, F. Cilloco, R. Felici, M. Capozi and A. Ippoliti, "Neutron Emission Under Particular Nonequilibrium Conditions from Pd and Ti Electrolytically Charged with Deuterium," *Il Nuovo Cimento* **11 D**, Giugno 1989, pp 921-926.

[PON-1] Stanley Pons and Martin Fleischmann, "Calorimetry of the Palladium-Deuterium System," Proceedings of the First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 1-19.

[PON-2] Stanley Pons and Martin Fleischmann, "Calorimetric Measurements of the Palladium/Deuterium System: Fact and Fiction," *Fusion Technology* **17(4)**, July 1990, pp 669-679.

[PON-3] Stanley Pons, Martin Fleischmann, Cheves T. Walling and John P. Simons, "Method and Apparatus for Power Generation," international patent application PCT/US90/01328, March 12 1990 (publication number WO 90/10935).

[PRE] M. Prelas, F. Boody, W. Gallaher, E. Leal-Quiros, D. Mencin and S. Taylor, "Cold Fusion Experiments Using Maxwellian Plasmas and Sub-Atmospheric D_2 Gas," *J. Fusion Energy* **9(3)**, 1990, p 309.

[ROL-1] Debra R. Rolison et al., "Mass-Charge Anomalies in Pd After Electrochemical Loading With Deuterium," Proceedings of the EPRI/NSF Workshop on Cold Fusion Phenomena, Washington DC, October 18, 1989.

[ROL-2] Debra R. Rolison, William E. O'Grady, Robert J. Doyle, Jr., and Patricia P. Trzaskoma (Naval Research Laboratory), "Anomalies in the Surface Analysis of Deuterated Palladium", Proceedings of the First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 272-280.

[ROU] R.K. Rout, M. Srinivasan, A. Shyam and V. Chitra, "Detection of High Tritium Activity on the Central Titanium Electrode of a Plasma Focus Device," *Fusion Technology* **19(2)**, March 1991, pp 391-394.

[RUS] V.D. Rusov, T.N. Zelentsova, M.Yu. Semenov, I.V. Radin, Yu.F. Babikova and Yu.A. Kruglyak, "Fast Neutron Recording by Dielectric Track Detectors in a Palladium-Deuterated Water-Tritiated Water System in an Electrolytic Cell", *Pis'ma Zh. Tekh. Fiz.* (USSR) **15(19)**, 1989, pp 9-13 (in Russian).

[SAK] Sakamoto, tabulated by Will/Bockris/Fox, but published reference not known.

[SAN-1] Carlos Sanchez, J. Sevilla, B. Escarpizo, F.J. Fernandez, and J. Canizares, "Nuclear Products Detection during Electrolysis of Heavy Water with Ti and Pt Electrodes," *Solid State Communications* **71(12)**, 1989, pp 1039-1043.

[SAN-2] Sandia National Laboratory test, reported by Samuel P. Faile, "Ion Implantation and Channeling In Pd", *Fusion Facts*, Dec 1989, p 11.

[SAN-3] K.S.V. Santhanam, J. Rangarajan, O'Neil Braganza, S.K. Haram, N.M. Imaye and K.C. Mandal, "Electrochemically Initiated Cold Fusion of Deuterium," *Indian J. of Technology* **27**, April 1989, pp 175-177.

[SAT] Tsutumo Sato, Makoto Okamoto, Poong Kim, Yasuhiko Fujii and Otohiko Aizawa, "Detection of Neutrons in Electrolysis of Heavy Water," *Fusion Technology* **19(2)**, March 1991, pp 357-363.

[SCA] Franco Scaramuzzi, describing 1951-2 results by Germagnoli, Marchetti, Cerrai and Silvestri (CISE), reported at the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[SCH-1] Glen J. Schoessow and J.A. Wethington, private communication to N.J.C. Packham, May 1989, reported in [BOC-2]

[SCH-2] Glen J. Schoessow, "Electrochemical Nuclear Process and Apparatus for Producing Tritium, Heat, and Radiation," international patent application PCT/US90/03382, June 18 1990 (publication Number WO 91/02360).

[SCH-3] Martha Schreiber, Turgut M. Gur, George Lucier, Joseph A. Ferrante, Jason Chao and Robert A. Huggins, "Recent Measurements of Excess Energy Production in Electrochemical Cells Containing Heavy Water and Palladium," Proceedings of the First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 44-56.

[SCH-4] Martha Schreiber, Turgut M. Gur, George Lucier, Joseph A. Ferrante, Jason Chao and Robert A. Huggins, "Recent Experimental Results on the Thermal Behavior of Electrochemical Cells in the Hydrogen-Palladium and Deuterium-Palladium Systems," Proceedings of the Special Symposium on Cold Fusion, World Hydrogen Energy Conference #8, Honolulu HI, July 22-27, 1990, pp 71-87.

[SCO-1] C.D. Scott, E. Greenbaum, G.E. Michaels, J.E. Mrochek, E. Newman, M. Petek and T.C. Scott, "Preliminary Investigation of Possible Low Temperature Fusion", presented at the Workshop On Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989, and published in *J. Fusion Energy* **9(2)**, 1990, p 115.

[SCO-2] C.D. Scott, J.E. Mrochek, E. Newman, T.C. Scott, G.E. Michaels and M. Petek, "A Preliminary Investigation of Cold Fusion by Electrolysis of Heavy Water," Oak Ridge Nat. Lab. report ORNL/TM-11322, given at COLD FUSION - A STATUS REPORT session with the ASME Winter Annual Meeting held in San Francisco, CA, December 12, 1989.

[SCO-3] Charles D. Scott, John E. Mrochek, Timothy C. Scott, Gordon E. Michaels, Eugene Newman and Milica Petek, "The Initiation of Excess Power and Possible Products of Nuclear Interactions During the Electrolysis of Heavy Water", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 164-169.

[SCO-4] C.D. Scott, J.E. Mrochek, Timothy C. Scott, Gordon E. Michaels, Eugene Newman, and Milica Petek (Oak Ridge National Laboratory), "Measurement of Excess Heat and Apparent Coincident Increases in the Neutron and Gamma-Ray Count Rates During the Electrolysis of Heavy Water", *Fusion Technology* **18(1)**, August 1990, pp 103-114.

[SEE] D. Seeliger, K. Wiesener, A. Meister, H. Marten, D. Ohms, D. Rahner, R. Schwierz and P. Wustner, "Search for DD-Fusion Neutrons During Heavy Water Electrolysis," *Electrochimica Acta* **34**, 1989, pp 991-993.

[SEM] Seminozhenko, tabulated by Will/Bockris/Fox, but published reference not known.

[SHA] Gad Shani, C. Cohen, A. Grayevsky and A. Brokman, "Evidence for a Background Neutron Enhanced Fusion in Deuterium Absorbed Palladium," *Solid State Commun.* **72(1)**, 1989, pp 53-57.

[SIN] Bikash Sinha, Y.P. Viyogi, S. Chattopadhyaya, M.R. Dutta Mazumdar, B.S.N. Murthy, G. Muthukrishnam, T. Bandyopadhyaya, M.D. Trivedi, D. Ghosh, D.K. Srivastava and P. Sen, "Observation of Neutron Bursts in Electrolysis of Heavy Water", *Indian J. of Technology* **27**, June 1989, pp 275-277.

[SON] Pier Giorgio Sona, Fulvio Parmigiani, Franco Berberis, Adriano Battaglia, Renza Berti, Giovanni Buzzanca, Aldo Capelli, Davide Capra and Marco Ferrari, "Preliminary Tests on Tritium and Neutrons Within Palladium Cathodes," *Fusion Technology* **17(4)**, July 1990, pp 713-717.

[SRI-1] M. Srinivasan, A. Shyam, S.B. Degwekar and L.V. Kulkarni, "Statistical Analysis of Neutron Emission in Cold Fusion Experiments", Proceedings of The First Annual Conference on Cold Fusion, March 28- 31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 175-184.

[SRI-2] M. Srinivasan, A. Shyam, T.C. Kaushik, R.K. Rout, V. Chitra, L.V. Kulkarni, M.S. Krishnan, S.K. Malhotra and V.G. Nagvenkar, "Observation of Tritium in Gas/Plasma Loaded Titanium Samples," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[SRI-3] S. Srinivasan, Y.J. Kim, O.H. Murphy, C.R.Martin and A.J. Appleby, "Evidence for Excess Heat Generation Rates During Electrolysis of D_2O in LiOD Using a Palladium Cathode: A Microcalorimetric Study," given at Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989.

[SRI-4] S. Srinivasan and A.J. Appleby, Proceedings of the EPRI/NSF Workshop on Cold Fusion Phenomena, Washington DC, October 18, 1989.

[STO-1] Edmund Storms and Carol Talcott, "A Study of Electrolytic Tritium Production," Los Alamos Nat. Lab. report LAUR-89-4138, 1989.

[STO-2] Edmund Storms and Carol Talcott, "A Study of Electrolytic Tritium Production", Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, University of Utah Research Park, Salt Lake City, UT, pp 149-163.

[STO-3] Edmund Storms and Carol Talcott, "Electrolytic Tritium Production," *Fusion Technology* **17(4)**, July 1990, pp 680-695.

[SZU] M. Szustakowski, J. Farny, M. Muniak, A. Nowak, P. Parys, W. Skrzeczanowski, R. Socha, J. Teter, J.Wolski, J. Wolowski and E. Woryna, "Investigations of Neutron Emission in a Cold Fusion Experiment in Palladium," Emerging Nuclear Energy Systems 1989, ICENES '89. Proceedings of the Fifth International Conference, Karlsruhe, West Germany, July 3-6 1989, pp 299-303.

[SZP] S. Szpak, P.A. Mosier-Boss and J.J. Smith, "On the Behavior of Pd Deposited in the Presence of Evolving Deuterium," *J. Electroanal. Chem.* **302**, 1991, pp 255-260.

[TAC] Tachikawa, tabulated by Will/Bockris/Fox, but published reference not known.

[TAK-1] Akito Takahashi, Takayuki Takeuchi, Toshiyuki Iida and Masanori Watanabe, "Emission of 2.45 MeV and Higher Energy Neutrons from D_2O-Pd Cell Under Biased-Pulse Electrolysis," *J. Nucl. Sci. & Tech.* **27(7)**, July 1990, pp 663-666.

[TAK-2] A. Takahashi, T. Takeuchi, T. Iida and M. Watanabe, "Neutron Spectra from D_2O-Pd Cells with Pulse Electrolysis," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[TAK-3] Akito Takahashi, Toshiyuki Iida, Fujio Maekawa, Hisashi Sugimoto & Shigeo Yoshida, "Windows of Cold Nuclear Fusion and Pulsed Electrolysis Experiments," *Fusion Technology* **19(2)**, Mar 1991, pp 380-390.

[TAN-1] Noboru Taniguchi, Sueki Baba, Kenji Kawamura and Takaharu Gamo, "Conditions for Cold Nuclear Fusion," *Nippon Kagaku Kaishi* **1990 (9)**, pp 992-8 (in Japanese).

[TAN-2] Ryoichi Taniguchi, Takao Yamamoto, and Setsuko Irie, "Detection of Charged Particles Emitted by Electrolytically Induced Cold Nuclear Fusion", *Japanese Journal of Applied Physics* **28(11)**, November 9, 1989, pp L2021-L2023.

[TAN-3] Ryoichi Taniguchi and Takao Yamamoto, "High Sensitivity Measurement of Charged Particle Emission with Use of the Pulsed Electrolysis Method," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, BYU, October 22-24, 1990.

[TIA-1] Zhong-Qun Tian, Steven C. Barrowes and Haven E. Bergeson, "Attempt to Confirm the X-Ray Radiography Results Reported by S. Szpak, et al.," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[TIA-2] Z.W. Tian, tabulated by Will/Bockris/Fox, but published reference not known

[TSA] Vladimir Tsarev, "Experimental Results on Neutrons, Protons and Theoretical Model, Geophysical," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[WAD] Nobuhiko Wada and Kunihide Nishizawa, "Nuclear Fusion in Solid", *Japanese J. of Applied Physics* **28(11)**, November 1989, pp L2017-L2020.

[WAK] Wakabayashi, tabulated by Will/Bockris/Fox, but published reference not known.

[WAN] Guang-Hou Wang, reported in [ZHA-1].

[WER] Werth, tabulated by Will/Bockris/Fox, but published reference not known.

[WOL-1] K.L. Wolf, N.J.C. Packham, D.R. Lawson, J. Shoemaker, F. Cheng, and J.C. Wass, "Neutron Emission and the Tritium Content Associated with Deuterium Loaded Palladium and Titanium Metals," presented at the Workshop on Cold Fusion Phenomena, Santa Fe, NM, May 23-25, 1989.

[WOL-2] K.L. Wolf, personal communication (June 1990), reported in *Fusion Facts,* June 1990, p 9.

[WOL-3] Kevin Wolf, "Neutron Emission Studies," Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[WOR-1] David H. Worledge (EPRI), "Technical Status of Cold Fusion Results," Proceedings of The First Annual Conference on Cold Fusion, March 28-31, 1990, U/Utah Research Park, Salt Lake City, UT, pp 252-260.

[WOR-2] presented at Dubna, USSR Cold Fusion Conference, March 22-26, 1991, reported by D.H. Worledge (EPRI), April 5, 1991.

[XIO] Ri-Heng Xiong, reported in [ZHA-1].

[YAG-1] M. Yagi, Y. Shiokawa, S. Suzuki, M. Hara, I. Satoh, K. Masumoto & T. Mitsugashira, "Measurement of Neutron Emission from a Ti-D_2 System," *J. Radioanal. Nucl. Chem.* **137(6)**, Dec 1, 1989, pp 411-420.

[YAG-2] M. Yagi, T. Mitsugashira, I. Satoh, M. Hara, Y. Shiokawa and K. Inoue, "Measurement of Neutron Emission from a SiO_2-D_2 System," *J. Radioanal. Nucl. Chem.* **137(6)**, December 1 1989, pp 421-429.

[YAM-1] Eiichi Yamaguchi and Takashi Nishioka, "Cold Nuclear Fusion Induced by Controlled Out-Diffusion of Deuterons in Palladium", *Japanese J. of Applied Physics* **29(4)**, April 1990, pp L666-L669.

[YAM-2] Eiichi Yamaguchi and Takashi Nishioka, "Nuclear Fusion Induced by the Controlled Out-Transport of Deuterons in Palladium", Proceedings of the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, Brigham Young U, October 22-24, 1990.

[YAN] C.S. Yang, C.Y. Liang, T.P. Perng, L.J. Yuan, C.M. Wan, and C.C. Wan, "Observations of Excess Heat and Tritium on Electrolysis of D_2O", Proceedings of the Cold Fusion Symposium, World Hydrogen Energy Conference #8, Honolulu, Hawaii, July 23-24, 1990, pp 95-105.

[YAR-1] M.A. Yaroslavskii, "Nuclear Reactions Induced by Temperature Changes and Phase Transitions in Solids," *Sov. Phys. - Doklady* **34(7)** pp 648-649. Translation of *Dokl. Akad. Nauk. SSSR* (USSR) **307(103)**, July 1989, pp 600-601.

[YAR-2] M.A. Yaroslavskii, "Neutron Emission During Plastic Deformation of Deuterium-Containing Solids Under Pressure," *Sov. Phys. - Doklady* **34(7)** p 637. Translation of *Dokl. Akad. Nauk. SSSR* (USSR) **307(103)**, July 1989, pp 369-370.

[YAR-3] M.A. Yaroslavskii, "Possible Mechanism for the Initiation of Nuclear Reactions During Temperature Changes and Phase Transitions in Condensed Materials," *Sov. Phys. - Doklady* **34(9)** pp 813-814. Translation of *Dokl. Akad. Nauk. SSSR* (USSR) **308(103)**, Sept. 1989, pp 95-97.

[ZAH] Lance L. Zahm, Andrew C. Klein, Stephen E. Binney, Jose N. Reyes Jr., Jack F. Higginbotham and Alan H. Robinson, "Experimental Observations of the Electrolysis of D_2O Using Palladium Cathode and Platinum Anodes," *J. Electroanal. Chem.* **281**, 1990, pp 313-321.

[ZEL-1] V.F. Zelensky et al., Kharkov Inst. report KhFTI-89-61, 1989.

[ZEL-2] V.F. Zelenskii, V.F. Rybalko, A.N. Morozov, G.D. Tolstolutskaya, V.G. Kulish, S.V. Pistryak and I.S. Martynov, "Experiments on Cold Nuclear Fusion in Palladium and Titanium Saturated with Deuterium by Ion Implantation," *Vopr. At. Nauki Tekh., Ser.: Fiz. Rad. Pov. Rat. Mat.* (USSR), 1990, pp 65-77 (in Russian).

[ZHA-1] presented at cold fusion conference, Beijing China, May 10-12 1990, reported by Jiujin Zhang in *Fusion Facts,* September 1990, p 32.

[ZHA-2] Zhongliang Zhang, reported at the Anomalous Nuclear Effects in Deuterium/Solid Systems Conference, BYU, October 22-24, 1990.

[ZHO] Hong-Yu Zhou, reported in [ZHA-1].

[Misc-1] Greg Cripps, "Summary of the Fifth International Conference on Emerging Nuclear Systems, Karlsruhe, Federal Republic of Germany, July 3-6, 1989," *Fusion Technology* **17**, March 1990, pp 356-359.

[Misc-2] reported by J.O'M. Bockris, July 10, 1989.

[Misc-3] tabulated by Will/Bockris/Fox, published reference unknown. (*)

[Misc-4] Report of the Committee for the Review of the National Cold Fusion Institute, 1990.

(*) **NOTE**: The phrase "tabulated by Will/Bockris/Fox..." refers to the frequent exchange of lists of cold fusion successes as tracked by Dr. Fritz Will (Director, National Cold Fusion Institute), J.O'M. Bockris (Texas A&M), Hal Fox (Editor, *Fusion Facts*), and with inputs from Los Alamos. For example, such tabulations include J.O'M. Bockris and D. Hodko, "Is there evidence for Fusion Under Solid State Confinement," Proceedings of the Cold Fusion Symposium, World Hydrogen Energy Conference #8, Honolulu, Hawaii, July 23-24, 1990, pp 1-27.

C. NEWS FROM THE U.S

SERIES OF PAPERS FROM SANTA FE CONFERENCE

Courtesy of Dr. Samuel Faile

The following series of six papers were presented at the Santa Fe "Workshop on Cold Fusion" held May 23-25, 1989. These papers have recently been published by the *Journal of Fusion Energy* after some considerable delay.

T.A. Parish (Texas A&M), R.T. Perry, & W.B. Wilson (both of LANL), "Neutron Sources and Spectra From Cold Fusion", *Journal of Fusion Energy,* Vol 9, No. 4, 1990, pp 479-481, 7 refs.

AUTHORS' ABSTRACT

Deterministic methods are used to calculate the neutron and photon sources and spectra that would develop if fusion reactions were occurring in cold fusion experimental devices. The results from the calculations give the neutron and gamma spectra resulting from a 2.45-MeV and a 14.1 MeV neutron source. The neutron source strength from certain (gamma,n) and (alpha,n) reactions are also determined.

V.C. Rogers & G.M. Sandquist (Rogers & Assoc., SLC, UT.), "Cold Fusion Reaction Products and Their Measurement", *Journal of Fusion Energy,* Vol 9, No. 4, 1990, pp 483-485, 7 refs.

AUTHORS' ABSTRACT

The major reaction products that have been possibly associated with cold fusion reactions are neutrons, protons, tritium, He-3, He-4, internal conversion electrons, and gamma radiation. The branching ratios and relative reaction rates for these products are examined for consistency with cold fusion experiments. Both theoretical calculations and experimental data are examined and presented. The He-4 plus internal conversion reaction has been proposed to explain the absence of neutrons or gamma rays in successful cold fusion experiments. However, this reaction is not favored, even in a deuterium-palladium system. Measurement of these reactions must be made carefully owing to the presence in the background of 2.2-MeV gamma rays, background tritium in heavy water, and neutrons from the photodisintegration of the deuterium from background radiation. These problems confronting cold fusion experiments are addressed.

Tsang-Lang Lin and Chi-Chang Liu (National Tsing-Hua U. Taiwan), "Cold Fusion Experiment at Department of Nuclear Engineering, National Tsing-Hua University", *Journal of Fusion Energy,* Vol 9, No. 4, 1990, pp 487-490, 5 refs.

AUTHORS' ABSTRACT

We have repeated the so-called cold fusion experiment by electrolyzing heavy water, with 0.1 M LiOD, with palladium rod as the cathode and platinum wire as the anode. The purpose of our experiment is to detect the neutrons that are produced from the fusion process of deuterium if fusion does occur. We use one ^{3}He detector and one BF_3 detector to detect the thermal neutrons coming out of the water bath that surrounds the heavy water cell. Possible neutron bursts are detected by the ^{3}He detector during a period of about 7 h after electrolyzing for 11 days.

B.D. Kay, K.R. Lykke, & R.J. Buss (Sandia Nat'l Labs), "Problems with the Mass Spectrometric Determination of Tritium from Cold Fusion", *Journal of Fusion Energy,* Vol 9, No. 4, 1990, pp 491-493, 11 refs.

AUTHORS' ABSTRACT

Among the attempts to measure particles produced in the cold fusion of deuterium in palladium metal is the mass spectrometric observation of tritium. An experiment which has been reported in the popular press involves attaching a hollow Pd electrode to a vacuum chamber and measuring the tritium produced during electrolysis using a mass spectrometer. We present data demonstrating that mass 5 and 6, which could be mistaken for the ions DT^+ and T_2^+, can arise from ion-molecule reactions in the ionizer of the mass spectrometer giving the ions HD_2^+ and D_3^+. With H_2 and D_2 present in the vacuum chamber, there are at least eight reactions which lead to these triatomic species, and these may contribute to a complex time and pressure dependence of the signals.

H.O. Menlove, M.M. Fowler, E. Garcia, M.C. Miller, M.A. Paciotti, R.R. Ryan (LANL), & S.E. Jones (BYU), "Measurement of Neutron Emission from Ti and Pd in Pressurized D_2 Gas and D_2O Electrolysis Cells", *Journal of Fusion Energy,* Vol 9, No. 4, 1990, pp 495-506, 15 refs.

AUTHORS' ABSTRACT

Experiments using high-efficiency neutron detectors have detected neutron emission from various forms of Pd and Ti metal in pressurized D_2 gas cells and D_2O electrolysis cells. Four independent neutron detectors based on ^3He gas tubes were used. Both random neutrons (0.05-0.2 n/s) and time-correlated neutrons bursts (10-280 n) of less than or equal to 100 micro sec duration were measured using time-correlation counting techniques. The majority of the neutron burst events occurred at about -30 C as the samples were warming up from the liquid nitrogen temperature.

J.W. Fleming, H.H. Law, J. Sapjeta, P.K. Gallagher, & W.F. Marohn (AT&T Bell Labs), "Calorimetric Studies of Electrochemical Incorporation of Hydrogen Isotopes into Palladium", *Journal of Fusion Energy,* Vol 9, No. 4, 1990, pp 517-523.

AUTHORS' ABSTRACT

The formation of palladium hydride and deuteride by electrolysis has been studied with high precision calorimetry using sealed cells with *in-situ* recombination of gaseous products as well as open cells. Palladium electrodes prepared by different methods were studied. With sealed cells of our design in the heat flow isothermal calorimeter, the uncertainties associated with the gas evolution, evaporation, entrainment, and side reactions were effectively eliminated. No unexpected excess heat was observed within energy balance error of about 2%.

ARIZONA - TWO FUSION PAPERS
Courtesy of Dr. Samuel Faile

H.E. Rafelski (U of Arizona), D. Harley, G.R. Shin, & J. Rafelski (U Frankfurt, Germany), "Cold Fusion: muon-catalyzed fusion", *J. Phys. B: At. Mol. Opt. PHys.*, Vol 24, (1991), pp 1469-1516, 115 refs.

AUTHORS' ABSTRACT

We put into perspective and further develop our recent work in muon catalyzed fusion, with the objective of identifying the key physical processes in the t(d,n)alpha fusion cycle relevant to energy related applications. We begin by discussing the fusion cycle and point out the importance of direct nuclear reactions in the catalyzed fusion processes. This is followed by an in-depth discussion of the muon loss reaction by attachment to the fusion alpha-particle. Finally, we examine some special topics that have attracted the attention of workers in the muon-catalyzed fusion (MuCF) community, such as energy efficient production of muons and proposals for MuCF reactors, the potential of Z>1 fusion, and other recently discussed forms of cold fusion.

EDITOR'S COMMENTS

The authors conclude, "...it is generally believed that MuCF is already close to the limits posed by a combination of practical approaches with *fundamental* laws of physics, and hence further improvement is exceedingly difficult."

In section 4.4 *Limits on cold fusion,* the authors review the probability of cold fusion with regard to the screening of the Coulomb potential by electrons. After some discussion of the limitations of a static model, the authors note, "Only a non-equilibrium study of what experts would call *a dynamic quantum-two-plasma model in a space harmonic stochastic time dependent lattice potential* can provide the ultimate theoretical answer about cold fusion in condensed matter.

SECOND PAPER:

Mariusz Gajda & Johann Rafelski (Dept of Phys, U of Arizona), "Jovian limits on conventional cold fusion", *J. Phys. G: Nucl. Part. Phys.*, Vol 17, (1991), pp 653-661, 16 refs.

AUTHORS' ABSTRACT

We evaluate the fusion rates occurring naturally and according to conventional wisdom in the planet Jupiter. In particular we consider if any significant part of Jupiter's excess heat could be due to fusion, and if significant limits arise for terrestrial 'cold fusion' experiments.

AUTHORS' SUMMARY

In summary, we have shown that presence of cold fusion neutrons in Jones' experiment is not in contradiction with available Jovian data. The 'cold fusion' experiments establish the best limit on the d-d reaction at extremely small energies. These experiments are nine orders of magnitude more sensitive than Jovian heat-based conclusions about d-d reactions. We have also shown that models of the Jupiter structure have to be studied careful, particularly with regard to the upper limits on the central temperature. Should central temperatures in excess of 10 eV be possible, we think that a significant fraction of Jupiter's heat could be of nuclear origin even in a highly conventional model. We hope to return to this question in the future.

CONNECTICUT - Ti in D_2 GAS CELLS

S.L. Rugari, R.H. France, B.J. Lund, S.D. Smolen, Z. Zhao, & M. Gai (Yale U.), and K.G. Lynn (Brookhaven Nat'l Lab), "Upper limits on emission of neutrons from Ti in pressurized D_2 gas cells: A test of evidence for 'cold fusion'", *Physical Review C*, Vol 43, No 3, (March 1991), pp 1298-1312, 16 refs.

AUTHORS' ABSTRACT

We have used a low background detector with high efficiency for detection of bursts to search for emission of neutrons from Ti alloy in pressurized D_2 gas cells (cooled to 77K in liquid nitrogen). Each cell contained between 16 and 67 g of Ti alloy chips and was prepared by methods identical to those used in a recent Los Alamos-Brigham Young University collaboration of Menlove *et al.* Three to four cells were used in each experimental run, with a total counting time of 103 h, leading to an estimate (based on the early reports of Menlove *et al.*) of at least four bursts and as many as 12 bursts expected in our experiment. In a later report the burst rate of Menlove *et al.* is greatly reduced leading to only one or so burst(s) expected in our experiment. The data were analyzed in two modes. In the first mode (single mode) all detectors were used to search for neutron bursts with an efficient of 28% for neutron detection and a background of 100 counts per hour (cph). In the second mode (coincidence mode) the neutron time of flight was measured in a search for random emission with an efficiency of 2% and a background of 2 cph. No statistically significant deviation from the background were observed for correlated neutrons emitted in bursts or for neutrons emitted randomly. All events are shown (with 90% confidence) to be consistent with background. For bursts of neutrons we deduce (with 90% confidence) an upper limit on the bursts' size of 50 neutrons. Our upper limit on the random emission of neutrons, 0.008 n/sec (90% confidence) is a factor of 6 to 25 smaller than the range of rates for random emission above background reported by the Los Alamos-Brigham Young University collaboration.

EDITOR'S COMMENTS

A report by Srinivasan and colleagues showed that of 1,000 Ti chips, only four showed evidence of cold fusion reaction after D_2 gas-loading under pressure. It is suggested that Ti-chip loading experiments be made by using selected Ti chips that have regions of cold fusion nuclear reaction (as indicated by autoradiography) after initial high-pressure D_2 gas-loading experiments. This approach should considerably increase the probability of cold fusion events (either neutrons or tritium). This experimental pre-selection could well remove the gas-loading experiments out of the "See, I told you it wouldn't work!" design. It is suggested that each Ti chip should be identified and used in autoradiography measurements on a pre- and post-experimental basis.

MICHIGAN - BeH_2 ULTATHIN FILMS
Courtesy of Dr. Samuel Faile

M. Seel (Mich Tech U.), "*Ab initio* band-structure studies of beryllium and beryllium-hydrogen ultrathin films', *Physical Review B, Condensed Matter*, Vol 43, No 12, pp 9532-37, 22 refs.

AUTHOR'S ABSTRACT

The electronic properties of hcp beryllium one-, two-, three-, and four-layer films and of a BeH_2 monolayer have been reinvestigated by all-electron Hartree-Fock band-structure calculations with improved basis sets. In agreement with local-density-functional calculations, all Be layers are found to be metallic, in contrast with previous Hartree-Fock calculations, which predicted zero-band-gap semiconductors for the one-layer (1L), 2L, and 3L systems. The metallic character is due to the precursor of the Be(0001) $2p_Z$ surface state crossing the Fermi energy. However, this behavior is not observed for the BeH_2 layer, which is still found to be insulating, contrary to local-density calculations, which predicted metallic behavior. [Because of the increased interest in thin films for cold fusion, we have included this reference. Ed.]

NAVAL RES LAB - Pd MORPHOLOGY

Debra R. Rolison & Patricia P. Trzaskoma (NRL), "Morphological differences between hydrogen-loaded and deuterium-loaded palladium as observed by scanning electron microscopy", *J. Electroanal Chem.*, Vol 287, No 2, 25 Jul 90, pp 375-383 8 ref.

AUTHOR'S INTRODUCTION

Among researchers achieving success in the replication of the Fleischmann-Pons effect, the necessity to determine the physical, chemical, and metallurgical nature of the palladium surface before and after long-term electrolysis of D_2O solutions has been emphasized. Our efforts to characterize the Pd-D_2O system have focused on the surface analysis of Pd foils before and after electrochemically loading the Pd with hydrogen or deuterium and a number of anomalous results have been obtained by mass spectrometry and X-ray photoelectron spectroscopy.

Scanning electron micrographic (SEM) surveys of the surface morphology of Pd foils after electrolysis of H_2O and D_2O also indicated that some differences result, but it became clear that the starting morphology of the etched Pd foil affected the development of the characteristic morphological features and structures observed for the Pd after electrolysis. With this as a concern, two series of experiments were run where the starting morphology of the etched Pd foil was known. This paper describes briefly the structural and intragranular differences that result when, as electrochemically prepared, deuterium-loaded and hydrogen-loaded Pd are compared.

AUTHOR'S CONCLUSION

Our SEM results show that the degree of the initial etch regulates the development of the surface structures that form with electrolysis of D_2O and H_2O, doing so probably through the number of reaction sites, as the more highly etched surfaces provide greater initial reactive surface area. Electrolysis of either light or heavy water at Pd restructures these roughened grains and produces greater intragranular homogeneity and features of higher surface area; in addition, a different structure results for PdD_X than for PdH_X. An additional series for PdH_X and PdD_X with a starting morphology akin to Pd/etched 2 X is being prepared to confirm this latter observation.

The "alpine" feature observed for PdD_X, with parallel rows of sharply edged ridges, may offer some of the asperity characteristic of dendrites. One of the crystal orientations remains featureless and unstructured with electrolysis in either D_2O or H_2O. These unstructured grains are depressed in elevation relative to the structured grains, but only for PdD_X. Our results are in accord with the idea that the reactivity of cathodic surfaces depends on at least three microscopic factors: grain orientation, surface preparation and the nature of the species being reduced.

On a speculative note our SEM results imply that studies of the Fleischmann-Pons effect with Pd single-crystals of an orientation characteristic of the smooth, featureless crystal grains would be spectacularly unproductive. Attempts to determine microscopically the crystal orientation of the structured and smooth grains are under way.

EDITOR'S COMMENTS

We look forward to further reports from the authors which may lead to a better understanding of the type of pre-preparation and the type of physical changes that may be expected in a Pd/D electrolysis system.

NRL - WASH. D.C. - THEORY
Courtesy of Dr. Samuel Faile

C.T. White, D.W. Brenner, R.C. Mowrey, J.W. Mintmire, P.P. Schmidt, & B.I. Dunlap, "D-D (H-H) Interactions within the Interstices of Pd", *Japanese J of Applied Physics*, Vol 30, No 1, Jan 1991, pp 182-189, 69 refs.

AUTHORS' ABSTRACT

Embedded atom, local-density-functional, and Hartree-Fock methods are used to calculate the effective interaction between deuterium (or equivalently within the Born-Oppenheimer approximation hydrogen) nuclei within palladium. No effects were found to suggest that the repulsion between deuterons in gas phase D_2 is reduced within the octahedral and tetrahedral interstices of this transition metal.

EDITOR'S COMMENTS

Early in 1989, several papers of a similar nature were written. However, no one seemed to be suggesting that two deuterons sitting in a Pd lattice were expected to fuse. The later papers addressed the more important issue of the itinerant deuteron hopping through a Pd lattice in which a ratio of Pd/D was 1.0 or higher. However, this paper does provide numerous references which may be of interest.

D. NEWS FROM ABROAD

CANADA - METAL-HYDROGEN SYSTEMS CONF.

METAL-HYDROGEN SYSTEMS, A review of Palladium and Palladium Alloys.

The second International Symposium of Metal-Hydrogen Systems, Fundamentals and Applications, was held from the 2nd to 7th September 1990, in Banff, Canada. A significant portion of the papers presented both positive and negative results in cold fusion research. A group from the Max Planck Inst in Stuttgart (Uchida, Wulz, and Fromm) reported an enhancement of hydrogen dissociation if Ni, Fe, or Pd, acting as catalysis, are on the surface of oxidised titanium.

Proceedings of the Symposium will be published in the *J of Less-Common Metals*, Spring 1991. The next International Symposium on Metal Hydrogen will be held in Uppsala, Sweden, June 8-13, 1992.

HUNGARY - WORLD FLASH ON COLD FUSION

T. Braun (Editor-in-Chief *J Radioanal & Nuc Chem*), "World Flash on Cold Fusion No. 10", *J Radioanal Chem.*, Vol 154, No 1 (1919), pp 1-4, 33 references.

Prof. Braun reports in his "world flashes" only those items which he had opportunity to scrutinize the full text. Papers are marked according to experimental effect detected (Heat, Neutrons, Gammas, & Tritium), and as Theory or Hypotheses/Comments. Of the 33 papers cited in this world flash, nine were marked as reporting positive experimental evidence for "effect detected". Five reported negative results and one reported + for neutrons and - for tritium. The rest of the papers discussed various theoretical, hypothetical, and comments on cold fusion.

By contrast the 2nd World Flash reported on 38 papers with 6 +, one both + & -, and 11 reporting negative results for "effect detected." The increase in the number of papers reporting positive results versus those reporting negative results are consistent with our observations. Those who have not succeeded in cold fusion research are either achieving positive results or they have given up. We predict a small percentage of negative papers at the forthcoming "Second Annual Conference on Cold Fusion".

INDIA - Pd-Pt PHASE DIAGRAM
Courtesy Dr. Samuel Faile

S.R. Bharadwaj, A.S. Kerkar, S.N. Tripathi, & S.R. Dharwadkar (Applied Chem Div, BARC), "The palladium-platinum phase diagram", *J of Less-Common Metals,* Vol 169, (1991), pp 167-172, 14 refs.

AUTHORS' ABSTRACT

The palladium-platinum equilibrium phase diagram was determined using a "spot" technique. The two metals form a series of solid solutions over the entire composition range, which solid solutions coexist with their liquid solutions. The experimentally observed gap between the solidus and the liquidus was comparable to that calculated employing a regular solution model. The phase boundaries delineated in the present work, however, differ significantly from those in an earlier work which were obtained by the Pirani method.

EDITOR'S COMMENTS

Several cold fusion experimenters are working with or are concerned with "platinizing" the palladium cathode in a cold fusion electrochemical cell. This paper has been reviewed to bring this information to the attention of our readers.

IRELAND-CHINA - H DIFFUSION IN Pd-Ag ALLOYS
Courtesy of Dr. Samuel Faile

X.Q. Tong & F.A. Lewis (Queen's U. No. Ireland & Tong is also with Tsinghua U. Beijing), "Mechanical-strain-induced influences on hydrogen diffusion within $Pd_{77}Ag_{23}$ alloy membranes", *J of Less-Common Metals*, Vol 169, (1991), pp 157-165, 19 refs.

AUTHORS' ABSTRACT

It had been observed that sudden changes in hydrogen gas pressure on the upstream side of tubular membranes of $Pd_{77}Ag_{23}$ and $Pd_{81}Pt_{19}$ alloys produced complementary changes of hydrogen pressure on the downstream side which have been attributed to "elastic dynamic" or "mechanically induced memory" effects. Further experiments have now been carried out which seem clearly to demonstrate that such effects can be more precisely associated with combinations of Gorsky effect and self-strain-induced diffusion-elastic effect migrations of hydrogen interstitials in the walls of the membranes.

EDITOR'S COMMENTS

This review has been included because some of the cold fusion experimenters are using palladium-silver combinations in cold fusion cells.

ITALY - TRITIUM FROM D_2O ELECTROLYSIS

F. Mengoli, M. Fabrizio, C. Manduchi, G. Zannoni, L. Riccari, F. Veronese, and A. Buffa (U di Padova & 2 Istit.), "The observation of tritium in the electrolysis of D_2O at palladium sheet cathodes', Vol 304, (1991), pp 279-287, 11 refs.

AUTHORS' CONCLUSION

It is clear that tritium excesses measured in some cells cannot be explained in terms of isotope enrichment due to D/T electrolytic separation.

An explanation in terms of fortuitous contamination is unlikely since numerous cells run concurrently did not show any (or only very low levels of) isotopic enrichment. we believe that this latter behaviour is the norm in the absence of tritium generation.

The poor reproducibility of the phenomenon compares with the sporadic occurrence of high H/Pd ratios observed in blank experiments.

JAPAN - COLD FUSION AND GRAVITY
Courtesy of Prof. Takaaki Matsumoto

Takaaki Matsumoto (Hokkaido Univ), "Observation of Quad-Neutrons and Gravity Decay During Cold Fusion", *Fusion Technology,* Vol 19, No 4, pp 2125-30, July 1991, 7 refs.

AUTHOR'S ABSTRACT

The Nattoh model predicts that neutron nuclei such as quad-neutrons are produced during cold fusion as a result of the emission of a new particle, the iton. Several quad-neutrons decays have been successfully recorded on nuclear emulsions. Especially important, micro-explosions caused by gravity decay have been clearly observed. This indicates that gravitational energy as well as fusion energy may be available in cold fusion.

EDITOR'S COMMENTS

Prof. Matsumoto sent us an excellent photograph of the results of a possible "micro-explosion caused by quad-neutron decay." The reproduction with his article in *Fusion Technology* is a good reproduction and worth seeing. It is evident that the nuclear film used by Matsumoto has captured some interesting nuclear events associated with cold fusion. The event that has been captured on the nuclear film needs to be replicated and more widely understood. Matsumoto's technique should be of interest to many researchers.

JAPAN - COOL ON FUSION
Courtesy of Prof. T. Matsumoto

Dr. Matsumoto writes the following:

Enclosed is a copy of the publication "Gensiryoku-Kohgyo", which is the only journal of the nuclear energy industry in Japan. The papers are written by researchers in JAERI (Japan atomic energy research institute) and the papers are mostly negative for cold fusion. JAERI is one of the two big organizations in Japan [working on fusion]. They are now studying the high temperature fusion with JT-60 and a big project of ITER (international tokmak experimental reactor), so it is natural that they have a negative opinion for cold fusion.

[At least energy decision makers in Japan have had sense enough to devote a reported 5% of their hot fusion budget to cold fusion. The U.S. Department of Energy could take a lesson from the Japanese. Ed.]

NETHERLANDS & GERMANY - Pd IMPURITIES
Courtesy of Dr. Samuel Faile

J.F. van Acker & W. Speier (U. of Nijmegen, Netherlands), and R. Zeller (Inst. for Festkorperforschung, Julich, Germany), "Local perturbation and induced magnetization originating from 3d impurities in Pd", *Physical Review B Condensed Matter,* Vol 43, No 12, pp 9558-68, 29 refs.

AUTHORS' ABSTRACT

We present an analysis of the electronic structure of 3d transition-metal impurities in Pd. Spin-polarized as well as nonmagnetic self-consistent calculations of Cr, Mn, Fe, Co, and Ni, in Pd were performed by means of the Korringa-Kohn-Rostoker Greens's function method, and parametrized in terms of a generalized Clogston-Wolff impurity model. This ansatz allows us to discuss the physics in terms of a localization of the 3d wave function at the impurity site and the relative positions of the perturbing potentials, which, except for Fe and Co majority-spin states, are repulsive. We find good agreement between the screening charges calculated by the *ab initio* formalism and those following from the generalized Clogston-Wolff model. This agreement forms the basis for an interpretation of the ferromagnetic or antiferromagnetic interaction with the host, which is caused by the spin-dependent covalent admixture. The linear relation between the relative induced moment in the host and the band filling, which appeared in previous results, can be explained in terms of Clogston-Wolff model parameters. [Papers that may shed some light on the strong effect of inhibitors and promoters in the use of Pd in cold fusion work are deemed important. Ed.]

POLAND & ITALY - CO AS A Pd POISON

A. Czerwinski (Warsaw U.), S. Zamponi & R. Marassi (U di Camerino, It.), "The influence of carbon monoxide on hydrogen absorption by thin films of palladium", *J. Electroanal. Chem.*, Vol 304, (1990), pp 233-239, 25 ref.

FUSION FACTS is published by the Fusion Information Center, an independent corporation not affiliated with the University of Utah.

***FUSION FACTS* SUBSCRIPTION COSTS**

FUSION FACTS EACH ISSUE MAILED FIRST CLASS.
12 ISSUES...$ 345
36 ISSUES...$ 900

***FUSION FACTS* SINGLE ISSUES**
CURRENT ISSUES OR OLDER ISSUES EACH....$ 10

SUBSCRIPTION REQUEST

For your convenience you can order by calling our 1-800 **Phone** number, our **FAX** number, or use the **Mail.**

Send *Fusion Facts* to:

NAME:________________________

COMPANY:_____________________

PO BOX, DEPT:__________________

CITY:_________________________

STATE___________ZIP__________

We accept **VISA** or **MASTER CARD**

CARD NUMBER _____-______-_____

Expiration Date __________

SIGNATURE ______________________

Send check, money order or credit card number with order and receive one extra issue free. Make checks payable to *Fusion Facts* and sent to:

Fusion Facts Subscription Office

P.O. Box 1831
Birmingham, AL 35201
Phone: 1-800/633-4931
Fax: (205) 995-1588

For non-subscription information

P.O. Box 58639, Salt Lake City, UT 84158
Telephone: (801) 583-6232