

- P.Acke2005** Ackerman, E. (2005). Bibliometrics of a controversial scientific literature: polywater research, 1962-1974. *Scientometrics*, 63:189–208.
 ANNOTATION: The author defines a number of metrics, such as total publication, publications in journals, books, and conference proceedings, all per year, and shows some graphs of these as a function of time, as well as other graphs of citation rates of several kinds. The data was derived from several sources. There have been other studies of this "affair", notably the "epidemic" model by Bennion and Neuton (1976). The publication dynamics are unlike that of the cold fusion literature, in that polywater literature was slower in gaining pace, whereas cold fusion exploded into the literature, and declined more slowly (it has not died yet). Polywater, of course, was disproved definitively by a single experiment; so was cluster impact fusion (Beuhler et al, 1990). This is unlikely to happen with cold fusion. Ackerman does not unfortunately mention the fact that Deryagin, who was one of the proponents of polywater (sometimes also called Deryagin-water) also appeared again in the cold fusion arena, with a paper by Klyuev et al(1986), which later gave rise to what was called fracto-fusion.
- P.Alva1957** Alvarez, L. W.; Bradner, H.; Jr, F. S. Crawford; Crawford, J. A.; Falk-Vairant, P.; Good, M. L.; Gow, J. D.; Rosenfeld, A. H.; Solnitz, F.; Stevenson, M. L.; Ticho, H. K.; Tripp, R. D. (1957). Catalysis of nuclear reactions by mu-mesons. *Phys. Rev.*, 105:1127–1128.
 ANNOTATION: Out of many hydrogen bubble chamber mu-meson tracks, a few ended by starting a new track, also of a mu-meson. This is compatible with H-D fusion catalysed by the mu-meson. The energy of the resulting emitted meson is also about that of the mass difference between the H-D input and (^3He) output of such a fusion reaction. A note added in proof shows how an increase in the deuterium content in the bubble chamber predictably increases the number of the events, supporting the thesis.
- P.Arac2006** Arachi, Y.; Emura, S.; Omura, A.; Nunogaki, M.; Asai, T.; Yamaura, S.; Inoue, A.; Arata, Y. (2006). Structural analysis of nano-sized-Pd/ZrO₂ composite after H(D) absorption. *Solid State Ionics*, 177(19-25):1861–1864. *Solid State Ionics 15: Proceedings of the 15th International Conference on Solid State Ionics, Part I*.
 ANNOTATION: The nanoparticle mix of ZrO₂ and Pd described by Arata and Zhang was loaded and deloaded with deuterium and x-ray crystallography performed on it. It showed an expansion of the nearest Pd-Pd atom distances of 0.08Å from 2.74Å upon deuterium loading, showing that the deuterium is absorbed in the particle bulk and not just on the surface. This confirms the model of Arata and Zhang.
- P.Asta1994** Astakhov, I. I.; Kazarinov, V. E.; Reznikova, L. A.; Teplitskaya, G. L. (1994). Diffusion of hydrogen isotopes in palladium hydride and deuteride in the presence of lithium. *Russ. J. Electrochem.*, 30:1379–1382.
 ANNOTATION: In a previous paper by these authors, Li was found to affect the flow of hydrogen through a Pd membrane. Here they try to find the mechanism of the effect. It appears that Li, incorporated into Pd, may form traps for hydrogen isotopes and thereby slow down its transport.
- P.Azum2002** Azumi, K.; Asada, Y.; Ueno, T.; Seo, M. (2002). Monitoring of hydrogen absorption into titanium using resistometry. *J. Electrochem. Soc.*, 149:B422–B427.
 ANNOTATION: As with Pd, the specific resistance of Ti changes with hydrogen loading. This was investigated. Hydrogen was absorbed even with an oxide layer covering the Ti after etching. Prolonged cathodic loading eventually led to cracking and even rupture of some samples.
- P.Azum1993** Azumi, K.; Fujita, T.; Ito, T.; Mizuno, T.; Seo, M. (1993). Diffusion and permeation of hydrogen/deuterium in palladium electrode. *Denki Kagaku*, 61:576–583. In Japanese, Engl. Abstr.
 ANNOTATION: Pure transport study, no cold fusion content.
- P.Bago1953** Bagotskaya, I. A.; Frumkin, A. N. (1953). Effect of surface-active substances on the absorption of hydrogen into iron and the mechanism of of hydrogen overvoltage. *Dokl. Akad. Nauk SSSR*, 62:979–982. In Russian.
 ANNOTATION: Hydrogenation of Fe.
- P.Bara1991** Baranowski, B.; Tkacz, M.; Majchrzak, S. (1991). Pressure dependence of hydrogen volume in some metallic hydrides. In *Molecular Systems under High Pressure* (edited by R. Pucci; G. Piccino), pages 139–156. Elsevier, Amsterdam.
 ANNOTATION: Input to the high fugacity/pressure argument.
- P.Baue1988** Bauer, H. H. (1988). Commonalities in arguments over anomalies. *J. Sci. Exploration*, 2:1–11.
 ANNOTATION: Has some relevance to arguments over CNF .
- P.Bell1997** Bellanger, G.; Rameau, J. J. (1997). Determination of tritium adsorption and diffusion parameters in a palladium-silver alloy by electrochemical impedance analysis. *Fusion Technol.*, 32:94–105.
 ANNOTATION: This is of importance to the purification of tritium by diffusion through the alloy but could be interesting to CNF workers, some of whom use this sort of alloy as cathode.
- P.Benn1976** Bennion, B.; Neuton, L. A. (1976). The epidemiology of research on 'anomalous water'. *J. Am. Soc. Inf. Sci.*, (Jan-Feb):53–56.
 ANNOTATION: Old study that can act as comparison for the CNF literature.
- P.Berl1997** Berlouis, L. E. A.; Hall, P. J.; MacKinnon, A. J.; Wark, A. W.; Manuelli, D.; Gervais, V.; Robertson, J. E. (1997). The decomposition of electrochemically loaded palladium hydride: a thermal analysis study. *J. Alloys Comp.*, 253-254:207–209.
 ANNOTATION: A number of Pd samples were loaded over some hours at the low current density (cd) of 2 mA/cm², and then decomposed under differential thermal calorimetry (DTC) and thermogravimetric analysis (TGA), to measure the enthalpy of decomposition, as well as the loadings etc. At the low cd, loading did not exceed about 0.6, but 0.9 was reached at 30 mA/cm². A curve of enthalpy of decomposition showed a decreasing trend with increasing load, reaching about half the low-load value at 0.9, 15 kJ/mol.

- P.Bock1998** Bockris, J. O. M. (1998). First experimental establishment of high internal pressure of molecular hydrogen developed in palladium during water electrolysis. *Int. J. Hydrogen Energy*, 23:1079–1085.
 ANNOTATION: One of F&P's arguments to support their thesis of dd-fusion is the very high pressure of deuterium within the Pd lattice. This paper, without referring to cold fusion at all, reports measurements made on that pressure. The electrode was a hollow Pd cylinder rather similar to Arata & Zhang's "bottle". The hydrogen is deposited on the outside, and a pressure transducer measures the resulting pressure on the inside (as indeed A&Z have done). The result is pressures, depending on the overpotential applied to the electrode, going to about 300 atm. The rate-determining step is the slow diffusion of the gas through the metal.
- P.Bock2000** Bockris, J. O. M. (2000). The mechanism of the evolution of hydrogen on palladium and associated internal damage phenomena. *Int. J. Hydrogen Energy*, 25:747–765.
 ANNOTATION: This is not a cold fusion paper but does refer to quite a number of such. It deals with the fundamental issue of the mechanism of hydrogen deposition at a Pd cathode. The key result is seen in Fig. 1, showing Tafel curves for electrolysis in both LiOH and LiOD. The authors find that the curves have a break-point at some current-density/potential, in contrast with the results of Green & Britz (1996). The paper also reports studies of surface features after electrolysis, on the Pd electrodes. There is damage, thought to be due to high hydrogen/deuterium fugacity at grain boundaries.
- P.Bock1994** Bockris, J. O. M.; Minevski, Z. S.; Lin, G. H. (1994). Hydrogen in palladium: kinetics, material properties and fugacity. *Electrochem. Soc. Proc.*, 94-21:410.
 ANNOTATION: Yet another electrochemical study of the Pd/D₂O system, and arguments about fugacity. Here, however, no actual astronomic pressures are claimed, only the conventional 10⁴ or less. Tafel curves are shown, and they have a sharp break, at an overvoltage of -0.4 V; this is not easy to accept but is explained as a transition from one water reduction mechanism to another, i.e. at low current density it is coupling of discharge with combination, while at high cd, fast discharge and slow combination.
- P.Bock1971** Bockris, J. O. M.; Subramanyan, P. K. (1971). The equivalent pressure of molecular hydrogen in cavities within metals in terms of the overpotential developed during the evolution of hydrogen. *Electrochim. Acta*, 16:2169–2179.
 ANNOTATION: In the electrolysis of water at a metal, an overpotential is forced on the metal/water/hydrogen system, and at a corroding metal, an overpotential arises due to the corrosion processes. In both cases, hydrogen enters the metal to some extent and can accumulate in cavities, sometimes leading to embrittlement of the metal. This paper tries to find a relation between the hydrogen pressure and the overpotential. The Nernst equation, relating these quantities, is dismissed at the outset as inapplicable. The relative rates of the electrochemical step, leading to adsorbed hydrogen, and of the dimerisation of these to H₂, affect the cavity pressure, and this is investigated. It turns out that for a fast electrochemical step followed by a slow dimerisation, rather large fugacities, corresponding to the Nernstian figures, can appear. At the other extreme - slow electrochemical, fast dimerisation - it is unity, i.e. 1 atm. Real systems probably lie between these extremes. There is a figure relating real pressure to fugacity. E.g., the fugacity of 10³⁰ corresponds to about 1000 atm.
- P.Bouc1995** Boucher, G. R.; Collins, F. E.; Matlock, R. L. (1995). Separation factors for hydrogen isotopes on nickel and platinum during electrolysis. *Fusion Technol.*, 27:183–186.
 ANNOTATION: Electrolysis was carried out in heavy water (electrolyte is not stated, as this is a follow-up paper), and tritium enrichment measured. Assuming that the isotope separation factor (γ) = 2, the results fit very well with theory, and there is no difference between different cathode metals.
- P.Brau1976** Brauer, E.; Dörr, R.; Züchner, H. (1976). Hydrogen diffusion in titanium. *Z. phys. Chem. NF*, 100:109.
 ANNOTATION: Pretreatment of the Ti surface consisted of (a) heating to near the melting point to remove O₂, H₂ and C (but see Mebrahtu et al, 1989), (b) evaporating a Pd layer on it to prevent oxidation and (c) coating with Pd black to facilitate [establishment of] equilibrium between H₂(gas) and H(metal). There are other complications. The resulting measured diffusion coefficient of H in (apparently) the metal is, at 293K, 2×10^{-7} cm²/s or $D_0 = 6 \times 10^{-2}$ cm²/s, EA = 7.4 ± 0.7 kcal/mol in $D(T) = D_0 \exp(-EA/RT)$. This is compared with D in other metals (T not given): 5×10^{-6} in Nb, 2×10^{-6} in Ta, 2×10^{-5} in V, by the same technique, unfortunately not described - you have to get hold of a thesis. These D values are 3-4 orders of magnitude larger than others', possibly due to more careful surface treatment. This work is at variance with the Brauer et al (1983) paper and we may have to do a literature search to assess the position.
- P.Brau1983** Brauer, E.; Gruner, R.; Rauch, F. (1983). Kinetics and mechanism of hydrogen diffusion in hydrides of titanium, zirconium and TiNi0.5. *Ber. Bunsenges. Phys. Chem.*, 87:341.
 ANNOTATION: All these form stable hydrides. Electrolysis was used to charge the metals with hydrogen; loadings corresponding to TiH1.65 and ZrH1.61 or about 60 at% were reached. The measured diffusion coefficients were 3.6×10^{-11} in Ti, 2×10^{-11} in Zr, both in cm²/s. At current densities of 15 mA/cm², the absorption of H is diffusion controlled. However, we are not measuring diffusion of hydrogen in the metal, but through the hydride; a layer of the hydride is slowly formed, going deeper into the metal, and the hydrogen has to diffuse through this. Compare with the earlier paper of Brauer et al (1976). Because of oxide formation on the metal surfaces, surface pretreatment is very important, and in this case gave D values an order of magnitude higher than previous work.
- P.Burk1993a** Burke, L. D.; Casey, J. K. (1993a). An examination of the electrochemical behavior of palladium electrodes in acid. *J. Electrochem. Soc.*, 140:1284.
 ANNOTATION: A study, mostly in the anodic regime, of the processes taking place at Pd in an acid solution. Hydroxide and hydrous oxide layers are formed, Pd dissolves, and oxygen is absorbed below the surface.

- P.Burk1993b** Burke, L. D.; Casey, J. K. (1993b). An examination of the electrochemical behavior of palladium in base. *J. Electrochem. Soc.*, 140:1292.
ANNOTATION: A study, mostly in the anodic regime, of the processes taking place at Pd in an alkaline solution. Hydroxide and hydrous oxide layers are formed.
- P.Bystr1997** Bystritsky, V. M.; Grebenyuk, V. M.; Parzhitski, S. S.; Penkov, F. M.; Sidorov, V. T.; Stolupin, V. A.; Bulgakov, T. L.; Mesyats, G. A.; Sinebryukhov, A. A.; Sinebryukhov, V. A.; Chaikovskiy, S. A.; Luchinsky, A. V.; Ratakhin, N. A.; Sorokin, S. A.; Bystritskii, V. M.; Toor, A.; Filipowicz, M.; Gula, A.; Lacki, E.; Wozniak, J.; Gula, E. (1997). A new approach in the experimental studies of nuclear reactions at ultralow energies. *Nukleonika*, 42:775–794.
ANNOTATION: This joint Russian/Polish/USAmerican team reports on dd fusion at low energies down to 240 eV. It might have some useful results for CNF.
- P.Camp1992** Campbell, S. A.; Cunnane, V. J.; Schiffrin, D. J. (1992). Cathodic contact glow discharge electrolysis under reduced pressure. *J. Electroanal. Chem.*, 325:257–268.
ANNOTATION: Thorough investigation of high-voltage electrolysis
- P.Cero1993** Cerofolini, G. F.; Boara, G.; Agosteo, S.; Foglio Para, A. (1993). Giant neutron trapping by a molecular species produced during the reaction of D+ with H- in a condensed phase. *Fusion Technol.*, 23:465–469.
ANNOTATION: In a variety of situations, where negatively charged H reacts chemically with D+, this team observed a neutron count significantly lower than the background. They infer that the excited H-D+ species first formed, for some unknown reason is a strong absorber of neutrons. It is much stronger, for example, than a Cd foil, often used for that purpose. The final gaseous HD product does not absorb neutrons.
- P.Chat1989** Chatterjee, L. (1989). Muon production for energy applications: cold fusion. *Indian J. Pure Appl. Phys.*, 27:787–790.
ANNOTATION: Suggestion, muon catalysed fusion. The author has some ideas about reducing the cost of muon production, which might bring muon catalysed fusion closer to usefulness.
- P.Chen1994** Chen, C. L.; Wu, J. K. (1994). Electrolytic hydrogen transport in palladium. *J. Mater. Sci. Lett.*, 13:84–85.
ANNOTATION: A permeation study: a Pd membrane (0.2 mm) was cathodically charged with hydrogen on one side with varying current, and the hydrogen emerging from the other side detected by anodic loading and measuring the current. The plot of I(anodic) vs I(cathodic) was linear with slope of 1 up to a charging current of about 5 mA/cm², where the anodic current flattened out. This is attributed to the formation of beta phase hydride at the cathodic surface and resulting recombination (formation of H₂ bubbles).
- P.Cho1990** Cho, Y.-S. (1990). Low-temperature ultrasonic attenuation peak in alpha'-palladium deuteride (PdD(x)). *Tae-han Kumsok Hakhoechi*, 28:92. In Korean.
ANNOTATION: "The ultrasonic attenuation of low-temp. peaks in the PdD(0.67) was studied. The peak is seen only for longitudinal waves, but not for transverse ones, and is obsd. only in the deuterides, but not in the hydrides. The low-temp. peak is correlated with relaxation phenomena due to redistribution of LO phonons by ultrasonic waves. Ultrasonic attenuation of the PdD(0.67)H(0.02) sample was measured. The low-temp. peaks of the PdD(0.67)H(0.02) and the PdD(0.67) do not show significant differences within the limit of exptl. error. Ultrasonic attenuations of the PdD(x) (x=0.64-0.72) decreased with increasing D concn." (Direct quote from Chem. Abstr. 113:119420 (1990)).
- P.Chou1987** Chou, P.; Vannice, M. A. (1987). Calorimetric heat of adsorption measurements on palladium. I. Influences of crystallite size and support on hydrogen adsorption. *J. Catal.*, 104:1–16.
ANNOTATION: Calorimetry showed that the enthalpy of chemisorption of H₂ on Pd is about 15 kcal/mol, about three times that of absorption in the bulk, as the hydride. The adsorption energy was to some extent a function of grain size.
- P.Coeh1928** Coehn, A. (1928). Evidence for protons in metals. *Naturwiss.*, 16:183–184. In German.
ANNOTATION: The observation that the absorption of hydrogen in Pd, Fe etc is proportional to SQRT(pressure) indicates the atomic nature of hydrogen in the metal, and this leads to the suspicion that it is present as protons. C measured hydrogen diffusion along wires, while imposing potential gradients along the wire, and observed a hydrogen migration towards the negative end.
- P.Coeh1931** Coehn, A.; Jürgens, H. (1931). On the contribution of protons to the conduction of electricity in metals. Resistance measurements. *Z. Phys.*, 71:179–204. In German.
ANNOTATION: Continuation of the work published in 1930, here focussing on the relation of metal resistance with hydrogen loading. This was done with pure Pd and Pd alloyed with 20% Ag, where the same effect was noted (increase of R/R₀ with loading). There is a maximum, previously observed by Smith.
- P.Coeh1930** Coehn, A.; Specht, W. (1930). On the contribution of protons to the conduction of electricity in metals. *Z. Phys.*, 62:1–31. In German.
ANNOTATION: Further experiments, following those reported in 1928. As well as gaining further evidence for the existence of protons in Pd, hydrogen loading was also measured by its effect on the resistance of the metal. As before, it was found that protons contribute to current flow.
- P.Cole1993** Cole, D. C.; Puthoff, H. E. (1993). Extracting energy and heat from the vacuum. *Phys. Rev. E*, 48:1562–1565.
ANNOTATION: This work discusses a single point in the area of ZP energy extraction, as suggested by R.L. Forward (1984); i.e. the question of whether this is possible at absolute zero. The answer is yes.
- P.Conw1992** Conway, B. E.; Wojtowicz, J. (1992). Time-scales of electrochemical desorption and sorption of H in relation to dimensions and geometries of host metal hydride electrodes. *J. Electroanal. Chem.*, 326:277–297.
ANNOTATION: Cold fusion is mentioned only peripherally, the accent here being on a new kind of battery,

using hydrogen storage in a suitable metal. For this, large capacity for hydrogen is desirable (and LaNi₅ seems to be a favourite alloy), and it is of vital interest to know about loading rates. This thorough paper examines this question in minute detail for different electrode geometries like plates, small spheres and wires. For optimum charging efficiency, a rational charging current program is suggested.

- P.Cran1989** Crandall, D. H. (1989). The scientific status of fusion. *Nucl. Instrum. Methods Phys. Res. B*, 42:409–418.
 ANNOTATION: A review of the various kinds of hydrogen fusion. The name "cold fusion" is given to muon catalysed fusion, known for some time; this is explained, among other variants. A "note added in proof" mentions the stunning news of the new CNF but appears skeptical.
- P.Czer1997** Czerwiński, A.; Czauderna, M.; Maruszczak, G.; Kiersztyn, I.; Marassi, R.; Zamponi, S. (1997). Influence of cesium cations on hydrogen and deuterium electroabsorption in palladium. *Electrochim. Acta*, 42:81–86.
 ANNOTATION: There have been conflicting claims of the deposition of alkali metals on palladium, and their ingress into the bulk, parallel with hydrogen evolution and loading. Mainly, Li⁺ ions have been considered. Li absorption figures of a few tenths of a %atomic to 10% have been claimed near the Pd surface, despite the unlikelyhood of Li deposition at the potentials applied. The present team now looks at hydrogen/deuterium loading into Pd in alkaline and acid solution, with and without Cs⁺ ions. The result is that in alkaline solutions, loading is affected markedly by Cs⁺ ions (up to 0.3% was found near the Pd surface), but not at all in acid.
- P.Czer1995** Czerwiński, A.; Maruszczak, G.; Żelazowska, M.; Łancucka, M.; Marassi, R.; Zamponi, S. (1995). The absorption of hydrogen and deuterium in thin palladium electrodes. Part III: The influence of solution composition. *J. Electroanal. Chem.*, 386:207–211.
 ANNOTATION: Another in the series of fundamental studies of the electrochemistry of the Pd/H₂O (or D₂O) system. Here, the team looks at alkali metal ion effects, and finds some, to do with underpotential deposition of these metal ions.
- P.Czir1989** Czirr, J. B.; Jensen, G. L. (1989). A neutron coincidence spectrometer. *Nucl. Instr. Methods A*, 284:365–369.
 ANNOTATION: This is the way to measure low-intensity neutron fluxes of MeV neutrons. The apparatus relies (I quote) on total energy absorption to measure neutron energy. A coincidence signal is required from the capture of thermalised neutrons in Li-6 glass scintillators incorporated in the detector body. This dual signal from a single neutron provides powerful discrimination against background events from gamma rays or ambient low-energy neutrons.
- P.Dee1935** Dee, P. I. (1935). Some experiments upon artificial transmutation using the cloud-track. *Proc. Roy. Soc. Lond. Ser. A*, 148:623–637.
 ANNOTATION: Old classic, bombarding deuterium with deuterons accelerated to hundreds of keV energies. Protons, helium and neutrons were observed. Also Li was also bombarded with protons, and helium-3 and -4 observed.
- P.De1G2000** DelGiudice, E.; Preparata, G.; Fleischmann, M. (2000). QED coherence and electrolyte solutions. *J. Electroanal. Chem.*, 482:110–116.
 ANNOTATION: Uses QED to unravel the purported mystery of why ionic crystals tend to dissolve in water, claiming that the usual explanations are not correct. This is an interesting paper that can be viewed as spin-off from theory developed in the context of cold fusion.
- P.DeNi1997** DeNinno, A.; Barbera, L. A.; Violante, V. (1997). Deformations induced by high loading ratios in palladium-deuterium compounds. *J. Alloys Compds.*, 253-254:181–184.
 ANNOTATION: Fundamental study of the loading process of hydrogen into Pd. Loading was monitored by online four-wire resistance measurements. Dynamic loading appears to strongly affect loading ratios achieved; these went up to around 0.8, the highest those for electrolysis at preloaded samples.
- P.Dick1981** Dickinson, J. T.; Donaldson, E. E.; Park, M. K. (1981). The emission of electrons and positive ions from fracture of materials. *J. Mater. Sci.*, 16:2897–2908.
 ANNOTATION: A number of (insulating) materials were subjected to breaking, and the emission of electrons and positive ions, as a result of the breaks, measured. Up to 15 kV have been observed to be produced from such experiments. Here, too, emissions were observed and the decay times appear to be strongly related to electrical conductance (up to 1s for insulators like quartz, down to 10 microsec for graphite), and electron emission densities up to 10⁸/cm² were seen. There are 33 references, going back to 1970.
- P.East1993** Eastman, J. A.; Thompson, L. J.; Kestel, B. J. (1993). Narrowing of the palladium-hydrogen miscibility gap in nanocrystalline palladium. *Phys. Rev. B*, 48:85–93.
 ANNOTATION: Absorption of hydrogen in nano-sized Pd particles varies slightly from that in bulk, coarse-grained Pd. The alpha phase contains a little more hydrogen, while the beta phase contains less, the smaller the particles. This is explained by the difference in grain boundaries between nano- and bulk Pd.
- P.Emur2007** Emura, S.; Arata, Y.; Arachi, Y.; Nunogaki, M.; Ohmura, A. (2007). Atomic structure analysis of Pd nano-cluster in nano-composite Pd/ZrO₂ absorbing deuterium. *J. High. Temp. Soc.*, 33(3):142–156. In Japanese, English abstr.
 ANNOTATION: No mention of cold fusion, but contains perhaps useful information on hydrogen absorption in Pd nano-particles.
- P.Enom1990** Enomoto, Y.; Hashimoto, H. (1990). Emission of charged particles from indentation fracture of rocks. *Nature*, 346:641–643.
 ANNOTATION: The author's main interest is earthquake prediction. It appears to be well known that cp's are emitted from stressed and fractured materials, and here are reported results of experiments with 11 kinds of rock. This may have application to fractofusion (but this is not mentioned by the authors).

- P.Enyo1994** Enyo, M. (1994). The effective hydrogen pressure at cathode as a key concept in hydrogen adsorption and absorption phenomena. *Proc. Electrochem. Soc.*, 94-21:75–91.
 ANNOTATION: A useful paper connecting the mechanism of hydrogen formation and its interaction with the cathode metal, and pressure arising from this. The pressure has been discussed in connection with cold fusion, and is thought by some to have a very large value, but in fact is reduced by activity coefficients to something much smaller. This kind of paper can cast light on the problem.
- P.Fedo1953** Fedorova, A. I.; Frumkin, A. N. (1953). Study of the palladium-water system by the electrochemical method. *Zh. Fiz. Khim.*, 27:247–249. In Russian.
 ANNOTATION: Electrochemical loading of Pd by hydrogen was performed at some temperatures, and the loading determined to be close to 0.68.
- P.Feld1997** Feldberg, S. W.; Reilly, J. J. (1997). Phenomenological treatment of hydrogen transport in a metal/metal hydride system. *J. Electrochem. Soc.*, 144:4260–4265.
 ANNOTATION: Mainly concerned with the use of metal hydrides for batteries, fuel cells and the like, this publication looks at concentration profiles across a metal membrane with different hydrogen activities at the ends. Unlike some more simplistic models in the literature, the result here is profiles with a high degree of nonlinearity across the metal, in the steady state.
- P.Feli1995** Felici, R.; Bertalot, L.; DeNinno, A.; LaBarbera, A.; Violante, V. (1995). In situ measurement of the deuterium (hydrogen) charging of a palladium electrode during electrolysis by energy dispersive x-ray diffraction. *Rev. Sci. Instrum.*, 66:3344–3348.
 ANNOTATION: One way to directly measure the H/Pd loading ratio is to measure the lattice parameters of the metal as it is hydrided; there is theory to connect these parameters to the loading ratio. The authors used a beam of hard white x-rays, capable of penetrating the electrolyte solution; the beam was bounced off the Pd disk at a low angle, and the lattice parameters measured from the energy dispersive spectrum of the detected beam at the exit end. The electrolyte was 0.1 M LiOD in D₂O, and charging was at about 20 mA/cm². The beta phase was detected after 7 days of charging. Pulsed currents were also tried, alternating between 20 mA and 200 mA at varying periods. A plot of lattice parameter or loading ratio vs time shows a sigmoid rise to a ratio of 0.76 ± 0.02 . After about 3 weeks of charging, the sample was removed and the amount of gas measured; this came to a loading of 0.77 ± 0.05 , confirming the in situ result.
- P.Fieb1957** Fiebinger, K. (1957). Die Bildung von 'Selbsttargets' für die Kernreaktion D(d,n)He(3) und ihr Zusammenhang mit dem Problem der Wasserstoffdiffusion in Metallen. *Angew. Phys.*, 9:213. In German.
 ANNOTATION: I have the impression that Fiebinger was (one of?) the first to relate the saturation of neutron emission from a metal bombarded with a deuteron beam to the diffusion of the deuterons into the bulk of the metal. Here, he used metals like Au, Ir, Rh, Ag, Pd, Pt and others. This paper and the one by Robinson et al is relevant to cold fusion experiments in which the deuteride is made by deuteron beam bombardment.
- P.Fili1990** Filipek, S. M.; Szafranski, A. W.; Warsza, M.; Majchrzak, S. (1990). Isotopic effects in Ni-Si-H(D) and Ni-V-H(D) systems. *J. Less Common Met.*, 158:177–189.
 ANNOTATION: This paper mentions that it may be relevant to cold fusion. It is concerned with the change in resistance of the title alloys with H- or D loading as well as with temperature. Some cold fusion papers have used the same effect seen in Pd to measure the loading. H and D behave differently and all alloys used here show maxima of R_p/R_0 vs. p, with p the pressure of applied gas (H₂ or D₂), R_p/R_0 the ratio of resistance at this pressure (at equilibrium) to that of the pure metal. The maxima are in the form of sharp peaks.
- P.Flan1991** Flanagan, T. B.; Oates, W. A. (1991). The palladium-hydrogen system. *Ann. Rev. Mater. Sci.*, 21:269–304.
 ANNOTATION: Up to date review of the field, 35 pp and 126 refs. A must-read for any serious 'cold fusion' buff.
- P.Forw1984** Forward, R. L. (1984). Extracting electrical energy from the vacuum by cohesion of charged foliated conductors. *Phys. Rev. B*, 30:1700–1702.
 ANNOTATION: In 1940, Casimir suggested that there must be force between two parallel conducting plates lying parallel to each other in vacuum, proportional to $1/a^4$ (a the plate separation), and RLF states that at small a like < 20 nm, this force can indeed be large, and could perhaps be tapped as an energy source. Whether this energy is conservative he is not sure, but assumes that it probably is, just like gravity, which can be tapped in, e.g. a dam, which is powered by the Sun (lifting water vapour in the first place). He suggests a configuration with which the effect (now in fact known) could be measured.
- P.Fran1947** Frank, F. C. (1947). Hypothetical alternative energy sources for the 'second meson' events. *Nature*, 160:525.
 ANNOTATION: Earlier work had shown that many of the tracks made by cosmic mesons ended by producing a secondary meson of about 4 MeV energy, in the photographic emulsions. F proposes and rejects a number of explanations of this effect; all all them in terms of a nuclear decay. But "nuclear build-up" - i.e. fusion - cannot be rejected. A meson might be captured by a proton and the pair act like a hydrogen atom but with the meson much more tightly bound, due to its great mass compared to an electron. From a distance, the atom would appear like a slow neutron and be able to closely approach other nuclei without Coulombic repulsion; e.g. protons or deuterons, and then fuse with expulsion of the meson. This is in fact an early hypothetical description of muon catalysed fusion, discovered 10 years later by Alvarez et al.
- B.Fran1981** Franks, F. (1981). *Polywater*. MIT, Boston, MA, USA. ISBN 0-262-06073-6.
 ANNOTATION: Just a few pages out of the book, citing Kurt Vonnegut's "Cat's Cradle".
- P.Goll1991** Gollerthan, U.; Brohm, T.; Clerc, H. G.; Hanelt, E.; Horz, M.; Morawek, W.; Schwab, W.; Schmidt, K. H.; Hessberger, F. P.; Muenzenberg, G.; Ninov, V.; Simon, R. S.; Dufour, J. P.; Montoya, M. (1991). Decay of

the compound nucleus ^{179}Au formed in the cold fusion reaction $^{90}\text{Zr} + ^{89}\text{Y}^*$. *Z. Phys. A*, 338:51–60.

ANNOTATION: This is not exactly cold, dealing with "low" excitation energy of 26 MeV, but is of terminological interest.

P.Gora1997 Goral, A. B.; Panta, P.; Maciak, J. (1997). The CNF ability of heavy electron. *Bull. Pol. Acad. Sci. Tech. Sci.*, 45:109.

ANNOTATION: AB Goral has previously proposed the existence of heavy leptons (6 MeV), which would be able to catalyse "cold fusion" as do muons. The paper states that it wishes to "remove any association with nonglorious Fleischmann & Pons 'cold nuclear fusion'" and is thus about something else. It may however be a reference to muon- (or lepton-) catalysed fusion, the original cold fusion. The paper presents experimental evidence for these heavy particles.

P.Gran1992 Graneau, P.; Graneau, N. (1992). The role of Ampère forces in nuclear fusion. *Phys. Lett. A*, 165:1–13.

ANNOTATION: The pair examine wires exploding under very large applied current pulses. They tie the results in with various fusion reactions, including "lukewarm fusion", i.e. CIF (now disproved).

P.Grde1999 Grden, M.; Kotowski, J.; Czerwinski, A. (1999). Study of electrochemical palladium behavior by the quartz crystal microbalance. I. Acidic solutions. *J. Solid State Electrochem.*, 3:348–351.

ANNOTATION: Following such studies as those of Cheek & O'Grady, Bucur & Flanagan and Grässjo et al, the present authors do a thorough study of hydrogen loading of a thin (200 nm) Pd film mounted on a quartz crystal balance. Like the previous authors, they find a super-Sauerbreyan EQCM response, up to a factor of about 3, due to strain effects on the Pd as it is loaded.

P.Gree1996 Green, T.; Britz, D. (1996). Kinetics of the deuterium and hydrogen evolution reactions at palladium in alkaline solution. *J. Electroanal. Chem.*, 412:59–66.

ANNOTATION: Using galvanostatic polarisation, current interruption and potential decay curves, overall Tafel curves were measured, and separated into the Volmer and Tafel reactions for the HER (DER). Anomalies (breaks) in the Tafel curves, as claimed by previous workers, were not found, and the results indicated that the Volmer-Tafel reaction predominated, with the possibility of the Heyrovsky route not ruled out at high current densities. Exchange current densities were found higher in LiOH than in LiOD, giving an H/D separation factor of around 3, in agreement with other work. Loading ratios D/Pd of between 0.78 and 0.82 were inferred and the concept of equivalent D₂ pressure confirmed.

P.Grei1991 Greiner, W.; Sandulescu, A. (1991). Cold valleys: cluster decay, cold fusion, cold fission - a unifying theory of related phenomena. *J. Phys. G*, 17:S429–S442.

ANNOTATION: Theoretical paper, of interest in the present context mainly for its use of the term "cold fusion", here applied to the fusion of colliding (208)Pb with (e.g.) (58)Fe to produce (no-name) 108. "Cold" here refers to the fact that the colliding partners are in their ground state.

P.Guil1991 Guilinger, T. R.; Kelly, M. J.; Knapp, M. J.; Walsh, J. A.; Doyle, B. L. (1991). Ion beam measurement of deuterium in palladium and calculation of hydrogen isotope separation factors. *J. Electrochem. Soc.*, 138:L26–L27.

ANNOTATION: The deuterium content of an operating Pd cathode (in the form of a thin film can be monitored by means of ion beam nuclear reaction analysis. This was done in this study. The Pd foil had a 100-200 nm Au coating to prevent loss of deuterium through the surface exposed to air; the other surface was in contact with the electrolyte. A 3.1 MeV (3)He beam was aimed at the foil, reaching it at about 1.5 MeV. The reaction with deuterium in the foil produces protons at 14 MeV, which were detected by a silicon surface barrier device. By calibration with a TiD sample with known loading, the absolute D/Pd loading could be calculated. The 25 mu foil was quickly charged to a loading of close to 0.8, and unloaded slowly upon current interruption. Replacement of some of the D₂O with H₂O, to the ratio D:H 65:35 quickly lowered the D/Pd loading to about 0.2; 86% D₂O increased this to 0.35. The results allowed the calculation of the separation factor SH, which came to 9.2-9.3.

P.Gupt1995 Gupta, R. K.; Singh, S.; Münzenberg, G.; Scheid, W. (1995). Neutron-halo nuclei in cold synthesis and cluster decay of heavy nuclei: Z = 104 nucleus as an example. *Phys. Rev. C*, 51:2623–2629.

ANNOTATION: Deals with fusion reactions resulting in element 104, some of which are considered "cold" by virtue of the relatively low energies required, i.e. just under 200 MeV. This is a conventional use of the term "cold fusion", along with the same term applied to muon catalysed fusion.

P.Hagi1990a Hagi, H. (1990a). Boundary conditions in electrochemical measurements of diffusion coefficients of hydrogen in alpha-palladium. *Mater. Trans.*, 31:842–847.

ANNOTATION: Various boundary conditions at the electrolytic charging/permeation of Pd with hydrogen lead to correspondingly different models. Constant potential charging is confirmed to be equivalent to holding a constant H concentration at the inside of the surface, while constant current gives a constant flux of H into the surface. The diffusion coefficient of H in low-charged (alpha-phase) Pd was found to be $(3 - 5) \times 10^{-11} \text{ m}^2/\text{s}$, and shows Arrhenius behaviour over the temperature range 275-345 K.

P.Hagi1990b Hagi, H. (1990b). Diffusion coefficient of hydrogen in palladium films prepared by RF sputtering. *Mater. Trans.*, 31:954–958.

ANNOTATION: Stimulated by reports of cold fusion, Hagi now measures D for H in Pd in the form of a thin film, produced by sputtering. The diffusion coeff is expected to be different in such a film, from its value in bulk Pd. It was determined in the temp. range 278-323 K by electrochemical stripping of the charged film. The boundary condition here is zero H₂ concentration at the Pd surface, during stripping. Maximum loading was inferred to have been about 0.8. D (298K) was $3.8 \times 10^{-11} \text{ m}^2/\text{s}$, in good agreement with previously found values for the bulk metal. D was dependent on film thickness up to about 0.7 mu, and constant therefrom. Thinner films -> smaller D values.

- P.Han1997** Han, J. N.; Pyun, S. I.; Yang, T. H. (1997). Roles of thiourea as an inhibitor in hydrogen absorption into palladium electrode. *J. Electrochem. Soc.*, 144:4266–4272.
ANNOTATION: Surfactants have attracted some attention in electrochemical loading of deuterium into Pd, and this is a fundamental study.
- P.Har11990b** Harley, D.; Mueller, B.; Rafelski, J. (1990a). Muon catalyzed fusion of nuclei with $Z > 1$. *J. Phys. G: Nucl. Part. Phys.*, 16:281–294.
ANNOTATION: The process involved in muon catalysis was investigated for H isotopes with light nuclei $Z > 1$, to identify those where there is at least one fusion per muon. Necessary conditions were established. (Chem. Abstr. 112:106504 (1990))
- P.Har11990a** Harley, D.; Mueller, B.; Rafelski, J. (1990b). Time independent description of the t(d,n)alpha fusion reaction in the presence of a muon. *Z. Phys. A*, 336:303–312.
ANNOTATION: Theory. Gives a good list of references on muon catalysed fusion.
- P.Hira1990** Hirai, E.; Matsuoka, N.; Takashima, Y. (1990). Volume reduction and tritium retention factor in electrolytic enrichment of water. *Radioisotopes (Hoshasen)*, 39:503–506.
ANNOTATION: "Volume reduction (N), tritium retention factor (R), tritium concentration factor (Z) and apparent separation factor (beta) were measured on the large and small electrolytic cell systems. The relative variation of R was smaller than that of Z. So, it is recommended to use R in calculation of tritium concentrations in water samples. Furthermore, it was empirically revealed that R can be obtained only from N if a reliable beta-value is previously known. Therefore, it is possible to obtain R without electrolysis of the tritium standard solution. Taking into account the above facts, the so-called non-spike analysis of tritium, in which electrolytic enrichment and liquid scintillation counting are combined, becomes practicable." (Quoted from English summary)
- P.Hoar1955** Hoare, J. P.; Schuldiner, S. (1955). Mechanisms of hydrogen producing reactions on palladium. *J. Electrochem. Soc.*, 102:485–489.
ANNOTATION: Fundamental study.
- P.Hoar1956** Hoare, J. P.; Schuldiner, S. (1956). Mechanisms of hydrogen producing reactions on palladium. III. Hydrogen overvoltage on the polarization and diffusion sides of a cathode-diaphragm. *J. Electrochem. Soc.*, 103:237–241.
ANNOTATION: Fundamental study.
- P.Hoff1986** Hoffmann, B.; Baumann, H.; Rauch, F. (1986). Hydrogen uptake by palladium-implanted titanium studied by NRA and RBS. *Nucl. Instrum. Methods Phys. Res. B*, 15:361–366.
ANNOTATION: Ti has an oxide layer, which prevents the uptake of H₂. So they implanted a Pd layer to prevent surface oxidation and this facilitated H-absorption greatly. They measured [H] profiles in the metal by Rutherford back-scattering spectroscopy (RBS) and nuclear reaction analysis (NRA). These were not the profiles expected from simple diffusion into the bulk, and they conclude that a surface reaction is rate limiting (compare the Brauer et al papers). They measured a maximum loading of 62 at%.
- P.Hu1995** Hu, C. C.; Wen, T. C. (1995). Effects of pH and anion on hydrogen sorption/desorption at/within oxide-derived Pd electrodes. *J. Electrochem. Soc.*, 142:1376–1383.
ANNOTATION: Fundamental work, despite citation of some CNF papers (e.g. F&P). The Pd electrodes used were a film on Ti supports, produced by dipping the Ti into a solution of PdCl₂ in isopropanol and firing in air at reduced pressure, then reducing cathodically to the metal. A large number of cyclic voltammograms were taken, in various electrolytes, to investigate possible anion effects on sorption of hydrogen to and into the Pd. The existence of alpha and beta phases was confirmed. Beta phase formation is inhibited increasingly by the presence of the anions (in order) acetate, chloride, hydrogen sulphate, perchlorate, oxalate and dihydrogen phosphate.
- P.Huke2006** Huke, A.; Czerski, K.; Dorsch, T.; Biller, A.; Heide, P.; Ruprecht, G. (2006). Evidence for a host-material dependence of the n/p branching ratio of low-energy d+d reactions within metallic environments. *Europhys. J. A*, 27(s01):187–192.
ANNOTATION: In normal plasma dd fusion, there is an equal probability of outcomes leading to neutron and proton emission, i.e. that the fusion products are either tritium and a proton, or 3-helium and a neutron. The branching ratio of these two is 1. There is an additional path, to 4-helium and a gamma particle, whose frequency is 10⁻⁷. It has been argued that this last one is enhanced in cold fusion, to being almost the only reaction. It is therefore of interest whether these branching ratios can be influenced by the environment in which the fusion takes place. This team examined the n/p ratio under self-targeting condition, where deuterons at below 20 keV are aimed at metal deuterides. The n/p ratio is observed indeed to depend on the beam energy to some extent, dipping to about 0.85 at 8 keV.
- P.Huke2008** Huke, A.; Czerski, K.; Heide, P.; Ruprecht, G.; Targosz, N.; Zebrowski, W. (2008). Enhancement of deuterium-fusion reactions in metals and experimental implications. *Phys. Rev. C*, 78:015803–1–015803–20.
ANNOTATION: Experimental study, trying to make sense of the various reports of enhancement of the fusion rate in different metals. The experiments were done at keV levels. It is not clear yet what the situation is, more work needed.
- P.Ibis1998** Ibisson, M. (1998). "The Grand Unified Theory of Classical Quantum Mechanics" by Dr. Randall L. Mills. *J. Sci. Expl.*, 12:621–624. Book review.
ANNOTATION: Ibisson reviews the Mills book, and finds it wanting.

- P.Ichi1995** Ichimaru, S.; Kitamura, H. (1995). Enhanced pycnonuclear reactions in ultrahigh-pressure metals. *J. Phys. Soc. Jpn.*, 64(7):2270–2273.
 ANNOTATION: Theoretical look at the possibility of fusion by ultracompression of a solid metal - "pycnonuclear" reaction. High pressure might enhance the electron screening of nuclei from each other. A dense binary-ionic substance is considered. The authors suggest realistic parameters that might yield measurable fusion rates. The paper was written in the context of stellar processes.
- P.Inoz1993** Inozemtsev, M. V.; Neumin, A. D.; Palkin, A. P. (1993). Solid protonic electrolytes and equilibrium potentials of hydrogen electrodes in electrochemical cells based on them. *Ionika Tverd. Tela*, pages 81–116. In Russian.
 ANNOTATION: 35 page long paper on solid proton conductors.
- P.Iyer1990** Iyer, R. N.; Pickering, H. W. (1990). Mechanism and kinetics of electrochemical hydrogen entry and degradation of metallic systems. *Annu. Rev. Mater. Sci.*, 20:299–338.
 ANNOTATION: A large review with 177 references. Hydrogen embrittlement has been a concern of metallurgists for a long time. The basic electrochemical and chemical processes of entry of hydrogen into the metal are discussed here. This should be read by cold fusion experimenters.
- P.Jaks1994** Jaksic, M. M.; Johansen, B.; Tunold, R. (1994). Electrochemical behaviour of rhodium in alkaline and acidic solutions of heavy and regular water. *Int. J. Hydrogen Energy*, 19:35–51.
 ANNOTATION: Cold fusion suggests investigation of other transition metals' electrochemical behaviour, in particular Rh, which is quite similar to Pd. Jaksic, an expert in isotope separation, and the other authors here report an extensive study of this metal in various electrolytes, using cyclic voltammetry. It is found that Rh absorbs large amounts of hydrogen and deuterium from alkaline and acidic solution; there are other findings.
- P.Jerk1994b** Jerkiewicz, G.; Borodzinski, J. J.; Chrzanowski, W.; Conway, B. E. (1994). Examination of factors influencing promotion of H absorption into metals by site-blocking elements. *Proc. Electrochem. Soc.*, 94-21:44–62.
 ANNOTATION: Fundamental study of surface active substances' effect on the reaction of hydrogen at metal surfaces.
- P.Jerk1994a** Jerkiewicz, G.; Zolfaghari, A. (1994). Comparison of hydrogen electroadsorption from the electrolyte with hydrogen adsorption from the gas phase. *Proc. Electrochem. Soc.*, 94-21:31–43.
 ANNOTATION: Fundamental study.
- P.Koba1990** Kobayashi, M. (1990). Decrease in deuterium content of heavy water in contact with air. *Annu. Rep. Res. Reactor Inst., Kyoto Univ.*, 23:188.
 ANNOTATION: Heavy water in contact with air containing light water vapour rapidly becomes contaminated with it. K investigated the speed of this process and found that a sample of D₂O open to the air at 21.5 degC and 70% humidity went from an initial 97.7 at% D to 13% in about 10 hours; the process has a half life of about 3 h. Temperature and humidity (and undoubtedly, convection of the air) all affect the exchange rate. There is also an apparently rapid equilibrium, H₂O + D₂O → 2 HDO, so that after the 10 hours, only 1.6% of the water was in the form of D₂O, 20.8% present as HDO.
- P.Kole1993** Kolesnichenko, I. I.; Michri, A. A.; Pshenichnikov, A. G. (1993). Acceleration of hydrogen transport through palladium membranes. *Sov. Electrochem.*, 29:622–630.
 ANNOTATION: Palladium membranes are useful for low temperature electrochemical systems and fuel cells, and it would be useful to be able to speed up the transport of hydrogen through them. This paper examines some possibilities. First the fundamental processes taking place at the interface are outlined; then some experiments with strongly adhering disperse Pt and Rh layers deposited on the Pd surface are reported. Up to 20-fold transport increases were achieved.
- P.Krap1992** Krapivnii, N. G.; Kleshya, V. B.; Sobornitskii, V. I. (1992). Calculation of the finite rate of the spread of hydrogen concentration during its diffusion into metals. *Elektrokhimiya*, 28:451–455.
 ANNOTATION: The mathematics of this process is examined, solving the hyperbolic partial differential equations under the special boundary conditions for electrolytic charging.
- P.Krap1982** Krapivnyi, N. G. (1982). Use of electrochemical extraction to study hydrogen entry into metals. *Sov. Electrochem.*, 18:1040–1044.
 ANNOTATION: This paper has been quoted by cold fusion workers in the context of in-situ measurement of the loading factor D/Pd. The paper in fact measures the uptake of hydrogen (isotope) by any metal by reversing the current (making the metal the anode) and integrating the reoxidation current. This is a kind of destructive measurement, and probably not suitable for cold fusion work.
- P.Kuzn1989** Kuznetsov, V. A.; Lipson, A. G.; Klyuev, V. A.; Sakov, D. M.; Toporov, Yu. P.; Simakov, Yu. S. (1989). Size reduction of metal-halide crystals. *Bull. Acad. Sci. USSR. Div. Chem. Sci.*, 37(7):1340. Orig. in: *Izv. Akad. Nauk. SSSR, Ser. Khim.* 37(7) (1989) 1466.
 ANNOTATION: This work measures the surface area of various alkali metal halide crystal particles undergoing crushing in a ball mill. S rises to a maximum and stays there. This is related to the L-factor, which is the energy required to compress a unit mass of the crystal to the size of the unit cell. From this, the maximum S for a new crystal can be predicted.
- P.Lang1989** Langmuir, I. (1989). Pathological science. *Physics Today*, (October):36–48.
 ANNOTATION: This is a reprint of an earlier talk Langmuir gave in 1953. He describes the characteristics of pathological science.
- P.Law1990** Law, S. (1990). Electrons switch on to heavy metal. *New Scientist*, 126:57–60.
 ANNOTATION: In some alloys - notably UPt(3) and CeCu(2)Si(2), among others, there seem to be electrons with an enhanced effective mass and these alloys are called heavy-electron superconductors. "It appears

that the positive metal lattice slows down the motion of the electrons to such an extent that they can scatter strongly from one another. This novel scattering produces a 'dynamic' contribution to the electrical potential the the electron feels. It is the principle of the origin of the enormous mass of the quasiparticles". No references are given but the workers in this area are named.

P.Li1996 Li, Y.; Cheng, Y. T. (1996). Studies of metal hydride electrodes using an electrochemical quartz crystal microbalance. *J. Electrochem. Soc.*, 143:120.

ANNOTATION: As did Cheek & O'Grady (see regular CNF paper file), these authors noted stress effects on the QCM oscillating frequency. They used the LaNi₅/hydrogen system. In contrast to the other team, however, they were able to separate the mass and stress effects.

P.Lib01993 Liboff, R. L. (1993). Feasibility of fusion of an aggregate of deuterons in the ground state. *Phys. Lett. A*, 174:317–319.

ANNOTATION: Motivated by controlled thermonuclear fusion, Liboff suggests the use of a circular or collimated beam of deuterons in the ground state. Such a beam can be compressed by an external magnetic field, and may then form a boson condensate; wave function overlap might favour d-d fusion.

P.Link1981 Linke, D. (1981). 5. Die Entdeckung der Platinkatalyse, das Döbereiner-Feuerzeug und seine Verbreitung. In *International Döbereiner-Kolloquium*, pages 21–27. Friedrich-Schiller-University, Jena, DDR. In German.

ANNOTATION: Quoting from original sources, Linke here reports Döbereiner's discovery of the 'cigarette lighter effect', i.e. the catalysis of burning of hydrogen in air at the surface of Pt or Pd, in 1923.

P.Lips1997 Lipson, A. G.; Lyakov, B. F.; Sakov, D. M.; Kuznetsov, V. A. (1997). Suppression of the scattering of conduction electrons by lattice phonons in palladium in the presence of small hydrogen (deuterium) inclusions. *Phys. Solid State*, 39:1891–1894.

ANNOTATION: Measured the conductance of Pd, Pd loaded with hydrogen (deuterium) and deloaded again, over a range of temperatures T from a few K to about 300K. At the low end, for PdH(0.72), there is a resistance maximum with T. The team concludes that this is due to clusters of quasimetallic hydrogen forming.

P.Maiz1992 Maizza, G.; Nakamura, K.; Fujitsuka, M.; Kitajima, M. (1992). Study on deuterium absorption of Pd at high-pressure D₂ gas and low temperatures. *Nuovo Cimento D*, 14:27–32.

ANNOTATION: Measured absorption by the resistivity of the Pd at some temperatures. This is a function of the loading. Absorption was found to be dominated by surface processes.

P.Mamy1978 Mamyrin, B. A.; Khabarin, L. V.; Yudenich, V. S. (1978). Anomalously high isotope ratio ³He/⁴He in technical-grade metals and semiconductors. *Sov. Phys. Dokl.*, 23:581.

ANNOTATION: Looked at 18 elements, from all the groups of the periodic table, and used mass spec to measure these ratios. These varied from 0.001 to 1, albeit at low levels. The authors speculate as to the origin of ³He and suggest that it comes from tritium decay by natural cold fusion over a very long period.

P.Mart2010 Martin, B. (2010). How to attack a scientific theory and get away with it (usually): the attempt to destroy an origin-of-AIDS hypothesis. *Science as Culture*, 19:215–239.

ANNOTATION: * Mainly on AIDS but does mention CNF peripherally. New ideas are sometimes attacked in a manner that is not consistent with perceived scientific behaviour. The example is the controversy between the bush meat and polio vaccine theories of AIDS.

P.Math1990 Mathews, T.; Venkatesan, D. (1990). Unique series of increases in cosmic-ray intensity due to solar flares. *Nature*, 345:600–602.

ANNOTATION: This paper states that the second half of 1989 was the most prolific period of particle production by the Sun since monitoring began in 1957. Flares lasting several hours are pictured, and a table given of the dates and times and intensities. Six such events are listed. Attas et al, *Nature* 344 (1990) 390 have correlated such flares with neutron bursts observed in their "cold fusion" cells, so these data should be noted by cold fusion researchers.

P.McBr1990 McBreen, J. (1990). Absorption of electrolytic hydrogen and deuterium by Pd: the effect of cyanide adsorption. *J. Electroanal. Chem.*, 287:279–291.

ANNOTATION: It is well known that substances that adsorb at an electrode may affect electrochemical reactions taking place at that electrode; in this case, CN⁻ ions adsorption affects oxide formation and ingress of hydrogen or deuterium at Pd, as well as inhibiting egress of these gases. Li⁺ aids ingress of H or D, in relation to Na⁺.

P.McBr1992 McBreen, J. (1992). Electrolytic hydrogen-metal interactions. *Electrochem. Soc. Proc.*, 92-5:248–257.

ANNOTATION: Some stuff of interest to CNF experimenters.

P.Meng1995 Mengoli, G.; Fabrizio, M.; Manduchi, C.; Milli, E.; Zannoni, G. (1995). Absorption-desorption of deuterium at Pd₉₅%-Rh₅% alloy. I: environment and temperature effects. *J. Electroanal. Chem.*, 390:135–142.

ANNOTATION: Using both metal/D₂ gas and electrolysis systems, the team investigates the deuterium uptake of the title alloy, at some temperatures. Gas loading was at 900 mbar, going from 900 C down to 20 C while measuring pressure to determine deuterium loading. For electrolysis, various ionic strengths of LiOD were used and loading measured by anodic extraction. Higher loadings than for pure Pd, up to 0.89 (D/Me) or 0.94 (D/Pd) for the gas phase, and 0.92 (D/Me) or 0.97 (D/Pd) for electrolysis were achieved. Absorption is achieved only below about 50 C. With electrolysis, high alkalinity favoured loading.

P.Meye1979 Meyer-ter-Vehn, J. (1979). Catalysed fusion processes. *Phys. Bl.*, 35:211. In German.

ANNOTATION: A description and historical review of hydrogen fusion catalysed by muons, heavy leptons and quarks - the latter being speculative. Frank suggested muon catalysed fusion in 1947; this was discussed again by Sakharov in 1948, and proved by Alvarez in 1958, then later taken up by Rafelsky and Jones. The author discusses various possibilities of making practical use of the process, e.g. in combination with laser fusion, etc.

- P.Mizu1995 Mizuno, T.; Enyo, M. (1995). Hydrogen absorption and hydride formation in Ti during cathodic electrolysis. *Denki Kagaku*, 63:719–725. In Japanese, Engl. abstract.
ANNOTATION: Fundamental work, but citing the original CNF papers of F&P and Jones et al of 1989. Scanning electron microscopy was used, as well as other methods. It was possible to obtain concentration profiles of hydrogen near the Ti surface and these were dependent on parameters such as current density and temperature. The mechanism of water reduction at Ti is discussed.
- P.Moor1939 Moore, G. A. (1939). The comporment of the palladium-hydrogen system toward alternating electric current. *Trans. Electrochem. Soc.*, 75:237–269.
ANNOTATION: Moore measured the impedance spectrum of some Pd wires electrolytically hydrated, in order to get an idea of the form of hydrogen in the metal. From certain experimental observations, it seemed that conduction in PdH is carried in part by ionised hydrogen in cracks and voids, and the impedance might throw light on this. Results bear this out, so it appears that there is ionised hydrogen in rifts and voids, carrying a large part of the current. Thus, the hydride does not obey Ohm's law. One sample of hydrogen-loaded Pd wire had been kept for 11 years, and was found to be still loaded with about 270 volumes of hydrogen. Moore is interested in the very high electrical capacity in the metal hydride, but this is parallel with a conductance and so not useful as a capacitor.
- P.Mouz1990 Mouze, G.; Ythier, C. (1990). Les nucleons de valence et la fission nucleaire asymetrique. *Rev. Roum. Phys.*, 35:563–577. In French.
ANNOTATION: Among other things, this paper discusses the production of transuranium elements such as 108, by the bombardment of, say, Pb or Bi with ion beams of Ar or Fe. In some cases, these will fuse to the super-heavies, and some of these processes have apparently been dubbed 'cold fusion' by some workers. It may be that energies like 300 MeV are low, compared to those usually used, and that this gave rise to the term. It is interesting as an example of prior use of 'cold fusion'.
- P.Naga1989 Nagamine, K. (1989). Muon catalyzed fusion. *Kagaku (Kyoto)*, 44:653. In Japanese.
ANNOTATION: Not strictly on cold fusion but might be of interest anyway, being a review with 6 references of muon catalysed fusion experiments. Muons have been invoked (and revoked) at times as an explanation for CNF. (Direct quote from Chem. Abstr. 111:241547 (1989)).
- P.Nait1998 Naito, S.; Yamamoto, M.; Doi, M.; Kimura, M. (1998). High-temperature diffusion of hydrogen and deuterium in titanium and Ti3Al. *J. Electrochem. Soc.*, 145:2471.
ANNOTATION: A fundamental study with interesting results and discussion.
- P.Naka1989 Nakahara, S.; Okinaka, Y. (1989). Defects induced in copper by cathodic charging of hydrogen. *J. Electrochem. Soc.*, 136:1892.
ANNOTATION: Not only Pd and Ti are affected by hydrogen. Although Cu does not swallow H (or D) wholesale, as do Ti and Pd, it does allow enough into its surface layers to do damage to the crystal structure.
- P.Nara2005 Naranjo, B.; Gimzewski, J. K.; Putterman, S. (2005). Observation of nuclear fusion driven by a pyroelectric crystal. *Nature*, 434:1115–1117.
ANNOTATION: This team found that heating up a pyroelectric crystal can produce voltage fields of hundreds of keV, sufficient to generate ion beams, and they measured fusion products arising from these. This is sometimes mentioned in connection with cold fusion, but is in fact hot.
- P.Numa2000 Numata, H.; Ohno, I. (2000). In situ potentiometric, resistance, and dilatometric measurements of palladium electrodes during repeated electrochemical hydrogen absorption. *Fusion Technol.*, 38:206–223.
ANNOTATION: A long-term electrolysis experiment, measuring Pd resistance and deformation, as well as resting potentials, was carried out, without any attempt at detection of possible nuclear emissions, or excess heat. Thus this paper is deemed a peripheral.
- P.Ohmo1991 Ohmori, T.; Sakamaki, K.; Hashimoto, K.; Fujishima, A. (1991). Ex situ observation of electrochemically hydrogenated palladium using a scanning tunnelling microscope. *Chem. Lett.*, pages 93–96.
ANNOTATION: An expensive and nifty tool was used here to find that palladium undergoes lattice expansion and acquires a nodule-like surface structure, upon being hydrogenated by electrolysis.
- P.Olip1934 Oliphant, M. L.; Harteck, P.; Rutherford (1934). Transmutation effects observed with heavy hydrogen. *Nature*, 133:413.
ANNOTATION: A beam of diplons - i.e. deuterons - were shot at ammonium salts and phosphoric acid, in which hydrogen has been replaced by deuterium. While beams of protons H⁺ show no results, the diplon beam causes an intense emission of fast protons and neutrons, at about 3MeV energies. The authors show that two fusion reactions, leading to, respectively, (3)He and the new species (3)H or tritium, take place. They note that both species appear to be stable. Interestingly, they also note that the tritium-producing reaction is "less frequent" than the one producing (3)He and protons.
- P.Oliv2006 Oliveira, M. C. F. (2006). A new approach to prepare highly loaded palladium. *Electrochem. Commun.*, 8:647–652.
ANNOTATION: The new approach consists of using hypophosphite ion as a source of hydrogen. A black Pd film is made by acid cleaning a Ni surface and dipping it into a PdCl₂ solution. Some Ni dissolves, and Pd deposits. The Pd film does contain some redeposited Ni however. The Pd is loaded with hydrogen by dipping into a hypophosphite solution. It is known that this substance is unstable and its decomposition is catalysed by Pd, giving hydrogen and phosphite. The hydrogen enters the Pd, and from electrochemical measurements on the loaded Pd, the authors conclude loadings > 1 (H/Pd).

- P.Pard1980 Pardee, W. J.; Paton, N. E. (1980). Model of sustained load cracking by hydride growth in Ti alloys. *Metallurgical Trans. A*, 11:1391–1400.
ANNOTATION: Is concerned with hydrogen embrittlement of Ti alloys, and develops models for the propagation speed of embrittlement cracks. Along the way, they quote the diffusion coefficient of hydrogen in the alpha phase (i.e. low H) at elevated temperatures as $0.018 \exp(-0.537\text{eV}/(\text{atom}\cdot\text{kT}))$ or $0.031 \exp(-0.638/(\text{atom}\cdot\text{kT}))$, which may be useful to someone.
- P.Pine1983 Pine, D. J.; Cotts, R. M. (1983). Diffusion and electrotransport of hydrogen and deuterium in vanadium-titanium and vanadium-chromium alloys. *Phys. Rev. B*, 28:641–647.
ANNOTATION: Measured diffusional and electrotransport charge number Z^* for H and D in these alloys as a function of time. Basic data of possible relevance.
- P.Powe1991 Powell, G. L.; Kirkpatrick, J. R. (1991). Surface conductance and the diffusion of H and D in Pd. *Phys. Rev. B*, 43:6968–6976.
ANNOTATION: A good paper for references to the diffusion of hydrogen isotopes in Pd. The authors measured the diffusion coefficient for H and D in a Pd sphere, at a range of temperatures and taking into considerations finite surface conductance, i.e. speed of transfer from the gas phase to the solid. A mathematical model is used to fit the experimental data, and plots of diffusion coefficients vs $1/T$ are presented. At ambient temperatures, the finite surface conductance plays a role, while at higher temperatures, a simple diffusion model does just as well. The implications for cold fusion experiments are that charging times can be expected to be marginally longer than calculated from a simple diffusion model - but not by much.
- P.Rafe1987 Rafelski, J.; Jones, S. E. (1987). Cold nuclear fusion. *Scientific American*, (July):66–71.
ANNOTATION: This is a very clear description, including some of the prehistory, of muon-catalysed fusion of hydrogen isotopes - the process which, long before 1989, got the name "cold (nuclear) fusion". There is some discussion of some of the determinants of commercial utility of the process.
- P.Robi1990 Robinson, S. L.; Moody, N. R.; Myers, S. M.; Farmer, J. C.; Greulich, F. A. (1990). The effects of current density and recombination poisons on electrochemical charging of deuterium into an iron-base superalloy. *J. Electrochem. Soc.*, 137:1391–1397.
ANNOTATION: Hydrogen embrittlement is an important problem with metals such as steels. To test alloys, a favourite method is to surface-charge it electrolytically with hydrogen, preferably at constant current. In this investigation, loading profiles down to 3 microns are measured for poisoned and unpoisoned IN903 superalloy. The deuterium isotope is used to enable the profile measurement, done by nuclear reaction analysis, after removal of the specimen from the electrolyte (1N D₂SO₄ in D₂O). In the presence of the poison (5 mg/l NaAsO₂), a greater loading was achieved, due to the poison's preventing the formation of D₂ gas bubbles from the adsorbed deuterium atoms formed from the primary electrochemical step. The profiles clearly showed some near-surface deuterium loss during the move from cell to the vacuum chamber where the profile was measured, but allows an inference of surface deuterium concentration during charging.
- P.Rous1994 Rousar, I.; Riedel, T. (1994). Sparking at cathode tools during electrochemical machining in flow-through cells. *J. Appl. Electrochem.*, 24:767–771.
ANNOTATION: If the ecm current is raised too much, sparking is one of the undesirable things that will happen. The paper has a good description of what happens at high current densities, and might be of peripheral interest to CNF electrolysis, where local cd's just might attain these levels.
- P.Rous1992 Rousseau, D. (1992). Case studies in pathological science. *Amer. Sci.*, 80:54–63.
ANNOTATION: The author describes several cases of PS, among them cold fusion, polywater, homeopathy.
- P.Salp1998 Salpeter, E. E. (1998). Hydrogen in strong magnetic fields in neutron star surfaces. *J. Phys.: Condens. Matter*, 10:11285–11288.
ANNOTATION: In strong magnetic fields polyatomic hydrogen is stable, and at high densities, can fuse in a pycnonuclear reaction, the "real cold fusion".
- P.Salv1991 Salvarezza, R. C.; Montemayor, M. C.; Fatas, E.; Arvia, A. J. (1991). Electrochemical study of hydrogen absorption in polycrystalline palladium. *J. Electroanal. Chem.*, 313:291–301.
ANNOTATION: This team used cyclic voltammetry and an impedance analyser to investigate the mechanism and kinetics of electrolysis at Pd in 0.1M NaOH. There are some good references, e.g. Breiter (1978) on the mechanism. No really useful conclusions are reached but an attempt is made to throw light on the rate of loading of hydrogen into Pd.
- P.Schu1956 Schuldiner, S.; Hoare, J. P. (1956). Mechanisms of hydrogen producing reactions on palladium. *J. Electrochem. Soc.*, 103:178–181.
ANNOTATION: Fundamental study.
- P.Senj1997 Senjuh, T.; Kamimura, H.; Uehara, T.; Sumi, M.; Miyasita, S.; Sigemitsu, T.; Asami, N. (1997). Experimental study of electrochemical deuterium loading of Pd cathodes in the LiOD/D₂O system. *J. Alloys Compds.*, 253-254:617–620.
ANNOTATION: Another fundamental study without direct reference to CNF. Loading was monitored by four-wire resistance measurement and up to 0.95 or so was achieved. Prior heat treatment at 1000C was favourable, and so was a loading current program of increasing current density, repeated loading and prior etching with aqua regia and diamond polishing.
- P.Shea1990 Shea, M. J.; Compton, R. N.; Hettich, R. L. (1990). Laser ablation studies of palladium electrolytically loaded with hydrogen and deuterium. *Phys. Rev. A*, 42:3579–3586.
ANNOTATION: This is not cold fusion but akin to inertial confinement: a laser pulse is shot at PdD or PdH prepared by electrolysis, and the resulting plasma studied by mass spectrometry. The expected species like H⁺, H₂⁺ etc are found. There is no mention of fusion, cold or otherwise.

- P.Skib1990 Skibbe, U.; Neue, G. (1990). A 2D-NMR method to study near-surface regions of conductors. *Colloids Surf.*, 45:235–242.
 ANNOTATION: A method is described, and applied to the study of surface layers of PdD; the authors point out that the work was started before cold fusion became public knowledge, and that they do not want to contribute to that area. Pd foil was "completely saturated" with D by electrolysis in acid solution, giving a D/Pd loading of 0.66. The results show that there is a higher loading at and near the surface. Also, a diffusion coefficient of D in the bulk is given as $2.3 \times 10^{-10} \text{ m}^2/\text{s}$, with a reference.
- P.Stor1998 Storms, E. (1998). Formation of beta-PdD containing high deuterium concentration using electrolysis of heavy-water. *J. Alloys Compds.*, 268:89–99.
 ANNOTATION: Electrolysis, at a number of current densities and temperatures, at 90 Pd platelets ($1 \times 2 \times 0.1 \text{ cm}^3$) in 0.3M LiOD, in a closed cell with recombiner. This allowed accurate measurement of the oxygen evolved, and thus the degree of D loading into the Pd. A number of interesting results were obtained, some unusual (e.g. loading efficiency is greatest at the higher currents), and conclusions were drawn about surface effects, cracks, uneven loading etc.
- P.Szaf1972 Szafranski, A. W.; Baranowski, B. (1972). The electrical resistance of the Pd-Ag-H system at 25 degC in a wide range of hydrogen pressure. *Phys. Stat. Solidi (a)*, 9:435–447.
 ANNOTATION: Anyone trying to measure the loading of hydrogen (or deuterium) into Pd or its alloys by its resistance must read this paper, which presents calibration curves and discussion.
- P.Szpa1994a Szpak, S.; Mosier-Boss, P. A.; Gabriel, C. J. (1994a). Absorption of deuterium in palladium rods: model vs. experiment. *J. Electroanal. Chem.*, 365:275–281.
 ANNOTATION: Investigation by Riley of the dynamics of charging of Pd with hydrogen, and comparing with the present authors' model gave agreement. Here, the same authors refine their charging model on the basis of Riley's results.
- P.Szpa1995 Szpak, S.; Mosier-Boss, P. A.; Scharber, S. R.; Smith, J. J. (1995). Cyclic voltammetry of Pd + D codeposition. *J. Electroanal. Chem.*, 380:1–6.
 ANNOTATION: Some basic research on the reduction of heavy water at Pd, deposited from solution along with the reduction of water. A gold cathode is used as base, to contain the deuterium formed. The technique used is CV, and the authors draw some mechanistic conclusions.
- P.Szpa1994b Szpak, S.; Mosier-Boss, P. A.; Smith, J. J. (1994b). Deuterium uptake during Pd-D codeposition. *J. Electroanal. Chem.*, 379:121–127.
 ANNOTATION: A fundamental study, using the trademark of this team, Pd deposition along with deuterium evolution. Electrode kinetics and mechanisms, as well as the structure of the interphase, are looked at.
- P.Trip2000 Tripodi, P.; McKubre, M. C. H.; Tanzella, F. L.; Honnor, P. A.; Di, Gioacchino.; Celani, F.; Violante, V. (2000). Temperature coefficient of resistivity at compositions approaching PdH. *Phys. Lett. A*, 276:122–126.
 ANNOTATION: Electrochemical loading of hydrogen into Pd, and measurement of the resistance as a function of loading, all at various temperatures. This could be useful background data.
- P.Tsir1993 Tsirlina, G. A.; Rusanova, M. Yu.; Petrii, O. A. (1993). Comparative studies of the sorption of deuterons and protons by palladium from acid solution. *Elektrokhimiya*, 29:469–471. In Russian.
 ANNOTATION: No doubt prompted by reports of 'cold fusion', this paper is nevertheless a fundamental electrochemical study of hydrogen behaviour at Pd, by current interruption and cyclic voltammetry. Hydrogen and deuterium differ in their behaviour.
- P.Tuno1990 Tunold, R.; Johansen, B.; Jaksic, M. (1990). Electrochemical behaviour of deuterium and protium on transition metals in alkaline solutions. *Adv. Hydrogen Energy*, 8:711–725. In: Hydrogen Energy Prog., Vol. 2.
 ANNOTATION: The behaviour of transition metal electrodes of Re, Pt, Pd, Ir, Ni and Au was examined by means of potential sweep electrolysis in both light and heavy water containing NaOH or NaOD. The voltammograms showed large differences between H and D; up to 400 mV for certain peaks. The usual assumption that there are just small differences does not hold up, due no doubt to the large 2:1 difference between the atomic weights of D and H. Heavy water is the stronger oxidising agent of the two, and the evolution of deuterium commences at higher (negative) potentials than that of hydrogen.
- P.Turn1978 Turner, P. J.; Pritchard, H. O. (1978). Calorimetric study of an electrochemical reaction. *Can. J. Chem.*, 56:1415.
 ANNOTATION: Gives some useful hints on a technique not often used, they say.
- P.Wark1996 Wark, A.; Crouch-Baker, S.; McKubre, M. C. H.; Tanzella, F. L. (1996). The effect of ultrasound on the electrochemical loading of hydrogen in palladium. *J. Electroanal. Chem.*, 418:199–204.
 ANNOTATION: Since the 50's and 60's, where two works described the effects of ultrasound on an electrochemical cell and attempted to provide a theory, not much work has been done with this until recently. The present authors decided to look at the effect on the electrolysis of water at a Pd cathode and the hydrogen loading in the metal. As reported in the old papers, the irradiation lowered cell voltage and the loading; and stopping the irradiation only restored the pre-irradiation condition after either long electrolysis, or a short burst of anodic polarisation. The authors were able to tie the ca. 30-50 mV of cell voltage change upon irradiation, to adsorbed hydrogen, known to play an important role in the process at the Pd cathode. Other adsorbed species may also play a role; further work is needed.
- P.Wiln1948 Wilner, T. (1948). Nuclear-physical experiments with simple means. *Elementa*, 31:13. In Swedish.
 ANNOTATION: TW, in his spare time, put together an ion beam setup, constructed from obsolete lab gear and some common household items such as a cycle frame tube, a kitchen heating plate and a football bladder ("used much like a bagpipe"). As a warm-up, he bombarded a Li target with protons at 13 kV (keV?), and detected the alpha particles with a scintillation layer of a mineral containing ZnS (using a

watchmakers' loupe). He then made deuterium by electrolysing heavy water and used this for a deuterium beam, which he aimed at a heavy water target mixed with P₂O₅ (in order to keep down the pressure), and detected the ensuing neutrons with a LiF detector. He also tried activation of In by the neutrons, which produces the isotope (116)In, decaying to tin. The deuterium beam experiment foreshadows the "self-targeting" experiments of the 1950's, and the indium attempt reminds of the modern technique of neutron activation analysis.

- P.Yama2002** Yamaura, S.; Sasamori, K.; Kimura, H.; Inoue, A.; Zhang, Y. C.; Arata, Y. (2002). Hydrogen absorption of nanoscale Pd particles embedded in ZrO₂ matrix prepared from Zr-Pd amorphous alloys. *J. Mater. Res.*, 17:1329–1334.
 ANNOTATION: No mention of cold fusion, but this is probably a description of how the material was made that was used in the Arata & Zhang paper in *J. High Temp. Soc.* 34 (2008) 85. The alloy is oxidised in air, which leaves the Pd in the form of nano-sized particles (10 nm) and the Zr as the oxide. The latter is found not to absorb hydrogen, but the Pd particles do, up to extremely high loading, normally not achievable.
- P.Yama1995** Yamazaki, O.; Yoshitake, H.; Kamiya, N.; Ota, K. (1995). Hydrogen absorption and Li inclusion in a Pd cathode in LiOH solution. *J. Electroanal. Chem.*, 390:127–133.
 ANNOTATION: This paper examines the interesting question of whether Li is inserted along with hydrogen upon electrolysis of LiOH at a Pd cathode. Even with underpotential deposition (UPD), this is not considered possible, but others claim to have observed Li insertion. The present team, too, finds insertion, up to about 7%at (and possibly higher), using SIMS. Assuming plain linear diffusion, the diffusion coefficient of Li in Pd is determined as lying between 10⁻¹⁸ and 10⁻¹⁶ cm²/s, compared with about 10⁻⁷ cm²/s for protons or deuterons. At electrolysis times up to 500 h, Li was found to a depth of 200 nm, with a maximum at about 30 nm (there may have been some surface loss upon removal of the cathode from the solution). Some of the results indicate an effect on hydrogen absorption by the included Li.
- P.Yang1996** Yang, T. H.; Pyun, S. I. (1996). An investigation of the hydrogen absorption reaction into, and the hydrogen evolution reaction from, a Pd foil electrode. *J. Electroanal. Chem.*, 414:127–133.
 ANNOTATION: Similar to previous work by Enyo et al, and Green et al, this looks at the title reactions, for light water only. Rather than work with Tafel curves, this uses impedance measurements. The Heyrovsky reaction is discarded for a start, and only the Tafel-Volmer reaction assumed. From the impedance curves, the reaction rate parameters were obtained by fitting.
- P.Yuki1998** Yuki, H.; Kasagi, J.; Lipson, A. G.; Ohtsuki, T.; Baba, T.; Noda, T.; Lyakhov, B. F.; Asami, N. (1998). Anomalous enhancement of DD reaction in Pd and Au/Pd/PdO heterostructure targets under low-energy deuteron bombardment. *JETP Lett.*, 68:823–829.
 ANNOTATION: Self-targeting work, interesting for its citations of prior work. Targets are deuterium gas, as well as deuterided metals.
- P.Yuki1997** Yuki, H.; Satoh, T.; Ohtsuki, T.; Yorita, T.; Aoki, Y.; Yamazaki, H.; Kasagi, J. (1997). D+D reaction in metal at bombarding energies below 5 keV. *J. Phys. G: Nucl. Part. Phys.*, 23:1459–1464.
 ANNOTATION: This is a self targeting study, shooting deuteron beams at targets of the two metals Yb and Ti in vacuum. The targets were predeuterided. The difference here is that comparatively low beam energies were used, from 2.5 to 6.45 keV. With both metals, the fusion rate decreases markedly with decreasing beam energy. The paper does not however say just what the fusion rates are, they are normalised to those at 6.45 keV, which were checked periodically. Equations and references are given for the actual fusion rate calculations. At low energies, fusion rate was above that calculated and the authors propose enhanced electron screening there, especially for Yb. The ratios, at least down at the lower limit of about 2 keV, are not enough to connect these results with cold fusion.
- P.Zhan1997** Zhang, H.; Zhang, P.; Fang, Z. (1997). Coupling microcalorimetry with electrochemical instruments for thermoelectrochemical research. *Thermochim. Acta*, 303:11–15.
 ANNOTATION: Without any reference to CNF, this paper describes the theory and hardware for a Calvet calorimeter, and the theory of calorimetry of an electrochemical system, and reports results. These appear OK.
- P.Zhan1998a** Zhang, W. S.; Xhang, X. W. (1998). A numerical approach to the voltammograms of a thick plate Pd/H electrode. *J. Electroanal. Chem.*, 445:55–62.
 ANNOTATION: Did digital simulation of hydrogen charging into Pd, considering diffusion and the electrochemical boundary conditions and mechanisms.
- P.Zhan1998b** Zhang, W. S.; Zhang, X. W.; Zhao, X. G. (1998). Voltammograms of thin layer Pd|H(D) electrodes in the coexistence of alpha and beta phases. *J. Electroanal. Chem.*, 458:107–112.
 ANNOTATION: This is a fundamental electrochemical study, finding that during the loading of a Pd film with H or D, there is a clear alpha/beta phase boundary moving across the film. Of interest to CNF people is the fact that two CNF papers (Passel et al, Storms et al) are cited for the science, without reference to CNF as such.
- P.Zhan2002** Zhang, W. S.; Zhang, Z. F.; Zhang, Z. L. (2002). Some problems on the resistance method in the in situ measurement of hydrogen content in palladium electrode. *J. Electroanal. Chem.*, 528:1–17.
 ANNOTATION: Thorough discussion of the title problem. There are temperature effects, coconduction of the electrolyte, internal stress effects, and effects of nonuniformity of loading, that all interfere with loading measurement. Some advice is given.
- P.Zolt2007** Zoltowski, P. (2007). Analysis of electrochemical techniques for studying the diffusion of hydrogen in metals. *J. Electroanal. Chem.*, 600:54–62.
 ANNOTATION: This paper is of interest to cold fusion researchers who are trying to load deuterium into Pd optimally, being a fundamental study of the transport of hydrogen in metals.