A Report from the American Physical Society Spring Meeting - 1-2 May 1989 Baltimore, MD

Special Session on Cold Fusion

Abstract

Beginning on the evening of 1 May 1989, a Special Session on Cold Fusion was held at the American Physical Society Spring Meeting in Baltimore. Representatives from GE Research attended. This report represents the combination of several reports by GE Researchers; at least one of which was written written between 2 and 3 am, immediately following the session.

The session was scheduled for 7:30pm to 12:24am[1] with four invited talks and seventeen contributed talks. One contributed talk was withdrawn prior to the meeting. A full agenda is provided as Appendix I. About 1800 people were in attendance during the four invited talks. This number dropped sharply after the invited talks, and then dwindled to about 100 by the end of the meeting. The meeting ended at 12:28am.

Neither Fleischmann nor Pons attended. Fleischmann was invited as soon as this special session was organized, and said that either he or Pons would try to attend. A few days ago, the conference was notified than both Fleischmann and Pons were too busy to attend.

In summary, the session was characterized by major research groups announcing that they had been unable to confirm the results of F&P. Many also refuted the results of Jones. Not one single group presented data to confirm the F&P cold fusion claims.

1. Invited Speakers

1.1. Jones

Steve Jones, BYU, opened the session with a discussion of his own work, which he emphatically said would NOT lead to a new power source, but does present interesting new physics.

After discussing briefly muon catalyzed fusion and piezo-driven fusion, Jones showed a laboratory notebook from his research group dated 22 May 1986, showing something which looked very much like the electrolytic set-up for a F&P cold fusion cell. They specifically set out to design a neutron detector using a liquid scintillator to slow down the neutrons and Li(6) doped glass in front of 2 PMT's to capture the (thermalized?) neutrons. They somehow got from this an energy spectrum of the neutrons. Fusion neutrons have a characteristic energy at 2.45 MeV. What they ended up seeing was a signal at ~2.5 MeV at about 5.7 standard deviations above the background.[2] Their actual observation rate was 6E-4 sec-1, the efficiency of detection was 1%, so their measured neutron production rate was 0.06 sec-1. He said they checked many controls like using light water and trying the whole thing with zero current on the cell. This appears to be very important. In those controls he only saw the usual background. They also tried some new experiments where they simplified the electrolyte (to an acid of some sort) and saw essentially the same excess

[1] yes, 12:24am exactly

[2] Someone later questioned this and said it may really be more like 2 standard deviations.

neutrons when the thing was on. He said something (we couldn't hear very well) about the palladium plating out on the titanium, which is important.

Jones also said that they are collaborating with researchers in Bolognia, Italy, on their pressurized cold fusion experiments; and with Los Alamos in an effort to confirm the BYU work.[3] In some experiments, Jones used Ti crystals fused together, yielding many rough, sharp points, which he said may be significant. He also roughened the surface of his electrodes with sandpaper, which he also thought was significant. Jones reports small increases in neutron flux above background, and ran three types of controls:

1. No current;
2. Light Water; and
3. No ''Salts.''

His main conclusions were that they *DO* see cold fusion, yielding ~0.4 fusions/sec (equivalent to 10e-13 Watts). He said this scales to the FP claims as 1 dollar is to the national debt. Useful energy production is a LONG way off, but there *IS NEW PHYSICS* there to be studied. During the questions and answers, Jones said that with all the salts present, there could be some plating out on the electrode thus decreasing the absorption of deutirium. Perhaps, he said, people are waiting *too* long to look for the neutrons.[4]

Jones' data were challenged by Morrison of CERN, who said Jones had overstated the statistical significance of his data.

This summarizes the most optimistic outcome of the entire session. Whether it's 2 or 5.7 standard deviations, if it is reproducible then it does seem to indicate *SOMETHING*, perhaps cold fusion, is possible in metals, though at an extremely low rate. One other speaker mentioned the possibility of looking for the K-alpha x-ray emission from Pd as a signal of fusion. Most of the other papers represent essentially gloomy forecasts on the whole predicament. It may be time for most people to sit back and let Los Alamos (with Pons' collaboration) either reproduce or repudiate the F&P results. On the other hand it's possible, even if F&P are wrong (and it sure looks that way), that some good will have come out of all this: people may be inspired now to look in completely new directions. After all, some of the possible ideas (boson condensation, screening, etc.) that have been touted to explain this cold fusion in a metal do not sound so terribly off base. And there still are the Jones' results to contend with. Perhaps now research will proceed via the responsible scientific approach.

1.2. Rafelski

The second speaker was Rafelski, Univ. of Arizona, who said that if you are going to get heat without radiation, you MUST get helium, which he called ''the ashes of nuclear fusion.''

1.3. Koonin

The next speaker, Steve Koonin, UC Santa Barbara, stated that Hagelstein from MIT now believes his theory of D+D --> He(4) is incorrect. He said that the BYU data is not convincing, and that Harwell Labs have not been able to confirm, even with Fleischmann's help. He went on to say that the UU data has not been proven by conventional standards, there is no reliably confirmation, and ''we are suffering from the incompetence or delusions of F&P.''

1.4. Lewis

The next speaker, Nathan Lewis, presented excellent data from a large, joint effort between CalTech and UC Santa Barbara. The team included both chemists and physicists. They measured:

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[3]The Los Alamos collaboration just began on 28 April 1989.

[4]does this mean no one looks continuously for neutrons?

1. neutrons;
2. gamma rays;
3. tritium;
4. helium; and heat.

They reported some of the best experiments we have seen to date. They made use of cosmic ray (veto) shielding. They saw no extra neutrons or gamma rays above background. They mentioned the need to be careful about false chemical equivalents of tritium, and saw no excess tritium. They saw no excess helium, and suspect that F&P measured helium in lab air, since their levels were much too high. They showed extensive calorimetry calculations showing F&P made certain, possibly unjustifiable assumptions, to get their 4-to-1 energy gain. They noted how stirring the cell is critically important in making temperature measurements. Lewis completely dismisses the F&P results.

Lewis claims he was the one who told Georgia Tech to check their neutron detector for temperature sensitivity, and also claims to have contacted Univ. of Fla. concerning problems with their experiments. He stated that he had obtained an electrode from Texas A&M, and could not reproduce their results in his laboratory. He gave strong indication that Texas A&M would retract their confirmation at next week's ECS meeting. He said he had tried, but failed, to get electrode samples from Huggins at Stanford, and had tried in vain to contact Pons.

2. Contributing Speakers

Brooks of Ohio State University tried to repeat the F&P experiments (with different electrolytes) and saw no neutrons above background.

Hirosky of the Univ. of Rochester also tried an F&P repeat and saw no neutron signal above background.

Dickens, Oak Ridge, said they had made over 300 runs with cells of various shapes and sizes, and had been unable to see neutrons above background. They also failed to reproduce the BYU data.

The paper from Stanford & SRI suggested a source of error in Huggins work, due to temperature gradients in the cell caused by insufficient stirring.

Sur, Lawrence Berkeley Laboratory, also reported no positive results.

Seeliger, Dresden Tech. University reported 20 extra counts per hour, well below the F&P results. They reported no heat.

Cantrell, Miami University, reported possible 2-for-1 excess heat, but then said he thought it was a chemical reaction involving a glass ''mat'' used in his cell.

Moshe Gai, Yale, reported on a large joint effort involving chemists and physicists from Yale and Brookhaven. This talk had been previously reported on usenet. He saw two excess neutrons, which they called Pons and Fleischmann.

3. Tuesday Session

A second Cold Fusion seminar was scheduled for the APS meeting on Tuesday 2 May 1989, at 7:30pm. The Tuesday session was to begin with ‘‘a general review with emphasis on European work by D.Q.O. Morrison, CERN.’’ Unfortunately none of our representatives were able to attend; also, due to the rapid decrease in interest in last night’s seminar after the Cal Tech talk, we did not believe the second seminar would generate much interest.

4. Conclusion

We have read the reports of the seminar in the Wall Street Journal, The New York Times, and USA Today. All accurately reflect the seminar. There is also story in the Baltimore SUN, which is somewhat more complete.

The results released by the 16-member MIT team, which were mentioned in all the newspapers on Tuesday, were neither presented nor discussed at the Special Session.

I. Full Agenda

Introduction. E.F. Redish, Univ of Maryland.

Comments. J.A. Krumhansi, APS President

Invited Talks

1. [Jones 89] (Same Paper as J1 3 on Thursday Morning.) 20 Min.
2. [Rafelski 89] 20 Min.
3. [Koonin 89] 20 Min.
4. [Lewis 89] 25 Min.

Contributed Talks (All 8 minutes)

1. [Whaley 89].
2. [Brooks 89].
3. [Hirosky 89].
4. [Hutchinson 89].
5. [Meyerhof 89].
6. [Furth 89].
7. [Bailey 89].
8. [Cranberg 89] (Not presented.)
9. [Norman 89].
10. [McCracken 89] (Withdrawn.)
11. [Seeliger 89].
12. [Salewicz 89].
13. [Wilets 89].
14. [Leggett 89] (Not presented.)
15. [Cantrell 89].
16. [Deakin 89].
17. [Gai 89].

II. References

[Bailey 89] Bailey, D. (University of Toronto).
Presentation: *Gammas from Cold Fusion*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Brooks 89] Brooks, W.K.; Marchelski, D.G.; Kalen, J.D.; Islam, M.S.; Kaitchuck, M.; M^{c}Creery, R.; Boyd, R.N.; Holbrooke, P.; Dyke, H. (Ohio State University).
Presentation: *An Investigation of Cold Fusion Using a Sensitive Neutron Detector*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Cantrell 89] Cantrell, Joseph; Wells, William E. (Miami University).
Presentation: *Electrochemically Induced Excess Heat in a 'Cold Fusion' Cell with a Zr2Pd Electrode*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Cranberg 89] Cranberg, Lawrence (TDN, Inc.).
Presentation: *Sources of Neutrons and Tritium from D-Li-6 Mixtures*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.
Not Presented.

[Deakin 89] Deakin, M.R.; Fox, J.D.; Kemper, K.W.; Myers, E.G.; Shelton, W.N.; Skofronick, J.G. (Florida State University).
Presentation: *Search for Cold Fusion Products Using X-Ray Detection*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Furth 89] Furth, H.; Bernabei, S.; Cowley, S.; Kulsrud. R. (Princeton Plasma Physics Laboratory, Princeton University).
Presentation: *Generation of D-D Fusion Reaction Bursts in Metal Deuterides*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Gai 89] Gai, M.; Ruggari, S.L.; France, R.H.; Lund, B.J.; Zhao, Z. (Yale University); Davenport, A.J.; Issacs, H.S.; Lynn, K.G. (Brookhaven National Laboratory).
Presentation: *Search for Neutrons and Gamma-Rays From 'Cold Fusion' in Deuterided Metals*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Hirosky 89] Hirosky, R.; Buchanan, E.; Jorne, J.; Melissions, A.C.;Toke, J. (University of Rochester).
Presentation: *Search for Neutron Production in a Palladium-Heavy Water Electrolytic Cell*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Hutchinson 89] Hutchinson, D.P.; Richards, R.K.; Bennett, C.A.; Havener, C.C.; Ma, C.H.; Perey, F.G.; Spencer, R.R.; Dickens, J.K.; Poony, B.D. (Oak Ridge National Laboratory); Bullock IV, J.; Powell, G.L. (Y-12 Development).
Presentation: *A search for Cold Fusion Neutrons at ORELA*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Jones 89] Jones, S.E. (Brigham Young University).
Presentation: *Cold Nuclear Fusion: recent Results and Open Questions.*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.
Same Paper as J1 3 on Thursday Morning.

[Koonin 89] Koonin, S.E. (University of California-Santa Barbara).
Presentation: *Theoretical Issues and Problems Raised By Cold Fusion Experiments*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Leggett 89] Leggett, A.J.; Baym, G. (University of Illinois).
Presentation: *'Solid State' Effects cannot Enhance the Cold Fusion Rate Enough.*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.
Not Presented.

[Lewis 89] Lewis, Nathan; Barnes, Charles; Koonin, Steven (California Institute of Technology).
Presentation: *Calorimetry, Neutron Flux, Gamma Flux, and Tritium Yield from Electrochemically Charged Palladium in D2O*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[McCracken 89] M^{c}Cracken, D.R.; Paquette, J.; Johnson, R.E.; Briden, N.A.; Cross, W.G.; Arneja, A.; Tennant, D.C.; Lone, M.A.; Buyers, W.J.L. (Chalk River Nuclear Laboratories).
Presentation: *Search for Cold Fusion in Electrolytic Cells*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.
Withdrawn.

[Meyerhof 89] Meyerhof, W.E. (Stanford University); Huestis, D.L.; Lorents, D.C. (SRI International).
Presentation: *Analysis of 'Excess Power in Cold Fusion'*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Norman 89] Norman, E.B.; Sur, B.; Lesko, K.T.; Czerwinski, K.R.; Hall, H.L.; Anderson, R.A.; Hoffman, D.C. (Lawrence Berkeley Laboratory).
Presentation: *Searches for Cold Fusion*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Rafelski 89] Rafelski, J. (University of Arizona-Tucson).
Presentation: *Cold Fusion: Can It Be True? A Theoretical Point of View.*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Salewicz 89] Salewicz, K.; Morgan III, J.D. (University of Delaware); Monkhorst, H.J. (University of Florida).
Presentation: *Fusion Rates for Hydrogen Isotopic Molecules of Relevance for Cold Fusion*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Seeliger 89] Seeliger, D.; Weisener, K.W.; Meister, A.; Ohms, D.; Rahner, D.; Schwierz, R.; Wustner, P. (Tech. University Dresden).
Presentation: *Search for D-D Fusion Neutrons*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Whaley 89] Whaley, K.B. (University of California-Berkeley).
Presentation: *Boson Screening of Deuterium in Metals*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

[Wilets 89] Wilets, L.; Alberg, M.; Rehr, J.J.; Mustre de Leon, J. (University of Washington).
Presentation: *Upper Limits to Fusion Rates of Isotopic Hydrogen Molecules at High Electron Density Interstitial Pd Sites*.
Special Session on Cold Fusion; Spring Meeting of the American Physical Society; Baltimore, MD; 01 May 1989.

Table of Contents

1. Invited Speakers 1
    1.1. Jones 1
    1.2. Rafelski 2
    1.3. Koonin 2
    1.4. Lewis 2
2. Contributing Speakers 3
3. Tuesday Session 4
4. Conclusion 4
I. Full Agenda 4
II. References 5