

DoE Review:

New Physical Effects in Metal Deuterides

Michael McKubre

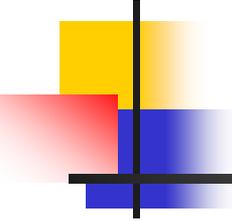
Peter Hagelstein

David Nagel

Randall Hekman

Presented November 1, 2004.

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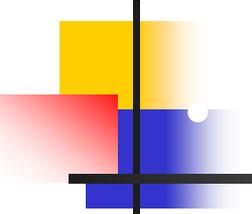


Who and How

Dave Nagel “Open Day” at ICCF10
Randy Hekman - Political Contacts
Peter Hagelstein - Chairman’s Letter
Mike McKubre

Meeting at DoE November 6, 2003
Submission of Paper August 1, 2004
Oral Review August 23, 2004
DoE response not yet formulated

Meeting at DoE HQ November 5 2003



Hagelstein, Hekman, McKubre, Nagel

Dr. James F. Decker

Principal Deputy Director of the Office of Science

Assistants to Anne Davies and Spencer Abrahams ++

ERAB”1” not wrong but: *“hasty and premature”*

“unfortunately interpreted”

Substantial progress in the field culminating in the successful conference in Cambridge:

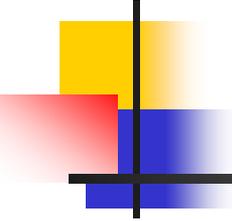
“Right” time for re-review

Clearly in DoE’s area of responsibility

Presented data

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Meeting Results



Jim Decker Reported by UPI

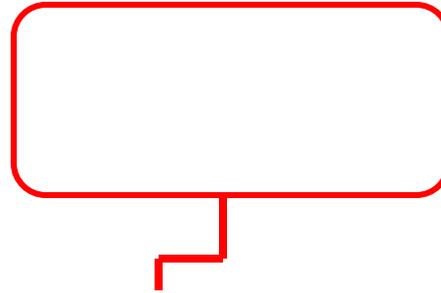
"They told me about a lot of research on cold fusion that has been done since the last review that was conducted about 15 years ago"

He described the physicists with whom he met as possessing *"excellent credentials"*

Based on their data, he said, a new review into cold fusion is warranted.

"The Office of Science will pass along the material to reviewers with appropriate expertise"

DoE Organization

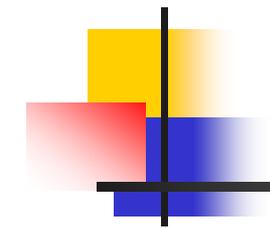


The original slide had an error in it. It is supposed to show many other organizational chart objects.

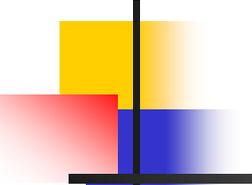
QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Science

DoE Sciences Budget (in \$US Billions)

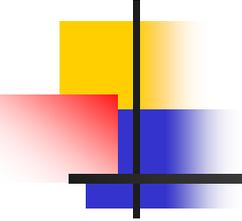


	FY 2003	FY 2004	FY 2005
	Approp.	Approp.	Request
Advanced Scientific Computing	0.163	0.202	0.204
Basic Energy Sciences	1.002	1.011	1.064
Biological and Environmental	0.494	0.641	0.501
Fusion Energy Science	0.241	0.263	0.264
High Energy Physics	0.702	0.734	0.737
Nuclear Physics	0.371	0.390	0.401
Other small things	0.349	0.260	0.261
Total	3.322	3.500	3.432



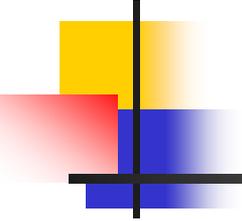
What we asked for...

- For DoE to appoint or select a panel to examine the progress made since ERAB (Nov. 1989):
 - Is there Science here?
 - Does this Science merit further DoE attention?
 - As a possible energy technology
 - As a new physical effect?
- A comprehensive review, both public and transparent, that was and appeared objective.
- A process that we could help design and guide.
- With hoped-for result of removing the stigma that has prevented funding and thus participation from the wider scientific community.



The DoE review design

- They do not want to review a lot of input.
- They want to conduct the review in the manner they normally use for funding proposals.
- They do not want transparency (or discussion of it).
- There will be no communication from the reviewers except what DoE headquarters chooses to release.
- They want a few line executive summary to result.
- And they want it quickly.



The Process Required by DoE

15 Page Written Report*

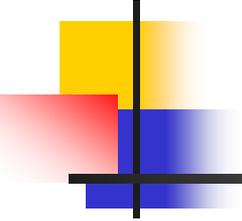
6 Selected Papers

Closed written review

1 Day Oral Presentation of Selected Topics

Short Executive Statement by DoE

* *“DoE is working toward reviewing a subset of the area to provide an internal recommendation about what if anything DoE should do in the area.” - PLH*



A Dilemma...

What was offered was not what was asked... (or agreed)?

We must trust ourselves (and the field) to a process with:

- known shortcomings
- and no recount

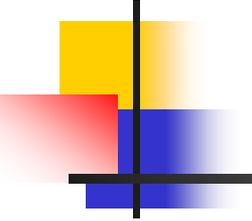
The brief format does not allow coverage of more than a few topics

We must put in all the effort (time and travel)...

For an output that cannot be correlated (traceably) to the input.

(How) Will this benefit the field?

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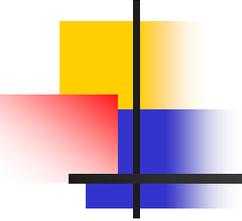
The “good” news

- 1) DoE Wanted to conduct a review ... Quickly!
Already tasked senior people
... some of whom were well known and respected.
- 2) Much of the benefit to the CF community was in the process - not the outcome.
- 3) The defined process was well bounded in scope and time.

Do we trust the data?

and our abilities to communicate effectively
to unknown and silent reviewers?

Do we believe DoE’s interest to be well motivated?



In the end...

We had asked for the review....

This was an opportunity to promote an elevated discussion of the topic.

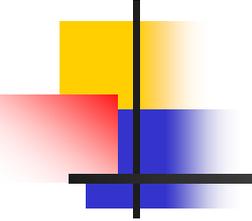
Only one direction was possible.

We had an opportunity and incentive to create a record of lasting scientific value.

We could disclose the process.

It was time to get to work!

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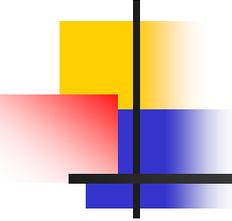
June & July

PLH & MMcK at SRI did much of the writing and coordination of the paper.

Talbot Chubb in WDC - Arata-Zhang.

Dave Nagel & Graham Hubler in WDC,
Randy Hekman (MI), Mike Melich (NA)

- Sanity check, review of words,
- Selection of the 6 (7) supplemental papers
- Design of the Oral Review.



Rationale (why did we write what and as we did?)

We anticipated a determined attack.
Insufficient time or place for a Review of the field.
Rumplestiltskin problem.

Focus on material that we could best defend
from direct experience!

Not a Review...

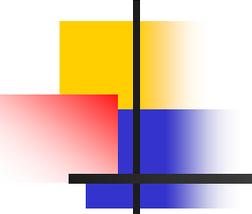
Selected topics with coherent theme.

Needed to address the 1989 issues:

Fleischmann-Pons PdD Heat (and nuclear products)

Jones neutrons and charged particles.

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Process

The following were uploaded to a DoE Server (starting ~1 August) for Reviewer access: *“New Physical Effects in Metal Deuterides”* (All?) 130 papers cited in this subtopic review

7 Supplemental papers for review:

M. Fleischmann and S. Pons, “Calorimetry of the Pd-D₂O System; from simplicity via complications to simplicity”, PLA **176**, (1993).

P. Hagelstein, “Unified Phonon-Coupled SU(N) Models for Anomalies Observed in Metal deuterides”, Proc. ICCF10, (2003).

S. E. Jones *et al*, “Charged-Particle Emissions from Metal Deuterides”, Proc. ICCF10, (2003).

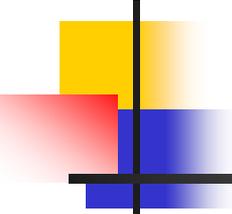
M. C. H. McKubre *et al*, “The Emergence of a Coherent Explanation for Anomalies Observed in Pd/D and Pd/H Systems”, Proc. ICCF8, (2000).

G. Mengoli *et al*, “Calorimetry Close to the Boiling Temperature of the Pd-D₂O Electrolytic System”, JEAC, **444**, (1998).

M. Miles *et al*, “Thermal Behavior of Polarized Pd/D Electrodes Prepared by Co-Deposition”, Proc. ICCF9, (2002).

E. K. Storms, “My History with Cold Fusion”, accepted for publication in JSCMNS, **1**, (2004).

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“NEW PHYSICAL EFFECTS IN METAL DEUTERIDES”

1 INTRODUCTION

2 EXCESS HEAT EFFECTS IN F-P EXPERIMENTS

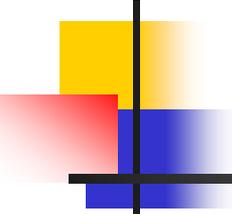
- 2.1 Total Excess Energy Production
- 2.2 Excess Heat and Loading
- 2.3 Surface Chemical Potential
- 2.4 Temperature Dependence
- 2.5 Excess Heat and Current density
- 2.6 Deuterium Flux and triggering

3 HELIUM AND EXCESS HEAT

- 3.1 Correlation of Excess Heat and Helium
- 3.2 Reaction Q Value

4 EXCESS HEAT BEYOND the BASIC F-P EXPERIMENT

- 4.1 Self-Sustaining Excess Heat Effect
- 4.2 Excess Heat in Other Metal Deuterides
- 4.3 Indirect Gas Loading



NEW PHYSICAL EFFECTS IN METAL DEUTERIDES

5 NUCLEAR EMISSIONS

- 5.1 The Jones Experiment
- 5.2 Stimulation of Nuclear Emissions with Electrical Current
- 5.3 Neutrons from Ti Shards in Deuterium gas
- 5.4 Relation between Nuclear Emission and Excess Heat Effect
- 5.5 Nuclear Emissions not Attributable to D-D Fusion
- 5.6 Broad Proton and Alpha Spectrum from D in TiD_x

6 CONCLUSIONS

APPENDICES

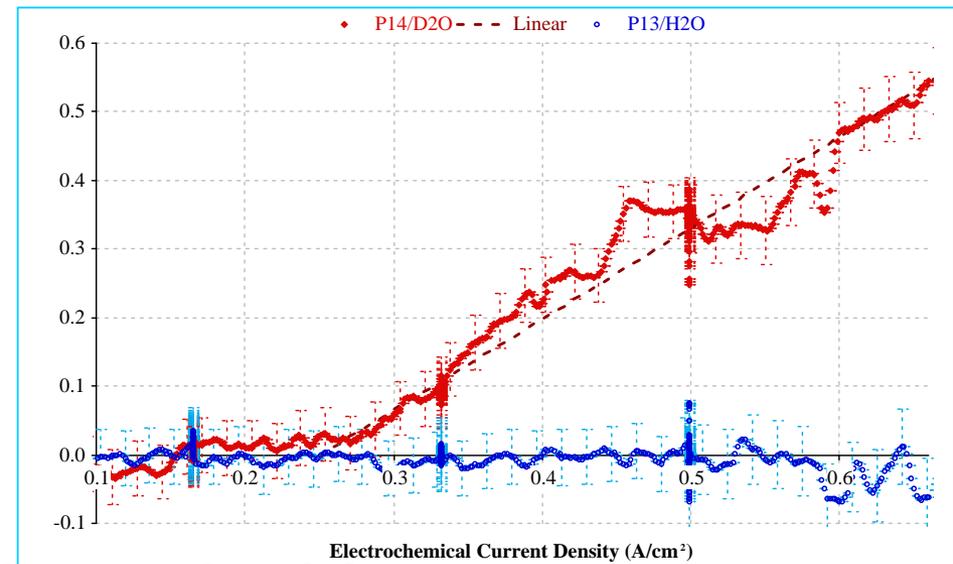
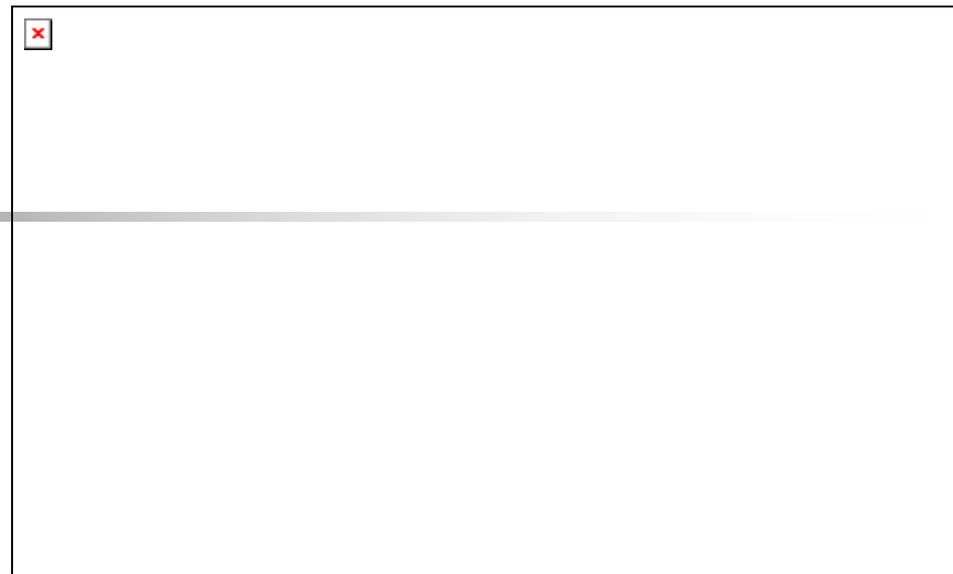
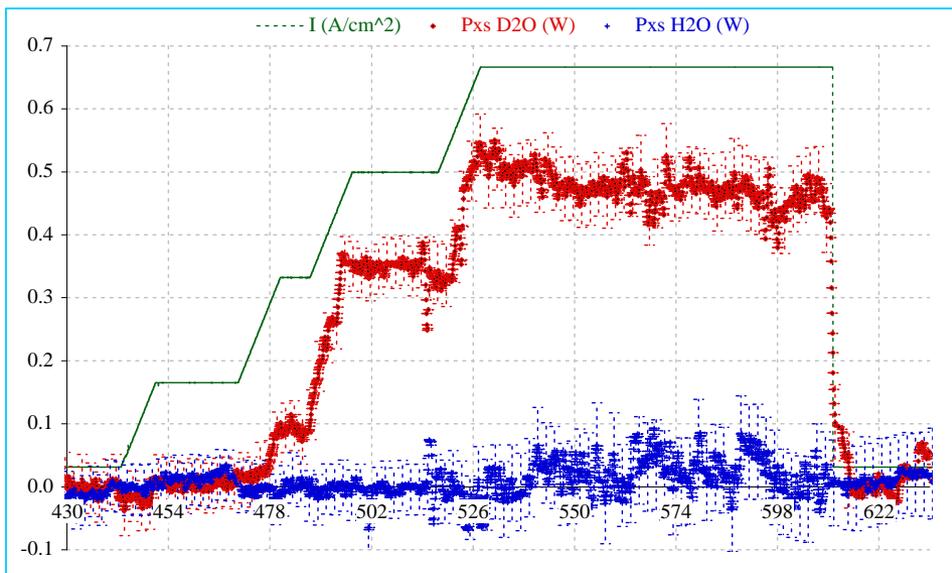
A CALORIMETRIC ISSUES

B THE CASE EXPERIMENT AT SRI

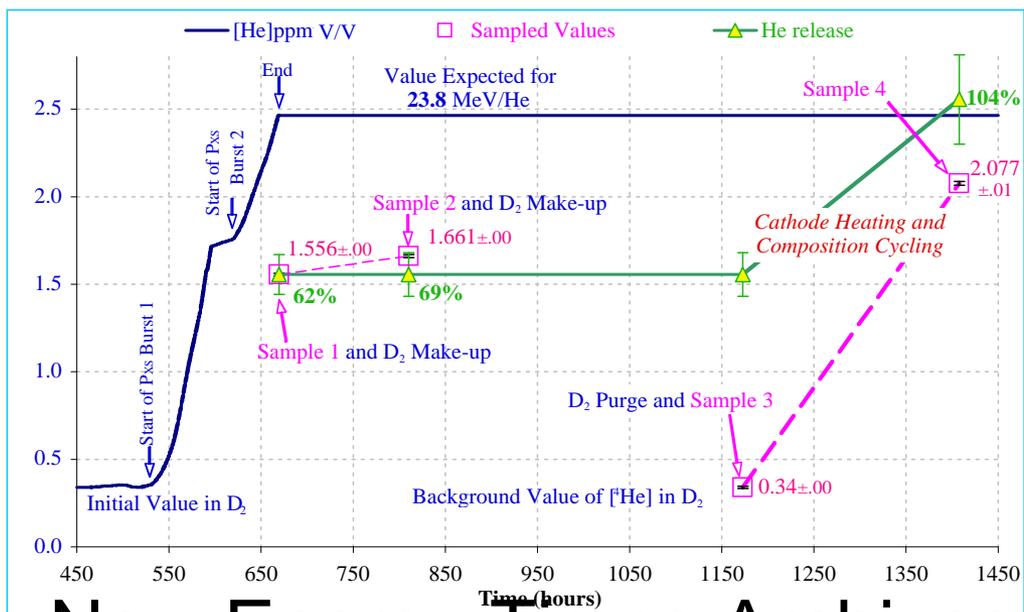
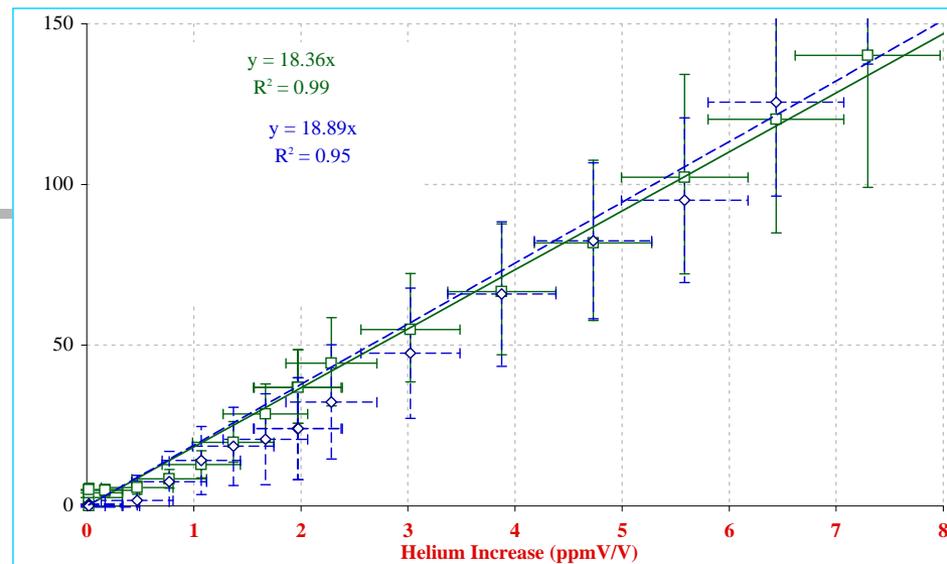
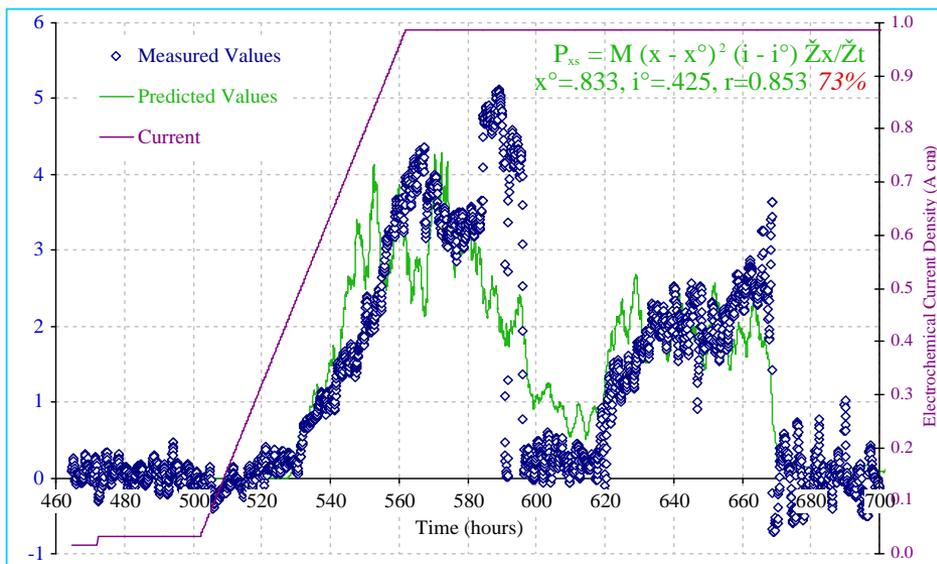
C THE ARATA AND ZHANG EFFORT

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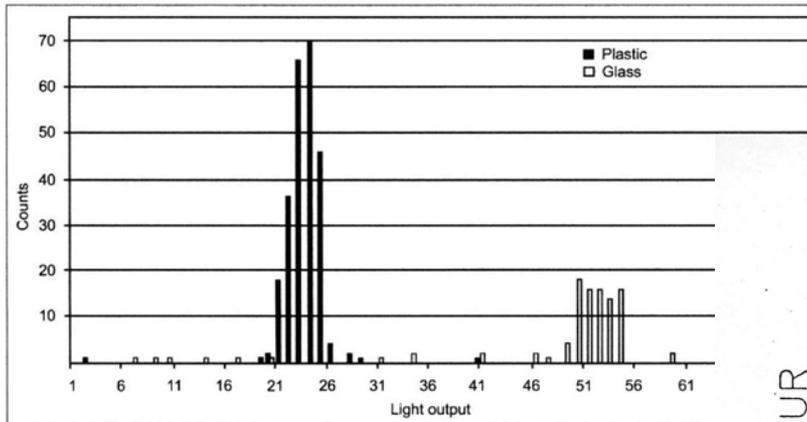
NEW PHYSICAL EFFECTS.. F1-4 P_{XS}



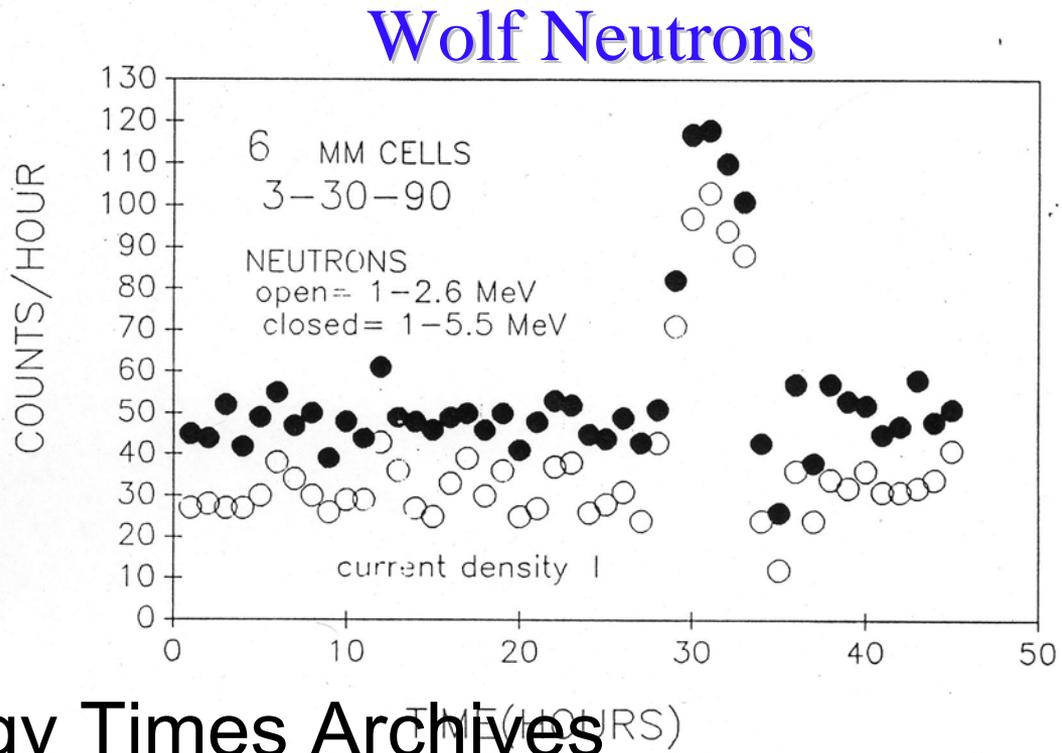
NEW PHYSICAL EFFECTS... F5-7 Heat and Helium

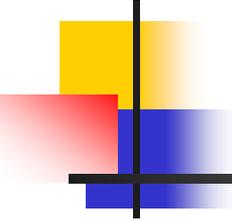


NEW PHYSICAL EFFECTS... F8,9 Nuclear



Jones Charged Particles





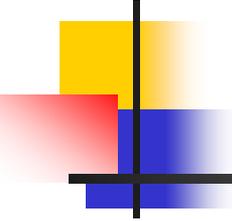
The research discussed in this paper provides evidence for effects in three categories:

The existence of a physical effect that produces heat in metal deuterides.

The heat is measured in quantities greatly exceeding all known chemical processes and the results are many times in excess of determined error using several kinds of apparatus.

In addition, the observations have been reproduced, can be reproduced at will when the proper conditions are achieved, and show the same patterns of behavior.

Furthermore, many of the reasons for failure to reproduce the heat effect have been discovered.

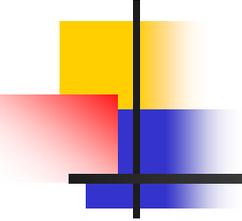


The research discussed in this paper provides evidence for effects in three categories:

(2) The production of ${}^4\text{He}$ as an ash associated with this excess heat,

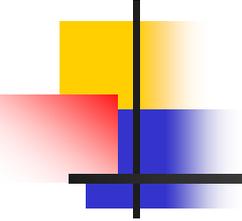
in amounts commensurate with a reaction mechanism consistent with





The research discussed in this paper provides evidence for effects in three categories:

- (3) A physical effect that results in the emission of:
 - (a) energetic particles consistent with $d(d,n) {}^3\text{He}$ and $d(d,p)t$ fusion reactions, and
 - (b) energetic alphas and protons with energies in excess of 10 MeV, and other emissions not consistent with deuteron-deuteron reactions.



New Physical Effects.... Concluding Comments

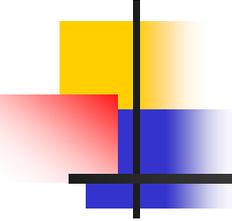
Experimental results for tritium production were noted, and anomalous results from deuteron beam experiments on TiD_x were discussed briefly.

In each case, the effects cannot be accounted for by known nuclear or solid state physics.

The underlying processes that produce these results are not manifestly evident from experiment.

The scientific questions posed by these experiments are, in the opinion of the authors, both worthy and capable of resolution by a dedicated program of scientific research.

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Agenda for Review of LENR

Monday, August 23, 2004

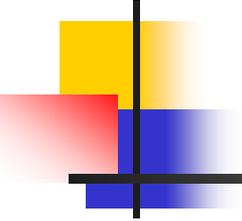
8:30 am	DoE/Panel	Executive Session
9:30 am	Steve Jones, BYU	Nuclear Emissions from TiD
10:15 am	Andrei Lipson, U of Ill	Fast Alpha and Proton Emission from TiD
11:00 am	Break	
11:15 am	Graham Hubler, NRL	Recent Work & On-Going Activities at NRL
12:00 am	Lunch	
1:00 pm	Vittorio Violante, ENEA	Review of recent Work at ENEA in Italy
1:45 pm	Peter Hagelstein, MIT	Connection with Theory and Bridge to Heat
2:30 pm	Break	
3:00 pm	Michael McKubre, SRI	Heat and Helium Results at SRI
4:30 pm	DoE/Panel	Executive Session
5:00 pm	DoE/Panel/Presenters	Follow-up Questions from Panel.

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Review of LENR

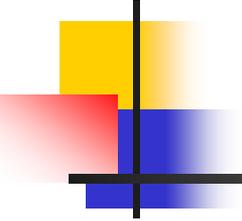
Monday, August 23, 2004

Attendees



6	Presenters	Jones, Lipson, Hubler, Violante, Hagelstein, McKubre
3	Organizers	Hekmann, Melich, Nagel
4	DoE	(P. Dehmer), G. Henry, J. Horwitz, D, Kovar
11	Reviewers	A. Bard (U of T), W. Brown (Lehigh), M-Y. Chou (Georgia T), W. Coblenz (DARPA), G. Hale (LANL), K. Kempar (Florida S) D. Klepner (MIT), D. Liebenberg (Clemson), B. Mueller (Duke) P. Paul (BNL), J. Smith (ex DoE),

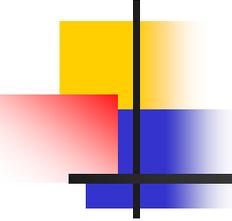
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Review of LENR Follow-up

- 1) Reassurance that P_{in} can be accurately determined in the presence of large current and/or voltage noise in electrochemical cells.
- 2) Comment on the apparent difference in required conditions for Catalytic (Case) and Electrochemical (F-P) heat effects.
- 3) Details of calorimeter calibration with estimates of accuracy and precision.
- 4) Complete duration power and integral (heat) plots from our and other laboratories.

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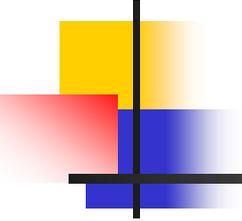
DoE Statement

[Jim Decker to Brian Josephson]

We have the reports of 18 reviewers which I received last Wednesday before going on travel. Some of those reports were received later than anticipated. We are carefully sorting through the reviewers' comments.

Some time ago, we had a media inquiry that we answered by saying we would release something by the end of the year. I was optimistic in thinking we could get something out this month. I assure you I am working to achieve a release as soon as possible.

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Acknowledgements

The four of us appreciate the serious attention given to this review by personnel within the DoE and their reviewers.

Dr. James Decker agreed to have the review.

Dr. Patricia Dehmer and Dr. Dennis Kovar designed and conducted the review with help from Dr. James Horwitz and Dr. Gene Henry.

We salute these individuals and the external reviewers for their concerned interest and participation.

Without the selfless and unstinting support of the following individuals this process would not have been possible:

Talbot Chubb, Graham Hubler, Steve Jones, Andrei Lipson, Mike Melich, Ed Storms, Vittorio Violante.

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