

## Low-Energy Nuclear Reaction Research – 2009 ACS Update

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## 1989 – 2009 Big Changes

- **Stigma Worn Off** \*
  - Experimental work – hard proof
  - Possible theoretical model to explain LENR  
(\* For people who have kept up to date)
- **Journals – “Gatekeepers”**
  - Top Echelons – no
  - Reputable Journals – yes
  - U.S. Physics Journals – no

## Signs of Progress

- **ACS / Oxford Univ. Press**
  - LENR Sourcebook Vol. 1, Vol. 2
- **Real Encyclopedias**
  - Elsevier, John Wiley and Sons (in press)
- **Dept. of Defense, Energy**
  - Undisclosed Meetings
- **Hell Freezes Over!**
  - Bob Park, U.S. physics spokesperson  
...Some real physics  
...Friends working on it

## New Instability and Conflict

- **LENR Proposed Theory – Widom-Larsen**
  - “...may prove to be a viable mechanism”
    - Dave Nagel, Chairman of ICCF-14
  - “Now a viable theory”
    - Dennis Bushnell, Chief Scientist, NASA Langley
  - “...as far as I can tell correct”
    - Dave Rees, Particle Physicist - Navy SPAWAR
  - “...I didn’t say it was wrong”
    - Richard Garwin, Nuclear Physicist

## New Instability and Conflict

- **Widom- Larsen**
  - “inconsistent with the general behavior of the LENR phenomenon”
    - [REDACTED], Radiochemist, Ex-employee
  - “Crazy, Misguided, Unethical”
    - [REDACTED], Cold Fusion Theorist
  - “We see a disaster...looks like a snow job.”
    - [REDACTED] and [REDACTED], Cold Fusion Theorists
  - “does not sit well with the observations of countless experimenters ... very few neutrons..”
    - [REDACTED], Cold Fusion Theorist

## Terminology - Disclaimer

- **2009 Perspective – Field still evolving**
- **“The following opinions are not necessarily reflective of the management...”**

## Terminology - 2009

- “Cold Fusion”

A highly speculative, little-supported process by which two like-charged atomic nuclei overcome the Coulomb barrier at normal temperatures and pressures

## Terminology - 2009

- “Low-Energy Nuclear Reactions”

Research and experiments that take place at or close to room temperature and pressure which produce nuclear-scale energy and nuclear products. LENR does not presume a fusion mechanism that involves surmounting a high-Coulomb barrier.

## Terminology - 2009

- “Condensed Matter Nuclear Science”

The field of research for LENR studies

## Utah N-Fusion Announcement



Martin Fleischmann  
University of Southampton

Stanley Pons  
University of Utah

## 1989 History – Failures

- May 1 – Parker- (MIT)  
“Fraud”
- May 1-2 – Koonin - (Caltech)  
“Incompetence and Delusions”  
Lewis- (Caltech), Myerhof - (Stanford)  
“Nothing There...Thermometer Error”
- May 2, 1989 – Pons’ Mtg. with Bush Cancelled

## 1989 History –Successes

- April 14 – V. Eden/ W. Liu - (U. Wash.) Tritium  
*The New York Times*
- April 19 – Bob Huggins (Stanford) Excess Heat  
*The New York Times*
- April 24 - John Bockris (TAMU) – Tritium  
*JEAC Oct.*
- Sept. – John Bockris (TAMU) – Excess Heat  
*Electrochimica Acta*
- Oct. – Fleischmann and Pons  
- Excess Heat in 23/28 Cells  
*NSF/EPRI Workshop*

## Strengths of Fusion Claim

- Nuclear-Scale Rates of Energy
- Neutron, Helium-4, Helium-3, Tritium Production
- $4\text{He}$  Temporally Correlated to Heat

Other neat nuclear stuff...

## Indirect Evidence

- Unequivocally nuclear
  - **But Fusion?**
- Circumstantial Evidence
- Imaginary Physics

## Why Doesn't "Cold Fusion" Look Like Hot Fusion?

"The circumstances of cold fusion are not those of hot fusion"

- Julian Schwinger

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20 Years of Experiments Later...

The products of "cold fusion" are not those of hot fusion

## Weaknesses of Fusion Claim

1. Gamma rays missing or suppressed
2. Wrong neutron to tritium ratios
3. Wrong Helium-4 to neutron ratios
4. Missing 1st branch of TNF
5. Missing 2nd branch of TNF
6. Imprecise data for "24 MeV" energy  
(wide range, incomplete assay)
7. Heavy Z transmutations
8. Normal water and hydrogen expts.

## "Light" Water LENR

- Pons to Chuck Martin: "We're seeing heat in light water too! It's the most amazing thing"

A Priori dismissal?

- [REDACTED]: "I don't trust the light water work of Miley."

- [REDACTED]: "I don't trust the Piantelli calorimetry"

## Fleischmann Knew

March 13, 1989 - Fleischmann:

- Tritium production too low
- Neutron production too low

“What on earth is going on?...I am so nervous.”

April 10, 1989 - Fleischmann-Pons

“...or an hitherto unknown nuclear process or processes”

## Not Fusion?

**Martin Fleischmann:**  
“What else could it be?”

Nuclear Fission?  
Nuclear Fusion?

Perhaps Like Christopher Columbus’  
“Discovery of India”

## Widom-Larsen Weak Interaction Claim (Strengths)

“Ultra-Low Momentum Neutron Catalyzed Reactions”

- No Imaginary Physics Required
- Known Physics in a New Perspective
- Explains H as well as D Experiments
- Possibly Explains Transmutations

## Widom-Larsen Weak Interaction Claim (Weaknesses)

1. **Difficult to understand:** Required skills: QED, astrophysics/particle physics, condensed matter physics, nuclear physics
2. **Withholding gamma suppression mechanism**
3. **No experimental confirmations?**

## So What?

What’s the “So What”?

## Possible Resolution

**Weak Interaction Models**  
May Resolve a 20-Year Science Dispute:

The Scientific “Fiasco” of the Century

## Scientific Process

### Scientific Method:

“Theory is not as important as experiment”

### Current Scientific Culture:

“Theory is very important”<sup>1</sup>

## The Future

### Materials Science >

What are the nano-requirements?

### Engineering >

How hot and how long?

### Economic >

At what price?

## The Future

# When?

## New Energy Times

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EXTRA SLIDES

## Myths of Weak Interactions

1. Limited to energetically weak energy release
2. Limited to low reaction rates

Not necessarily in LENR!

## Neutron Catalyzed Reactions (Weak Interactions)

- Hideo Kozima
- John Fisher
- George Anderman
- Lali Chatterjee
- (Tadahiko Mizuno)
- (Yasuhiro Iwamura)
- (Stanislaw Szpak)
- (Allan Widom - Lewis Larsen)  
(14 MeV per 4He atom)

## 2004 Dept. of Energy Review

- Oct. 2003 – “Cold Fusion” Review Proposed to DoE (no transmutation, no light hydrogen)
- March 2004 – DoE: Begins Review
- Dec. 2004 – DoE: “Cold Fusion” Still doesn’t look like real fusion – but something is going on

## Dept. of Energy/Defense Meetings

- Feb. 20 2004 – DoE/EPRI: Lewis Larsen – Invited Talk (Theory, Excess Heat, Transmutations)
- Oct. 25-28, 2006 – DTRA/NRL Workshop: (20-30 participants)
- Dec. 12-13, 2006 – DTRA Meeting  
Invited talks: Lewis Larsen, Mitch Swartz, Dave Nagel, Bob Park (100 participants)
- More DoE and DoD – Meetings, proposals...  
(DTRA Sept. 5, 2007, Sharon Weinberger’s Wired Blog)