

# Low-Energy Nuclear Reaction Research – 2009 ACS Update

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8:55a.m. -- Hilton -- Alpine Ballroom West

# 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.**

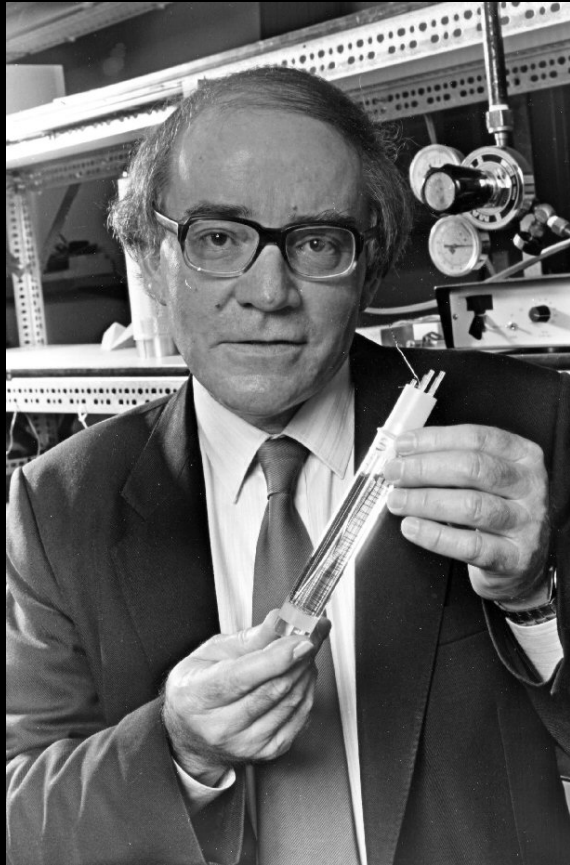


# Terminology - 2009

- **“Condensed Matter Nuclear Science”**

**The field of research for LENR studies**

# Utah N-Fusion Announcement

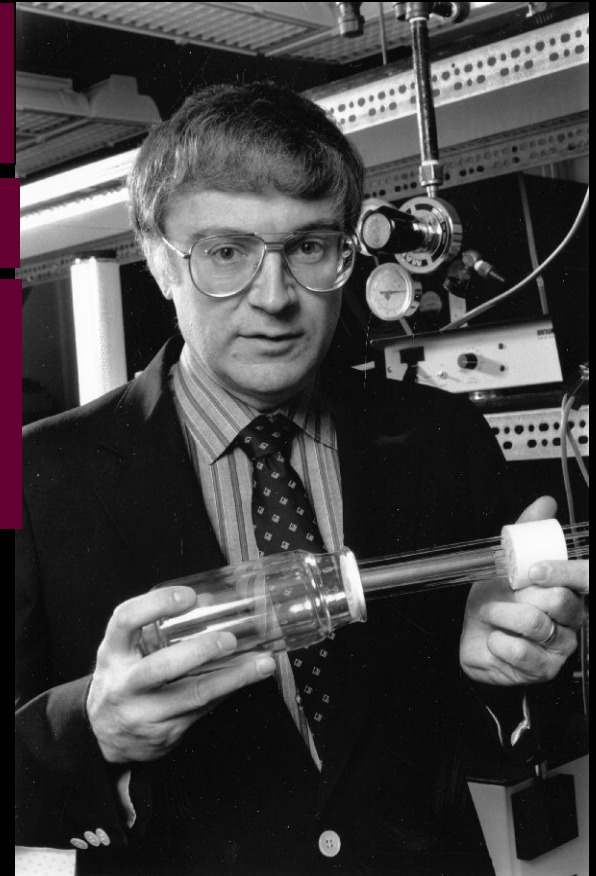


Martin Fleischmann  
University of Southampton

University of Utah  
Press Conference

March 23, 1989

“... established a  
sustained nuclear  
fusion reaction ... “



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

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

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

**- Julian Schwinger**

**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**  
**[www.newenergytimes.com](http://www.newenergytimes.com)**

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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)  
Iwamura Yasuhiro, Itoh Akihiko, Gotoh Nobuaki and Oyoda Ichiro "Detection Of Anomalous Elements, X-Ray And Excess Heat In A D2 Pd System And Its Interpretation By The Electron Induced Nuclear Reaction Model" Fusion Technology, Vol. 33, pp. 476-492 (July 1998)
- (Stanislaw Szpak)  
Szpak S. et al. "Further Evidence Of Nuclear Reactions In The Pd/D Lattice: Emission Of Charged Particles" Naturwissenschaften DOI 10.1007/s00114-007-0221-7 (March 2007)
- (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)**