

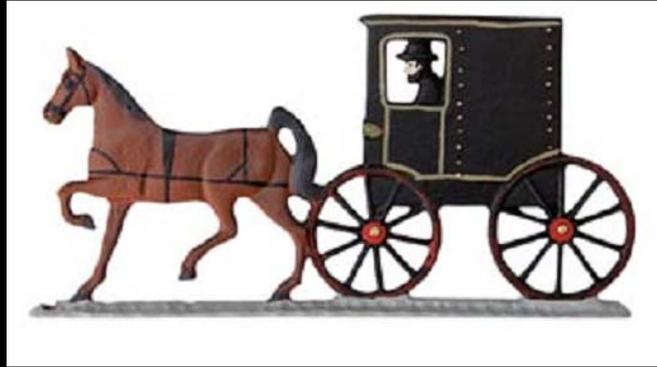
# Energy: What is Possible?

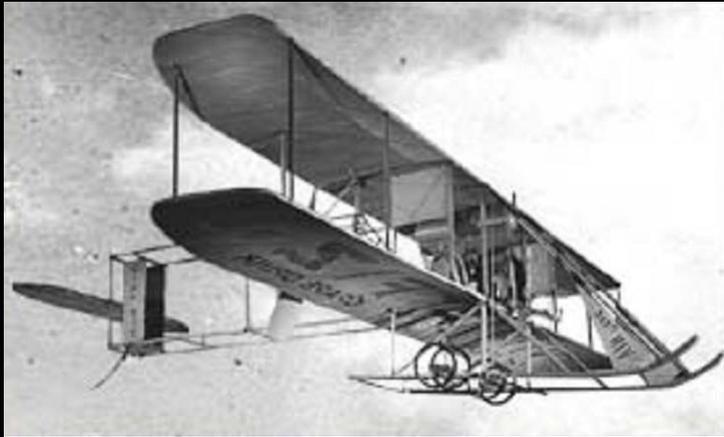
## Introducing Low Energy Nuclear Reactions (LENR)

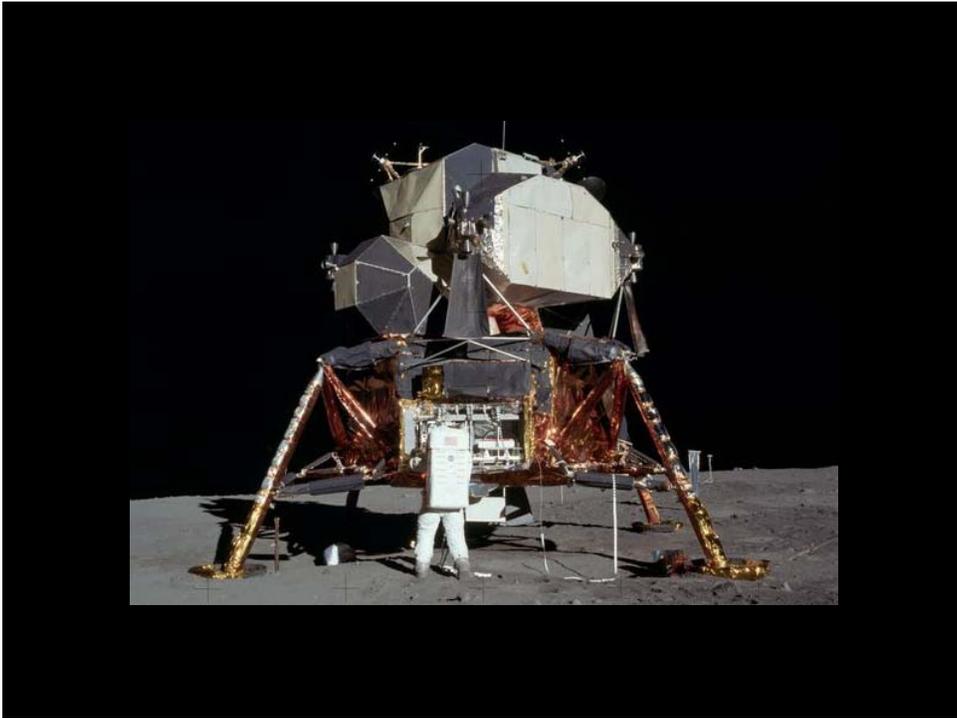
**Steven B. Krivit, Editor**  
*New Energy Times*

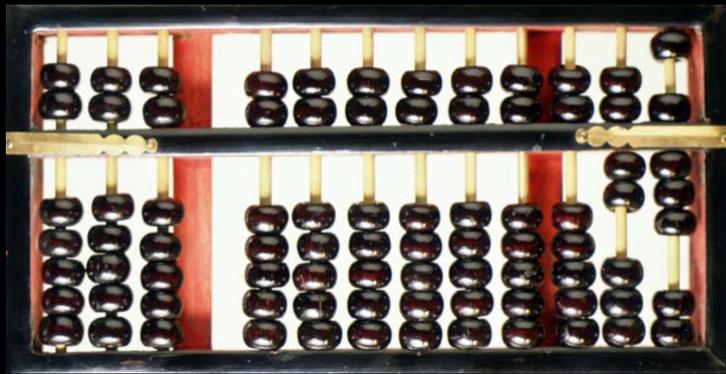
International Conference on Systemics, Cybernetics and Informatics  
Hyderabad, India, January 3, 2008

# Technological Advances











**Energy:**

Paradigm Shift Possible?

# Energy Basics

1. Cost
2. Location
3. Size



1. Cost?
2. Location?
3. Size?



## Production Cost of Electricity (US) (2002)

	\$.01/kW-hr
Coal	2.5
Gas	3.6
Oil	7
Wind	6
Nuclear Fission	6.5
<b>Solar</b>	<b>37.5</b>

## Energy Density and Status

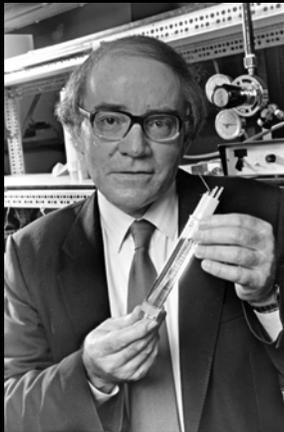
	Volume (MJ/L)	Reality?
Wood	3	
Ethanol	24	
Coal	72	
Gasoline	35	
Hydrogen	0.01	
Nuclear Fission	1,500,000,000	Costly
Thermonuclear Fusion	423,000,000	Dream

## Q. What is Thermonuclear Fusion?

- A. Joining of atomic nuclei
- B. Dream of bringing the power of the sun down to the earth
- C. Continually receding delivery date
- D. Continually increasing cost

# A Third Route to Nuclear Energy?

## Cold Fusion Is Announced



Martin Fleischmann  
University of Southampton

University of Utah  
Press Conference

March 23, 1989

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



Stanley Pons  
University of Utah

Q. What is Cold Fusion?

Q. What is Cold Fusion?

A. Nobody Really Knows!

Q. Is Cold Fusion -

- Really Cold?
- Really Fusion?

Low Energy Nuclear Reactions

**(LENR)**

## Why Was Cold Fusion So Controversial?

1. Apparent contradiction to laws of physics
2. Threat to thermonuclear fusion research
3. Difficult science problem
4. "End of Science" attitude

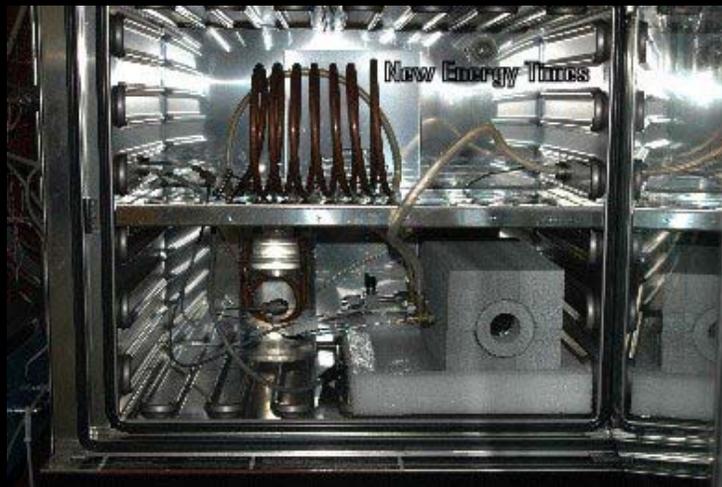
## "End of Science" Attitude

1. "The big problems that can be solved have been"
2. "The big ones that haven't been solved can't be."

## LENR Experiments – Glow Discharge



## Thermal Isolation Box



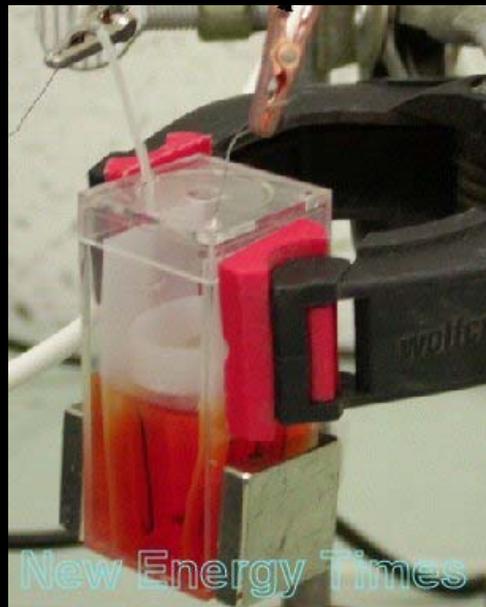
ENEA  
(Italy)



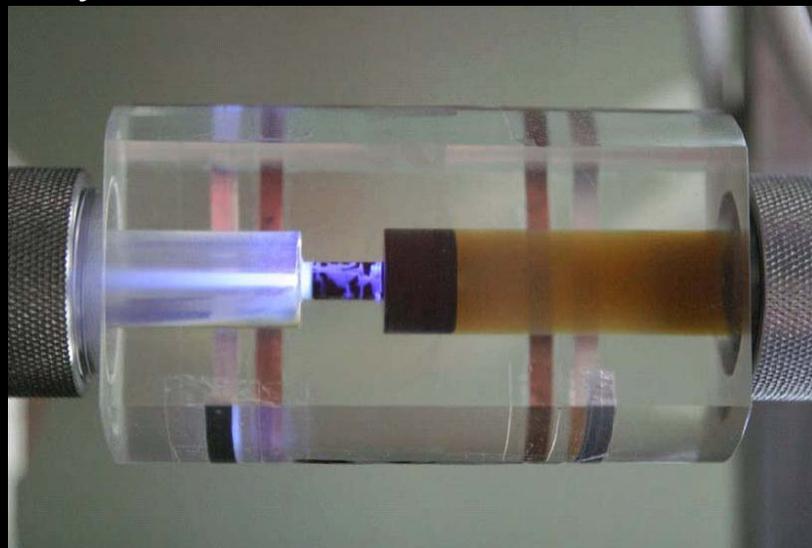
Electrolysis  
Experiment  
(Energetics –Israel)



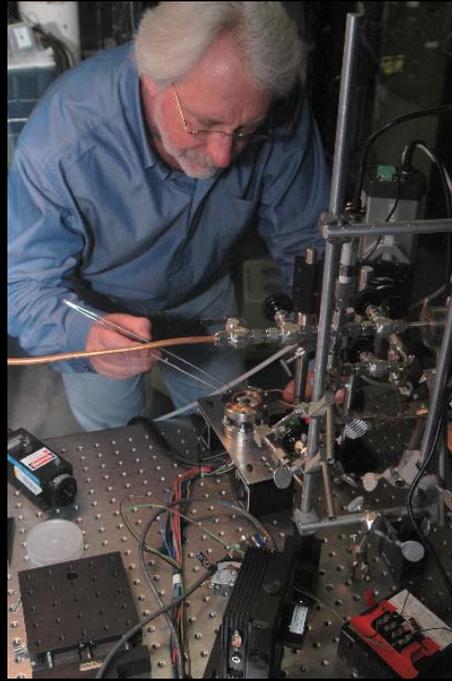
**Electrolysis  
Co-deposition  
Experiment**  
(SPAWAR San Diego, USA)



**Hydraulic-Electrostatic** (Keldysh, Russia)



Hi-Tech



Low-Tech



## LENR – The Last 19 Years

- 55 peer-reviewed journals
- 13 International Conferences
- 29 Regional Conferences
- 6 Recent books [Storms, Kozima, Khriv/Winocur, Beaudette, Mizuno, Vysotskii/Komilova]
- 200 active researchers
- 13 nations

## What goes in -

Hydrogen or deuterium; gas or heavy water

Host metal; palladium, nickel...

Lithium Deuterioxide (Electrolyte, Reactant?)

Low energy input (electrical, heat, mechanical)

What comes out -

**Energy, in the form of heat**

**Helium**

- Other “stuff” and effects

What is Excess Heat?

**More energy coming out of the  
experiment than can be  
explained by known science**

What DOES NOT come out -

**Greenhouse gases**

**Strong prompt radiation**

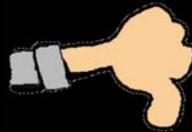
**Long-lived radioactive waste**

Other (mostly) nice things...

**Hydrogen and deuterium are in  
virtually infinite supply**

**No geographic limitations**

**Palladium limitation**



**Nickel possibility**

Other nice things...

**Potentially portable...**

**car...plane...boat...rocket...**

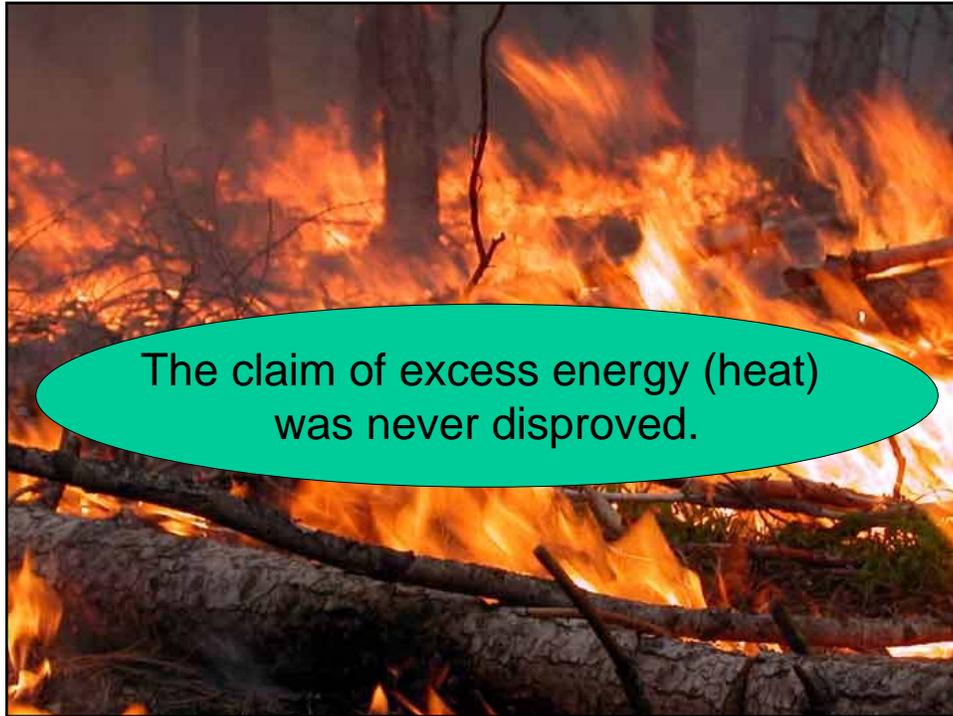
**Potentially grid-free**

Not nice thing...

**Potential military applications**

# Was Cold Fusion Ever Disproved?

Fleischmann and Pons' Theory and Gamma Spectrum



The claim of excess energy (heat)  
was never disproved.

## Unscientific Response



Ronald R. Parker  
MIT  
“It’s Fraud”



Steven Koonin  
Caltech  
“Incompetence  
and delusions”



Nathan Lewis  
Caltech  
“No Evidence”

## From Basic Science to Application...

Theory Mystery

It's a Materials  
Science Problem!

Nanotech  
Challenge!

## Production Cost of Electricity (US) (2002)

	\$.01/kW-hr
Coal	2.5
Gas	3.6
Oil	7
Wind	6
Nuclear Fission	6.5
<b>Solar</b>	<b>37.5</b>
<b>LENR</b>	<b>???</b>

## Energy Density and Status

	Volume (MJ/L)	Reality?
Wood	3	
Ethanol	24	
Coal	72	
Gasoline	35	
Hydrogen	0.01	
Fission	1,500,000,000	Costly
Thermonuclear Fusion	423,000,000	Dream
LENR (If not fusion)	10,000 (conservative)	Unknown

## Commercial Viability?

**Small size relative to energy output**

**Raw materials probably abundant**

**Solve the science problem**

**Solve the engineering problems**

**Keep overall cost down**

“Relevant for at least 10 years  
from now”

-Dr. E.G. Rajan

LENR:  
What is Possible?  
What will you create?

[www.newenergytimes.com](http://www.newenergytimes.com)  
[www.LENR-CANR.org](http://www.LENR-CANR.org)

## New Energy Times Magazine

Phone: (310) 470-9190  
steven1@newenergytimes.com

**ICCMNS-14**  
**Washington, D.C.**  
**Aug. 10-15 2008**