Scientific and Practical Questions about Lattice-Enabled Nuclear Reactions

David J. Nagel
Research Professor
Department of Electrical and Computer Engineering
School of Engineering and Applied Science
and
CEO of NUCAT Energy LLC

2014 Cold Fusion Colloquium at MIT

21-23 March 2014

Motivations

Questions often drive scientific research.

There are several significant and basic LENR questions, which are not getting attention.

LENR questions are needed for program planning.

New LENR experiments are needed.

Earlier article in Infinite Energy Issue #84 (2009):
"Questions and Answers about Lattice-Enabled Nuclear Reactions"

Q: Is there only one, or more than one, basic physical mechanism active in LENR experiments to produce the diverse measured results?

There are many types of chemical reactions.

Of all the theories for LENR mechanisms, what compels us to think that it is a "winner take all" situation?

Might the appearance of various LENR products be due to the operation of various mechanisms?

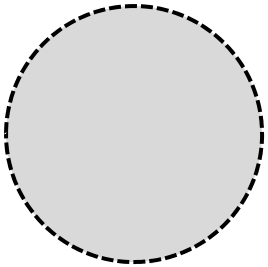
Q: Is there only one, or more than one, basic physical mechanism(s) active in LENR experiments to produce the diverse measured results?

Q: Is excess heat from electrochemical and gas loading experiments due to the same basic mechanism(s)?

Is there any empirical evidence for the same mechanisms producing energy with both methods of loading?

Potential experiment: Use the same materials in both electrochemical and gas loading experiments.

Cylindrical rod, maybe covered with nanomaterials

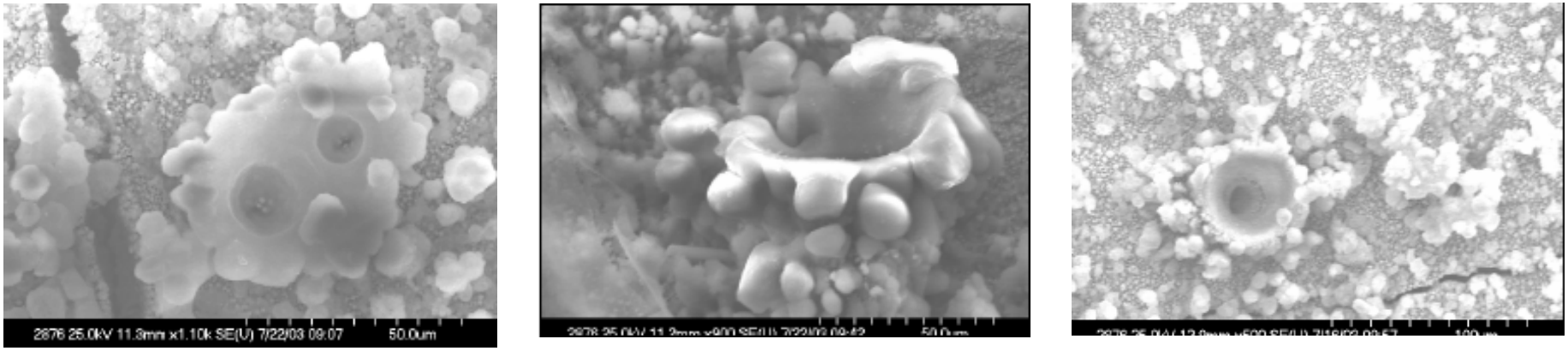


Use as cathode and as the material in a gas experiment

Q: Is there only one, or more than one, basic physical mechanism(s) active in LENR experiments to produce the diverse measured results?

Q: Is excess heat from electrochemical and gas loading experiments due to the same basic mechanism(s)?

Q: Do LENR occur exclusively as individual uncoupled events, or is it possible to have cascades of LENR, in which one reaction makes more likely the occurrence of additional LENR?

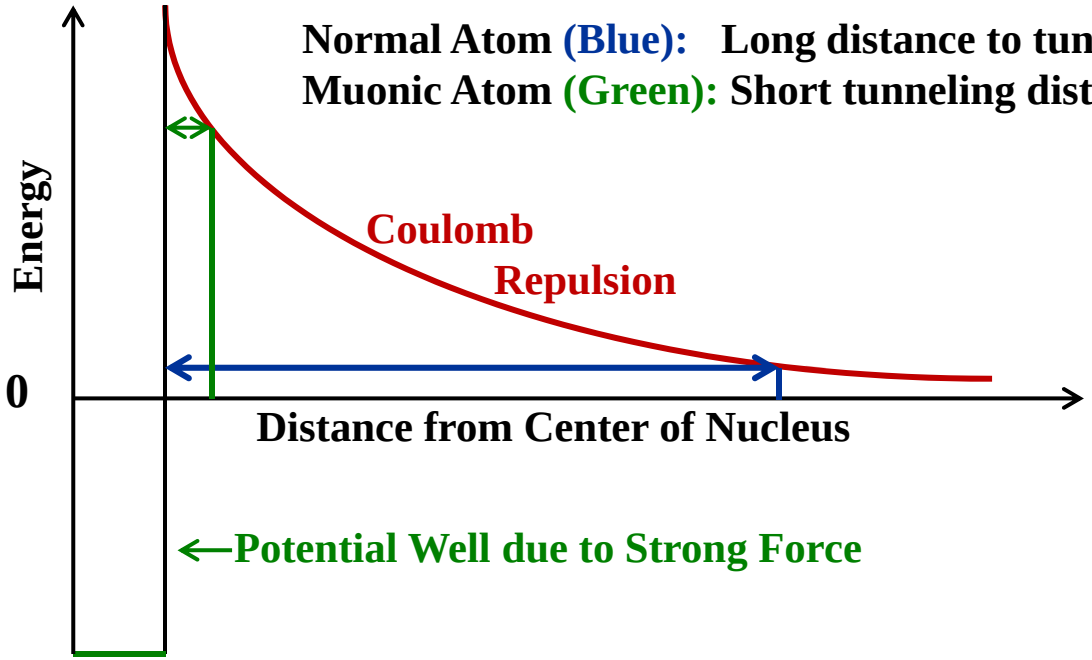


S. Szpak *et al*, Naturwissenshaften, Vol. 92, pp. 394-397 (2005)

Q: Is the excess heat due only entirely or only partially to nuclear reactions?

There are theories that involve formation of "compact objects": Dufour, Heffner, Mayer & Reitz, Meulenberg & Sinha, & Mills.

Binding Energy = 3.7 keV

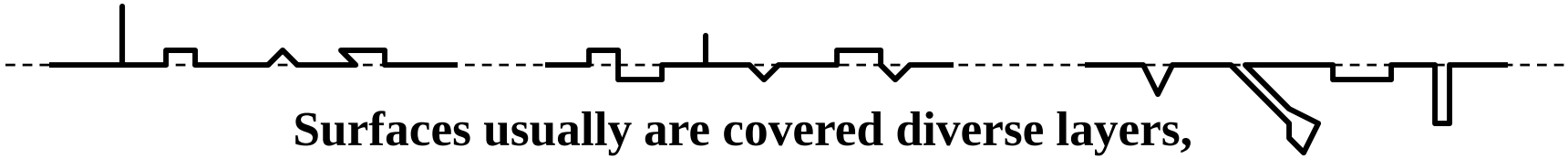


$$E_T = N_C\{E_C + \Sigma f_N E_N\}$$

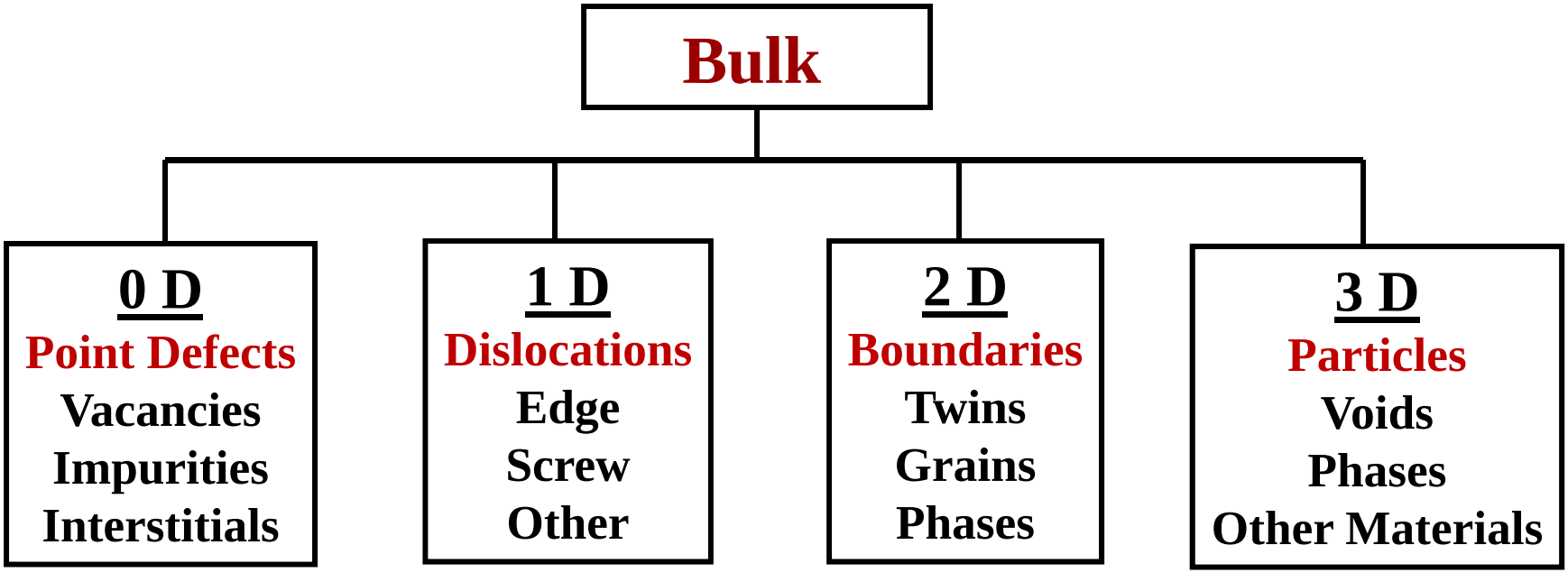
$$\text{with } E_C << E_N$$

D. J. Nagel & R. Swanson
ICCF-18

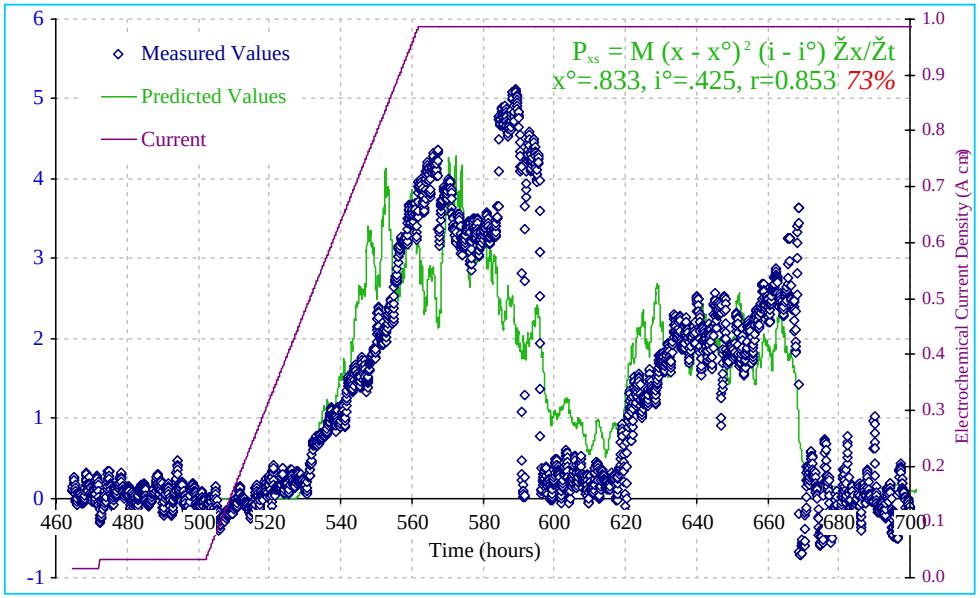
Q. Do LENR occur on or near surfaces or in the bulk of materials or in any locations on or in a material?



Surfaces usually are covered diverse layers, which are usually complex in both their composition and structure. The layers can be enabling or disabling.



Q. Do resonances of any kind (electrical, mechanical or chemical) play a role in causing LENR?

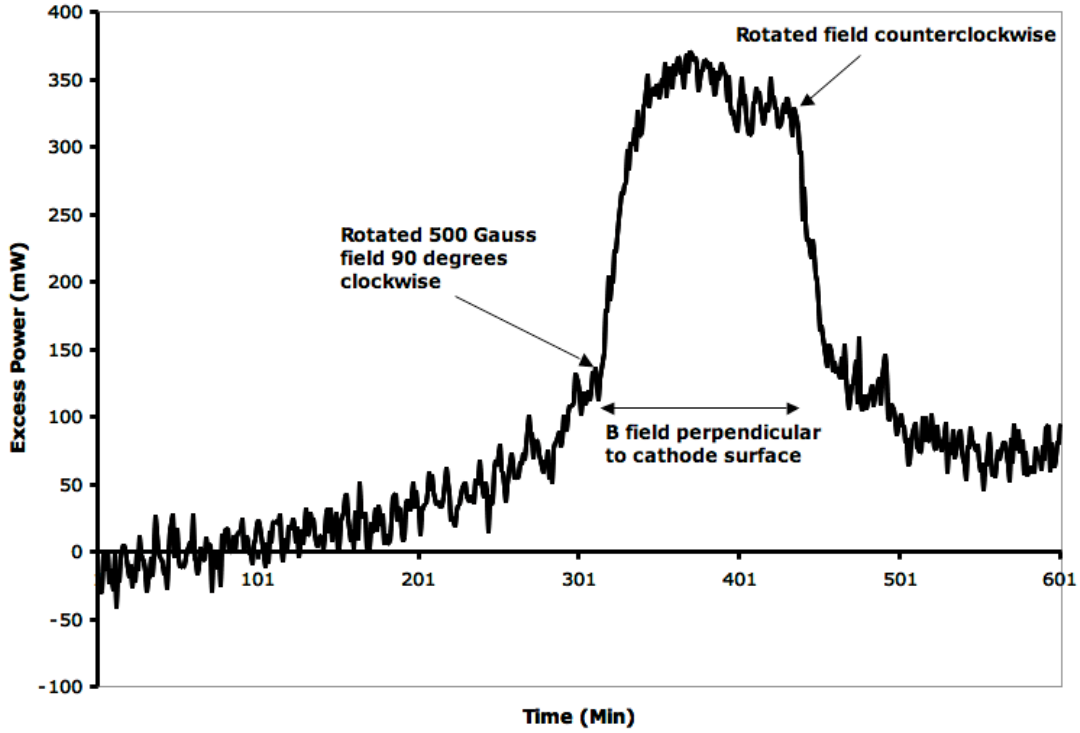


McKubre *et al*,
Proc. of ICCF-5, 1995

T. Zilov *et al*,
Proc. of ICCF-11, 2004

Need other tests of McKubre's equation to verify that it captures all of the relevant variables.

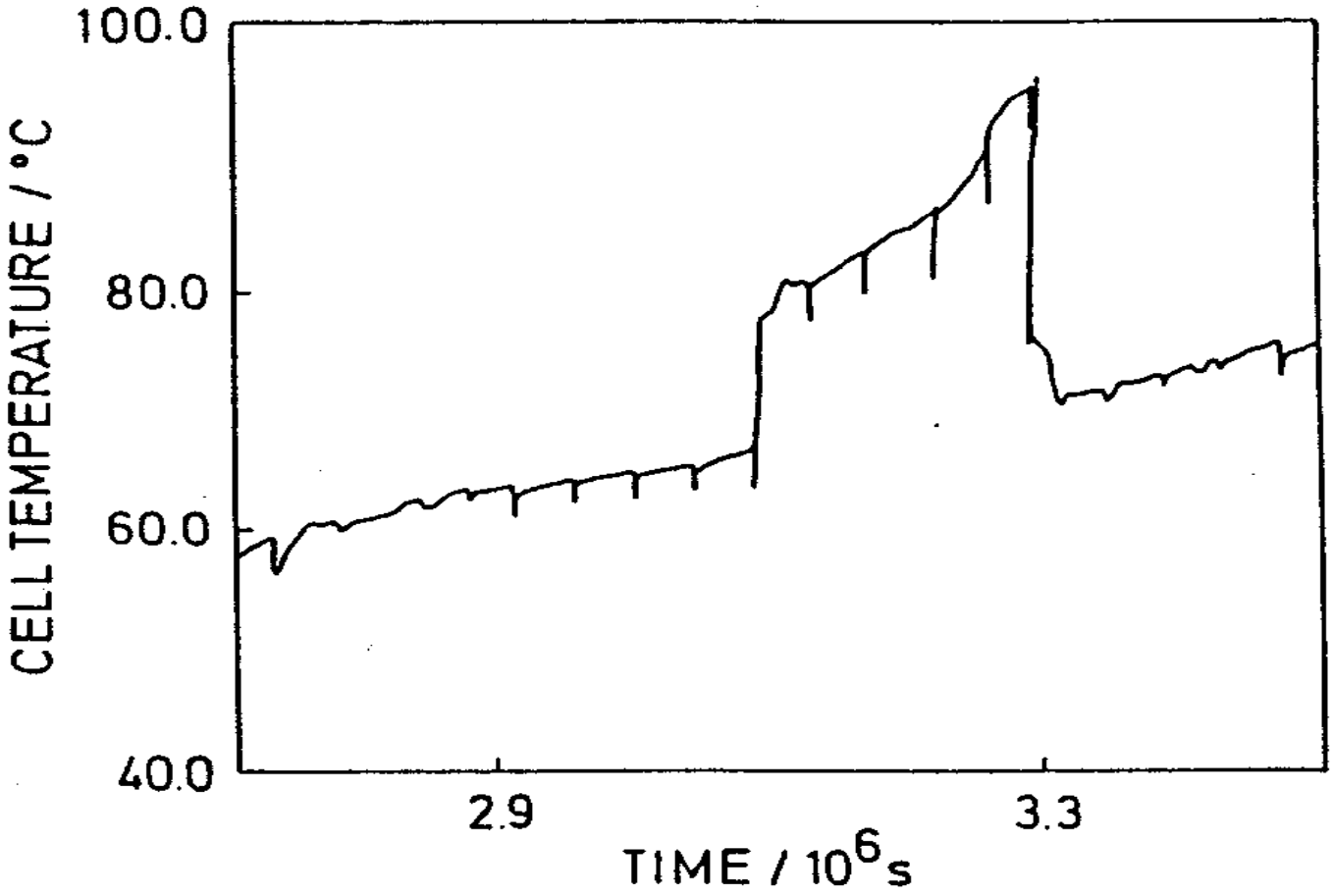
Q. What are the roles of electrical, magnetic, electromagnetic, ultrasound and other applied fields in LENR experiments?



Scott R. Chubb and **Dennis G. Letts**
"Magnetic Field Triggering of Excess Power in Deuterated Palladium"
ICCF-16 (2011)

Also see M. Swartz
"Impact of an Applied Magnetic Field on a High Impedance Dual Anode LANR Device"
J. Condensed Matter Nuclear Science, Vol. 4, pp. 93–105 (2011)

Q. What is the role of sudden thermal changes within electrochemical cells?



S. Pons, M. Fleischmann, C. Walling and J. Simpson
International Patent Publication No. 90/10935 (1990)

Planned Articles for Infinite Energy Magazine

Scientific Questions on Lattice Enabled Nuclear Reactions:
Mechanisms and Materials. **[#117 Sept-Oct 2014]**

Scientific Questions on Lattice Enabled Nuclear Reactions:
Experiments, Theories and Computations. [#118 Nov-Dec 2014]

Practical Questions on Lattice Enabled Nuclear Reactions:
Engineering and Applications. **[#119 Jan-Feb 2015]**