

DOCUMENTATION OF LUDWIK KOWALSKI'S CONTRIBUTIONS TO THE LENR FIELD

*A PROJECT OF THE LENR RESEARCH
DOCUMENTATION INITIATIVE*

THIRD DRAFT REPORT

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1. Introduction

Cold fusion (CF) was announced on March 23, 1989, by Dr. Martin Fleischman and Dr. Stanley Pons. The immense potential energy benefits of CF (also referred to as Low Energy Nuclear Reactions, LENR) were immediately recognized. Humankind's need for a source of cheap, clean, inexhaustible, and safe energy seemed to be realized. However, LENR was rejected by mainstream science within a year or so, and it remains highly marginalized to this day. On the other hand, the phenomenon has continued to be rigorously pursued by many investigators in several countries. The mounting evidence for the reality of LENR shows that its potential benefits may yet be realized.

Because it is a pariah science, LENR has attracted relatively few new investigators to the field. Many of the researchers became active in the early months and years after the 1989 announcement. Now 30 years later a significant number of these investigators are leaving the field. The results of their many years of LENR investigation are at risk of being lost, which would be extremely unfortunate not only for the field, but also potentially for humanity.

An initiative is underway to mitigate the risk of loss of research records of LENR investigators. Its objectives are to collect, organize, document, and archive these records. It is being performed by LENRGY, LLC¹, whose President is Dr. Thomas Grimshaw. The LENR Research Documentation Initiative (LRDI) assists researchers in making sure that their efforts are preserved and to keep the records available for additional analysis and interpretation. The LRDI began with a pilot project with Dr. Edmund Storms. It is described in a recent article in *Infinite Energy*² as well as on a dedicated website³.

¹ LENRGY: LENR Energy – Pursuing the Benefits of Cold Fusion Realization. www.lenrgyllc.com.

² Grimshaw, T., 2020. Documenting Cold Fusion Research: Preserving a Vital Asset for Humankind. *Infinite Energy*, Issue 150, March/April 2020, p. 9-13.

³ LENR Research Documentation Initiative: Collection, Organization, Description, Archiving of LENR Research Records. www.lenr-documentation.org.



Dr. Ludwik Kowalski was born in Poland in 1931 and received his Doctorate of Physical Sciences from the University of Paris in 1963⁴. Subsequently in 1986 he was awarded the MA degree in Mathematics Education from the Kean College of New Jersey. He immigrated to the US in 1964 and, starting in 1969, held a position in the physics department at Montclair State University for 35 years, retiring in 2004. In 1978 he published a book, *Understanding Physics* with Dr. Hal Hellman⁵.

Dr. Ludwik Kowalski has made significant contributions to the LENR field. When LENR was announced in 1989, he followed the trend of other physicists for several years in not accepting the phenomenon. However, he took a new interest in 2002. His LENR work continued at least until 2017, when he authored an article on the sociological aspects of the LENR's rejection. Most of his contributions are recorded on his "Learn Cold Fusion" (LCF) website⁶, which is described in Section 4 below. A photo of Dr. Kowalski with Dr. Martin Fleischmann taken at 2011⁷ is shown in Figure 1-1.

⁴ Kowalski, L., 1963. Contribution to the Study of the Fission of Heavy Nuclei at High Energy. Theses Presented to the Faculty of Sciences at the University of Paris. Paris, Masson & Co, Editors.

⁵ Kowalski, L., and H. Hellman, 1978. *Understanding Physics*. Belmont, CA, Wadsworth Publishing Co.

⁶ <https://msuweb.montclair.edu/~kowalskil/cf/>.

⁷ Kowalski, L., 2012. Cold Fusion Is Not Voodoo Science. Learn Cold Fusion Website, #403, March. <http://ludkow.info/cf/403memoir.html>.



*Figure 1-1.
“Prof. Kowalski on left with Martin Fleischmann.
Taken in 2011 at ICCF-10, Cambridge, Massachusetts.*

A project, the Kowalski LENR Research Documentation Project (KLRDP), is being performed under the umbrella of the LRDI. Its objectives are to preserve the record of Dr. Kowalski’s LENR contributions. This report of the KLRDP includes a biographical summary, LENR publications and information from websites prepared by Dr. Kowalski. Linda Kowalski is gratefully acknowledged for her vital role in supporting this project.



2. Biographies

Dr. Kowalski was working on a research project at Brookhaven National Laboratory at the time of the LENR announcement in 1989. As noted above, he adopted the predominantly negative view toward LENR along with the mainstream scientific establishment. However, in 2002, he took an active interest as a result of attending a scientific conference in Albuquerque, New Mexico. In 2012, he prepared a summary of his LENR work up to that time⁸. It is entitled “Cold Fusion Is Not Voodoo Science”. A link to the document on the LCF website references “Ludwik’s 10 Years with Cold Fusion: a Memoir.” The contents are shown below, and the entire document is in Appendix A. A slightly revised version of this article is also available online⁹.

- 1) Introduction.
- 2) What Is Cold Fusion.
- 3) Meeting a Russian Scientist, Alexander Karabut.
- 4) Meeting George Miley.
- 5) Beginning Of Censorship: Also From Miley's Paper.
- 6) Theories Guide But Experiments Decide.
- 7) First US Government Investigation.
- 8) Second US Government Investigation.
- 9) Excess Heat, Real Or Apparent?
- 10) Robert Park, A Scientist Writer.
- 11) Three Professional Biographies.
- 12) The First CF Conference I Attended.
- 13) The Editor Of Physics Today Rejected My Letter.
- 14) Meeting Fleischmann And Jones.
- 15) New CF Results Reported By Other Researchers.
- 16) Cooperation With Oriani.
- 17) Next CMNS Conference: My Main ICCF11 Presentation.
- 18) My Two Other ICCF11 Presentations.
- 19) History Of Attempts to Publish.
- 20) Transmutation Of Radioactive Nuclei--Or An Artifact.
- 21) The Galileo Project.
- 22) The Curie Project.
- 23) Flowcharts: The Last CF Conference I Attended.
- 24) Andrea Rossi's Unbelievable Claims.
- 25) What is Next?

⁸ Kowalski, L., 2012. Cold Fusion Is Not Voodoo Science. Learn Cold Fusion Website, #403, March. <http://ludkow.info/cf/403memoir.html>.

⁹ <https://www.lenr-canr.org/acrobat/KowalskiLcoldfusion.pdf>.



An excellent biography is provided on the website of the Hoover Institute. It is in a press release of January 2011 regarding Dr. Kowalski's contribution of his papers to that organization¹⁰.

Wikipedia also has a thorough description of his career. These biographies are included in Appendix A. Neither of them makes reference to Dr. Kowalski's LENR work.

After Dr. Kowalski's birth in 1931 his family moved from Poland to the Soviet Union in 1932. This move ended in tragedy during Stalin's Purge of 1938, when his father was arrested and imprisoned in a Gulag labor camp. He died there two years later at the age of 36. Dr. Kowalski initially remained a Communist, but later became a staunch anti-Communist. His family story and personal political journey are included in two webpages, which are presented in Appendix B.

3. *LENR Publications*

Jed Rothwell's LENR-CANR.org website¹¹ is the premier electronic library for the cold fusion field. A search for "Kowalski" on the website resulted in 16 items, which are listed in date order in Table 3-1. The ones that are available have been downloaded for the KLRDP.

¹⁰ The Diaries of Ludwik Kowalski, Former Stalinist, Donated to the Hoover Institution Archives. Press Release, January 3, 2011. <https://www.hoover.org/news/diaries-ludwik-kowalski-former-stalinist-donated-hoover-institution-archives>.

¹¹ LENR-CANR.ORG: A library of papers about cold fusion. <https://lenr-canr.org/>.



Table 3-1.

Items Found in Search for “Kowalski” on LENR-CANR.org Website

Year	Description	DL?*
2003	Engvild, K.C. and L. Kowalski. Triple Deuterium Fusion Between Deuterons And The Nuclei Of Lattice Trapped Deuterium Molecules. in Tenth International Conference on Cold Fusion. 2003. Cambridge, MA: LENR-CANR.org.	Y
2003	Kowalski, L. Teachers Debate Cold Fusion. in Tenth International Conference on Cold Fusion. 2003. Cambridge, MA: LENR-CANR.org.	Y
2003	Kowalski, L. The Dilemma Of A Physics Teacher. in Tenth International Conference on Cold Fusion. 2003. Cambridge, MA: LENR-CANR.org.	Y
2004	Kowalski, L., et al. Charged particles from Ti and Pd foils. in Eleventh International Conference on Condensed Matter Nuclear Science. 2004. Marseille, France.	Y
2004	Kowalski, L. History of attempts to publish a paper. in Eleventh International Conference on Condensed Matter Nuclear Science. 2004. Marseille, France.	Y
2004	Kowalski, L., Please Donate ICCF Proceedings To The Niels Bohr Library. 2004.	Y
2004	Kowalski, L. Recent cold fusion claims: are they valid? in Eleventh International Conference on Condensed Matter Nuclear Science. 2004. Marseille, France.	Y
2005	Kowalski, L., et al. New results and an ongoing excess heat controversy. in The 12th International Conference on Condensed Matter Nuclear Science. 2005. Yokohama, Japan.	N
2005	Kowalski, L., et al. Searching for excess heat in a Mizuno-type Cell (PowerPoint slides). in The 12th International Conference on Condensed Matter Nuclear Science. 2005. Yokohama, Japan.	N
2005	Kowalski, L., S. Little, and G. Luce. Searching for excess heat in Mizuno-type plasma electrolysis. in The 12th International Conference on Condensed Matter Nuclear Science. 2005. Yokohama, Japan.	Y
2007	Kowalski, L. On emission of nuclear particles caused by electrolysis. in Proceedings of the 8th International Workshop on Anomalies in Hydrogen / Deuterium Loaded Metals. 2007. Sicily, Italy.	Y
2008	Kowalski, L., Comments on 'The Use of CR-39 in Pd/D Co-deposition Experiments' by P.A. Mosier-Boss, S. Szpak, F.E. Gordon and L.P.G. Forsely, Interpreting SPAWAR-Type Dominant Pits. Eur. Phys. J. Appl. Phys., 2008. 44: p. 291-295.	Y
2008	Kowalski, L. Nuclear or not nuclear: how to decide? in ICCF-14 International Conference on Condensed Matter Nuclear Science. 2008. Washington, DC.	Y
2010	Kowalski, L., Comments on Codeposition Electrolysis Results. J. Condensed Matter Nucl. Sci., 2010. 3: p. 1-3.	Y p7
2011	Driscoll, J., et al., Issues Related to Reproducibility in a CMNS Experiment. J. Condensed Matter Nucl. Sci., 2011. 5: p. 34-41.	Y p40
2012	Kowalski, L., Cold Fusion is not Voodoo Science. 2012, LENR-CANR.org.	Y

* Downloaded for Kowalski LENR Research Documentation Project



4. “Learn Cold Fusion” (LCF) Website

Dr. Kowalski’s major contributions to the LENR are posted on his website, which has 416 articles and essays on the phenomenon. Each topic has its own webpage. It is referred to as part of his “Learn Cold Fusion” (LCF) project, so that name is used in this report. It was started in 2002 while he was still at Montclair State University and continues to be located on the University website¹². Additions to the website continued for 11 years; the last entry was in September 2013.

The LCF website has on its first page an index to the items with a link (“click”) for each one. The first 30 topics in the index are shown below as representative of the webpages, and the entire list of 416 items is in Appendix C. The entire website has also been downloaded for the KLRDP as a PDF file. It consists of over 1800 pages.

- My motivation? Click to see a short introduction.
- 0) I am no longer saying "it is voodoo science." click
- 1) Introducing Cold Fusion to students. click
- 2) A typical "cold-fusion" setup. click
- 3) Three kinds of Cold fusion. click
- 4) Short biographies of three Cold Fusion Scientists. click
- 5) Aberration of the scientific methodology. click
- 6) On dangers of "second hand" publishing. click
- 7) On Pathological Science (N-rays story). click
- 8) On Burden of Proof in Science. click
- 9) Scientific Method in Cold Fusion. click
- 10) A Russian connection. click
- 11) Bottom Line. click
- 12) What do physics teachers think about CF? click
- 13) More about the Russian Connection. click
- 14) What is pseudo-scientific in this? click
- 15) Or what is pseudo-scientific in this? click
- 16) Here is an example of real pseudo-science. click
- 17) An Italian connection. click
- 18) Nobel Prize for "cold fusion?" click
- 19) A French connection. click
- 20) Excommunication of heretics? click
- 21) If it were up to me I would do it. click
- 22) Another good article summarized. click
- 23) A Japanese connection. click

¹² <https://msuweb.montclair.edu/~kowalskil/cf/>.



- 24) Three short introductory tutorials. [click](#)
- 25) A technical tutorial. [click](#)
- 26) Comments on the 1989 ERAB report. [click](#)
- 27) Conspiracy? For what purpose? [click](#)
- 28) Summary of a very impressive paper. [click](#) or
- 29) Another French connection. [click](#)
- 30) New APS ethics guidelines and the CF issue. [click](#)

The LCF website is described on one of its webpages that is reached through a link, “My motivation? Click to see a short introduction”. This webpage was apparently prepared at about the time the website was initiated. Its contents are shown below¹³:

About my "learn cold fusion" project

In the fall of 2002, to my surprise, I discovered that the field of cold fusion is still active. This happened at the International Conference on Emerging Nuclear Systems (ICENES2002 in Albuquerque, New Mexico). Several papers presented at this conference were devoted to cold fusion topics. Intrigued by the discovery I started reading about recent cold fusion findings and sharing what I learned with other physics teachers. I have been doing this over the Internet using Montclair State University web site

<http://blake.montclair.edu/~kowalskil/cf/>

What follows is a set of items posted, more or less regularly, on that web site since October of 2002. The items reflect my own process of learning, mostly from articles published by cold fusion researchers. I am still not convinced that excess heat, discovered by Fleischmann and Pons, is real or that nuclear transmutations can occur at ordinary temperatures. But I do think that time is right for the second evaluation of the entire field. I do not believe that extraordinary findings of hundreds of researchers are products of their imagination or fraud. Our scientific establishment should treat cold fusion in the same way in which any other area is treated. Those who study cold fusion do not appear to be pseudo-scientists or con artists. The items on my list are arranged in the order in which they were posted on my web site.

It seems clear Dr. Kowalski’s LCF website is important primarily for the benefit of his observations and insights into the cold fusion phenomenon. It is also a valuable historical record of developments in the field during the period he was making observations and writing the articles.

¹³ There is a P.S. at the end of the webpage that is less relevant and has not been included.



5. Example Article, LCF #421: Oriani's Death and Comments on NAE

Dr. Kowalski's LCF website covers a variety of topics, but its webpages have a generally consistent format. One example is #421, which was provided by Linda Kowalski and has actually not yet been posted on the LCF website (the last entry is #416). Two topics are covered – the death of prominent cold fusion researcher Richard Oriani and an interview with Dr. Edmund Storms conducted by Peter Gluck. The Storms interview focuses on his concept of the nuclear active environment (NAE) where cold fusion reactions take place. Dr. Kowalski makes comments and proposes questions about the NAE. The contents of the webpage are shown below.

421 Oriani's Death and Comments on NAE

Ludwik Kowalski, Ph.D. (see Wikipedia)

Professor Emeritus, Montclair State University, Montclair, N.J. USA

1) Yesterday (9/3/2015) I learned about the death of Richard Oriani at age 94. The obituary in StarTribune, his local newspaper, can be seen at:

<http://www.startribune.com/obituaries/detail/95363/?fullname=richard-a-oriani>

My contribution to this formal goodbye is also there.

2) In a private message received today, a colleague quoted Max Planck--"science does progress funeral by funeral." Another CMNS researcher commented: "In this case we are seeing regress, not progress. As I said years ago this is a generational role reversal. Young scientists are conservative while the old, and now dying ones champion new ideas! The world is upside down. ..."

Is the CMNS field progressing or regressing? I do not know how to answer this question. One thing is sure, this area of science, often called "Cold Fusion," is still active.

3) A good example of activity is the "Interview with Dr. Edmund Storms, conducted by Peter Gluck. It was posted on the CMNS forum for active scientists (see the blue italic text below). Dr. Storms is a nuclear chemist with over thirty years of service at Los Alamos National Lab, and now working privately at Kiva Labs. His 2014 book, "The Explanation of Low Energy Nuclear Reaction," describing the field, is commercially available:

http://www.amazon.com/The-Explanation-Energy-Nuclear-Reaction/dp/1892925109/ref=pd_sim_14_1?ie=UTF8&refRID=0W6QXKDRE343BXFS7ZT6&dpSrc=sims&dpST=_AC_UL320_SR216%2C320_

Also see his YouTube presentation at:

<https://www.youtube.com/watch?v=qfpdvwaQSnA&noredirect=1>

Peter Gluck, PhD in chemical engineering, is a retired technologist who has worked many tens of thousands of hours with matter (chemical industries), energy (new sources of energy) and information (web search). He communicates with the world via the blog EGO OUT.

< <http://fqxi.org/community/forum/topic/2015> >



INTERVIEW WITH DR. E. STORMS

Based on a discussion stimulated, in part, by the coming CERN Seminar on D/H loaded palladium, Ed Storms has summarized his answers in this way. It is about the essence of the problems of the field. "LENR [Low Energy Nuclear Reactions] has two aspects, each of which has to be considered separately. The first question is where in the material does the nuclear reaction take place. In other words, where is the NAE [Nuclear Active Material] located. This means where in space is the NAE located, such as near the surface, and what is unique about the NAE. The LENR reaction CAN NOT take place in the normal lattice structure where it would be subjected to the well known laws [such mutual electric repulsion of positive nuclei] that apply to such structures.

I propose the only place able to support such a nuclear reaction while not being subjected to the known chemical requirements are cracks consisting of two surfaces with a critical gap between them. Before the nature of the nuclear process can be discussed, a NAE must be identified and its existence must be agreed to. Failure to do this has resulted in nothing but useless argument with no progress in understanding or causing the phenomenon [of nuclear fusion].

Once the characteristics of the NAE are identified, a mechanism can be proposed to operate in this NAE with characteristics compatible with this environment. Attempts to propose a mechanism without identifying the NAE are doomed to failure. Without knowing the NAE, we are unable to test the characteristics of the nuclear mechanism to see if it can take place in an ordinary material and we are unable to know how to create a potentially active material.

This requirement is so basic, further discussion is pointless unless agreement is achieved. This is not a normal physics problem where any idea can be made plausible simply by making a few assumptions. The nature of the chemical environment prevents many assumptions. We are proposing to cause a nuclear reaction in ordinary material where none has been seen in spite of enormous effort and none is expected based on well understood theory. A significant change in the material must first take place. This change must be consistent with the known laws of chemistry. Only the creation of cracks meets this requirement.

Once the NAE is identified, the characteristics of the nuclear reaction must be consistent with what is known. Simply proposing behavior based on general physics concepts is useless. For example, the role of perturbed angular correlations, which you suggest, must be considered in the context of the entire proposed reaction. The question means nothing in isolation. Like many proposed mechanisms, the idea cannot be tested because it has no clear relationship to the known behavior of LENR or to the variables known to affect the phenomenon.

This is not a guessing game. We now have a large collection of behavior all models most explain. Why not start by considering models that are consistent with this information?"

4) NAE, in other words, if I understand Storms correctly, is a hypothetical environment in which mutual repulsion of protons is much weaker (and we do not know why) than in the vacuum separating atoms. He is right that cold fusion would take place spontaneously (nearly by definition) in such environments. But is he also right by saying that "attempts to propose a mechanism [of cold fusion] without identifying the NAE are doomed to failure." Probably not. Theoretical scientists have no other options but to use models that have already been validated.

5) Let me mention something else questionable. On one hand Ed states that we know nothing about NAE; on the other hand he claims that NAE can be created "in cracks only." How does he justify this?



6) Is it correct to say that NAE is related to nuclear cold fusion like air, our well-known Flying Active Environment, is related to airplanes on Mars? We know a lot about FAE but we know nothing about NAE.

7) The last paragraph of the interview is profound; it has to do with the essence of scientific methodology. Yes, speculations resulting from arbitrary assumptions belong to mathematics (and to theology), not to physical science, where theories are “made plausible” by reproducible experimental data, as we know.

6. Contributions to the Galileo Project

Dr. Kowalski contributed significantly to the Galileo Project, which was led by Stephen Krivit of the New Energy Institute (NEI)¹⁴. These contributions are described on the LCF website entries shown below. Copies are included in Appendix D.

- 319. A Contribution to Galileo Project
- 320. Phase 2 of Galileo Project
- 321. Scientific Issues in the Galileo Project.

In March 2007 Dr. Kowalski gave a presentation at the American Physical Society (APS) meeting on the Galileo Project. A copy is included in Appendix D. The title of the presentation is “Our Galileo Project March 2007 Report”. The NEI has posted a video of the presentation on YouTube¹⁵. Information provided with the YouTube posting is shown below.

2007 - Ludwik Kowalski (Montclair State Univ.) LENR Presentation at APS

298 views

Apr 24, 2011.

StevenKrivit

“Our Galileo Project March 2007 Report “ presented by Ludwik Kowalski at the American Physical Society March meeting in Denver, Colorado on March 5, 2007.

See New Energy Times magazine issue #21 <http://newenergytimes.com/news/2007/N...> For more information.

The YouTube presentation, which is about 15 minutes long, has been downloaded as video and audio files for the KLRDP.

¹⁴ Krivit, S., 2007. The Galileo Project: What Worked, What Didn't. Presentation at the 8th International Workshop on Anomalies in Hydrogen- and Deuterium-Loaded Metals. Catania, Sicily, Italy. October.

¹⁵ 2007 - Ludwik Kowalski (Montclair State Univ.) LENR Presentation at APS. <https://www.youtube.com/watch?v=VPMjc8C1f8g&list=UL69W83GiHW-w&index=62>.



7. 2017 Article on the Philosophy and Sociology of LENR

In 2017 Dr. Kowalski published an important cold fusion paper entitled “Philosophical and Social Aspects of the Cold Fusion Controversy”. It was published simultaneously in Polish and English in the Polish journal *Postepy Techniki Jadrowej* (Advances in Nuclear Technology). The cover of the journal issue, February 2017, is shown in Figure 7-1.

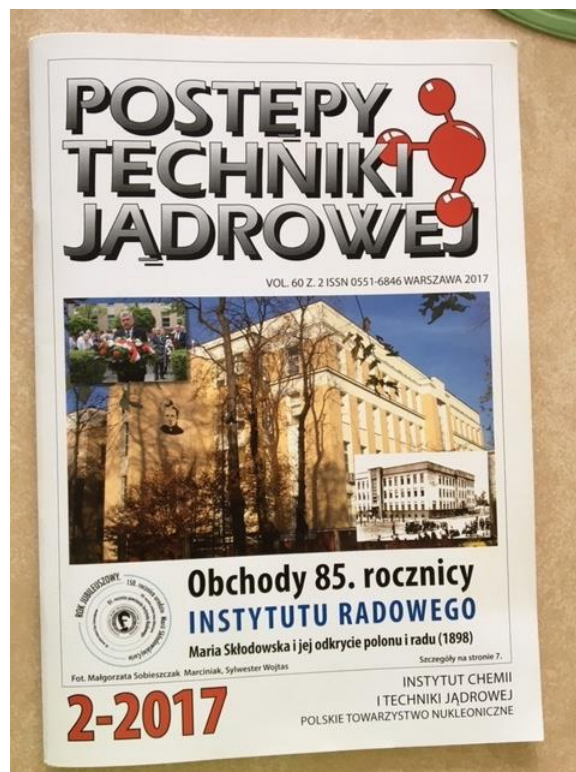


Figure 7-1.

Image of the February 2017 Journal Containing Ludwik’s Article

A similar paper was presented previously at the *IVe Congres de la Societe de Philosophie des Sciences* in June 2012. And another similar paper was submitted earlier, in April 2012, to the journal *Progress in Physics*. These two papers are posted on the LCF website as #413 and #409 and are included in Appendix E. The content of the Polish journal article is shown below.



PHILOSOPHICAL AND SOCIAL ASPECTS
OF THE
COLD FUSION CONTROVERSY
Ludwik Kowalski, Ph.D.
Professor Emeritus, Montclair State University, USA

ABSTRACT

The area of research known as Cold Fusion (CF) has been the arena of a science-and-society feud since 1989, as described by Stephen Ritter in a recent issue of Chemical and Engineering News (1). The conflict is very unusual in terms of duration, the caliber of combatants, and the deviation from basic principles of scientific methodology of validation of claims. The purpose of this article is to comment on methodological mistakes made during the still-ongoing feud among scientists.

1. INTRODUCTION

Scientific methodology (2) refers to the set of norms developed to deal with mistakes and controversies in scientific research. Most mistakes are recognized when new results are discussed with colleagues, or via the peer review process. Occasional errors in published papers are subsequently discovered during replications conducted by other researchers. Scientific results, if valid, wrote J.R. Huizenga, must be reproducible on demand. "When errors are discovered, acknowledged and corrected, the scientific process moves quickly back on track, usually without either notice or comment in the public press." (3) The process, in other words, is expected to be self-corrective.

The so-called "scientific method" is not a list of divine commandments. It is a set of norms described by scientists, and by those who observe their ways of working. The author of this article is a retired nuclear physicist who has observed cold fusion researchers over the last three decades, and participated in several CF conferences and three cooperative replication projects (in which the claimed sensational results were not confirmed). The CF episode is an unusual controversy resulting from a sensational 1989 announcement made by Fleischmann and Pons (F&P). The event (4,5,6,7,8) divided physical scientists into two feuding camps (9,10,11,12,13,14). This is a rare example of a situation in which the expected self-correction of the scientific process was essentially stopped by two formal governmental interventions.

2. ROLE OF ACCEPTED SCIENTIFIC THEORIES

Why is the CF controversy unresolved? Because CF experimental claims are not reproducible on demand, and because they conflict with the generally accepted theory of nuclear reactions. A theory, in this context, is a logical/mathematical structure that agrees with a wide range of already verified experimental data. Scientists know the rule--theories guide but experiments decide. But they are very reluctant to abandon accepted theories. To be reluctant means to insist on additional verification of new experimental results.

Referring to such situations, Huizenga wrote (3): "There are occasionally surprises in science and one must be prepared for them." Theories are not carved in stone; scientists do not hesitate to modify or reject them when necessary. Rejecting a claim because it conflicts with a theory is not as convincing as rejecting it on the basis of reliable empirical data. In that sense methods of validation of claims in physical and other sciences are similar. Scientific theories are models of objective reality; they are often changed, or modified, when new facts are discovered.

3. LEVELS OF CONFIDENCE IN SCIENTIFIC CLAIMS

A discovered experimental fact is usually presented to the scientific community, to be independently confirmed or refuted. Experimental results are accepted--at a high level of confidence--when they become reproducible on demand. Absence of such reproducibility justifies suspicion of possible errors or fraud. Methods of validation of theories (explanations of facts) are slightly different.

A new scientific theory is also presented to a community of experts, to be independently evaluated. Their level of confidence in a theory depends on the validity of underlying assumptions and on the rigor of quantitative analysis.



But even a most reliable scientific theory, usually called a law, is said to be falsifiable, in principle, when conflict with reproducible-on-demand data becomes undeniable (15). Such unusual conflict could trigger a scientific revolution (16).

To explain something usually means to identify causes and to construct a logically satisfying model of reality. An attempt to explain a fact, or to resolve an apparent logical conflict, usually leads to discoveries of other facts. A classical example was the discovery of planet Neptune, in 1846. A more recent and less widely known example was the discovery of a subatomic particle named neutrino. Experimental data collected in the 1920's showed that beta rays (electrons emitted in radioactive decay) had lower mean energies than expected on the basis of the theoretical $E=mc^2$ formula. Austrian theoretical physicist W. Pauli solved this "logical inconsistency" by suggesting that tiny neutral particles, later named neutrinos, were responsible for the missing energy. His hypothesis was formulated in 1933. Experiments confirming the reality of neutrinos were performed, 23 years later.

4. UNFORTUNATE TERMINOLOGY

The essence of the discovery announced by F&P was "excess heat." Their small electrolytic cell generated more thermal energy than the amount of energy supplied to it. Trying to establish priority, under pressure from University of Utah administration, the scientists announced their results at a sensational press conference (March 23, 1989). They wanted to study the CF phenomenon for another year or so but were forced to prematurely announce the discovery.

The unfortunate term "cold fusion" was imposed on them (17). Why unfortunate? Because it created the unjustified impression that cold fusion is similar to the well known hot fusion, except that it takes place at much lower temperatures. This conflicted with what had already been known--the probability of nuclear fusion of two heavy hydrogen ions is negligible, except at stellar temperatures. It was a mistake to interpret experimental data before the results were recognized as independently reproducible. In fact, F&P had no evidence for the emission of energetic ^1H , ^3H and ^3He products, listed in their first published paper (4). Such evidence appeared only five years later (22). The only thing they knew was that the measured excess heat could not be attributed to a known chemical reaction. Claiming that the measured excess heat was due to a nuclear process was premature. The adjective "non-chemical" does not automatically translate into "nuclear."

Suppose the discovery had not been named cold fusion; suppose it had been named "anomalous electrolysis." Such a report would not have led to a sensational press conference; it would have been made in the form of an ordinary peer review publication. Only electrochemists would have been aware of the claim; they would have tried to either confirm or refute it. The issue of "how to explain the heat" would have been addressed later, if the reported phenomenon were recognized as reproducible-on-demand. But that is not what happened. Instead of focusing on experimental data (in the area in which F&P were recognized authorities) most critics focused on the disagreements with the suggested theory. Interpretational mistakes were quickly recognized and this contributed to the skepticism toward the experimental data. Using unconfirmed data to justify the nuclear origin of excess heat, by F&P, was inconsistent with the prevailing norms of scientific methodology. A more recent case of violation of scientific norms, by a CF researcher, Andrea Rossi, is described in (14).

5. TWO US GOVERNMENT INVESTIGATIONS OF CF

The significance of CF, if real, was immediately recognized. Some believed that ongoing research on high-temperature fusion, costing billions of dollars, should be stopped to promote research on CF. Others concluded, also prematurely, that such a move would be opposed by "vested interests" of mainstream scientists. Responding to such considerations, the US government quickly ordered a formal investigation.

A panel of scientists, named Energy Research Advisory Board (ERAB), and headed by John Huizenga, was formed to investigate CF in 1989. The final report (18), submitted to the DOE several months later, negatively interfered with the normal development of the field. Modest financial support for additional CF research, by the DOE, NSF, and other agencies, was practically stopped after the report was published.



It is interesting that only one of the ERAB's six conclusions referred to CF experiments; the remaining five conclusions were about anticipated practical uses of CF, and about various aspects of the suggested interpretation of results. Instead of focusing on reality of excess heat, critics focused on the fact that the hypothesis was not consistent with what was known about hot nuclear fusion. The same observation can be made about the six ERAB recommendations. Only one of them referred to possible experimental mistakes. It is clear that the ERAB observations were based mostly on "theoretical grounds," not on independently performed experiments. The unfortunate governmental intervention had one serious and unprecedented consequence--editors of some scientific journals started rejecting manuscripts written by CF scientists, bypassing peer review (19).

The second DOE investigation (20) of CF was announced in March 2004, nearly 15 years after the first. A group of 18 experts was selected to review a very significant CF claim--the correlation between excess heat and generation of helium (21,22).

But the DOE experts were not asked to replicate correlation experiments; they were asked to read the report submitted by five CF scientists (20), and to vote on whether or not the evidence for the claims was conclusive. Such a way of dealing with a controversy was not consistent with the scientific method.

Ideologically and politically motivated rejections of scientific claims are not new. Giordano Bruno and Galileo Galilei are well known examples. Lysenkism--Stalin's discrimination of geneticists--is a more recent illustration. And cybernetics, in the Soviet book entitled "Short Philosophical Dictionary," was defined as "bourgeois pseudo-science serving American imperialism." Ludwik Kowalski accepted this kind of "truth" as a communist student in Poland (23). What can be done to make sure that similar discrimination will not be used in the US, to impose "the truth" about evolution, stem cell research, etc.?

6. CONCLUSION: MORE QUESTIONS THAN ANSWERS

Long-lasting controversies about scientific discoveries are not new. Alfred Wegener's theory of continental drift is a good illustration. Mainstream geologists rejected experimental data supporting his now-accepted theory for half a century. The CF controversy, however, seems to be different both in terms of governmental involvement and in the caliber of adversaries on both sides of the divide. Huizenga and Fleischmann were indisputable leaders in nuclear science and electrochemistry. Most leading CF researchers are PhD-level scientists. The same is true for many scientists who reject CF claims.

The long-lasting CF episode is a social situation in which the self-correcting process of scientific development was not allowed to evolve. To what extent was this due to extreme difficulties in making progress in the new area, rather than to negative effects of competition, greed, jealousy, and other "human nature" factors? Such unanswered questions (24) are worth addressing in the context of debates about science and society.

One thing is undeniable; the world is still waiting for the first reproducible-on-demand demonstration of a nuclear process resulting from a chemical process. No progress is possible when reported experimental data cannot be reliably replicated in other laboratories. Considering potential CF benefits, and relatively low costs of research in this area, the DOE should have helped to resolve the controversy, one way or another, in a well-equipped national laboratory, during the second investigation. But it failed to do so. How can such a policy be explained? Why is CF research allowed to stagnate without financial support? These questions also belong to debates about science and society. Will the past 25 years be recognized as the painful beginning of a new paradigm (16), or will this period be known as pseudoscientific (24)? How can the persistence of the CF controversy be explained?

7. OPTIONAL ADDENDUM: THREE INTERESTING BIOGRAPHIES

The discovery of CF was made nearly simultaneously by three highly competent scientists: Martin Fleischmann, Stanley Pons (both chemists) and Steven Jones (physicist). Excerpts from their biographies, taken from Mallove's book (25), are shown below.

Martin Fleischmann was born March 29, 1927, in Karlsbad, Czechoslovakia, to Jewish parents. The family came to England to avoid persecution by the Nazis. Martin went to high school in Sussex, England during the war, attended



Imperial College in London after the war (1947-1950), and later distinguished himself by achieving at age forty the professorial Chair in Electrochemistry at the University of Southampton.

Since 1986, Fleischmann has been a Fellow of the Royal Society, an honor given only to the most distinguished of scientists. The author of over 200 scientific papers -- a number of them with Pons as collaborator -- and a number of portions of textbooks, Fleischmann won the Royal Society of Chemistry's medal for Electrochemistry and Thermodynamics in 1979. He was president of the International Society of Electrochemistry (1970-1972). In 1985 he was awarded the Palladium Medal by the U.S. Electrochemical Society.

Stanley Pons, who is almost young enough to be Fleischmann's son, was born in 1943 in the small town of Valdese in the North Carolina foothills. Pons's Italian Protestant ancestors had fled religious persecution in the old world... He was drawn to the world of chemistry as a child, as many youngsters had also been, encouraged by parent-bestowed chemistry sets and the like. Pons attended Wake Forest University in Winston-Salem, North Carolina, graduating in 1965, and began advanced studies at the University of Michigan at Ann Arbor. But with his doctorate almost in hand in 1967, he left school to work in his family's businesses. Eventually, his love for chemistry drew him back to active science. With the encouragement of faculty at University of Southampton in England, he entered its graduate program in chemistry and received his Ph.D. there in 1978. Martin Fleischmann was one of his professors. ... Pons came to the University of Utah in 1983 as an associate professor, becoming a full professor in 1986, and Chairman of the Department in 1988. He has authored or coauthored over 150 scientific publications.

Steven Jones was well known to physicists and the hot fusion community, which gave him a credibility that Fleischmann and Pons could not match. Born in 1949, he was raised a Mormon, with all that his religion's outlook and demanding codes of conduct implies. Jones was a missionary in Europe for the Church of Latter-Day Saints and pursues his science with religious fervor, almost literally. His University stationery bears witness, inscribed as it is with the Brigham Young University motto, "The Glory of God Is Intelligence."

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8. Project Management and Future Opportunities

The methods used in the MLRDP are based on general LRDI procedures that are modified to meet the specific requirements of individual LENR investigators¹⁶. The project is being performed according to accepted project management practices¹⁷. As noted above, the overall LRDI procedure is set forth in a recent article in Infinite Energy¹⁸.

The KLRDP began with a phone call with Linda Kowalski in August 2020. Memos were then used to document a number of websites relevant to the Project. They are listed in Table 9-1. Ms. Kowalski also sent by email the contents of the memos dated August 31 and September 1, 2020.

The primary opportunity for future progress in the KLRDP is to analyze, interpret and integrate his LENR work in a comprehensive report on his research, insights (LENR explanation) and activities in the field. The materials documented in this report would be the source for a future project with these objectives. As noted in a previous section, Dr. Kowalski's papers and website articles are a resource not only for his LENR work but also for the events taking place in the field generally at that time.

A visit to Dr. Kowalski and Linda is not advisable during the COVID-19 pandemic, but may become possible in the future. A site visit may "turn up" additional records of his LENR research. For example, there may be more articles that have not yet been added to the LCF website.

¹⁶ Grimshaw, T.W., 2019. Collection, Organization, and Documentation of LENR Research Results: Guideline. January.

¹⁷ Project Management Institute, 2017. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) — Sixth Edition and Agile Practice Guide (ENGLISH). Project Management Institute. Newtown Square, PA.

¹⁸ Grimshaw, T., 2020. Documenting Cold Fusion Research: Preserving a Vital Asset for Humankind. Infinite Energy, Issue 150, March/April 2020, p. 9-13.



Table 9-1.

List of Memos for the Ludwik Kowalski LENR Research Documentation Project

8/23/2020	“Learn Cold Fusion” Website: Essays on Cold Fusion Topics
8/24/2020	“Kowalski” Listings on LENR-CANR.org
8/25/2020	Ludwik Kowalski Collection at Hoover Institution, Stanford University
8/26/2020	Ludwik Kowalski Photos and Biographies
8/27/2020	“Learn Cold Fusion” Website: Full Collection of Essays on Cold Fusion Topics
8/28/2020	Kowalski on New Energy Times YouTube
8/29/2020	Ludwik Kowalski Photos and Biographies
8/30/2020	Ludkow Website
8/31/2020	Cold Fusion Article by Ludwik Published in 2017
9/1/2020	Ludwik Article “421 Oriani’s Death and Comments on NAE”
9/2/2020	Ludwik Article: “Cold Fusion Is Not Voodoo Science”
9/11/2020	List of Memos for the Kowalski LENR Research Documentation Project



Appendix A. Biographical Information

A1. Summary of LENR Activities (LCF #409)



A2. Biographies on Wikipedia and by the Hoover Institute

Ludwik Kowalski

From Wikipedia, the free encyclopedia

Born: 1931, Poland

Alma mater: Warsaw University of Technology, Curie Institute, Warsaw

Occupation: scientist, professor

Ludwik Kowalski (born 1931) is a Polish-American physicist, anti-communist author, and professor emeritus of Montclair State University in Montclair, New Jersey.

Life

Kowalski was born in Poland. His parents, members of the Polish Communist Party (the precursor of Polish United Workers' Party), decided to emigrate to the Soviet Union in 1932. In Moscow, they continued in their careers as an engineer and nurse. His father was arrested in the night during the Great Purge in 1938 as an "enemy of the people," never to be seen again by his family. Kowalski and his mother lost their home and lived briefly in the polyclinic where his mother worked, then moved to the Dedenievo settlement, some 30 miles north of Moscow, where his mother worked in a nursing home. Kowalski joined the Red Pioneers in elementary school. He learned that his father had died in a Siberian camp some two years later, aged 36.

In June 1941, when Nazi Germany attacked the USSR, the Red Army retreated from Dedenievo, but the German army halted in nearby Jachroma (Yakhroma). However, the Germans bombed the settlement, killing many residents. Kowalski survived this period in the basement of an old church where peasants had stored vegetables from collective farms. In 1943, Kowalski's mother became a nurse in a Polish orphanage near Moscow, while Kowalski relearned Polish in the attached elementary school.

In 1946, the orphanage moved to Warsaw and merged into the existing Nasz Dom orphanage. His mother worked there as a nurse, and Kowalski attended a progressive gymnasium (high school). His mother re-joined the Polish Communist Party, and he joined the Union of Polish Youth. Kowalski then attended the Warsaw Polytechnic Institute (now the Warsaw University of Technology) and then also joined the Party.

As an engineer, Kowalski specialized in electro-medicine. He learned how to design electrical instruments for doctors. He obtained a graduate degree based on research at Warsaw's Radium Institute (now the Curie Institute, Warsaw). In 1956, his application to work in a nuclear laboratory in the Soviet Union was rejected, and he traveled to Paris, where his father's sister lived. He hoped to be able to pursue doctoral studies in France. A written recommendation from Cezary Pawlowski, director of the Radium Institute and a former assistant of Marie Curie, helped him join the laboratory of Joliot-Curie, where he worked for the next seven years. In 1963, having obtained his doctorate in Physics from the Sorbonne, he returned to Poland to work in an academic research laboratory.

In 1964, Kowalski attended a scientific conference in the US—and stayed on, becoming a research associate with Professor Jack Miller in Columbia University's Chemistry department. In 1969, he began a 35-year career as a professor and researcher of Physics at Montclair State University. Since retiring in 2004, he has continued to work in two areas of personal interest—conducting Physics experiments and writing about experience under the Communism of the Soviet Union from an anti-communism viewpoint.

Works

Kowalski has authored and co-authored nearly 100 scholarly papers on Physics, a textbook on Physics, and two books on Stalinism.



In January 2011, Hoover Institution archived his original notebook diaries (in Polish), letters, and personal documents and photographs.

His papers can be found online. His presentations can be found online.

One of his memoirs is an autobiography based on a diary he kept between 1946 and 2004 (in the USSR, Poland, France, and the USA) and illustrates his evolution from one extreme to another - from devoted Stalinist to active anti-communist:

"Stalin's Hell on Earth". Wasteland Press. 2008. pp.. ISBN 978-1-60047-232-9.

Diary of a Former Communist: Thoughts, Feelings, Reality (memoirs online) (2010)

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External links

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Ludwik Kowalski Biography from Hoover Institute Announcement

The Diaries of Ludwik Kowalski, Former Stalinist, Donated to the Hoover Institution Archives

Monday, January 3, 2011

Ludwik Kowalski, a retired physics professor at Montclair State University in New Jersey, has an extraordinary biography. He was born in 1931 in Warsaw to a Jewish family. Shortly after his birth, his naively idealistic parents, deceived by Soviet propaganda, moved to the Soviet Union. In 1938, Ludwik's father, an engineer, along with tens of thousands of Polish Communists and ethnic Poles, was arrested on false charges and sent to the GULAG. He died of exhaustion in the Kolyma gold mines at the age of thirty-six. Ludwik spent most of his childhood in Moscow, receiving a thoroughly Stalinist education; he and his mother returned to Poland a few months after the end of the war. He completed his secondary and university education in Warsaw, followed by graduate studies in France, from 1957 to 1962; he received a doctorate from the Institute of Nuclear Physics in Orsay. After a brief visit to Poland, the young scientist was invited to a scientific conference in the United States. That 1964 visit led to a research position at Columbia University and his immigration to the United States.

His father's tragic fate had not shaken Kowalski's blind faith in the Soviet system, and he became a dedicated young Communist while living in Poland. In secondary school in Poland, he began keeping a diary, in which he recorded his reactions to developments in his private life, with observations on major developments on the national and international scene. Kowalski continued to write his diary through much of his life, though his notes from the 1950s



are most extensive and interesting as a source on Polish society, education and culture during the early years of the communist regime.

The diary also provides a record of the author's gradual intellectual de-Sovietization and the search for his own identity. Kowalski's reactions to the death of Stalin, the revelations of the Twentieth Congress of the Soviet Communist Party, the Hungarian revolution, and the Polish October 1956 are important landmarks in the young scholar's personal liberation, a process that was very private and took decades to complete. As a university professor and a scientist, he concentrated on his teaching and research and did not reveal his complete political metamorphosis until he retired from academia in 2004. Since that time, he has written two books: *Hell on Earth: Brutality and Violence under the Stalinist Regime* (2008) and *Tyranny to Freedom: Diary of a Former Stalinist* (2009). Both books were published by Wasteland Press in Shelbyville, Kentucky.

The Ludwik Kowalski Papers available in the Hoover Institution Archives include the original notebook diaries (in Polish), hundreds of letters, and personal documents and photographs.

Source:

<https://www.hoover.org/news/diaries-ludwik-kowalski-former-stalinist-donated-hoover-institution-archives#:~:text=Ludwik%20Kowalski%2C%20a%20retired%20physics%20professor%20at%20Montclair,by%20Soviet%20propaganda%2C%20moved%20to%20the%20Soviet%20Union>.



Appendix B. Changing Views on Communism

Dr. Kowalski's family (Figure B-1) belonged to the Polish Communist Party. In 1932 his parents, Marek and Halina Kowalski, responded to the lure (propaganda) of Communism in the Soviet Union and moved to Moscow.



Figure 8-1.

Ludwik with His Parents, Marek and Halina Kowalski

Unfortunately, the move to the Soviet Union did not end well for the family. Marek was imprisoned during Stalin's Purge of 1938 and died in a Gulag camp two years later at the age of 36. Ludwik and his mother eventually returned to Poland, where he continued to belong to the Communist Party. Sometime later he changed his mind about Communism, or at least Stalinism.



He authored two books on these subjects, “Hell on Earth, Brutality and Violence under the Stalinist Regime” (2008) and “Tyranny to Freedom, Diary of a Former Stalinist” (2009).

Dr. Kowalski has developed eight “projects” on a separate website from his LCF website¹⁹. One of the projects (webpages) is entitled “Introduction: Stalin’s Hell on Earth”²⁰. It is dedicated to his father, Marek Kowalski. It includes links to online chapters of his 2008 book. Another webpage is entitled “Introduction: Diary of a Former Communist”²¹ and is dedicated to his mother, Halina Kowalski. It has links to online chapters of his 2009 book. These webpages are included below.

¹⁹ www.ludkow.info.

²⁰ <http://ludkow.info/father2/>.

²¹ <http://ludkow.info/diary/>.



B1. Introduction: Stalin's Hell on Earth (Dedicated to Marek Kowalski)



B2. Introduction: Diary of a Former Communist (Dedicated to Halina Kowalski)



B3. Donation to the Hoover Institution

Dr. Kowalski donated his diaries and other papers to the Hoover Institution in January, 2011. A description of the collection is available from the institution's website²². The scope and content of Dr. Kowalski's collection is as follows.

The collection includes the original notebook diaries (in Polish), hundreds of letters, and personal documents and photographs, relating mainly to communism.

Kowalski began keeping a diary in secondary school in Poland. In it he recorded his reactions to developments in his private life, with observations on major developments on the national and international scene. Kowalski continued to write his diary through much of his life, though his notes from the 1950s are most extensive and interesting as a source on Polish society, education and culture during the early years of the communist regime.

The diary also provides a record of the author's gradual intellectual de-Sovietization and the search for his own identity. Kowalski's reactions to the death of Stalin, the revelations of the Twentieth Congress of the Soviet Communist Party, the Hungarian revolution, and the Polish October 1956 are important landmarks in the young scholar's personal liberation, a process that was very private and took decades to complete. As a university professor and a scientist, he concentrated on his teaching and research and did not reveal his complete political metamorphosis until he retired from academia in 2004. Since that time, he has written two books: *Hell on Earth: Brutality and Violence under the Stalinist Regime* (2008) and *Tyranny to Freedom: Diary of a Former Stalinist* (2009). Both books were published by Wasteland Press in Shelbyville, Kentucky.

The Hoover Institution Library & Archives is self-described on the website as shown below.

Founded by Herbert Hoover in 1919, the Hoover Institution Library & Archives are dedicated to documenting war, revolution, and peace in the twentieth and twenty-first centuries. With nearly one million volumes and more than six thousand archival collections from 171 countries, Hoover supports a vibrant community of scholars and a broad public interested in the meaning and role of history.

²² <https://www.hoover.org/news/diaries-ludwik-kowalski-former-stalinist-donated-hoover-institution-archives>



Appendix C. Index for the “Learning Cold Fusion” Website



Appendix D. Galileo Project: LCF Articles and Presentation

D1. Articles on LCF: #319, #320 and #321



D2. 2007 Presentation



Appendix E. LCF Entries Related to 2017 Polish Journal Paper

E1. Philosophical and Social Aspects of the Cold Fusion Controversy (LCF #413)



E2. Social Aspects of Cold Fusion: 23 Years Later (LCF #409)