On the 30th Anniversary of the Discovery of the Cold Fusion Phenomenon

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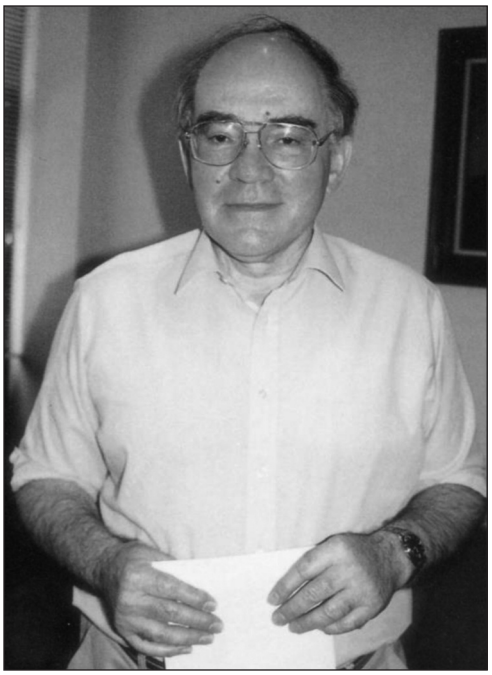
March 23 is the birthday of the cold fusion phenomenon (CFP). On this day 30 years ago, the existence of nuclear reactions in a solid at near room temperature was declared by Martin Fleischmann and Stanley Pons at a press conference held at the University of Utah (Salt Lake City, Utah, USA). This event, right or wrong, is the start of open research on CFP that has lasted 30 years since and has given a specific destiny to the research field we have been involved in. The investigation of the physics of the CFP has lasted without interruption and is developing day by day now.



Martin Fleischmann on April 7, 1995 in his office at IMRA S.A. Science Center in Valbonne, France. *(Photo by Hideo Kozima)*

Section I recollects the history of cold fusion research from my point of view, focusing on my research activity beginning about 30 years ago at the beginning of this science.

It is necessary to recollect the great pioneering work accomplished by Martin Fleischmann. We give a brief survey of Fleischmann's work in Section II. It is interesting to notice the motivation of the scientist who discovered the new phenomenon—nuclear reactions in transition metal deuterides and hydrides at around room temperature—with an inappropriate premise on the nuclear reaction between two deuterons. In Appendix A, we cite several quotes on this point from writings by Martin Fleischmann.

It is necessary or inevitable to contemplate the responses of scientists on the news of discovery of new events inexplicable and covered with notorious facts. In Appendix B, we cite raw voices of scientists on the discovery based on superficial facts without scrutinous investigation of experimental facts.

Section III briefly discusses the financial situation for the field, and we introduce the U.S. Department of Energy (DOE) reports.

The words "cold fusion" and "cold fusion phenomena" are used in the titles of several of Fleischmann's papers (see Appendix A). Fleischmann gave special meaning to the words "cold fusion," as we see in Section II, where we survey his thought process resulting in the discovery of the CFP.

"Cold fusion phenomena," as used by Fleischmann, means whole events resulting from nuclear reactions occurring in materials composed of host elements (Pd, Ti) and deuterium. In the progress of research in this field, we know now that nuclear reactions occur not only in deuterium systems but also in protium systems. Furthermore, we know the observables related to the nuclear reactions in this field range not only to excess energy but also to transmuted nuclei including tritium, ^{4}He and neutrons. We can guess that the events producing these products in such various materials had been called a "phenomena" by Fleischmann. He would have used "cold fusion phenomena" to express the whole research field he explored and developed since 1989, combining the term "cold fusion" in his mind from the beginning and "phenomena" containing various events observed. Borrowing his terminology partially, we will use the term "cold fusion phenomenon" to refer to the events thus occurring in cold fusion materials where nuclear reactions occur at around room temperature without acceleration mechanisms for participating particles.

I. My Research on the Science of the Cold Fusion Phenomenon

I have published two books and many papers on the CFP. The books are:

— *Discovery of the Cold Fusion Phenomenon: Development of Solid State-Nuclear Physics and the Energy Crisis in the 21st Century*, Ohtake Shuppan Inc., 1998[1]
— *The Science of the Cold Fusion Phenomenon: In Search of the Physics and Chemistry Behind Complex Experimental Data Sets*, 1st Edition, Elsevier, 2006[2]

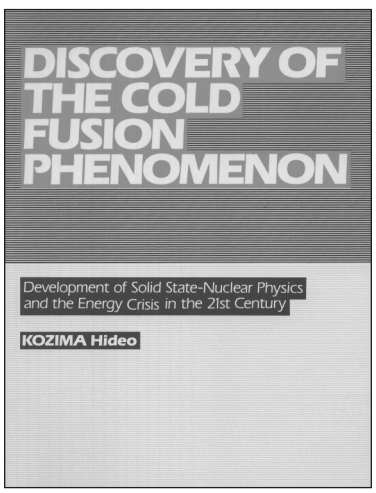
These books give testament to the progress of my research.

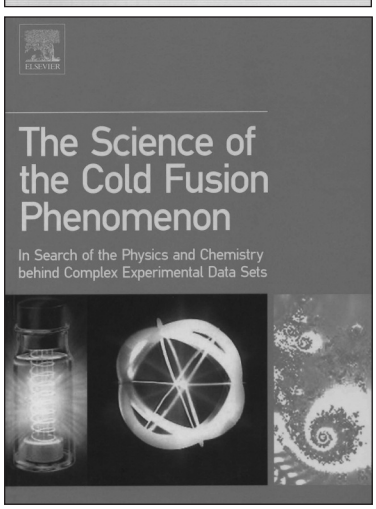
Discovery of the Cold Fusion Phenomenon shows the effectiveness of the phenomenological approach with the trapped neutron catalyzed (TNCF) model. This is also understood as evidence of the participation of neutrons on nuclear reactions in materials composed of host elements and hydrogen isotopes (cold fusion materials) where the CFP occurs.

The Science of the Cold Fusion Phenomenon shows that the premises assumed in the TNCF model have been explained

using quantum mechanics where a new feature of nuclear interactions between nuclei of host elements at lattice sites (lattice nuclei) and hydrogen isotopes at interstitial sites (interstitial protons/deuterons) works effectively to realize a new interaction between lattice nuclei not noticed before. In addition to the possible new interaction between lattice nuclei, the effect of complexity on the CFP has been investigated in relation to various experimental data.

The elaborate work by Ed Storms should be mentioned here; he compiled and published an extensive list of papers through 2007 in *The Science of Low Energy Nuclear Reaction: A Comprehensive Compilation of Evidence and Explanations about Cold Fusion*.[3] This work is very useful in contemplating the total picture of CFP.





I-1. The Subtitle of "Discovery of the Cold Fusion Phenomenon"

The subtitle of *Discovery of the Cold Fusion Phenomenon* is suggestive of the history of cold fusion research: "Development of Solid State-Nuclear Physics and the Energy Crisis in the 21st Century." The first half of this subtitle is reflected in papers I presented at the 19th Japan Cold Fusion Research Society meeting (JCF-19) held in October 2018.[4] In this paper, the essential contents of solid state-nuclear physics have been systematically surveyed. The complexity in the process of formation of cold fusion materials and the novel features of the interactions between host elements and occluded hydrogen isotopes have been extensively investigated.

Key concepts developed in our theory are:

(1) Complexity in formation of the metal-hydrogen superlattice
(2) Super-nuclear interaction between neutrons in different lattice nuclei
(3) Neutron energy bands and neutron drops in them
(4) Nuclear interactions between neutrons in the neutron bands and nuclei at disordered sites

The second half of the subtitle, "the Energy Crisis in the 21st Century," sheds light on cold fusion research. This problem is discussed in Sections II and III.

I-2. The Subtitle of "The Science of the Cold Fusion Phenomenon"

We now take up the subtitle of *The Science of the Cold Fusion Phenomenon*, "In Search of the Physics and Chemistry Behind Complex Experimental Data Sets."

We have noticed many characteristics of the CFP observed in metal-hydrogen systems and carbon-hydrogen systems, as pointed out in some of our writing.[2,5] It should be noted here that the chemistry of the CFP seems to be a key factor in forming cold fusion materials in electrolytic systems.[6,Sec4] We noticed certain characteristics of cold fusion materials in the electrolytic systems, with a preference for a cathode metal and an electrolyte: "It should be emphasized here that there are preferences for combination of a cathode metal (Pd, Ni, Ti, Pt, Au, etc.), an electrolyte (Li, N, K, or Rb) and a solvent (D_2O or H_2O) to induce CFP."[6,p45]

The physics of the CFP seems to be the fundamental factor for the occurrence of nuclear reactions in cold fusion materials. Main efforts to explain the nuclear reactions in cold fusion materials at near room temperature without any acceleration mechanisms have been endeavored as follows.[2,4,7-9] To give a unified explanation of these complex experimental data containing such characteristics, we have struggled with successive trials (shown below) and have arrived at our final perspective summarized in the paper published in 2019.[4]

The history of our research chronologically is as follows:

1. Observation of neutron emission from Pd/LiOH+H_2D/Pt electrolytic system.[10]
2. Proposal of the trapped neutron catalyzed (TNCF) model assuming quasi-stable neutrons in cold fusion materials.[11]
3. Publication of Book 1 compiling experimental data analyzed by the TNCF model.[1]
4. Proposal of the neutron drop (ND) model assuming formation of cold fusion matter containing neutron drops $^{A}_{Z}\Delta$ composed of Z protons and (A – Z) neutrons.[12]
5. Publication of Book 2 compiling experimental data analyzed by the TNCF and ND models.[2]
6. Explanation of the neutron energy band (acentral premise of the ND model) by a quantum mechanical verification of the super-nuclear interaction between neutrons in different lattice nuclei.[13]
7. Compilation of three laws in CFP induced from experimental data sets.[14]
8. Explanation of the formation of the metal-hydrogen superlattice and the nature of the three laws in the CFP by complexity inherited in the cold fusion materials.[8]
9. Justification of the phenomenological approach using the TNCF and ND models to CFP by inductive logic and meta-analysis.[4]

II. Martin Fleischmann: A Great Scientist Who Discovered CFP

In this section, we follow Fleischmann's ideas (through his papers) that led to the discovery of the cold fusion phenomenon (CFP).

We know that no one can be omnipotent. Even Martin Fleischmann is, regrettably, not an exception. He had been uncomfortable in the d – d fusion reactions at several points but remained there without stepping over its conceptual barrier to a mechanism applicable not only to deuterium systems but also to protium systems. There are several sentences from early papers showing his insight into new mechanisms for the CFP:

- The most surprising feature of our results however,

is that reactions (v) and (vi) are only a small part of the overall reaction scheme and that the bulk of the energy release is due to an hitherto unknown nuclear process or processes (presumably again due to deuterons).[15,p308] [See also Appendix A for the reactions, and Reference 15.]

■ In the development of any new area of research (and especially in one likely to arouse controversy!) it is desirable to achieve first of all a q*ualitative demonstration* of the phenomena invoked in the explanation of the observations. It is the *qualitative demonstrations* which are unambiguous: the *quantitative analyses* of the experimental results can be the *subject of debate* but, if these *quantitative analyses* stand in opposition to the *qualitative demonstration*, then these methods of analysis must be judged to be *incorrect*.[16,p476]

■ An important key to the understanding of the system is given by the strange properties of D (and of H and T) in such lattices. We must ask: how can it be that D can exist at a ~100 molar concentration and high supersaturations without forming D_2 in the lattice? How can it be that D diffuses so rapidly through the lattice (diffusion coefficient > 10^{-7} cm^2s^{-1} greater than that of either H or T!) whereas He is practically immobile? The answer to the last question is, of course, that deuterium is present as the deuteron whereas ^4He does not form α-particles.[16,p485]

In Appendix A, we have collected several sentences showing Fleischmann's ideas on the CFP; there are his interesting ideas from the original simple one resulting in the paper published in 1989 to later ones speculating possible mechanisms for various experimental data obtained in the progress of the science in this field. Short explanations are given for each sentence from my point of view at present.

III. Problems Related to the "Energy Crisis in the 21st Century"

In this section, we focus on the financial phase of scientific research in modern society, and influences that impeded funding for cold fusion research (journalism attacks, mainstream science critiques and misguided reviews by government agencies). Financial constraints have had an enormous effect on cold fusion research from 1989 until the present day.

Financial support for scientific research has been a fundamentally important problem in promoting research programs in modern society. I gave a short overview of this problem in 2017.[17] One reason CFP has not flourished as much as it could have is that funding sources available to "conventional science" have not been available to cold fusion research. Progress in any science or advancement requires funding.

In the discovery and development of CFP, there are shadows of this problem from the first day up to the present. The DOE Report published in 1989[18] recommended no federal funding for cold fusion research. The financial phases of cold fusion research were discussed by Taubes[19] and Huizenga.[20] The same problems occurred after 1989 until 2004, covered in the second DOE Report published in 2004[21] (where reviewers did not recommend any federally-funded program but suggested that "funding agencies should entertain individual, well-designed proposals for experiments that address specific scientific issues relevant to the question of whether or not there is anomalous energy production in Pd/D systems, or whether or not D-D fusion-reactions occur at energies on the order of a few eV").

III-1. The 1989 DOE Report[18]

The shortcomings of the first DOE Report were discussed in my book published in 1998[1,Sec1.2] and in other writings,[5] highlighted as follows:

■ The Committees in the Department of Energy had been composed of experts in relevant fields to the CFP and their technical opinions should be esteemed. It should, however, be pointed out limitations imposed on them by their duty different from the researchers in this field. Their duty binds them to confine their sight and also their expertise limits their investigation of the data of the CFP inside their field, preventing extension of their sight.[5,p119]

■ Conclusion (1) is based on Conclusions (2) - (5), and it has no basis if Conclusions (2) - (5) are incorrect. The issue of excess heat and fusion products discussed in Conclusion (2) has significance only when D + D reaction is assumed as the main process. This assumption was adopted by the majority of the scientists at that time, including those who discovered cold fusion.

If there is some other mechanism governing the process, this argument is no longer valid. If you are searching for truth, whether one assumption made by a scientist is correct or not has no importance. You should search for the truth based on the fact that the phenomenon did occur...[I]t is possible to explain the results of cold fusion experiments without any inconsistency.

Conclusion (3) was based on the fact that the cold fusion phenomenon presented poor reproducibility. However, the reproducibility of a phenomenon is determined by the condition of the entire system, in which the process takes place. Simple analogy from other physical phenomena should not have been used to draw a conclusion...

Conclusion (4) only shows that the interpretations of the discoverers of cold fusion were not appropriate, and it has nothing to do with the truth. It is hard to believe that board members have made such an elementary mistake. It was found later that inside solid, such as Pd or Ti, with a combination of various factors, complex phenomena can occur. There is always such possibility in science. Today, it is quite obvious to everybody. The board members might have forgotten for some reason that natural science is built upon the fact.

Conclusion (5) is similar to Conclusion (4). If any

> new findings had been denied only because they were [in] contradiction with the existing knowledge, there would have been no progress in science and there will not be any progress in the future.
>
> The discussions expressed in the DOE Report remind us [of] Procrustes' bed. As Procrustes used his bed as an absolute standard to measure heights of his captives, the critiques against cold fusion used d – d reaction as an inevitable standard to judge anomalous events.[1,pp3-6]

It is difficult to evaluate scientific works without a proper point of view even if one has enough knowledge about the theme of the works.

III-2. The 2004 DOE Report[21]

Almost 15 years after the first DOE Report, several scientists in the U.S. asked their Department of Energy to reconsider the evaluation issued in 1989.

The DOE Report of 2004 has a different character from that of 1989. The new Report was issued according to the request presented by several cold fusion researchers.[22] From the 2004 DOE report:

> The Department of Energy's (DOE) Office of Science (SC) was approached in late 2003 by a group of scientists who requested that the Department revisit the question of scientific evidence for low energy nuclear reactions. In 1989 Pons and Fleischman first reported the production of "excess" heat in a Pd electrochemical cell, and postulated that this was due to D-D fusion (D=deuterium), sometimes referred to as "cold fusion." The work was reviewed in 1989 by the Energy Research Advisory Board (ERAB) of the DOE. ERAB did not recommend the establishment of special programs within DOE devoted to the science of low energy fusion, but supported funding of peer-reviewed experiments for further investigations. Since 1989, research programs in cold fusion have been supported by various universities, private industry, and government agencies in several countries.[21]

According to the limited evidence given to the DOE as noted above, the material is confined to the "experimental evidence for anomalies in metal deuterides" and does not include data obtained in protium systems. Therefore, the material given to the DOE is necessarily an incomplete one to show the cold fusion phenomenon as a whole. However, the 2004 DOE Report had merit to evaluate positive phases of cold fusion research after the 1989 DOE Report.

The Conclusion of the 2004 DOE report is cited as follows:

> While significant progress has been made in the sophistication of calorimeters since the review of this subject in 1989, the conclusions reached by the reviewers today are similar to those found in the 1989 review.
>
> The current reviewers identified a number of basic science research areas that could be helpful in resolving some of the controversies in the field, two of which were: 1) material science aspects of deuterated metals using modern characterization techniques, and 2) the study of particles reportedly emitted from deuterated foils using state-of-the-art apparatus and methods. The reviewers believed that this field would benefit from the peer-review processes associated with proposal submission to agencies and paper submission to archival journals.[21]

One of the positive comments by one of 18 anonymous reviewers for the 2004 Report should be cited:

> It is now clear that loading level and current density thresholds are required in order to observe excess heat in these experiments. The values are consistent regardless of the approach used and the laboratory where the experiment was conducted. Early failures to reproduce the heat effect were, in part, due to not meeting these requirements. It has also been found that thermal and current density transients, which are thought to effect the chemical environment such as deuterium flux, can trigger heat "events." SRI has published an expression for the correlation between excess power and current density, loading, and deuterium flux. These discoveries have led to a better understanding of the phenomena and more reproducibility. (Reviewer #9)[5,pp122;23]

Even if nuclear transmutation in the CFP was excluded from the investigation by experts on the review team of the DOE, the partial positive evaluation given in their Report was encouraging to the cold fusion community.

III-3. Books by Huizenga and Taubes

Unpleasant episodes surrounding the financial support of researchers described by Taubes in detail in his book *Bad Science*[19] and the movement in the State of Utah to establish the National Cold Fusion Institute (described by Huizenga[20,Ch10]) made the atmosphere around cold fusion research dark or even black. These episodes had a strong negative influence about the CFP on scientists all over the world.

Some examples of the negative influence are seen in book reviews cited in Appendix B. Prominent scientists wrote their reviews after only reading the books by Huizenga and Taubes, without reading original papers and contemplating experimental data presented there. Even if a scientist is trained in one of the established branches of modern science, it is not easy to understand pioneering work in a truly novel field of research if one doesn't use their scientific spirit for the field which is alien to them.

It should be remembered that there was a scientist on the 1989 Cold Fusion Panel of the DOE who insisted on adding several words of reservation to deny the existence of cold fusion, in the Preamble as follows:

> Ordinarily, new scientific discoveries are claimed to be consistent and reproducible; as a result, if the experiments are not complicated, the discovery can usually be confirmed or disproved in a few months. The claims of cold fusion, however, are unusual in that even the strongest proponents of cold fusion assert that the experiments, for unknown reasons, are not consistent and reproducible at the present time.

> However, even a single short but valid cold fusion period would be revolutionary. As a result, it is difficult convincingly to resolve all cold fusion claims since, for example, any good experiment that fails to find cold fusion can be discounted as merely not working for unknown reasons. Likewise the failure of a theory to account for cold fusion can be discounted on the grounds that the correct explanation and theory has not been provided. Consequently, with the many contradictory existing claims it is not possible at this time to state categorically that all the claims for cold fusion have been convincingly either proved or disproved. Nonetheless, on balance, the Panel has reached the following conclusions and recommendations.[18,p36;1,p7;5,p120]

IV. Conclusion

The history of cold fusion research in these 30 years since the observation of a part of the CFP induced by nuclear reactions in cold fusion material is a typical story of discovery of a new science. There had been no framework to put the events in and we had to treat them by trial-and-error. In the process of trial-and-error, there were many unintentional errors which might be, regrettably, supposed intentional. The social condition for scientific activity in modern times has been severe, asking shortsighted success for investment, which does not fit with science.

I have endeavored to give a unified scientific explanation for the complicated variety of experimental data obtained in various cold fusion materials. Fortunately, the phenomenological approach using a model with trapped neutrons in cold fusion materials could explain experimental data qualitatively and sometimes quasi-quantitatively. As summarized in Section I, our trial on this line developed to enclose whole phases of the CFP. I hope that my system of explanation for the CFP thus established may be, at least, a tiny step to establishing solid state-nuclear physics.

Acknowledgement

I would like to express my heartfelt thanks to everyone who helped and collaborated with me in my work of establishing the science of the CFP for almost 30 years. John Dash was my collaborator for a long time and he gave financial support which helped to develop the research since 1999. Makoto Okamoto and Kodi Husimi understood my phenomenological approach and gave spiritual and financial support.

Appendix A: Martin Fleischmann on the Cold Fusion Phenomenon

Martin Fleischmann realized the dream of F. Paneth of 70 years ago that deuterons will fuse in a palladium metal where they are occluded with a very high concentration. In the 1989 paper, Fleischmann *et al.* wrote:

> A feature which is of special interest and which prompted the present investigation, is the very high H/D separation factor for absorbed hydrogen and deuterium...This can be explained only if the H^+ and D^+ in the lattice behave as classical oscillators (possibly as delocalized species) *i.e.* they must be in very shallow potential wells. In view of the very high compression and mobility of the dissolved species there must therefore be a significant number of close collisions and one can pose the question: would nuclear fusion of D^+ such as
>
> $$^2D + {}^2D \rightarrow {}^3T\ (1.01\ MeV) + {}^1H\ (3.02\ MeV) \quad (v)$$
> $$^2D + {}^2D \rightarrow {}^3Te\ (0.82\ MeV) + n\ (2.45\ MeV) \quad (vi)$$
>
> be feasible under these conditions?[15,p302]

However, it is interesting to notice the following sentence in the same paper:

> The most surprising feature of our results however, is that reactions (v) and (vi) are only a small part of the overall reaction scheme and that the bulk of the energy release is due to an hitherto unknown nuclear process or processes (presumably again due to deuterons).[15,p308]

Fleischmann's motivation to this experiment was published as a preliminary note in the *Journal of Electroanalytical Chemistry*[15] and later printed in another article.[24]

The controversial contents of this paper in addition to other data obtained in the following few years had been consistently analyzed by the TNCF model.[25]

The following quotes are from Fleischmann's ICCF1 lecture in 1990[26]:

> ■ We, for our part, would not have started this investigation if we had accepted the view that nuclear reactions in host lattices could not be affected by coherent processes...The background to this research has been presented from the point of view of the behavior of D^+ in palladium cathodes since this has been our exclusive concern. A somewhat different account would be relevant to the behavior of deuterium in titanium, the other system which has been the subject of intensive research following the description of the generation of low levels of neutrons during cathodic polarization.[26,p347]

> ■ It is now also essential to broaden the base of the research to include both the quantitative evaluation of the effects of the many variables leading to the control and optimization of particular outputs...and the extension of the range of systems showing the various effects. For the Pd-D system the central conundrum, the disparity of the excess enthalpy generation and of the expected nuclear products according to reactions (i) and (ii) however remains unsolved. It is clear that there must be other nuclear reaction paths of high cross-section and that these will only be discovered by a careful search for products on the surface and in the bulk of the electrodes (as well as in the solution and gas spaces).[26,p348]

Fleischmann at ICCF2[16] seems to have realized the nature of the CFP and necessity of a qualitative approach which has been elucidated in our recent paper:[27]

> In the development of any new area of research (and especially in one likely to arouse controversy!) it is desirable to achieve first of all a q*ualitative demonstration* of the phenomena invoked in the explanation of the observations. It is the *qualitative demonstrations* which are unambiguous: the *quantitative analyses* of the experimental results can be the *subject of debate* but, if these *quantitative analyses* stand in opposition to the *qualitative demonstration*, then these methods of analysis must be judged to be *incorrect*.[16,p476]

Fleischmann persisted with the d – d fusion reactions, with no alternative mechanisms considered:

> The most rudimentary measurements of the generation of tritium and of the neutron flux (or rather the lack of it!) show that the nuclear reaction paths
>
> $^2D + {}^2D \rightarrow {}^3He$ (0.81 MeV) + n(2.45 MeV) (i)
> $^2D + {}^2D \rightarrow {}^3T$ (1.01 MeV) + ^1H (3.02 MeV) (ii)
>
> which are dominant in high energy fusion (and which have roughly equal cross-sections under those conditions) contribute to only a very small extent to the observed phenomena.
>
> We reach the conclusions:
> (i) The lattice has an important influence on the nuclear processes;
> (ii) The observed processes are substantially aneutronic;
> (iii) The generation of excess enthalpy is the main signature of these new nuclear processes.[16,p478]

Fleischmann was aware of the correlation between the super-diffusivity of D in Pd and the CFP in it:

> An important key to the understanding of the system is given by the strange properties of D (and of H and T) in such lattices. We must ask: how can it be that D can exist at ~100 molar concentration and high supersaturations without forming D_2 in the lattice? How can it be that D diffuses so rapidly thorough the lattice (diffusion coefficient > 10^{-7} cm^2s^{-1} greater than that of either H or T!) whereas He is practically immobile? The answer to the last question is, of course, that deuterium is present as the deuteron whereas ^4He does not form α-particles.[16,p485]

This point was explained in our recent paper.[28]

In 1998, Fleischmann explained the basic concept of his experiment on the CFP done before 1989.[24,29] He noted that in 1983, Fleischmann and Pons posed themselves the following two questions:

> i) Would the nuclear reactions of deuterons confined in a lattice be faster (and different) from the fusion of deuterons in a plasma?
> ii) Could such nuclear reactions be detected?[24]

He adhered to the d – d fusion reactions and looked for a mechanism to realize them in solids. He considered the quantum field theory (QFT) the savior for his expectation:

> The scientific importance lies in the fact that whereas the Bohm-Aharanov Effect is a clear demonstration of the need to replace the C.M. [classical mechanics] by the Q.M. [quantum mechanics] paradigm, the Coehn-Aharanov Effect (indeed, "Cold Fusion" in general) is a demonstration of the need to go one step further to the Q.F.T. [quantum field theory] paradigm.[29,p123]

We might be able to infer about Martin Fleischmann's mind from what he wrote in the referred papers. The impact of the discovery of the CFP in the PdD system in 1989 to his thought had been too strong to open the gate of his mind to the protium system in addition to the gate to the deuterium system, which might have given him greater freedom of choice of the mechanism for the CFP.

Appendix B: Responses of Scientists to the News of the Cold Fusion Phenomenon

It is necessary or inevitable to contemplate the several responses of famous scientists on the news of discovery of new events which are inexplicable and covered with notorious facts induced by the social affairs. We cite raw voices of scientists on the discovery of the CFP; they all depended only on superficial facts reported by journalists without scrutinous investigation of experimental facts. Again, we recollect that no one can be omnipotent. We have to remember the historical facts around the discovery of the CFP and give our decision based on the experimental facts and our scientific spirit.

Appendix B-1: Huizenga's Book

On the back cover of Huizenga's *Cold Fusion: The Scientific Fiasco of the Century*,[20] Chemistry Nobel Laureate Glenn T. Seaborg writes: "Huizenga has written an authoritative, frank, hard-hitting account of the cold fusion fiasco. He compares this with other examples of pathological science and makes suggestions for the proper operation of the scientific process."

Douglas R.O. Morrison, particle physicist at CERN, Geneva, reviewed it as follows: "Cheap, clean energy is everybody's dream. John Huizenga tells the story of the rise and decline of cold fusion from the inside, as co-chairman of the Department of Energy panel on cold fusion—a fascinating account...a book to read and keep."

Appendix B-2: Taubes' Book

On the back cover of Taubes' *Bad Science: The Short Life and Weird Times of Cold Fusion*,[19] Leon Lederman (Nobel Prize for Physics, 1988) writes: "Gary Taubes has written a powerful, tense description of the 'cold fusion affair,' a depressing incident in recent science history. Exhaustive research and a lively journalistic style provide the reader with a stranger-than-fiction account of the decline and fall of two respectable chemists and their university administrator accomplices. [Bad Science] is more than a contribution to history, it is an instructive popular account of how good science operates, what can go wrong. As such, it contributes to the crucial task of popular science literacy."

Burton Richter, Nobelist for Physics in 1976, wrote: "*Bad Science* is great, a spellbinding story of science gone wrong."

Mel Schwartz (Nobel Prize for Physics, 1988) reviewed: "The story of cold fusion as told in this marvelous volume reads like a combination soap opera and mystery. If you want to gain a deep understanding of how science should and should not be done, this is the story that will do it for you. Whether you are a scientist or not, you won't be able to put it down."

F.S. Rowland, Chairman of the American Association for the Advancement of Science, wrote: "Unfortunately, *Bad Science* is an all-too-accurate summary of the furor over cold fusion. Gary Taubes has given us the definitive study of how a large part of the scientific community—fortunately not all—fell apart in the false light of a potentially infinite energy source."

Glenn T. Seaborg (Nobel Prize for Chemistry, 1951) wrote: "Taubes has written an absorbing, blow-by-blow account of the cold fusion fiasco…a penetrating and balanced dissection of pathological science."

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