be expected to know. This is so simply because some people have experiences that others do not have—and perhaps never will. But this is a long story for another time.

In sum, this book is a fun read intended for a literate and large audience. It is replete with wonderful insights and on-target assessments from a person whose original playful paranormalism has contributed so much to an important discussion on human nature, a discussion that might never have taken place so forcefully otherwise. For that, we should all be grateful—even if only for the book's entertainment value. Although one could disagree with Moody's major points, there is much to recommend in this book to anybody interested in the topic of the paranormal and the merits of discussions on it.

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The Discovery of the Cold Fusion Phenomenon by Hideo Kozima. Tokyo, Japan: Ohotake Shuppan, 1998. 370 pp. $42.00 (in the USA). ISBN 4-87186-046-2.

Hideo Kozima's remarkable book is the first textbook describing cold fusion phenomena. With its more than 400 references and 70 diagrams of experimental results, thorough readers would have difficulty supporting the contention of university physicists that no such phenomenon exists.

The author is careful to explain in the introductory chapter how cold fusion is a term based on misunderstandings in early work. Many of the phenomena do not involve fusion, but reactions with neutrons and protons within the solid material in which most of the phenomena occur.

The book consists of 18 chapters. Only 10 of them explain experimental work. An usually large number of chapters, four in all, are about the author's theory and its detailed numerical application to the varied phenomena of so-called cold fusion: the neutrons, the tritium, the heat, and the gamma rays. (Incidentally, he does not mention x-ray emission from electrodes, which have been reliably reported.)

Kozima's idea—and ideas of this kind are at the cutting edge of present theories of cold fusion—is connected with neutrons inside the solid lattice. His contention is that there are trapped neutrons. They originate in the atmosphere by the interaction of cosmic rays with nitrogen. They arrive on a solid lattice at about 10^2 cm^{-2} sec^{-1}, and thereafter they can take part in a large number of nuclear reactions inside the solid. In the later chapters, Kozima works out what would be the number of neutrons per cc to be consistent with the results that he examines and comes to the conclusion that, by and large, consistency is reached if the concentration of trapped neutrons is between 10^8 and 10^{13} per cc.

The first four chapters are introductory and rather light weight. They talk about the infamous ERAB (Energy Research Advisory Board) Report in which the cold fusion researchers 1989 work was interrogated by a number of scientists appointed by DOE (U.S. Dept. of Energy) in a style that would suggest a prosecuting attorney's examination. They touch on the general idea of catalysts and how enzymes react in the body (the appropriateness of some sections here in Chapter 3 seems rather doubtful). Chapter 4 treats nuclear fusion reactions in a classical sense. In Chapter 5, we begin to take off and fly with a discussion of the rediscovery of the cold fusion phenomenon in modern times. The author presents Fleischmann, Pons, and Hawkins (1989) as the discoverers. Nonetheless, the book also makes clear—in later chapters—that several papers reported nuclear reactions in solids before Fleischmann, Pons, and Hawkins. Most remarkable of all, and something new to the reviewer, Kozima quotes a recent book by Kushi (1994) in which a U.S. Army report from the Material Technology Laboratories Report of 1978 is described. This report concerns Energy Development from Elemental Transmutation in Biological Systems. It is said to have validated the work done up to that time as proving the transmutation in the cold and also the production of nuclear energy. Other works carried out before that of Fleischmann and Pons include a study at U.S. National Laboratories of Nuclear Reactions, conducted by passing high currents through wires (producing neutrons), and the work of Borghi in 1943 in which neutrons were produced by a passage of high currents through a klystron.

Chapter 6 has the essence of the phenomenological descriptions for systems involving deuterium, and Chapter 7 reports similar material for hydrogen-containing systems, although it is far less in extent. In Chapter 8, the idea of thermal neutrons is considered in a general manner. The summary of the experimental data is given in Chapter 9.

Then, in Chapter 10, facts in respect to biotransmutation are given, and Kozima implies that it is a general phenomenon in nature. The ticklish subject of reproducibility is presented and discussed. The facts here are clear. If an investigator tries to start a cold fusion experiment on any given day, there is about one chance in five that he or she would see a positive result. If one is willing to wait a few days and try again, a successful experiment may be seen. At the same time, each of the results discussed in this book has been repeated many times in many laboratories in many countries. Therefore, the results are repeatable, but not reproducible in the normal sense. Scientists will have to get used to looking at phenomena like this.

Chapter 11 contains the main testing out of the trapped neutron model. The author produces a noncontroversial equation for the rate at which the reaction of neutrons occurs but has an adjustable parameter, that is, the concentration of neutrons in the solid.

As stated above, most of the phenomena can be accounted for numerically *if* the concentration of neutrons in the solid is between 10^8–10^{13} cc^{-1}. It is difficult to understand how the concentration of neutrons in a given solid would vary so much. In fact, if one studies the table of all the results that have been matched, the range to get a fit is much greater, more like 10^2–10^{13}. The author is not forthcoming in commenting on this range, he seems to have an easy-going attitude toward acceptability.

By Chapter 12, the reader is immersed in the trapped-neutron theory, and it is compared with various other theories using discussions of the corresponding Mössbauer effect and the role of the electrolyte.

Chapter 13 further develops seven other theories and how they compete with the trapped-neutron theory; Chapters 14 through 18 are "postscript chapters." The book really ends after Chapter 13. Chapter 14 is about the energy crisis and how cold fusion might solve it. Chapter 15 is a general chapter about revolutions in paradigms. Chapter 16 presents the views on the field of a number of Japanese scientists. Chapter 17 is about symbols and units, and Chapter 18 is the reference list.

To call this a book about cold fusion is perhaps too much. It is particularly oriented toward a presentation of the author's theory. Thus, the typical examples of the reactions of trapped neutrons with the constituents of the lattice are:

$$\begin{aligned} n + {}^{6}_{3}\mathrm{Li} &= {}^{4}_{2}\mathrm{He}(2.1\ \mathrm{MeV}) + t(2.7\ \mathrm{MeV}), \\ t(\varepsilon) + d &= {}^{4}_{2}\mathrm{He}(3.5\ \mathrm{MeV}) + n(14.1\ \mathrm{MeV}) + \varepsilon, \\ n(\varepsilon) + d &= n(\varepsilon') + d(\varepsilon''), \\ d(\varepsilon) + d &= {}^{3}_{2}\mathrm{He}(0.82\ \mathrm{MeV}) + n(2.45\ \mathrm{MeV}) + \varepsilon. \end{aligned}$$

The product particles of these trigger reactions create higher energies than does the thermal reaction and can induce successive nuclear reactions (*i.e.*, breeding reactions).

In a qualitative way, the trapped-neutron theory explains a great deal. Once one is convinced that free neutrons are inside the solid, one can see that several transmutation reactions might well take place and produce energy. The major problem is providing convincing evidence for the large number of trapped neutrons that the theory demands. It is difficult to measure in an independent way, and the author uses it as an adjustable parameter. Were Kozima able to establish agreement with the experiment at, for example, 10^7–10^9 neutrons per cc, the reader might be able to believe in the model and swallow the discrepancies in the concentration of cold fusion present in palladium. Much greater ranges are needed to obtain a fit, however, and one has to ask why. Is this the origin of the famous irreproducibility? Could it be that various pieces of palladium have had various trapping times for neutrons? It is difficult to see that neutrons from the atmosphere, over the several years in which most of the pieces of palladium have existed, could build up to the necessary values. Thus, 10^2 neutrons per cm^{-2} and sec^{-1} implies the need for 10^4 years to build up 10^{13} neutrons cc^{-1} (even if all were trapped).

Another issue that raises doubts about the model is that Kozima always stresses the importance of LiOD (or LiOH) electrolyte and the diffusion of lithium into the palladium. It is true that lithium does this, as was shown by Oliver Murphy at Texas A&M in 1990, but other works that have used sodium or hydrogen as cations in the electrolyte, and these have lead to cold fusion too.

Other phenomena that the trapped-neutron theory would seem difficult to accommodate are those observed by Chien at Texas A&M in 1992. He found that whenever he added fresh D_2O to, LiOH, the production of tritium stopped and then started again spontaneously after some hours. Correspondingly, it is not easy to see why the potential of the electrode alters the rate at which tritium is produced on the neutron theory. Finally, the impact method of provoking nuclear change—little known but now verified—does not have an obvious interpretation in terms of neutrons.

Nevertheless, one feels that Dr. Kozima has provided a useful text by placing his attention on neutrons. The details need further working out—particularly the origin of the neutrons and the concentration that he has to assume—but his work clearly strengthens the neutron case.

It is increasingly necessary to consider the sociology of this new phenomenon, which has been lurking in the literature for more than 50 years but came to prominence in the 1990s. There are now more than 2,000 positive papers in the literature written after 1990. It is scandalous that one still has to go to specialist journals to obtain acceptance for publication (i.e., the "establishment journals" of physics and chemistry still refuse to publish cold fusion papers, and the U.S. patent office will not accept patents for devices based on cold fusion).

This is a historically important fact because it indicates a frozen physics. New phenomena may not be accepted if they disagree with the present paradigm. Thus, the importance of Dr. Kozima's book goes beyond his providing a compendium of cold fusion facts with an interesting attempt at interpretation. It should act as a clanging bell to scientists in general that something is wrong with textbook perceptions in nuclear physics—and perhaps with the lack of perception by physicists that there is always a next step.

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The Truth in the Light by Peter Fenwick (with Elizabeth Fenwick). New York: Berkley Books, 1997. 278 pp. $12.00, paper. ISBN 0-425-15608-7.

Light and Death by Michael Sabom. Grand Rapids, MI: Zondervan Publishing House, 1998. 240 pp. $12.99, paper. ISBN 0-310-21992-2.

No one can complain about a dearth of books on near-death experiences (NDEs), but many of the authors of the books published on this topic have either written autobiographical accounts or declared themselves researchers and