Chapter 1　Discovery of the Cold Fusion Phenomenon

" - - - - *From this natural phenomenon which previously seemed impossible to you, you should realize that there may be others which you do not yet know. Do not conclude from your apprenticeship that there is nothing left for you to learn, but that you still have an infinite amount to learn*." Blaise Pascal ***Pensées*** (230) p. 126, Translated by A.J. Krailsheimer., Penguin Books, 1966.

From March 1989 to the end of this year, throughout 9 months, almost all physicists and chemists in the world were enthusiastic to know the reality of the so-called "cold fusion" first reported by electrochemists Fleischmann and Pons of the University of Utah, USA.

The Financial Times, a British business paper, reported on the 23rd of March, two scientists from England and the US, M. Fleischmann and S. Pons successfully caused nuclear fusion in a test tube by means of electrolysis guided by Fleischmann's hypothesis that the environment of transition- metal deuterides makes fusions of two deuterons realistic increasing their probabilities by a factor of several tens of order of magnitude (~ 10^{50}). Nuclear fusion is believed to occur only in a super high temperature, super high-pressure environment and requires a gigantic apparatus that could cost hundreds of billions of dollar.　If their success was true, it could provide solutions to energy issues.

This news caused a tremendous excitement among energy researchers and engineers around the world. Since 1950, the future energy resources became an issue among industrial nations and how to secure energy resource for industrial as well as household use beyond the first half of the 21st century had become a pressing agenda.

The destiny of the cold fusion research is, however, not smooth reflecting social and scientific situation of the end of 20th century. Investigation of the history of the cold fusion research and of cold fusion phenomenon itself gives us a precious lesson about science itself and about the relationship of science and society. In this chapter, I have tried to show a real process of scientific research using the first stage of the cold fusion research as a sample and also to reveal factors biasing the process through it.

If Fleischmann's hypothesis, that immense amplification of the probability of fusion reactions of two deuterons to be an intermediate unstable nucleus $^{4}_{2}He^{*}$ and then its decay to new nuclei occurs in transition-metal deuterides, is true, it will be a revolution of nuclear physics and solid-state physics. (Cf. Appendix D, Topics 7, Wonders of

Transition-metal Hydrides) The reality of the hypothesis was, however, not proved and the whole experimental data was not consistent with the hypothesis. . Therefore, we would like to use a name “cold fusion phenomenon” for experimental data as a whole related with the so-called cold fusion, i.e.

Cold Fusion Phenomenon **(*CFP*)** stands for “nuclear reactions and accompanying events occurring in solids with high densities of hydrogen isotopes (H and/or D) in ambient radiation.”