

Historical Research on Fusion Science Based on Oral History Method

-Interview to Dr. Shigeru Mori-

オーラルヒストリーに基づく核融合の歴史研究

-森茂氏インタビュー-

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An interview to Shigeru Mori (former board of director at Japan Atomic Energy Research Institute) was carried out in 2011. He basically considers fusion science not as an academic research but research and development of mission oriented. What was talked in the interview showed the circumstances of the first period of fusion research in JAERI. Those information, such as, the processes or backgrounds of each event, his thinking in decision making, communication among researchers is generally not found in written materials. In this report, some details of the interview to Shigeru Mori will be shown.

Oral history is a useful method for historical researches as complementary materials of written documents. Fusion Science Archives at the National Institute for Fusion Science (NIFS FSA) has continued the activity for the last decade and stores those interview records.

An interview to Shigeru Mori, the former vice-president of Japan Atomic Energy Research Institute, was carried out at the office of Japan Atomic Energy Agency (JAEA) in Tokyo on March 10, 2011. The interview was planned and conducted under the collaboration with JAEA and Nihon University. The interviewers were H.Iguchi and K.Kimura, from NIFS, S.Matsuda and H.Yoshida from JAEA and T.Amemiya from Nihon University. The interview took about four hours, however, he kept on talking without any coffee break. Outline of the interview is described below.

1. School Age

S. Mori was born in Hiroshima city in 1923 at a family of traditional medical doctor. After finishing the high school at Hiroshima, he entered the University of Tokyo and chose nuclear physics course under Prof. Goro Miyamoto. He was one of the first students of the class of G. Miyamoto, who

had his own class being independent from Prof. R. Sagane. However, close connection between these two classes continued afterward. In this class, he met Tihiro Ohkawa, who later became an active fusion researcher in US, and Masaji Yoshikawa, who later became a Director General of JAERI. Because of the wartime, materials necessary for experiments were short. They were involved in making those things by themselves. S. Mori was good at these works. He experienced the air raid to Tokyo on March 10th, 1945 by B-29 of US air force. His family was suffered from the atomic bomb to Hiroshima city on August 6th. He lived a difficult age both for himself and his family.

2. About A-B dispute

In the early age of Japanese fusion research, there was a severe discussion on strategy of fusion research in Japan, which was called A-B dispute later. Opinions were divided into two. One group supported an idea to start basic plasma physics and education (A-plan). Another group insisted that we should construct a medium-sized fusion experimental device to catch up western research level carried out in USA, England, USSR, etc. (B-plan) S. Mori was in the latter group. He thought

that fusion research was a mission oriented one and was not an academic research. After the decision was made to start from A-plan, the Institute of Plasma Physics, Nagoya University was established as an inter-university collaboration organization. S. Mori and his colleagues had to wait for the B-plan to start for several years.

3. Spherator to Tokamak

Fusion research at JAERI started in the middle of 1960s by constructing a toroidal device with multipole field configuration (a hexapole device). Then S. Mori and his colleagues planned to build the next step machine with the Spherator configuration, which was developed by Shoichi Yoshikawa at PPPL in USA, because Spherator experiment showed unique experimental results that could be explained by theoretical predictions. However, T-3 tokamak results were reported from USSR that it overcame the serious barrier of Bohm diffusion. S. Mori decided to change the next step plan from Spherator device to tokamak and requested for approval to Japan Atomic Energy Commission, whose chairperson was S. Kikuchi. It was natural and smooth transition for S. Mori, because tokamak was considered to be an internal current system that carries current by plasma itself instead of material conductors. It has a merit as a future commercial reactor that energy loss at the support of current conductors could be eliminated. However, S. Kikuchi did not accept his idea at first, saying that he did not believe such a person who changed his idea over one night. There was a hard open discussion between S. Kikuchi and S. Mori, which was called as “an air-fight between Mori and Kikuchi”. The situation tended to worse at this moment. However, a bureaucrat at JAERI watching this scene suggested S. Mori that his explanation was not easy to understand for a non-fusion-researcher. He set up an occasion for S. Mori to explain to S. Kikuchi on the reason to change the plan more in detail. Finally S. Kikuchi understood Mori’s idea and accepted the new plan.

Tokamak experiments using JFT-2 were successful. H. Yoshimura of Nihon University, who was a co-secretary of Nuclear Fusion Committee at Science Council with S. Mori, stated this successful step that Japanese fusion research took off finally.

4. US-Japan Collaboration

US-Japan collaboration on energy research started 1978 after the Fukuda-Cater agreement in the previous year. Trade friction between two countries due to a large Japanese surplus was the background of this movement. Japan wanted to

place fusion research with top priority, and decided to join the Doublet experiment, which was a non-circular tokamak device lead by T. Ohkawa at GA. It was agreed that the JAERI team and the GA team shared machine time every other week. The JAERI team showed high performance in experimental research, which drastically raised the status of Japanese fusion researchers. On the other hand, JAERI had to give up its own program on non-circular tokamak experiment JT-4, although its design activity had been in progress. Since the decision was made after discussion in researchers, not by top-down style, this change of plan was accepted without confusion.

5. R&D in Fusion Technology

S. Mori found in early 1960s that there was a reactor design using stellarator configuration at PPPL, the Stellarator-D. He got the blue copy of this thick report stored as an Atomic Energy Commission report in USA and read it. The design adopted the magnet coils with normal conductors cooled at minus 20 °C. The power loss at the coils was so huge and the thermal power output was 10 GW. He was much shocked at this result and felt that fusion energy is just a dream. However, it soon became clear that a super-conducting magnet could be used for commercial purposes. He learned about super conductor from N. Yasukochi of Nihon University, who was a specialist on this filed. S. Mori decided to list up this technology as one of four main R&D issues in fusion technology at JAERI. S. Shimamoto was called to join this research from France. About tritium handling, Y. Naruse who was working at Radio Isotope section joined fusion research. R. Hashiguchi of Tokyo University of Science contributed much to material researches. In addition, reactor design study had been continued and enforced. Such research activities at JAERI on various field of fusion technology to be necessary in a commercial reactor were evaluated that fusion research at JAERI was performed as really mission oriented style.

6. Other topics

In this interview, many other topics were introduced. Those were INTOR workshop in which he played a chairperson of this big international collaboration, and Japan Atomic Industrial Forum (JAIF) for which he became a senior adviser. He also talked about recent personnel life.

The interview record will be registered and stored at NIFS FSA soon.