

### §3. The Role of Inter-University Institute for Nuclear Fusion Research in Early Period

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The idea of inter-university collaborating institute was produced in 1950s, when the scientific research activities in Japan had a very hard time in obtaining budget and other necessary supports. The Institute of Plasma Physics, Nagoya University (IPP, 1961-1989) belongs to this category and was established after the intensive discussions (AB-dispute, 1959) on the starting-up policies of fusion research in Japan. IPP was expected to be a center of collaborative work along A-plan, i.e., to promote the general studies of plasma physics and technology for fusion research. This line of activities was funded by Monbusho budget for university-based research. Although affiliated with Nagoya University, IPP was not always restricted within the host university, but kept its inter-university nature as to be operated substantially by the autonomy of the fusion researchers' community, Kakuyugo-Kondankai. This relation between the Institute and the University was often referred to as "Mutual Respect and Mutual Independence"

IPP had organized and carried out a number of collaborative activities with the nation-wide researchers, as well as its own programs. Compared with other collaborative institute, for instance, INS (Institute for Nuclear Study, Univ. Tokyo, 1954-1997) which was devoted mainly to the shared use of large accelerators, IPP paid more efforts to make collaboration works rather than simple use of some specified big facility. The principle was quite effective to bring university activities up.

After starting of IPP, the nation-wide strategy of nuclear fusion research was re-discussed by a Panel in SCJ (Science Council of Japan), in view of the next step of development. The report (1967) claimed the necessity of an approach along the line of comprehensive experimental device, where (i) projective planning, (ii) choice of machine type, and (iii) new institution for the program, were emphasized. This was a kind of restoration of B-plan, i.e., to introduce a sizable machine, and followed up by STA (Science and Technology Agency) budget for National Atomic Energy Research with an approval of JAEC (Japan Atomic Energy Commission). Then JAERI (Japan Atomic Energy Research Institute), ETL (Electro-technical Laboratory) and RIKEN

became in charge of the program, and Tokamak and other systems had come in the scope. It should be noted a new type of institute to conduct stepwise trials for fusion reactor goal with a target point defined on the  $(T - n\tau)$  diagram was first mentioned. As an actual system, JAERI became responsible for this new type of institution.

For the inter-university institute, IPP, the main target was to make systematic and basic research of plasma science and to give fundamental knowledge applicable to controlled fusion. Actually IPP at this period started keV-plasma confinement and multi-path approach for new regions of plasmas as its own program plans.

Due to the expanding areas of fusion science, SCM (Science Council of Monbusho) gave a new proposal for promotion of fusion researches in universities in 1975, to set up various research centers through 1980: Tokamak (Kyushu U.), Heliotron (Kyoto U.), Mirror (U. Tsukuba), Theory (Hiroshima U.), Laser (Osaka U.), Tritium (Toyama U.), etc. Developments in many directions induced somewhat different factors in the style of inter-university collaborations. As for IPP itself, possibility of a reacting plasma experiment (R-tokamak) had been considered.

On the JAEC-STA side, NFC (Nuclear Fusion Council) started in 1975, and the 2<sup>nd</sup> step of Comprehensive Fusion Research Program was set up to aim at break-even conditions in JT-60 machine. In this mission-oriented line JAERI, Naka Establishment, succeeded in attaining the aimed break-even plasma in JT-60U in 1996. The reactor technology development became much more important.

In 1980s SCM also reconsidered the way of promoting fusion research and development for universities, analyzing the general trends of research activities in the near future and gave the new propositions. Eventually the LHD project was given as the next step large program of university side. Among others the growing importance of inter-university scheme of collaborative activities was mentioned. The inter-university institute attached to a university should be up-scaled and to be independent of a particular university. Then IPP was reorganized jointly together with Plasma Physics Laboratory, Kyoto University and Institute for Fusion Theory, Hiroshima University, into a new organization for inter-university collaboration, NIFS (National Institute for Fusion Science) in 1989.

There were two different funding lines for fusion research promotion in Japan: Monbusho and STA. They were in a sense complementary and alternating in character. Since 2001 they have been reorganized into a single ministry MEXT.

We can follow these changes in the role of inter-university institute for fusion research by checking the materials preserved and indexed at NIFS Archives.