

§11. Effects of Monbusho's Grant-in-Aid in Promoting Nuclear Fusion Research in Japan

Obayashi, H., Fujita, J., Kuroda, T., Matsuoka, K., Terashima, Y. (Nagoya Univ., Prof. Emer.), Sato, N. (Tohoku Univ., Prof. Emer.), Sato, K.N. (Kyushu Univ., Prof. Emer.), Iguchi, H., Namba, C., Kimura, K., Hanaoka, S., Kohmoto, Y.

Introduction

Kakenhi (Grant-in-Aid for Scientific Research) has been operated by *Monbusho* (Ministry of Education) as the governmental budget to support scientific motivations of researchers. It was quite effective in the starting-up phase of new science such as nuclear fusion and plasma science.

[A] *Trend of Kakenhi for Nuclear Fusion Studies*

Types and durations of *Kakenhi* granted for Fusion-related Studies during the second half of last century are shortly given.

(0) *Kikan-Kenkyu* (Institutional Equipment) (1957~62)

Supporting a few small size experiments

(1) *Sogo-Kenkyu* (Cooperative Research) (1958~60; 1961~62)

Organizing and operating *Kakuyugo Kondankai* (Fusion-researchers' community had been established.)

(2) *Tokutei-Kenkyu* (Specific Area) [4 terms + 1 intermission]

(1963~65; intermission; 1972~74; 1975~77; 1978~79)

Promoting university-based fusion studies

(3) *Tokubetsu-Kenkyu* (Special Area) (1980~89)

Expanding research fields to include reactor technology (Fusion Research was designated as a Special Area.)

(4) *Post Tokubetsu-Kenkyu* (1990~)

Not proceeding into *Jutenryoiki-Kenkyu* (Priority Areas) (*Sogo-Kenkyu* and other schemes were made use of.)

[B] *Subject Items and Classifications*

In the scheme of *Kakenhi*, an individual applicant should find at which research field his/her own subject could actually be submitted. As the guiding map for this purpose, "List of Categories, Areas, Disciplines and Research Fields" is prepared. In promoting any branch of scientific activities due to this scheme, it is quite important to keep appropriate item registrations in the List.

In this line of *Kakenhi* system, a new discipline of Plasma Science and Technology was set up in 1976. Since 1993, another item of Nuclear Fusion Studies was added within the discipline of Integrated Engineering. Such arrangements would be of great favor to the progress of plasma and nuclear fusion studies, together with the designated scientific importance given as the class for Research Area, as shown in the preceding section.

[C] *Plasma Science Promotion*

As plasma phenomena will reveal themselves not only in fusion studies, but in various physical and technological fields with different aspects, researches on their properties are of great importance. Referring to this general vision, a *Sogo-Kenkyu* program, "New Plasma Physics," (1982~84) was organized, dealing with a wide range of topics, i.e., (i) basic plasma, (ii) space plasma, (iii) applied plasma, and (iv) fusion plasma. This activity was amplified in stressing relations between fundamental understandings and actual plasma behaviors, and got to produce a series of yearly meetings, "Symposium on Plasma Processing (SPP)," starting in 1984. The *Sogo-Kenkyu* itself was succeeded by the next program, "Experimental Investigations on New Plasma Phenomena (1985~87)." Furthermore, in the scope of applied plasma science, a *Jutenryoiki-Kenkyu* (Scientific Research on Priority Areas) "Control of Reactive Plasmas (1988~91)" was granted, which was deeply concerned with plasma processing and other industrial applications. Organized activities in this priority area were expressed to hold an international conference series "International Conference on Reactive Plasmas (ICRP)," every three years since 1991. These efforts were quite important and effective to reorganize people investigating different types of plasma, from chemical to nuclear, and giving discussions of essentially inter-disciplinary looking.

[D] *International Collaboration*

So far the *Kakenhi* granted for nuclear fusion studies has not directly been used to hold any specific event of international collaborations in the fields, but it has indirectly given better conditions in the domestic side. Within the class of *Tokubetsu-Kenkyu*, some of overseas travel expenses, which had been very difficult to keep, could be charged in *Kakenhi* to fit the trend of globalization. It might also be mentioned that the *Kakenhi* categorized as International Scientific Enterprise, not for the limited research areas, had been very effective in international cooperation.

Concluding Remark

Kakenhi is in itself a funding system for individual ideas of researchers and quite different from the project implementing budget. But when a region of newly born science is going to develop, this system may be helpful and effective. Nuclear fusion together with plasma science has given an example of the case that this worked fairly well with several points of problem. It will be of great help to edit a flow chart on the *Kakenhi* activities in understanding the relation with other eventual chronology.

This work has been conducted under NIFS Collaborative Research Program (NIFS09KVXJ013).