

## Synchrotron Radiation in Japan: A Perspective for a New Model of International Cooperation

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Eighteen years have past since I met Prof. Kazutake Kohra for the first time at the University of Campinas, Brazil. Prof. Kohra had been invited to conduct a series of conferences of X-Ray Dynamical Diffraction at a meeting of the Brazilian physical society. At that time, Prof. Kohra, the leader of the National Synchrotron Radiation (SR) Project (today Photon Factory), told me that even though the Japanese community on Diffraction and Spectroscopy with SR was one of the largest and most highly qualified in the world, a part of the scientific community was still apathetic with respect to the project "go ahead".

It was not easy to imagine at that time such a rapid and astonishing evolution in a relatively small interval of time. Today, SR activities in Japan have become one of the most dynamic and advanced in the world, performing an excellent synchronization between fundamental science and applications to high technology, with a harmonious participation of universities, industries and research centers. This has been contributing as one of the key points for the development of science and technology in Japan. However, the most positive point of the conception of the National Laboratory of SR has been the very high efficiency in the utilization of advanced instrumentation and, in particular, the possibility of effective interactions between scientists belonging to various institutions. This interaction has directly been reflected in the scientific level improvement of the whole community.

The increasing number of SR facilities in Japan is remarkable. Including the compact storage rings, there are 18 facilities in operation, and by counting other projects under construction or being planned, there are a total of 27 facilities, which is equivalent to 35% of all facilities in operation and being planned in the world (Tomimasu, Chester, July, 1991).

Actually, outside Europe, the Soviet Union, United States and Japan, an increasing number of SR facilities are being planned and commissioned, for example, in China, India, Taiwan, Brazil and Korea. And certainly, in the near future the medium size and compact storage rings for technological applications will be spread all over the world. The new concept of a National Laboratory with the common use of facilities and instrumentation is especially important for the developing countries, in order to avoid spreading their financial resources too thinly.

At this point, it becomes convenient to mention three important arguments to justify the main objective of this article:

### (I) Users and Staff of SR Facilities

In view of the scientific and technological advances in the world, the volume of utilization of SR has been

sharply increasing in terms of users. In Japan, at the Photon Factory, for example, the number of users almost surpasses 3,000 researchers, and most of the research groups of universities and industries (that do not have their own beamlines) must wait for a long time in order to do experiments. On the other hand, there is a critical shortage of staff members for the SR facility. They are responsible for the construction, operation and maintenance of the facility, for R & D, for giving advice, and conducting experiments in collaboration with external users. This problem will likely become much more serious in the future.

#### (II) International Cooperation

In recent years, the strong economic power of Japan has transformed the international technical cooperation program of the Japanese government (ODA) into one of the richest in the world. In this sense, the effort and dedication of JICA (Japan International Cooperation Agency) to cooperate on such a large scale and multidisciplinary areas is highly appreciated. The point to be emphasized is that the cooperation model adopted until now has been for Japan to contemplate unilaterally external requests for investments, donation of equipments and dispatch of experts to the country asking for help. It would be desirable to make improvements in this cooperation model, such as a linking between basic science and technological applications. The feasibility and experimental study, implementing this new model of cooperation with more participation by the Japanese scientific community is urgently required.

#### (III) Unification around One project

It is worthwhile to mention the example of the European Synchrotron Radiation Facility (ESRF), in which almost all European countries are participating in a single SR project. It would be ideal if all segments of Japanese government could participate in an International Program of SR, and in so doing, promote international cooperation.

In fact, Japan is in an ideal situation to assume an international leadership role as a center for the diffusion of knowledge and training on Synchrotron Radiation, and to implement a new model of international cooperation, especially for Asia and other developing countries. The creation of an International Center of Synchrotron Radiation (ICSR) in Japan would fulfill many objectives and aspirations of national and international interests. The main ones are:

(1) Technical training of young engineers and creation of human resources at the graduate and post-doctorate levels. In this sense, an important aspect is the adoption of a "training on the job" methodology, which satisfies both the increasing manpower shortage in Japan and also instills the Japanese work ethics in the young foreign engineers and scientists.

(2) Exchange of high level researchers and technicians. The personnel trained in item (1) could take advantage of the collaboration channel after their return to their home country, a basic condition for international cooperation.

(3) International beamlines would be available for the foreign community at the ICSR in this exchange program. Therefore, many countries without their own storage rings at present, would be highly benefitted.

(4) Foreign experts would be invited by ICSR to conduct courses and to perform collaborative research with their Japanese counterparts.

(5) The participation in the ICSR of an institution with an international reputation and representativeness (for

example, the United Nations University) would be desirable.

(6) For an international cooperation program of such magnitude, the participation and support of all segments of Japanese government would be desirable and essential.

It is well known that the most important and fundamental aspect of international cooperation between an advanced country and the developing countries is the creation of trained personnel who can contribute to the development process in the native country. The cooperation network acts as a cultural, scientific and technical linkage with the "mother" country. The ICSR would demonstrate an advanced methodology of international cooperation between the Japanese government, and countries that have not yet entered this field, other countries interested in advancing, and also those countries with expertise in SR. The SR laboratories presently in operation in Japan, and others being planned or to be commissioned in the future, as in the case of SPring-8 and MR would benefit greatly from the creation of an International Center of Synchrotron Radiation. And most importantly, it would constitute a pioneer and non-conventional model for contributing to global equilibrium in the world.

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