



I. Introduction

The Great East Japan Earthquake, which occurred at 2:46 pm on March 11, 2011, devastated those prefectures facing the Pacific Ocean in East Japan and seriously damaged several major scientific research facilities around the area.

Among the facilities affected were the Photon Factory in Tsukuba, J-PARC, and JRR-3 in Tokai. They have been the essential members of Quantum Beam Facilities in Japan. As an immediate assistance, SPring-8 established the Priority Program for Disaster-Affected Quantum Beam Facilities. It was intended to support the users of the Photon Factory facing difficulties to conduct their research proposals. The program, however, kept its door open to the J-PARC and JRR-3 users as well, provided that they could appropriately convert their proposals from neutron-beam-based to X-ray-beam-based. The users from the Photon Factory, J-PARC, and JRR-3 amounted to 297, 4, and 17, respectively, while those facilities were under the recovery process.

It was probably the first incident that the network among the Quantum Beam Facilities in Japan functioned substantially. The experience became a valuable lesson of forming the “Quantum Beam Platform,” which should be a collective research environment in order for science and technology to be a driving force for disaster recovery and reconstruction.

More specifically, science and technology is now strongly required to challenge the energy and environmental problems in light of the current social

situation. In this respect, there were three noteworthy events in 2011, symbolizing the proactive stance of SPring-8 on these problems.

Firstly, SPring-8 began acting as a satellite center of the Low-Carbon Research Network funded by the government to promote advanced low-carbon research. Newly installed in 2011A to fulfill this mission were a nanobeam X-ray absorbing spectrum analyzer and a fluorescence analyzer at BL39XU and BL37XU, respectively. When combined with the X-ray nanobeams generated by SPring-8, it is expected that these advanced analyzers will play a central role as advanced tools for atomic and molecular structural/electronic/compositional analysis and control, being essential for the advancement of green/nanotechnologies.

Secondly, in order to further activate the use of SPring-8 towards low carbon and healthcare innovations, the Green/Life Innovation Field has been designated as a new priority field for two years from 2011B. To attract potential users contributing to the innovations, briefing sessions were organized in major cities of Japan.

Lastly, in the direction of the outreach effort, the 3rd SPring-8 Conference was held in Tokyo, November 2011, entitled “Revitalization of Japan driven by leading edge technology and diversity of SPring-8 –towards the solution of the energy problem–.” The conference intensively covered the research projects directly linked to new-generation

batteries, solar energy and fuel cells. To clarify the *raison d'être* of SPring-8 in the current situation of Japan, the final session was dedicated to a panel discussion, the conclusion of which was that SPring-8 should keep the position as a COE of photon science for academia-industry collaboration by the synergy of cross-disciplinary utilization, especially for overcoming the difficult time of Japan.

In 2011, SPring-8 saw not only the disaster recovery efforts but also another way of making a social contribution. Recently, it has become possible to investigate nanoscale pieces of evidence at the scene of crimes by exploiting the X-ray nanobeam technology at SPring-8. To scientifically uncover the truths, the Japan Synchrotron Radiation Research Institute (JASRI) established the Nano-Forensic Science Group in December 2011. This group is expected to make a large contribution to realize a secure and safe society, not only developing an analysis technology by fully utilizing the nanotechnology applications of SPring-8, such as X-ray fluorescence, X-ray absorption fine structure, and X-ray structural analyses, but also building new databases that help in the identification of evidence materials.

By employing an advanced IT technology, it became possible to virtually generate an experimental environment on a personal computer located far from SPring-8. This Remote Experiment system has been regarded as a promising approach that could further accelerate the utilization of SPring-8, by eliminating the disadvantage of the physical location of SPring-8. In 2011B, the operation of Remote Experiment for public use was commenced domestically, first mainly targeting protein crystallography. Remote Experiment is highly desired, especially in industrial applications, because it enables users to save time and money to travel to/from SPring-8. Carefully considering the needs of users and the safety of the experiments, SPring-8 will gradually extend the application fields of Remote Experiment.

It is highly important for SPring-8 not only to promote its utilization but also to feedback research outcomes to the society. To ensure the feedback process more strictly, the conditions for non-proprietary use were amended from 2011B in such a way that users must publish their research outcomes in refereed journals or equivalents within three years after the end of the research term. In case the users are unable to comply to this condition, they must submit either a SPring-8 research report or a corporate technical journal article refereed at their home institutions. Needless to say, the new condition is not to discourage challenging research at all, but is based on the general knowledge that even unsuccessful/failed experiments

could aid other users. More importantly, SPring-8 should strengthen its accountability about the utilization of its valuable X-ray beams for the society through this approach.

As the Registered Institution for Facilities Use Promotion for SPring-8, JASRI organized the 1st International Advisory Committee, July 26-28, 2011, in order to follow its recommendations on the (1) scientific/technological attainments, (2) future plan, (3) balance between academia and industry, (4) interrelationship between academia and industry, (5) manpower shortage, (6) proposal selection system, (7) publication statistics, (8) remote access, (9) beamline portfolio, (10) human resource development, (11) user community, (12) contract beamline, and (13) quantum beam platform. Together with comments regarding overall management structure, the committee deliberately made recommendations and suggestions on each issue, the report of which is open to public at http://www.jasri.jp/ja/enterprise/jiac/pdf/jiac2011_e.pdf.

Also formed in 2011 were two specific review committees for evaluating the Budding Researchers Support Program and the Priority Industrial Application Program. The first program was highly evaluated because it had been playing an essential role of effectively supporting and motivating promising doctoral students. In accordance with the suggestion made by the review committee, the program will expand its applicant eligibility to master students from 2012A, and will offer expert consultation to those students who are less experienced with SPring-8. The second program was also given high marks for an excellent prior consultation by coordinators and for the dedicated experiment support by beamline staff. From 2012A, it will be relaunched as the Priority Industry Creation Program to facilitate industry-academia-government cooperation in technological development.

There was a steady progress in the SPring-8 upgrade plan, which intended to drastically enhance the capabilities of the present SPring-8 and promote the synergetic use with SACLA. The workshop on the SPring-8 upgrade plan was held at SPring-8 in April 2011, especially from the perspective of accelerator and storage ring development. The key concepts of the upgrade plan are (1) an ultimate storage ring in a hard X-ray regime, (2) synergetic use with an X-ray free electron laser, and (3) an energy-efficient facility. In the near future, the utilization of the upgraded SPring-8 will pioneer a whole new science. To realize these concepts and reach the real goal discussed in the previous symposiums and workshops, the working group has intensively worked on the upgrade plan and released a preliminary report for the SPring-8 upgrade plan in January 2012.