Editor's Note

This is the 2017 issue of SPring-8/SACLA Research Frontiers that covers outstanding scientific outcomes of SPring-8 and SACLA in 2016 and 2017. The cream of the scientific achievements is collected here.

Reviews in this issue were contributed by Prof. Jian-Ren Shen of Okayama University and Prof. Makoto Seto of Kyoto University. Prof. Shen has been working on mechanism of photosynthesis in plants, in which oxygen molecule and sugar are produced from carbon dioxide and water with the energy of light. This process is important for mankind for prevention of global warming and solving energy and food crises. The protein Prof. Shen is working on is photosystem II (PSII) which is a huge membrane-protein complex with a total molecular weight of 700 kDa. This protein performs the initial water-splitting reaction of photosynthesis. After getting its high-resolution crystal structure in 2011, Prof. Shen's group proceeded to clarify detailed mechanism of the reaction by making use of SACLA. The damage-free structure of the Mn cluster at the catalytic center of the protein was revealed with pulse X-rays of SACLA. Further, structure of an intermediate state of the reaction was clarified in a pump-probe experiment. This research is still under progress for complete understanding of the reaction, and the current situation is summarized in the review.

Prof. Seto has been working on nuclear resonant scattering at BL09XU since SPring-8 started operation 20 years ago. This is fundamental physics research requiring very sophisticated experimental techniques. His group has been publishing many top-class physics papers over the years. Initially, the experiment looked formidable for non-specialists, but thanks to the very bright and stable X-ray beam of SPring-8 and high skills of the Prof. Seto's group, applications of the technique are increasing. NRVS (Nuclear Resonance Vibrational Spectroscopy) is extensively used to study catalytic centers of metalloproteins. Since the experiment can be now possible under high pressure, Mössbauer radiation was used in earth science to measure thermal conductivity of silicate melts. The narrow energy bandwidth (neV) allows studies on slow dynamics of liquid by quasi-elastic scattering measurements. These experiments emerged from the long-time efforts of Prof. Seto, to which SPring-8 owes much.

SPring-8/SACLA Research Frontiers is made of two parts. The first is the scientific results (Scientific Frontiers) and the second is additional information on hard and soft infrastructures that support scientific research. Although some important numbers such as the operation time are given in the second part, other information and more complete statistical numbers on the operation of SPring-8 and SACLA are available on the website so that more updated information can be accessed (http://www.spring8.or.jp/en/about_us/spring8data/).

The full text of SPring-8/SACLA Research Frontiers is also available on the SPring-8 website (http://www.spring8.or.jp/). For the list of publications produced by SPring-8 users and staff, please visit the publication database at http://www.spring8.or.jp/en/science/publication_database/.

On behalf of all the editors, I would like to thank those who helped us by recommending excellent research results suitable for publication in this issue, and the users and staff of SPring-8 who contributed their reports to this issue.

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Editorial Board