PREFACE

The RIKEN Accelerator Progress Report is the annual report of all research activities conducted in RIKEN Nishina Center for Accelerator-Based Science (RNC). This volume, No. 53, covers the activities conducted in the Japanese fiscal year of 2019 (April 2019 to March 2020).

First, March 31, 2020 was the last day for Hideto En'yo as the Director. Hideto led the RNC for a long period, since October 2009. On this occasion, all RNC members wish to express their gratitude and thank him for his management over ten and half years. During this period, one of the many excellent achievements of RNC was the discovery of Element 113, "Nihonium." The year 2019 was designated as the International Year of the Periodic Table (IYPT). Hideto served as a member of the IYPT-Japan Committee and organized a session for the Closing Ceremony in December, Tokyo, to demonstrate the world-wide efforts in "Creation of superheavy elements," with a focus on period-7 elements including Nihonium. In April 2019, David Morrison was appointed as the Deputy Director of RIKEN Brookhaven Research Center.

The year 2019 was the first year of the new Japanese era "Reiwa," which started on May 1. In RNC, this new period was celebrated with the results obtained from the first spectroscopy of ^{78}Ni, which was published in Nature, issued on the second day of Reiwa, May 2. Other selected achievements are compiled in "Highlights of the Year" in this volume, which showcase the multi-disciplinary activities of RNC in the field of science, technology, and innovation. It should be noted that these achievements were made not just by in-house researchers and engineers in RNC; for some of these projects, RNC collaborated with users at the RI Beam Factory (RIBF) and RIKEN Muon Facility at the Rutherford Appleton Laboratory.

Two excellent progresses were made in the RIBF facility. The first progress is the record breaking beam intensities achieved at the Super-conducting Ring Cyclotron (SRC); the maximum intensity achieved for ^{124}Xe was 173 pnA, and that for ^{238}U was 94 pnA. The excellent beams at SRC make the fast-beam programs at BigRIPS more productive, especially for the nuclear structure study in ^{100}Sn and its vicinity, and in neutron-rich nuclei produced via in-flight fission. The second progress is the intensity- and energy-upgrade of the linear accelerator RILAC, which was achieved by the recent installations of the 28-GHz ECR ion source as well as super-conducting radio-frequency cavities. The first beam with the upgraded RILAC "SRILAC" was successfully extracted at the very end of FY2019. At the same time, a new gas-filled recoil separator "GARIS-III" was installed to be coupled with SRILAC. The combination of SRILAC and GARIS-III strengthens the scientific programs focused on super-heavy elements.

Two advisory committees, Nishina Center Advisory Committee (NCAC) and RIKEN Advisory Committee (RAC), were organized. NCAC evaluated the RNC management with respect to organization, research achievement, and planning, and they suggested that the intensity upgrade of RIBF was the first priority in the coming years to be competitive with other facilities across the world. Based on the report of NCAC, RAC provided this advice to the President of RIKEN.

Since the end of FY2019, the social situation in the world has changed dramatically because of the COVID-19 pandemic. According to the measures of governments, universities, and institutes, research activities have been limited significantly. Remote-work and web-meetings using computer-network technology are highly recommended and useful for organizing discussions and collaboration works. However, the importance of face-to-face discussions and collaborations for increasing creativity has been recognized. It is hoped that research networks and relationships over the world will become more involved in future to overcome this difficult situation by sharing ideas and wisdom.

Hiroyoshi Sakurai
Director
RIKEN Nishina Center for Accelerator-Based Science