Preface

The Institute for Chemical Research (ICR) was founded in 1926 as the first research institute of Kyoto University. Its founding vision was "excel in the investigation of the basic principles of chemistry and their applications." ICR is a successor to the Specialized Center for Chemical Research established at the College of Science of Kyoto Imperial University in 1915 for the study of a special medicinal substance called "Salvarsan," that is arsphenamine. Ever since, ICR has continuously carried out outstanding research and flourished as a large-scale organization. We have five research divisions (Synthetic Chemistry, Materials Chemistry, Biochemistry, Environmental Chemistry, and Multidisciplinary Chemistry) and three research centers (Advanced Research Center for Beam Science, International Research Center for Elements Science, and Bioinformatics Center). Currently, almost 120 faculty members, 210 graduate students, and 60 researchers are engaged in research activities in 30 laboratories directed by fulltime professors and 5 laboratories supervised by visiting professors. These laboratories are affiliated as a "cooperative lab" with graduate schools covering a broad range of fields such as science, engineering, agriculture, pharmaceutical sciences, medicine, and informatics.

Based on the founding vision, ICR has encompassed a wide range of scientific disciplines, including physics, biology, and informatics, as well as chemistry. ICR members are spearheading cutting-edge research and yielding groundbreaking results in their special fields. Some of the research achievements last year are as follows: *1) Jitter-free Electron Pulses Directly Accelerated by an Intense Laser Beam and Their Application; 2) Discovery of Self-Assembling Small Molecules as Vaccine Adjuvants; 3) Biogeography of Marine Giant Viruses Reveals Their Interplay with Eukaryotes and Ecological Functions; 4) Observation of Superconducting Diode Effect; 5) Organic Light Emitters Exhibiting Very Fast Reverse Intersystem Crossing; 6) Modifying Angular and Polarization Selection Rules of High-order Harmonics by Controlling Electron Trajectories in k-Space; 7) Additive-Free Conversion of Internal Alkynes by Phosphanylalumanes*. Some other topics were also presented in the 120th ICR Annual Symposium on December 11, 2020.

The legacy of our founding philosophy continues today and describes the essence of our research activities. With the founding vision in mind, we have entrusted our scientists with the responsibility of choosing research topics within advanced chemistry-related fields. Thus, ICR members are actively involved in interdisciplinary research projects, creating new knowledge and contributing to the future of materials-related fields. One of our major new challenges is the design of ecologically sustainable smart materials. Our institute is collaborating with other research institutions inside and outside Kyoto University as a key member of the following projects/organizations: *MEXT Inter-University Collaborative Project* "*Integrated Consortium on Chemical Synthesis*" including four core research institutions, *Kyoto University Research Coordination Alliance* including 19 research institutes/centers of Kyoto University, *MEXT-supported "under-one-roof" Joint Project* on bio-inspired smart materials in Uji Campus, and *Uji-Campus Base of Equipment Support* for reinforcing research infrastructure. We also promote international collaboration with overseas universities/institutions (with 68 official international collaboration agreements). On the basis of our strong global activity in chemistry-oriented fields, ICR was newly certified as an *International Joint Usage/Research Center* by MEXT in 2018 and approved by Kyoto University in 2019 to establish an *On-site Laboratory,* the "*Kyoto University Shanghai Lab*" in Shanghai, China under the Designated National University program (MEXT). To foster and secure young researchers through these activities, we have initiated diverse research and graduate education programs, including an in-house annual grant system, "*ICR Grant for Promoting Integrated Research*." These collaborative achievements ensure that our institute serves as a global research core in chemistry-oriented fields.

In recent years, many global-scale problems have become apparent. Science and technology must play a large role to help society mitigate and overcome disasters such as the new coronavirus as well as longer term issues such as climate change and environmental pollution. With keywords of "Diversity" and "One Team" together with the founding vision, ICR continues to strive to answer those challenges, promoting a multidisciplinary, chemistry-related community, and deepening science and technology for a sustainable society. We hope this Annual Report will serve to update you on the progress of our research activities and globalization. Finally, we appreciate your continued encouragement and support.

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TSUJII, Yoshinobu
Director