



Institute for Molecular Science (IMS) is one of the world's leading core research facilities in molecular science and is also a center for inter-university joint research in Japan. It sets an extremely wide range of research goals, from understanding the behavior of individual molecules to that of collective molecular systems. These molecular systems are closely related to scientific understanding in biology, engineering and space sciences. Currently, IMS is engaged in four major research areas: Theoretical and computational molecular science, photo-molecular science, materials molecular science, and life and coordination-complex molecular science, as well as two interdisciplinary research areas. They are the Research Center of Integrative Molecular Systems (CIMoS), established in April 2013, and the Center for Mesoscopic Sciences (CMS), inaugurated in April 2017. The former is dedicated to the development of highly functional molecular systems, including molecular rhythms, sensing and response, and even self-repair, while the latter is developing innovative methodologies to study mesoscopic molecular systems, ranging from theoretical methods to cutting-edge measurement techniques. A year later, IMS also established the Advanced Molecular Science Division, which showcases examples of outstanding research in molecular science; in April 2019, IMS launched the Research Innovation and Collaboration Division, which works to strengthen collaboration with social activities. Other than these research divisions, IMS has three research facilities; UVSOR Synchrotron Facility, Instrument Center facilitated with various molecular detectors, and Equipment Development Center. IMS also operates Research Center for Computational Science, jointly with National Institute for Physiological Sciences and National Institute for Basic Biology located on the same campus. In April 2018, Okazaki Institute for Integrative Bioscience (OIIB) was reorganized into Exploratory Center for Life and Living Systems (ExCELLS) directly under National Institutes of Natural Sciences (NINS) to advance its activities.

Annual Review 2025 is a summary of the research activities by all individual research groups conducted at IMS during October 2024–September 2025 on molecular structures, reactions and functions demonstrating “novel molecular possibilities.” In addition to these individual activities, IMS conducts many special programs in the institute basis such as (i) Large-scale and high-coherence fault-tolerant quantum computer with dynamical atom arrays supported by a JST program “MOONSHOT Goal 6: Realization of a fault-tolerant universal quantum computer that will revolutionize economy, industry, and security by 2050,” (ii) Development of cold-atom based quantum simulators and their applications to quantum computing within the framework of Japan's flagship program on quantum sciences and technologies “Q-LEAP” by MEXT and “PRISM” by the Cabinet Office of Japan (2018–2028), (iii) in 2023, IMS, National Institute for Physiological Sciences (NIPS), and ExCELLS have jointly launched “the Frontier of Spin Life Sciences.” In this project, a wide range of life science and physiological science research will be promoted under one roof, covering technological development at the molecular level and life phenomena at the individual level, such as novel magnetic resonance (MR) imaging of individual molecules targeted by new MR molecular probes. As a complementary collaboration with the Frontier of Spin Life Sciences, the project was adopted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) as part of the “Coalition of Universities for Research Excellence Program (CURE)” program, and collaboration with related universities has been initiated. IMS also conducts (iv) Advanced Research Infrastructure for Materials and Nanotechnology in Japan, and (v) Inter-University Network for Common Utilization of Research Equipments. In addition to these national projects, IMS runs several international collaboration programs and also owns an internship program for young scientists: Institute for Molecular Science International Internship Program (IMS-IIP). IMS-IIP provides internship opportunities for young overseas researchers (master's and doctoral students, post-doctoral fellows, young faculty members of MOU partners, *etc.*) to stay in IMS laboratories.

IMS will continue to contribute to lead the molecular science together with many young promising and well-established senior scientists. This institute has been well benefited with your constant support and we do expect your further support and advice for creating this new era of molecular science.

August, 2025

A handwritten signature in black ink, appearing to read 'Y. Watanabe'.

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Director General, Institute for Molecular Science