Okazaki Institute for Integrative Bioscience

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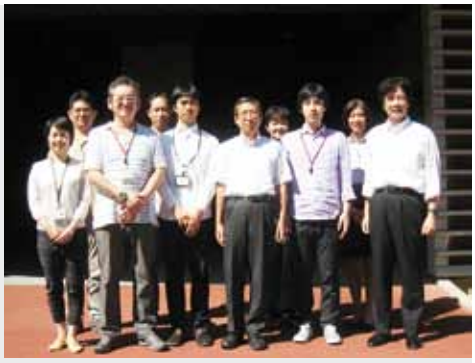

The main purpose of Okazaki Institute for Integrative Bioscience (OIIB) is to conduct interdisciplinary, molecular research on various biological phenomena such as signal transduction, differentiation and environmental response. OIIB, founded in April 2000, introduces cutting edge methodology from the physical and chemical disciplines to foster new trends in bioscience research. OIIB is a center shared by and benefited from all three institutes in Okazaki, thus encouraging innovative researches adequately in advance of academic and social demands. OIIB has started the research programs, "Okazaki ORION Project" and "BioNEXT Program" from 2014. The research groups of three full professors and one associate professor who have the position in IMS join OIIB to be involved in these research projects. The research activities of these groups are as follows.

Aono group is studying the bioinorganic chemistry of metalloproteins that show a novel function. They elucidated the structure and function relationships of the heme-based sensor proteins in which a heme was the active site for sensing gas molecules such as CO and O_2. They are also studying the structure and function relationships of transcriptional regulators and metal transport proteins that are responsible for metal homeostasis in bacteria. Iino group is studying operation mechanism of molecular machines using single-molecule techniques based on optical microscopy. Especially they focus on new rotary and linear molecular motors. In this year, they directly visualized rotation of a rotary molecular motor *Enterococcus hirae* V1-ATPase, and determined kinetic parameters for all elementary reaction steps of a linear molecular motor *Trichoderma reesei* Cel7A. They also applied single-molecule techniques to a synthetic molecular rotor double-decker porphyrin, and directly visualized the rotary motion for the first time. Kato group is studying structure, dynamics, and interactions of biological macromolecules using nuclear magnetic resonance (NMR) spectroscopy, X-ray crystallography, and other biophysical methods. In particular, they conducted studies aimed at elucidating the dynamic structures of glycoconjugates and proteins for integrative understanding of the mechanisms underlying their biological functions. In this year, they successfully elucidated the working mechanisms of proteasome assembly chaperones, Nas2 and Pba3–Pba4, the carbohydrate recognition modes of the cargo receptor complex, ERGIC-53–MCFD2, and the functional role of a product of a recently identified causative gene for dystroglycanopathy, AGO61. Fujii group is studying molecular mechanisms of metalloenzymes, which are a class of biologically important macromolecules having various functions such as oxygen transport, electron transfer, oxygenation, and signal transduction, with synthetic model complexes for the active site of the metalloenzymes. In this year, they studied molecular mechanisms of metalloenzymes relating to monooxygenation reactions and denitification processes. Kurihara group is studying an artificial cell based on a giant vesicle constructed from organic chemical approach. Their goal is to realize an artificial cell in which elements such as information, container and metabolism interact each other. In this year, they studied cross-catalytic vesicular system: A vesicle is reproduced by the catalyst which was synthesized in the vesicle, *i.e.* interaction between container and metabolism.