Okazaki Institute for Integrative Bioscience

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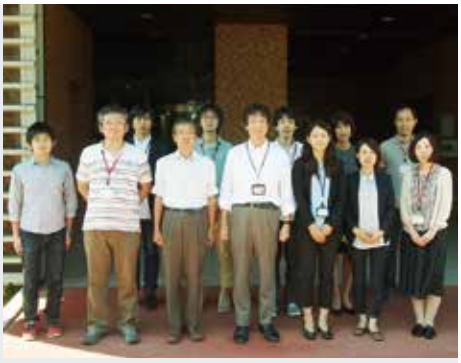

The main purpose of Okazaki Institute for Integrative Bioscience (OIIB) is to conduct interdisciplinary, molecular research on various biological phenomena such as signal transduction, differentiation and environmental response. OIIB, founded in April 2000, introduces cutting edge methodology from the 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. Their research interests are focused on the structure and function relationships of transcriptional regulators and metal transport proteins that are responsible for metal homeostasis, especially iron and/or heme homeostasis, in bacteria. They are also working on a novel photosensor protein that adopts vitamin B_{12} (adenosylcobalamin) as the active site for photosensing, which is a transcriptional factor regulating gene expression in response to visible ligth. Iino group is studying operation mechanism of molecular machines using single-molecule techniques based on optical microscopy. Especially they focus on rotary and linear molecular motors. In this year, they have succeeded in generation of a rotary molecular motor F_1-ATPase with an unnatural amino acid, and determined key chemical factors of arginine finger catalysis. They also developed high-speed angle-resolved imaging of single gold nanorod with microsecond temporal resolution and one-degree angle precision, and successfully applied to probe rotation of F_1-ATPase at 3.3 μs temporal resolution. 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 characterized dynamic conformational ensembles of high-mannose-type oligosaccharides by NMR-validated simulation and determined several crystal structures of proteins involved in protein-fate determination in cells, including putative substrate-binding domains of UGGT and protein disulfide isomerase. 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 which has three main elements, *i.e.* information, compartment and metabolism. In this year, they studied catalyst-producing vesicular system: A vesicle is reproduced by the catalyst which was synthesized in the vesicle. In this system, they observed the interaction between the production of compartment membrane molecule and catalyst.