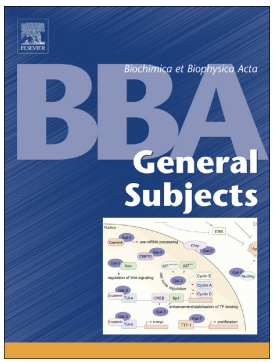

Biophysical exploration of dynamical ordering of biomolecular systems

Koichi Kato

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Editorial

Living systems are characterized by dynamic processes of assembly and disassembly of various biomolecules that are self-organized, interacting with the external environment. The omics-based approaches developed in recent decades have provided comprehensive information regarding biomolecules as parts of living organisms. However, the fundamental question with respect to how these biomolecules are ordered autonomously to form flexible and robust systems still remains unsolved. To address this question, integration of multilateral approaches is necessary, including biological, physical, and chemical approaches. In particular, recently advanced and still evolving biophysical methodologies have enabled us to explore the dynamical ordering of biomolecular systems. This is exemplified by the achievements attained by applying solution and solid-state NMR spectroscopy, X-ray and neutron scattering, cryo-electron microscopy, native mass spectrometry, high-speed atomic force microscopy, and various time-resolved spectroscopic and imaging techniques for observing and manipulating biomolecular systems. Recently developed theoretical and computational approaches have also promoted our understanding of the mechanisms underlying the dynamical assembly and disassembly of biomolecules that have internal complexities. These approaches have successfully bridged the gap between biomolecular science and supramolecular chemistry, with active attempts to create artificial molecular systems having the fundamental properties of biological systems.

In this special issue, the leading experts provide comprehensive review articles describing the principles and applications of these cutting-edge techniques for exploring the dynamical ordering of biomolecular systems for creation of integrated functions.