



Hong Kong University of Science and Technology
Department of Chemical & Biological Engineering

Molecular and structural bases of gap junction channel formation and gating

Donglin Bai

**Professor, Department of Physiology and Pharmacology
University of Western Ontario**

Date : 9 November 2026 (Monday)
Time : 2:00 – 3:30 pm
Venue : Rm 4475 (near Lift 25/26), HKUST

Abstract

Gap junction (GJ) channels provide direct pathways for the exchange of ions and small molecules between adjacent cells, playing essential roles in intercellular communication. These channels are formed by the docking of two hemichannels, each composed of six connexin subunits. Despite recent advances in high-resolution GJ structures, the molecular mechanisms governing channel formation and gating remain incompletely understood. In this presentation, I will discuss our studies integrating electrophysiology, site-directed mutagenesis, structural analysis, and molecular dynamics simulations to investigate two fundamental aspects of GJ channel function. First, I will highlight how the amino-terminal domain contributes to transjunctional voltage-dependent gating, single-channel conductance, and open-state stability. Second, I will discuss the molecular interactions between extracellular domains that determine hemichannel docking compatibility and the formation of functional GJ channels between different connexin hemichannels. Together, these studies provide mechanistic insights into GJ channel assembly and regulation, with implications for understanding connexin-associated human diseases.

Biography

Dr. Donglin Bai received his BSc (1982) and MSc (1985) from Peking University, Beijing, and his PhD (1994) from the University of Cambridge, U.K. He then moved to Canada and worked on neurotransmitter receptors (GABA, NMDA, AMPA, noradrenaline, angiotensin) as a postdoctoral fellow at the Loeb Research Institute (Ottawa), the Department of Physiology (Toronto), and the Samuel Lunenfeld Research Institute (Toronto). In 2002, he was recruited as an Assistant Professor in the Department of Physiology and Pharmacology at the University of Western Ontario. He is currently a tenured Full Professor at the same university. His current research interests are in the physiology of gap junction channels, including hemichannel docking, single-channel conductance, and gating properties. He is also interested in revealing how gap junction gene mutants are linked to human diseases (cardiac arrhythmias, hypomyelination, cataracts, deafness, and skin diseases) and in developing strategies to rescue the mutants. He received grant support from the following Canadian funding agencies: CIHR, CRC, NSERC, HSFC, NFRF, and ERA.