

生命科学セミナー

Time Travel with Neurons: Axonal Ion Channel Dynamics and Chordate Evolution



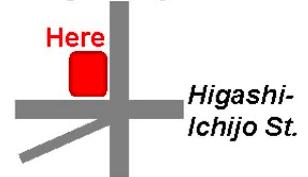
Prof. Yasushi Okamura

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Fri. 24th October 2025, 16:30-17:30

KUIAS Main Building, 2F Seminar Room
(Kyoto University Campus map #77)

Higashi-Oji St.



Abstract:

In mammals, including humans, neurons are exceptional cells capable of surviving for an entire lifetime. How neurons maintain their functions has long been one of the central questions in physiology and neurobiology. The homeostatic regulation of molecules such as ion channels and receptors is also fundamental to neuronal plasticity, including memory formation and the maturation of brain function. The axon initial segment (AIS), the site where action potentials are initiated, is one of the most critical anatomical features of mammalian neurons. At the AIS, ion channels and receptors are clustered through interactions with cytoskeletal components and the scaffolding protein ankyrin-G.

In my talk, I will discuss two lines of research related to the AIS.

First, how the number and localization of voltage-gated sodium and potassium channels are maintained at the AIS under steady-state conditions. I will introduce our recent study using a knock-in mouse strain in which old and new channel proteins are discriminated by a color of fused fluorescent protein.

Second, our recent work investigating at what point in evolution the vertebrate-specific structure for action potential conduction, namely the AIS, first emerged. To address the issue, we study the tunicate nervous system, focusing on the interaction between voltage-gated sodium channels and ankyrin. My hypothesis regarding the evolutionary origin of the AIS will be presented.

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