E&B Seminar Series

SCHOOL OF BIOLOGICAL SCIENCES THE UNIVERSITY OF HONG KONG 香港大學生物科學學院

SHKU Science

ECOLOGY & BIODIVERSITY

The origins of neurons, brains & memory: Deciphering convergent evolution at the single-cell resolution

Date	**4 Oct (Wed.)**
Time	**16:00 (UTC+8)**
Venue	**3N01**

How to make a neuron, a synapse, and a neural circuit? Is there only one ‘design’ for a neural architecture with a universally shared genomic blueprint across species? The brief answer is “No.”

This seminar will discuss neural systems' convergent and parallel evoluiton using several interdisciplinary approaches, from sequencing aboard oceanic vessels (Ship-Seq) & single-cell multiomics to behavior. Briefly, Four early divergent lineages from the nerveless common ancestor of all animals independently evolved distinct neuroid-type integrative systems with peptides as the primary transmitters. Synapses also evolved more than once. The first neural systems were peptidergic, with predominant volume transmission using at least several dozen signaling peptides. Multiple origins of neurons from secretory cells might explain the observed molecular diversity of neural systems. This scenario also explains the lack of homologs in peptidergic systems across the earliest branching animal lineages.

In summary, little-explored examples of convergent neuronal evolution in representatives of early branching metazoans provide conceptually novel microanatomical and physiological architectures of behavioral controls in animals with prospects of neuro-engineering and synthetic biology.

Dr. Leonid L. Moroz takes advantage of marine biodiversity (>20 phyla) to understand how neurons operate, learn, and remember; how this complexity formed. He reveals that neurons and centralized brains independently evolved from ancestral cell lineages. Using massive single-cell ‘omics’ together with physiology and advanced imaging, he reconstructs how the descendants of these cell lineages “come together” to form nervous systems of ctenophores or bilaterian brains, including octopuses or humans. Unique floating labs have been developed to sequence marine organisms directly aboard (Ship-Seq) to reconstruct the Genealogy of Neurons and Cell Type Tree of Life. Here, he integrates Planetary Biodiversity and Biomedicine.

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