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Marine Biodiversity and Ecosystems

Large-Scale Reprograming of Differentiated Larval Tissues Establishes Adult Nervous System during Sea Cucumber Metamorphosis

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Time: 2026. 08. 13 Thu. 15:00

Venue: Auditorium, 1st Floor
Interdisciplinary Research Building
跨領域科技研究大樓1樓演講廳

Host: Dr. Yi-Jyun Luo 駱乙君助研究員

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Abstract

Most of our understanding of animal body plan formation come from the study of a handful of selected model organisms. These model species are predominantly direct developers, in which the adult body plan arises directly from embryogenesis. However, this developmental strategy is not broadly representative of animal diversity. In many taxa – and particularly in marine invertebrates – the formation of the adult body plan is postponed by one or several larval stages, a strategy known as indirect development. How an adult body plan arises through the transformation of a pre-existing larva, rather than as a direct outcome of embryogenesis, remains poorly understood, biasing our view of animal body plan evolution. To address this gap, we have started investigating the molecular and cellular mechanisms underlying adult body plan formation in the indirect-developing sea cucumber *Apostichopus parvimensis*. Larval and juvenile stages in this species are completely transparent, making it amenable for live imaging through metamorphosis. Using cell tracking, fluorescent in situ hybridization and single-cell RNA sequencing, we show that metamorphosis in *A. parvimensis* involves extensive recycling of larval tissues into adult structures. In particular, portions of the larval ciliary band give rise to the adult central nervous system. These findings challenge the existing dogma of metamorphosis, in which most larval tissues are presumably simply discarded. Instead, it suggests that cellular reprogramming might be an important – but underappreciated mechanism when building an adult body plan from a larval stage. Our approach also demonstrates how harnessing animal biodiversity with new modern molecular tools and outside of traditional model species can reveal new features of animal development and evolution.