NUS National University of Singapore | Department of Biological Sciences Faculty of Science

VIRTUAL BIOLOGY COLLOQUIUM

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Hosted by A/P Liou Yih-Cherng

Stem Cells in Crypt-like Structures Lining the Base of the Zebrafish Intestine

By **Paul Matsudaira**

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In the mammalian intestine, stem cells (ISCs) located in basal crypts, replicate and translocate along the villus where they die and are shed from the tips. This conveyer belt-like pattern of absorptive surface renewal is generally thought to occur in the less advanced architecture of the zebrafish intestine in which villi are elongated into villar ridges (VR) and crypts are absent. To understand how epithelial dynamics is maintained without crypts, we imaged the lineage patterns of epithelia driven by promoters for ISC markers, Prmt1, Lrig1, and Bmi1. All three markers generate distinct stripes of Zebrabow recombinant colors that originate from the intervillus pocket (IVP) between neighboring villa ridges. The striping pattern is not only consistent with ISCs in an IVP but also a non-random ISC distribution in the IVP. We confirmed that the ISC marker, Prmt1, is localized to a single cell within a 40-60 µm diameter flat cluster of cells at the base of the intervillus pocket. Furthermore, the color and width of recombinant epithelial stripes on the flanking VRs share the same recombinant color and dimension as these clusters. These results identifies that Prmt1, Bmi1, and Lrg1 as ISC markers and the ISCs reside within basal clusters that are functionally analogous to a crypt. We propose that the villus/crypt architecture of our intestine evolved from further differentiation of these flat crypt-like structure into the elongated crypt.

About the Speaker

Formerly a biology and bioengineering professor at the Massachusetts Institute of Technology (MIT), Paul Matsudaira has studied the cytoskeleton since graduating from college. He was the EM technician of Tom Schroeder where he helped investigate the role of microfilaments in the contractile ring. As a graduate student of Dave Burgess he identified the structure and function of the intestine brush border cytoskeleton. Following postdoctoral research on the assembly of actin bundles at the MPI Biophysical Chemistry with Klaus Weber and the MRC LMB with Alan Weeds, Paul started his academic career at the Whitehead Institute and MIT where his lab studied biophysics of actin and other polymer protein bundles, mechanics of polymers and single cells motility, and developed microanalytical methods. In 2009, he moved to Singapore to establish the Centre for BioImaging Sciences, head the Department of Biological Sciences, and helped found the Mechanobiology Institute.

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