QUANTITATIVE & SYSTEMS BIOLOGY COLLOQUIUM: Gastrulation Movements Regulated by a Rho GEF

Date:
3/12/2026

Time:
10:30 AM – 11:45 AM

Location:
SSM 116

Richard Harland
UC Berkeley

About The Speaker:

Biosketch

Richard Harland is the C.H. Li Distinguished Professor and was the Chair of the Department of Molecular and Cell Biology at the University of California, Berkeley. He is now the Dean of the Division of Biosciences in the College of Letters and Sciences. He is a Developmental Biologist whose interests are to understand early vertebrate development at the molecular level, and particularly the processes of dorsal ventral patterning of the early embryo, and the induction and patterning of the neural plate. Harland was born and raised in York, U.K.and attended Clare College, Cambridge University. His Ph.D was conducted at the MRC Laboratory of Molecular Biology in Cambridge with Ron Laskey on regulation of DNA replication in Xenopus embryos. Following postdoctoral work there and at the Fred Hutchinson Cancer Research Center with Hal Weintraub and Steve McKnight in Seattle, WA, he moved in 1985 to the University of California, Berkeley. There he pursued his interests on dorsal ventral patterning and neural induction using Xenopus. Harland is a past president, and Conklin medal awardee of the Society for Developmental Biology, and is a fellow of the American Academy of Arts and Sciences.

Research Interests

Harland and colleagues developed a variety of methods in Xenopus; to isolate novel genes by mRNA injection (expression cloning), visualize their expression (by whole mount in situ hybridization) and determine their in vivo functions by gain and loss of function methods. Recently he has contributed to the assembly and exploitation of the Xenopus tropicalis and Xenopus laevis genomes in systems developmental biology, and in developing X. tropicalis in genetics and molecular embryology. Research highlights include the finding that the Spemann organizer controls vertebrate embryogenesis by releasing a variety of inhibitory molecules, notably the first identified neural inducer made by the organizer, Noggin, as well as other antagonists of Bone Morphogenetic Proteins. These antagonists are also deployed in a variety of other animals and contexts, such as in controlling BMP activity in mammalian skeleton development. In analyzing the movements of gasrulation he and his colleagues determined the role of components of the Planar Cell Polarity pathway, in coordinating polarized cell movements during gastrulation. Previous and continuing work focuses on the anterior posterior differentiation of the neural plate and the coordination of Fibroblast Growth Factor, Wnt, and BMP signaling in the posterior neural plate and neural crest development.

Abstract:

Is the cellular basis for gastrulation a self-organizing process?

The combination of pre-localized mRNAs and microtubule-based symmetry breaking leads to a progressive increase in signal complexity in the frog embryo, which patterns the germ layers, and induces the organizer. The cell biology of gastrulation movements is also becoming well described, and the mechanistic basis for different cell movements is being elucidated. So far, individual movements are driven by the activation of genes whose products often act to organize actomyosin contractions in the context of epithelial or mesenchymal cells. I will discuss an example where a change in the level of a Rho-GEF drives changes in the cortical actomyosin cytoskeleton to enable closure of the blastopore, and involution of the mesoderm. In general, the movements of gastrulation among vertebrates appear more different than the underlying gene expression that sets up the body plan, but these changes must have evolved from the basic cytoskeletal and adhesion toolkit, and it remains to be determined just how similar or different the underlying self-organization of cells may be during vertebrate gastrulation.

For more information, contact: Stefan Materna
smaterna@ucmerced.edu