Animal Limb Morphogenesis

John Rallis[1], Maria Kalogeridi[1], Mikis Mylonakis[2], Stylianos Psycharakis[2], Ioannis Liaskas[1], Marina Ioannou[1], Giannis Zacharakis[2*] and Anastasios Pavlopoulos[1#*]

[1] Developmental Morphogenesis Laboratory, Institute of Molecular Biology and Biotechnology, Foundation for Research and Technology Hellas, 70013 Heraklion, Crete, Greece.

[2] Laboratory for Biophotonics and Molecular Imaging, Institute of Electronic Structure and Laser, Foundation for Research and Technology Hellas, 70013 Heraklion, Crete, Greece.

Presenting author: Anastasios Pavlopoulos, email: a.pavlopoulos@imbb.forth.gr
* Corresponding author: Anastasios Pavlopoulos, email: a.pavlopoulos@imbb.forth.gr
Giannis Zacharakis, email: zahari@iesl.forth.gr

ABSTRACT

Limb development in vertebrate and invertebrate animals has served as an influential model to understand common molecular principles of pattern formation and cell fate specification. Recent technological advances in fluorescence live imaging are also increasingly empowering scientists to tackle the physical basis of tissue and organ morphogenesis with important implications for normal development, regeneration and tissue engineering [1][2]. We are combining multi-view light-sheet microscopy and computational image analysis tools with functional genetic and genomic approaches to visualize and measure the molecular, cellular and tissue dynamics underlying embryonic tissue and limb formation in the genetically and optically tractable shrimp-like crustacean Parhyale hawaiensis [3]. Our interdisciplinary approaches have started shedding light on how biological form arises at different levels of biological organization - from gene regulation, through gene function and control of polarized cell activities, to final morphology. This project at the interface of physics and biology has engaged students from both disciplines who are receiving advanced training on the physics of living matter. It has also sparked further collaborations to address different biological questions with other new imaging modalities, as well as the establishment of the Bioimaging Thematic Club seminar series to promote scientific interactions between the diverse communities of biologists, physicists, computer scientists, engineers, mathematicians and physicians at FORTH and the University of Crete.

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