Morphogenesis of the semicircular canal system in the zebrafish embryo

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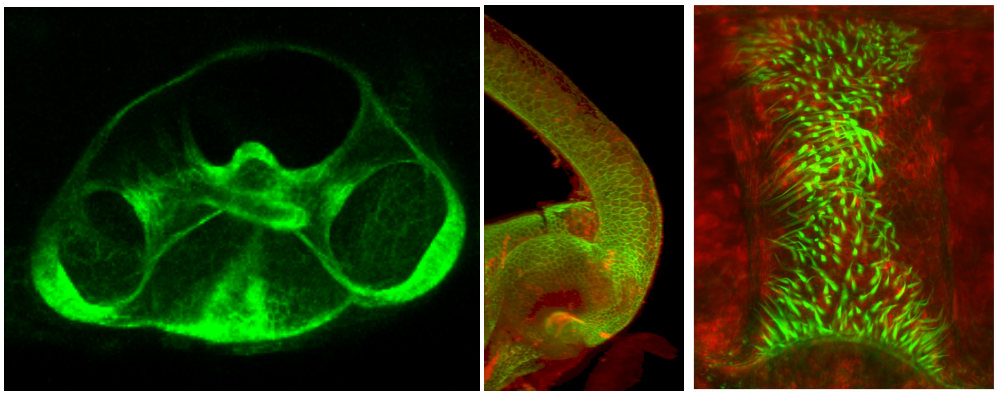

Figures: Left. Dorsal view of a zebrafish ear at about four days old, expressing the fluorescent protein GFP. Pillars of tissue spanning the lumen of the ear form the hubs of the newly formed canal ducts. **Middle.** Image of the posterior canal duct and ampulla of an adult zebrafish inner ear, taken with a light sheet microscope. **Right.** Sensory hair cells in the crista of a juvenile zebrafish.

Development of the complex labyrinthine structure of the inner ear from a simple epithelial vesicle is a spectacular example of morphogenesis: the generation of shape and form in the embryo. This project will focus on development of the semicircular canal system of the ear. There are three canals in each ear, arranged orthogonally to one another. They function to detect turning movements, helping an organism to balance correctly. Each canal consists of a curved duct of non-sensory epithelium; at the base of each duct, a swelling or ampulla houses a ridge of sensory tissue, the crista. The canals develop from the otic vesicle, a simple ball of tissue in the embryo. This project will involve a morphological and genetic analysis of the dynamic cell movements and shape changes that generate the canal ducts, ampullae and cristae, using the zebrafish embryo as a model system. Some of the genes involved in this process, including *otx1b* and *gpr126,* are already identified. The aim is to clarify the precise roles of one or more of these genes, and to discover how they drive changes in cell behaviour. The student will have access to wild-type, mutant and transgenic zebrafish lines to test their ideas. Techniques will include analysis of mutant phenotypes using in situ hybridisation, light sheet and confocal microscopy.

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