

3D Optical imaging of fast dynamics in Zebrafish embryos

Projet de 3A- ESPCI
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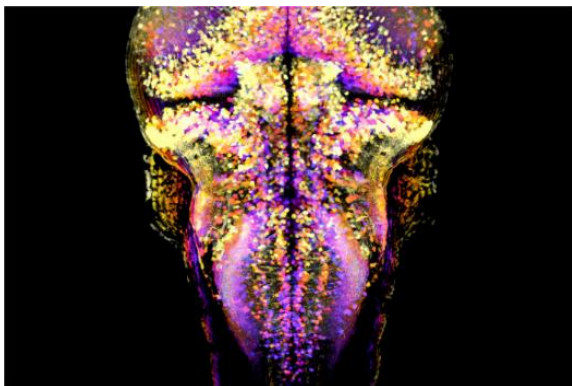
Olivier Thouvenin
Claire Wyart
Duration : 2 à 4 mois
Possibilité de poursuivre en thèse

Summary

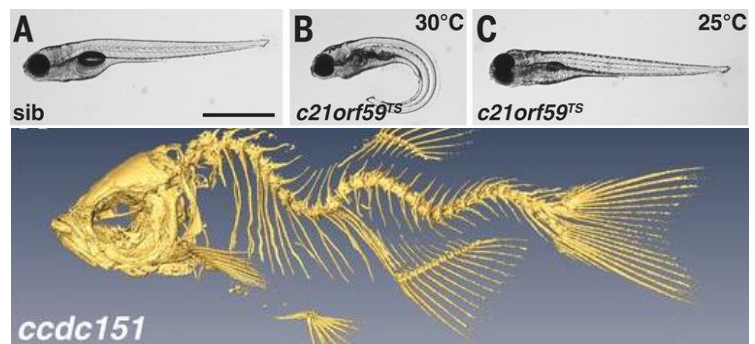
Zebrafish larvae are a common model organism, whose small size and transparency allow whole-body optical imaging at cellular resolution. In our lab, we used zebrafish to investigate the mechanisms underlying locomotion, and body-axis formation (with models of idiopathic scoliosis). Nevertheless, real time imaging of cell dynamics is technically challenging especially when 3D imaging is required or when the sample is freely moving. During this internship, we propose to build a new light sheet microscope, called SCAPE (M. Bouchard et al., Nature Photonics, 2015), that enables extremely fast volume recordings up to 10-100 volumes per second, giving a new opportunity to investigate neuronal dynamics of full neuron networks in real time. We recently obtained plans and thorough building instructions from the group who developed SCAPE. Hence, building this microscope should be achievable in a short period of time even without strong experimental knowledge in optics.

Then, many critical projects in the lab could be achieved with such a microscope depending on remaining time, and student own motivation and interests. For example, this microscope will be used for 3D imaging of cerebrospinal fluid circulation to understand body-axis formation in zebrafish, for neuronal optical imaging of entire networks correlated to zebrafish behavior. It could also be coupled to electrophysiology, and/or optogenetics to provide a deeper understanding of such networks.

This internship will be co-advised by Claire Wyart, a biophysicist group leader in Institut du Cerveau et de la Moelle (ICM), and Olivier Thouvenin, a young associate professor in optics in ESPCI, and former postdoc from Wyart lab. The microscope and experiments will be performed at ICM. Don't hesitate to contact us for more details on the different biological questions.



Optical imaging of a zebrafish hindbrain from the Wyart lab. Color codes for the depth



Genetic modifications of sensory neurons along spinal cord can cause scoliosis