Séminaire

Mardi 3 février 2026 à 10h30

Amphithéâtre Henri Benoît

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Laboratoire Jean Perrin

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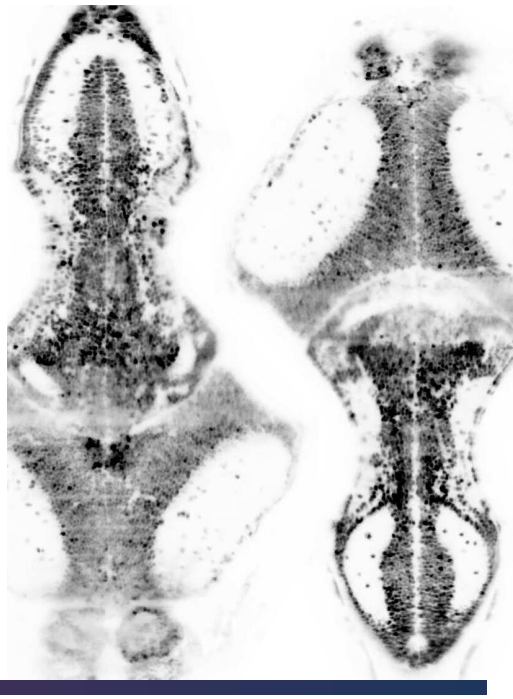
From Instability to Efficiency: Sensorimotor Strategies for Locomotion in Fish

Animal locomotion arises from a continuous feedback loop between motor commands and sensory inputs. From a physical perspective, this loop faces fundamental challenges: time delays can lead to instabilities, the relationship between action and sensory feedback is context-dependent, and both body and environment evolve over time. How biological systems achieve stable yet flexible behavior under these constraints remains an open question.

In this talk, I will present experiments performed on a miniature and transparent fish, combining quantitative behavioral assays with brain-wide neuronal recordings. I will first show how stable navigation can emerge from a simple feedback mechanism, provided that sensory and motor transformations are nonlinear. I will then turn to locomotor development. Using freely swimming assays, we identify a transition from continuous swimming in larvae to an intermittent burst-and-glide strategy in juveniles. Our analysis shows that this transition, which is energetically optimal, reflects an in-built bifurcation in the dynamical system governing speed control. Together, these results show how animals exploit nonlinearities and instabilities of their sensorimotor systems to achieve efficient and adaptive locomotion.



Les personnes souhaitant rencontrer G. Debregeas sont priées de prendre contact avec Thierry Charitat.