



Graduate School Event

Thesis Defense: Deciphering spinal interneuron heterogeneity across vertebrate evolution

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The spinal cord plays a central role in sensorimotor behavior, integrating sensory input and descending commands from the brain to generate movement. Like the brain, it is composed of diverse populations of excitatory and inhibitory neurons. Over the course of evolution, vertebrates have adapted to new environments and evolved distinct body plans, yet it remains unclear how the neuronal architecture of the spinal cord has changed to support these adaptations. Advances in single-cell genomics have made it possible to characterize neuronal diversity at single-cell resolution, but in the spinal cord such data are largely limited to mammals. To address this gap and understand how spinal neuronal diversity has evolved, this thesis compares spinal cell types across vertebrates, including zebrafish, frog, lizard, mouse and human. First, we generate a single-cell transcriptomic atlas of the developing spinal cord of the amphibian *Xenopus laevis* and compare it with mouse developmental data. This reveals a highly conserved developmental framework across tetrapods, including conservation of the major cardinal classes, their spatial distributions and temporal subdivisions. Second, we extend this comparison to the adult spinal cord by generating a single-cell and spatial transcriptomic atlas of the frog spinal cord and comparing it with mouse and human data. In contrast to development, we find marked divergence between amphibians and mammals, largely restricted to dorsal excitatory interneurons of the superficial dorsal horn, including several mammalian-specific populations. Adding zebrafish further supports the dorsal excitatory compartment as a major site of species-specific diversification. Finally, we characterize the adult spinal cord of the lizard *Pogona vitticeps* to test whether these populations are specific to mammals or shared across amniotes. This analysis further supports their mammalian specificity and links them to late-born dorsal lineages. Together, these findings suggest that the spinal cord is built on a largely conserved developmental framework, whereas adult neuronal diversity has diverged selectively in the dorsal spinal cord. The superficial dorsal spinal cord thus emerges as a recently evolved hub for sensory integration in mammals.

Tuesday, October 20, 2026 01:00pm - 02:00pm

Office Bldg West / Ground floor / Heinzl Seminar Room (I21.EG.101) and Zoom



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