

# Unravel the gene regulatory network governing the binary decision of neuronal midline crossing



**Dr. Yan Zhu**

National Institute of Genetics  
Brain Function Laboratory

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Despite the tremendous amount of information obtainable nowadays from single cell transcriptomics studies, we still lack a systemic and unifying understanding of the nature and the interplay of the genetic programs that drive the unfolding of neuronal diversification during development. In this talk, I'd like to discuss our recent work in delineating the genetic program that underlies the binary partitioning of neurons into commissural and ipsilateral projection categories. We uncovered an evolutionarily conserved gene regulatory mechanism, involving the bHLH transcription factors *Nhlh1* and *Nhlh2*, which is essential for the expression of the key guidance molecule *Robo3* in all floor plate-crossing commissural neurons from the spinal cord to the midbrain. We showed that this global mechanism is modulated regionally by neuron class determinants to achieve specificities of the commissural and ipsilateral division. Our work has shed light on a molecular strategy in which an interplay between a globally-acting program and the lineage-based regional programs controls a common trait shared across heterogenous neuronal classes.

