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LES SÉMINAIRES DE L'INMG

*It takes two to tango with elegance:
Glia and pioneer neurons orchestrate
C. elegans brain assembly*

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Brain assembly is hypothesized to begin when pioneer axons extend over non-neuronal cells, forming tracts guiding follower axons. Yet, the identities of the pioneer-neurons and of their guidance-substrates and their interactions, are not well understood. Here, using time-lapse embryonic imaging, genetics, protein-interaction, and functional studies, we uncover the early events of *C. elegans* brain assembly. We demonstrate that *C. elegans* possesses radial-glia-like cells key for assembly initiation. Glia guide pioneer and follower axons using distinct signals. Pioneer neurons we identify, with unique growth properties, anatomy, and innervation, cooperate with glia to guide follower axons. We identified a CHIN-1/Chimaerin- KPC-1/Furin double mutant that severely disrupts assembly, unlike previously known mutants. CHIN-1/Chimaerin and KPC-1/Furin cooperate non-canonically in glia and pioneer neurons for guidance-cue trafficking. We exploit this genetic bottleneck to define a guidance-gene network governing assembly, with specific glia and pioneer-neuron contributions. Our studies reveal previously-unknown roles for glia in pioneer-axon guidance, and suggest conserved principles of brain formation.