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Centre de Recherche en Biologie Cellulaire de Montpellier



CRBM external seminar

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Mechanisms of emergence & maintenance of nervous system architecture; insights from *C. elegans*

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Georgia Rapti obtained her PhD, in 2010, Paris Diderot University and École Normale Supérieure, Paris, France under the supervision of Dr. Jean-Louis Bessereau.

She then went in the USA for a Postdoctoral research position at The Rockefeller University, New York, USA where she worked under the supervision of Dr Shai SHAHAM.

She is currently Group leader at EMBL from December 2019.

Her group dissects cellular and molecular mechanisms of nervous system assembly and the underlying glia–neuron crosstalk, using advanced genetics, genomics and live imaging approaches.

Abstract

Brain circuits are tight interconnected networks and their operational complexity reflects the complexity of their architecture. Faithful circuit function relies on proper assembly and interactions of neurons and glia, vital circuit sculptors. Moreover, resilient maintenance of circuit architecture is key to preserve functional integrity upon environmental challenges. Understanding the principles of circuit assembly and resilience *in vivo* ultimately allow for a better comprehension of circuit function. Despite extensive neurodevelopment studies, glia-neuron interactions underlying circuit development and maintenance remain understudied. The *C. elegans* nervous system offers a powerful setting to address these points: it harbors stereotyped anatomy, with neurons and glia defined in single-cell resolution, easy genetics and molecular tractability. We study these focusing on the *C. elegans* brain neuropil, that harbors hundreds of neurons and 4 astrocyte-like glial cells and forms in embryogenesis. We dissect mechanisms of assembly and maintenance by combining large-scale screens, quantitative imaging of cellular, subcellular features and extracellular matrix (ECM), with manipulation of genes, cells and their environment. Our studies decipher new synergistic pathways building the neuropil, identifying pioneer neurons and glial cells and their underlying morphogenetic mechanisms. In addition, our studies uncover an interplay of proteostasis, ECM and mechanics that ensures robust circuit integrity. This work and others highlight important similarities of the *C. elegans* neuropil and vertebrate circuits and we devise future approaches to assess functional conservations of the mechanisms we uncover in *C. elegans*.

Selected publications

Rapti G. Open Frontiers in Neural Cell Type Investigations; Lessons From *Caenorhabditis elegans* and Beyond, Toward a Multimodal Integration. Front Neurosci. 2022 Mar 7;15:787753.

Rapti G. A perspective on *C. elegans* neurodevelopment: from early visionaries to a booming neuroscience research. J Neurogenet. 2020 Sep-Dec;34(3-4):259-272.

Rapti G, Li C, Shan A, Lu Y, Shaham S. Glia initiate brain assembly through noncanonical Chimaerin-Furin axon guidance in *C. elegans*. Nat Neurosci. 2017 Oct;20(10):1350-1360.