

11:00am, Thursday Septembre 10th 2026

Ecole Polytechnique

Meeting room Bat 84

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In vivo imaging of cortical dynamics in autism

Autism spectrum disorders are increasingly recognized as disorders of large-scale brain network function. In this presentation, I will discuss how in vivo mesoscopic calcium imaging can reveal altered cortical dynamics in Shank3 mouse models of autism and Phelan–McDermid syndrome.

Longitudinal wide-field imaging shows that Shank3b^{+/-} mice develop progressive cortical hyperconnectivity, first involving somatosensory barrel-field regions and later extending across the dorsal cortex. These abnormalities are strongly brain-state dependent, being most evident during wakefulness and attenuated under anesthesia.

Recent findings further indicate that Shank3 mutation affects the cortical activity patterns preceding voluntary movements, reducing the coupling between distributed cortical dynamics and behavior. These alterations point to impaired coordination of sensorimotor and associative networks during action preparation.

Finally, I will present two neuromodulatory approaches aimed at recovering cortical function and behavior in this mouse model of autism. Specifically, we developed an all-optical mesoscale approach combining wide-field calcium imaging with targeted optogenetic inhibition, in parallel with a less invasive approach with transcranial electrical stimulation. This framework provides a strategy to identify causal circuit mechanisms and evaluate interventions aimed at restoring cortical communication and sensory processing in autism.

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