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TEMASEK LIFESCIENCES LABORATORY

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The Auditorium (Level 1)

Hosted by: Dr KOH Tong-Wey

Molecular mechanisms underlying experience-dependent neural circuit wiring

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Dr Xiang Yu is Senior Investigator and laboratory head at the Institute of Neuroscience, Chinese Academy of Sciences, in Shanghai, China. After receiving her Bachelor's degree from Trinity College, University of Cambridge, she completed her Ph.D at the MRC Laboratory of Molecular Biology in Cambridge and her post-doctoral work at Stanford University. Her laboratory is interested in understanding the molecular mechanism underlying experience-dependent neural circuit formation and plasticity. Recent works from her laboratory showed that the neuropeptide oxytocin mediated crossmodal plasticity in the mouse sensory cortices during early development, and demonstrated a critical role of the cadherin/catenin cell adhesion complex in activity-dependent spine pruning, through a competition-based mechanism. She is recipient of the Grass Fellowship at the Marine Biological Laboratory (2005), the Hundred Talent Program of the Chinese Academy of Science (2005), the Talented Young Investigator Award of the National Science Foundation of China (2011), the Shanghai Talented Young Scientist Award (2014), and the China Young Women Scientists' Award (2014).

Sensory experience is critical to development and plasticity of neural circuits. Our laboratory is interested understanding the molecular mechanism underlying activity-dependent neural circuit development and refinement. In recent works, we studied the mechanisms underlying global forms of plasticity during early development and local forms of plasticity during neural circuit refinement in adolescence. We uncover an early form of crossmodal plasticity in the mouse sensory cortices, where deprivation of sensory input into one sensory modality crossmodally reduce excitatory synaptic transmission in other sensory cortices. We further demonstrate that this effect is mediated by the neuropeptide oxytocin and can be rescued by increased natural sensory experience through environmental enrichment. In terms of neural circuit refinement, we demonstrated that a competition-based mechanism concurrently induced maturation of active spines and pruning of less active spines, an effect mediated by the cadherin/catenin cell adhesion complex. Developmental neurological disorders, including autism and schizophrenia, have been reported to have defects in spine pruning, and oxytocin treatment is a hotly debated therapy for autism. We hope to contribute towards a better understanding of these important disorders through our work.

Recent Publications:

1. Zhang S.X., Duan L.H., He S.J., Zhuang G.F. and **Yu X.** (2017) Phosphatidylinositol 3,4-bisphosphate regulates neurite initiation and dendrite morphogenesis via actin aggregation. ***Cell Res.*** 27:253-273.
2. Bian W.J., Miao W.Y., He S.J., Qiu Z. and **Yu, X.** (2015) Coordinated spine pruning and maturation mediated by inter-spine competition for cadherin/catenin complexes. ***Cell*** 162: 808-822 (highlighted by *Nat. Rev. Neurosci. 16*: 577)
3. Zheng J.J., Li S.J., Zhang X.D., Miao W.Y., Zhang D., Yao H. and **Yu, X.** (2014) Oxytocin mediates early experience–dependent cross-modal plasticity in the sensory cortices. ***Nat. Neurosci.*** *17*: 391-399 (highlighted by same issue *News and Views 17*, 340 and by *Nat. Rev. Neurosci. 15*: 139)