BDR SEMINAR (Kobe & online hybrid)

Kazunari Miyamichi

RIKEN Center for Biosystems Dynamics Research

Wednesday, November 12, 2025

13:00–14:00

1F Auditorium, DB Building C, Kobe / Broadcast online via Zoom

※This seminar is open only to BDR Members.

Organization and Plasticity of Cell-Type–Specific Neuronal Circuits

Summary

The nervous system adapts behavior and physiology to life-stage demands. Parental caregiving emerges when offspring are expected, and pregnancy increases food intake to support gestation. These examples suggest flexible mechanisms that reconfigure deep brain circuits according to internal state, yet how this plasticity is implemented remains unclear. We focus on hypothalamic oxytocin neurons, central regulators of parental behavior and maternal physiology. We show that life-stage transitions involve sex-specific circuit remodeling: in male mice, excitatory input from the lateral hypothalamus to paraventricular oxytocin neurons rises at the onset of paternal caregiving, whereas in female mice, excitatory input from the preoptic area declines during pregnancy, reducing meal-related activity and enhancing food intake. These results challenge the classical view of the hypothalamus as a rigid, hardwired network, instead revealing highly dynamic circuits that adapt to physiological state. Extending this framework, we are mapping spinal sympathetic pathways that convey hypothalamic outputs to organs. Our data indicate cell type–specific connectivity to peripheral targets, enabling organ-selective modulation. Future studies will explore their plasticity. Together, these studies aim to elucidate organizational principles and adaptive flexibility in circuits linking brain and body.