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OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY
沖縄科学技術大学院大学

THEORETICAL SCIENCES VISITING PROGRAM

TSVP TALK

Feedback Control and Variability in the Nervous System

2023

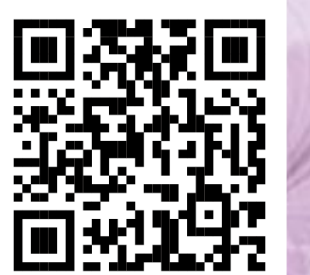
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Jan. 12

16:00–17:00

HYBRID

L4E48, ZOOM



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We are living in an era when it is possible to measure and manipulate neural circuits in increasing detail. On one hand this promises to reveal circuit mechanisms that underlie brain function. On the other hand, data gathered from large populations of neurons and their synaptic connections remind us of the challenge of finding a systems-level understanding. We observe huge variability and fluidity in neural circuit properties despite efforts to extract precise measurements under controlled conditions. It can be tempting to conclude that much of what we see is messy, idiosyncratic biology. I believe that principles from engineering can help us make sense of the mess: nervous systems need to be robust, and to negotiate fundamental tradeoffs in speed, precision, and stability. Much of this is achieved by feedback control loops at every level of organisation, from molecular pathways to neural circuits. I will present examples of our recent and ongoing work that illustrates the diversity of feedback mechanisms in the nervous system, and how these may reconcile apparent messiness with coherent function.

University of Cambridge

Timothy O'Leary

Timothy O'Leary is Professor of Information Engineering and Neuroscience at the University of Cambridge. His research uses concepts and methods from systems theory and control engineering to understand the brain at the cellular and network level. He trained in pure mathematics and obtained his PhD in biophysics and physiology at the University of Edinburgh. He then worked with Eve Marder as Swartz Theoretical Neuroscience Fellow in Brandeis University before starting his group in Cambridge in 2016.



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