

Institut d'Alembert Seminar / July 03th, 2023 at 15:00 pm
Amphi Simondon – 1B36 – South-West- Building

**NEURAL CIRCUITS FOR REINFORCEMENT LEARNING AND
MENTAL SIMULATION**



By Kenji DOYA,
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Presentation:

In the standard “model-free” reinforcement learning, an agent learns an action policy simply through the experiences of state-action-reward sequences. In the “model-based” framework, an agent first learns an internal model of state transition, state-action-next state, and uses that for planning of action sequences to reach a goal, or for estimation of the present state from the past state and action in the face of sensory uncertainty. A large body of study suggests that the basal ganglia play an essential role in model-free reinforcement learning. The neural mechanism of model-based reinforcement learning through mental simulation of imaginary states is less clear and an important topic of research. We present our functional brain imaging study to delineate the whole brain circuit linking the cerebellum, the basal ganglia and the cerebral cortex for mental simulation. We will further report our ongoing study of imaging the local circuit dynamics for mental simulation.

Biography:

Kenji Doya is a Professor of Neural Computation Unit, Okinawa Institute of Science and Technology (OIST) Graduate University. He obtained his PhD in 1991 at the University of Tokyo and worked as a postdoc at U. C. San Diego and the Salk Institute. In 1994, he joined Advanced Telecommunications Research International (ATR) as a Senior Researcher and then served as a Group Leader of Kawato Dynamic Brain Project. In 2004, he was appointed as a Principal Investigator of the OIST Initial Research Project and started Okinawa Computational Neuroscience Course (OCNC) as the chief organizer. As OIST established itself as a Graduate University in 2011, he became a Professor and served as the Vice Provost for Research till 2014. He is interested in reinforcement learning in both natural and artificial creatures. He served as a Co-Editor in Chief of Neural Networks from 2008 to 2021 and the Chairperson of Japan Neuroscience Society annual meeting (Neuro2022) in Okinawa. He currently serves as a board member of International Neural Network Society (INNS) and the President of Japanese Neural Network Society (JNNS). He received INNS Donald O. Hebb Award, JNNS Academic Award, APNNS Outstanding Achievement Award, and the age-group 2nd place at Ironman Malaysia 2022.