

INTRODUCTION

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Decision making is the process for animals or humans to select one of multiple options based on the prediction of their goodness and badness. Economists and psychologists have long studied how rational human beings or evolutionarily optimized animals should make choices between rewards or punishments with different combinations of amount, probability, and timing. Recently, the brain's mechanism for decision making is a major research topic in neuroscience and psychiatry, thanks to the advances in neural recording, functional brain imaging, pharmacology, and gene technologies. The computational theory of *reinforcement learning* has played a major role in bringing together the top-down, normative approaches of prescribing how an optimal decision should be made and the bottom-up, experimental approaches of observing how actual individuals and neurons behave in making choices.

In this session on neuroscience of decision making, we have two speakers: Dr. Hiroyuki Nakahara from RIKEN Brain Science Institute and Dr. Serge Ahmed from University of Bordeaux. Dr. Nakahara will present how the network of the brain, specifically the circuit called the basal ganglia, and the neurochemical signaling, specifically the neurotransmitter called dopamine, realize learning of action choices from experiences of rewards. Dr. Ahmed will address how such network and neurochemical mechanisms for decision making can go wrong, especially in drug addiction.

The neuroscience of decision making can have a very deep and wide implications as it may elucidate the physical origin of *free will*, which has long been the subject of only philosophers. Understanding of decision making mechanisms in the brain and its regulation by genes and environments may lead to reconsideration of our commonsense of ethics and responsibilities. I look forward to questions and

discussions from variety of research disciplines on this highly attractive and controversial topic.