INSTITUT PARIS DESCARTES NEUROSCIENCES COGNITION

FÉDÉRATION DE RECHERCHE EN NEUROSCIENCES

Neuroscience Seminar Series

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Salle des Conférences (R229)

Centre Universitaire des Saints-Pères

45 rue des Saints-Pères, 75006 Paris

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Generating behavior without neural representation of the body - the special case of the soft-bodied octopus

Octopuses provide an outstanding example of successful motor behavior created with a flexible body lacking any form of skeletal support. In skeletal animals the interfacing of sensory and motor information for planning motor reactions is based on neural representation of sensory and motor information in body-part coordinates. In contrast, in hyperedundant soft-bodied animals this approach is impractical due to the infinitely large DOF needed to represent the soft body. Octopus evolution overcame this difficulty through coevolution of body and brain to fit the octopus's highly active interaction with its environment. I will show that this was achieved thorough the selection of unique solutions at all levels, from the neuromuscular system of the arms up to the organization of higher motor control centers in the brain. All these unique solutions help explain how the "alien" or strange looking body of the octopus simplifies locomotion control; how the special distribution of the central and peripheral nervous system simplifies control of goal-directed arm movements like reaching and fetching; why higher control centers in the brain are not organized somatotopically as in vertebrates; why arm coordination in locomotion involves probabilistic control mechanisms rather than a deterministic CPG; and, finally, why motor learning employs 'strategy-learning' rather than 'skill-learning'. In summary, we learn from the octopus that embodied organization, a concept developed in robotics, is also an important biological principle for achieving simple and efficient neural control of behavior emerging from the adaption of the body's physical properties and morphology to the behavioral task environment.

Those interested in meeting with the speaker please contact

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