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Dynamique et physiopathologie des réseaux neuronaux / *Dynamics and physiopathology of neuronal networks*

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tensions, and morphogenesis is well captured by a quasi-static mechanical description, as we recently proposed for compaction and for the formation of the inner-cell mass in the mouse embryo (Maître, Turlier *et al.*, 2016). At the opposite, most non-mammalian embryo types, such as marine animals or insects, develop on much shorter timescales, of the order of a few hours. In this case, viscous dissipation becomes essential to consider again as it constitutes a main factor limiting cell shape dynamics (Turlier *et al.*, 2014). On such timescales, the biophysical characterization and precise modeling of cell divisions and its mechanical coupling to the rest of the embryo is an essential point that we aim to integrate into realistic simulations of embryo morphogenesis.

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DYNAMIQUE ET PHYSIOPATHOLOGIE DES RÉSEAUX NEURONAUX / *DYNAMICS AND PHYSIOPATHOLOGY OF NEURONAL NETWORKS*

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RECHERCHE

Page web : https://www.college-de-france.fr/site/en-cirb/venance.htm.

Our main interest is how neural networks of the brain support its cognitive capacities. We aim at providing rational mechanistic explanations of adaptative control of behavior. Procedural learning corresponds to the acquisition of skills through repeated performance and practice of a behavior in response to external cues, such as biking or playing an instrument. Basal ganglia, a set of subcortical nuclei, participate in the detection of environmental cues and in the selection of appropriate actions based on motivation and reward, thanks to their reciprocal connections to the cerebral cortex and limbic system. Cortex-basal ganglia loops are involved in the adaptive control of behavior and are the main substrate for procedural learning. We therefore focus our work on dissecting the processing of information in cortico-basal ganglia circuits, from sub-cellular to neural network levels. The key roles of basal ganglia are highlighted by motor and cognitive disorders observed in pathologies such as Parkinson diseases, for which no fully satisfying treatments are available yet.

Our main focus is about the role of the striatum, the primary input nucleus of basal ganglia, which is a strategic gate extracting pertinent information and a major site of memory formation. Indeed, striatum acts as a coincidence detector of distributed patterns of cortical and thalamic activity and is in charge to extract pertinent information from background noise at a t time in a given situation, which will give rise to an action in adequation with the environment. Our first aim was to investigate the biological processes at play to set the striatal filter which allows this proper signal/noise detection. The strenght of the striatal filter depends mainly on the corticostriatal synaptic efficacy changes. Corticostriatal long-term plasticity provides a fundamental mechanism for the function of the basal ganglia in action selection and in procedural learning. Our last publications focused on the characterization of striatal synaptic plasticity repertoire at play in physiological and pathophysiological conditions.

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