McGill

DEPARTMENT OF PHYSIOLOGY

Dr. F.C. MacIntosh Lectureship Seminar

GUEST SPEAKER

Dr. Paul Cisek

Department of Neuroscience,
Université de Montréal

FRIDAY, NOVEMBER 3, 2023
11:00AM

MCINTYRE MEDICAL SCIENCES BUILDING
ROOM 1034

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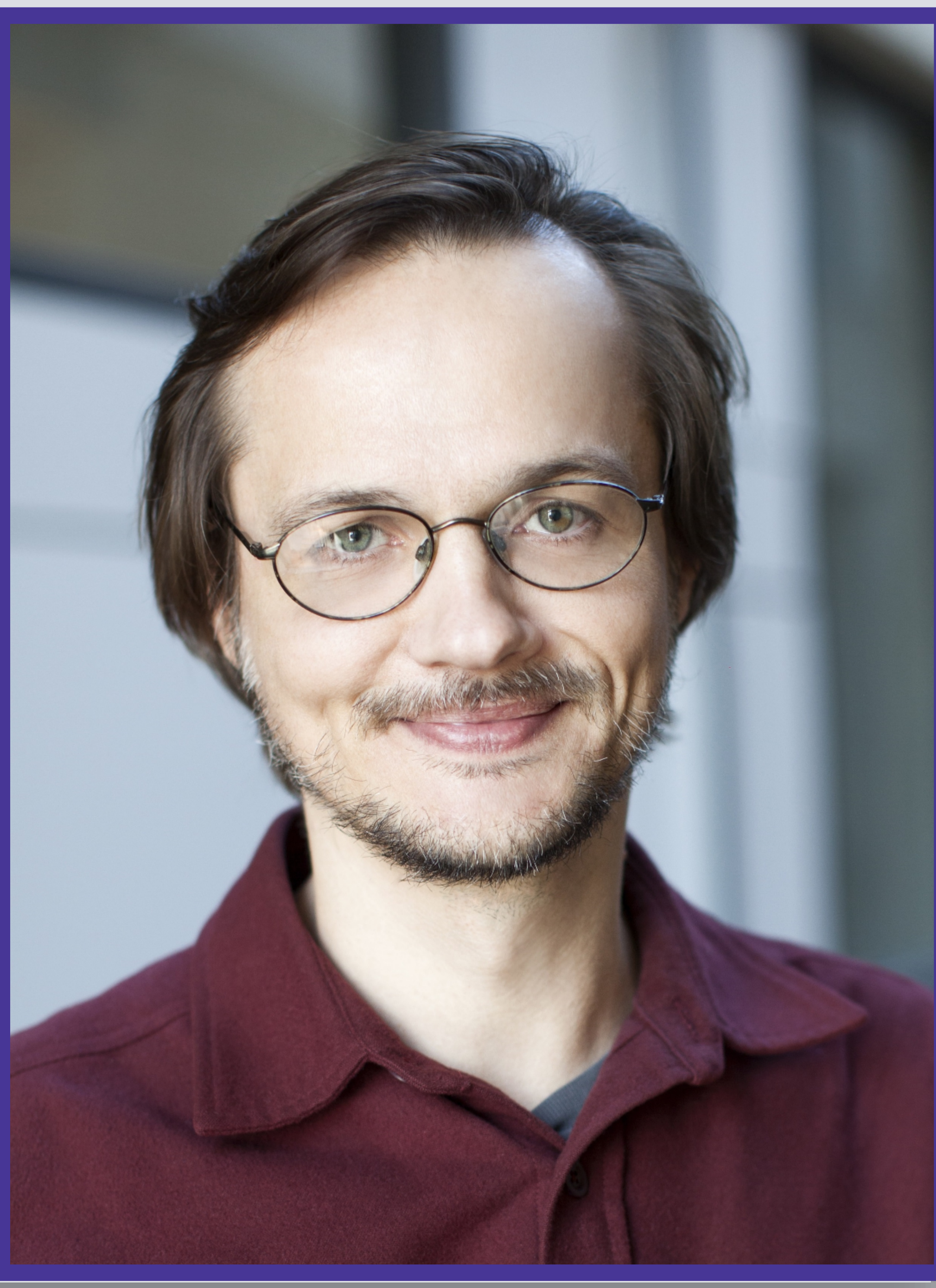

"Neural mechanisms of embodied decisions"

Psychological and neurophysiological studies of decision-making have focused primarily on scenarios in which subjects are faced with abstract choices that are stable in time. This has led to serial models of decision-making which begin with the representation of relevant information about costs and benefits, followed by careful deliberation about the choice leading to commitment. These cognitive models are separate from models of motor planning and execution, which normally begin with a single target or goal. However, the brain evolved to interact with a dynamic and constantly changing world, in which the choices themselves as well as their relative costs and benefits are defined by the momentary geometry of the immediate environment and are continuously changing, even during ongoing activity. To deal with the demands of real-time interactive behavior, animals require a neural architecture in which the sensorimotor specification of potential actions, their valuation, selection, and even execution can all take place in parallel. I will describe a general hypothesis for how the brain deals with the challenges of such dynamic and embodied behavior, and present the results of a series of behavioral and neurophysiological experiments in which humans and monkeys make decisions on the basis of sensory information that changes over time. These experiments suggest that sensory information pertinent to decisions is processed quickly and combined with a growing signal related to the urge to act, and the result biases a competition between potential actions that unfolds within the same sensorimotor circuits that guide action. Finally, I will present analyses and a computational model describing how the processes of deliberation, commitment, and movement execution can be considered as states of an integrated dynamical system distributed across cortical and subcortical circuits.