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Talk Title:
Behavioral and neurophysiological markers of the integrated control of decision-making and action execution

Abstract:
The mechanisms of reward optimization in decision-making have generally been studied separately from those in movement control. However, during natural behavior, animals (including humans) are often faced with decisions about actions, and the time they invest in deciding and acting must be optimized together rather than separately to ensure an adapted rate of reward. This implies that the regulation of decisions and actions are integrated, share common principles, and perhaps involve the same neural substrates.
In this presentation I will first describe behavioral experiments in which humans and monkeys performed visually-guided choices between reaching movements. Results indicate that the level of decision urgency strongly influences reaching kinematics, suggesting that a shared regulation signal determines both decision speed and movement vigor. The shared regulation hypothesis is supported by neurophysiological recordings in the monkey cortico-basal ganglia network. Secondly, I will describe behavioral experiments in which the shared regulation hypothesis is further investigated. Reaching constraints are manipulated in blocks of trials, and effects of motor costs on subjects' decision strategy are assessed. The data do not support a shared regulation, but instead suggest a flexible mechanism allowing to maintain the rate of reward in a costly context or after making errors.
Together, these results argue for a significant and adapted level of integration of decision-making and movement control during goal-oriented behavior.

Biographical Information:
My Ph.D. research (2003-2007) at University of Marseille (France) focused on the role of the Frontal Eye Field (FEF) during eye-hand coordination and the ocular exploration of the peripersonal space.
My post-doctoral stage in Paul Cisek's lab (2008-2013) at University of Montreal (Canada)

provided me with the opportunity to pursue my PhD's line of research while extending my technical and theoretical competences to multi-electrode recording and computational modeling. My research project was based on a new model of how the brain makes decisions over time. We recorded single neurons in monkey PFC, PMd and M1 to explore the neural correlates of dynamic decision-making.

As a research associate in Paul Cisek's lab (2014-2018), we explored the neural bases of speed-accuracy trade-off adjustments during dynamic decisions and movement execution. Today (since 2018) I am an INSERM researcher at the Lyon Neuroscience Research Center, investigating the regulation of decision and action under the urgency-gating framework.