

## Beyond economics: The challenges and mechanisms of embodied decisions

Paul Cisek

University of Montréal

Psychological and neurophysiological studies of decision-making have focused primarily on scenarios, such as economic choice, in which subjects are faced with discrete options that are stable in time, permitting a serial process of representing the relevant information, careful deliberation about the choice, followed by action planning and execution. However, the brain evolved to guide interactions 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 during ongoing activity. Such "embodied decisions" still dominate our lives, whether we're playing a sport or walking through a crowd, and they pose challenges that are very different than the demands of economic choice. To deal with these challenges, 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 a series of neurophysiological recording experiments in rhesus monkeys aimed at testing the predictions of this hypothesis.

### Relevant papers:

Cisek, P. and Pastor-Bernier, A. (2014) On the challenges and mechanisms of embodied decisions. *Philosophical Transactions of the Royal Society B* 369(1655): 20130479.  
doi:10.1098/rstb.2013.0479

Thura, D. and Cisek, P. (2014) Deliberation and commitment in the premotor and primary motor cortex during dynamic decision-making. *Neuron* 81: 1401-1416.

Pastor-Bernier, A. and Cisek, P. (2011) Neural correlates of biased competition in premotor cortex. *Journal of Neuroscience* 31: 7083-7088.

Cisek, P. and Kalaska, J.F. (2010) Neural mechanisms for interacting with a world full of action choices. *Annual Review of Neuroscience* 33: 269-298.