Optimal Feedback Control: the glue to link behaviour, brains and biomechanics
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Abstract
There have been many ways to interpret neural activity in primary motor cortex with the last 25 years largely focused on identifying neural representations (i.e. muscles versus movements). The results highlight myriad representations are present with little consensus on what this means. Recent theories based on optimal control have been influential for interpreting voluntary control and emphasize the importance of online sensory feedback for guiding motor action. My talk will describe our recent studies that highlight the sophistication of online control including knowledge of limb mechanics, scaling to spatial target location, and avoidance of obstacles in the environment. As well, I will highlight how primary motor cortex provides a key role in this sophisticated use of sensory feedback to guide motor action.

Bio
Professor, Dept. of Biomedical and Molecular Sciences, Dept. of Medicine, Queen’s University. Has formal training in Engineering (B.A.Sc. and M.A.Sc. in Systems Design Engineering, University of Waterloo) and Life Sciences (Ph.D. in Physiology, Queen’s University). His research program explores the neural, mechanical and behavioural aspects of voluntary motor control using novel robotic technology he developed that can sense and perturb planar arm movements. He has a highly interdisciplinary research program that combines non-human primate behavioural neurophysiology, human behavioural psychophysics, clinical research on sensorimotor impairments associated with various neurological disorders, computational theory, and technology development. He is also actively involved in technology transfer as Co-Founder and Chief Scientific Officer of BKIN Technologies which commercializes and manufacturers the KINARM robot and associated technologies.