Decision Making in Continuous Monitoring Contexts

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Kennedy Center, (Room 901): 1pm, Tuesday, November 22nd, 2011

Biographical Note:
Simon received his B.E. and Ph.D. in electronic and biomedical engineering in University College Dublin, Ireland, where he worked under the supervision of Richard Reilly. He joined the Cognitive Neurophysiology Laboratory of the Nathan Kline Institute for Psychiatric Research in 2005 to conduct postdoctoral research on attention and sensory processing under the mentorship of John Foxe. In 2008-2010 he completed a second postdoc in single unit neurophysiology in Columbia University under Jacqueline Gottlieb. This year, Simon took a position in the Department of Biomedical Engineering in the City College of New York. He uses human electrophysiology and psychophysics to understand the brain mechanisms of attention and decision-making.

Abstract:
Our understanding of the neural mechanisms underlying the formation of a perceptual decision has been significantly advanced in recent years by single-unit electrophysiology. In particular, the two temporally parallel but distinct processes of 1) sensory evidence encoding and 2) translation of accrued evidence into a decision variable suitable for driving action, have been characterized in a number of brain areas, along with their relationship to behavior. Examining these dynamic decision processes in humans is far more difficult due to limitations of the available techniques. I will present the results of recent human electroencephalography (EEG) work in which we fully separate the signals of representation and accumulation of sensory evidence, and trace their dynamics in the context of continuous monitoring for intermittent targets. Our signal separation does not rely on either anatomical or behavioral modeling, nor does it require signal processing beyond the most basic spectral analysis; rather, it falls out naturally from our task design. Using this approach we gain insight into aspects of perceptual decision making that are more amenable to investigation in humans than experimental animals, such as the effects of fluctuating vigilance in the absence of high motivation.

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