

# Jefferson E. Roy

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## Summary of Expertise

- Cognitive behavior studies
- In vivo neuroscience recording methods
- Grant management/budgeting
- Matlab and Julia programming
- Mentoring and supervision
- Scientific writing and presentations
- Technical consulting
- Science outreach

## Education

**McGill University**, Montréal, QC, Canada

- Ph.D. in the Department of Physiology Dean's Honours List

**University of Western Ontario**, London, ON, Canada

- B.Sc. (Honours) in Physiology, Department of Physiology

## Neuroscience Experience

**The Picower Institute for Learning and Memory at MIT**, Cambridge, MA, USA

Research Scientist III under the mentorship of Earl. K. Miller, Ph.D. (2007-present)

- Investigating neuronal mechanisms of cognitive flexibility during goal-directed behavior
- Design and implement multiple electrophysiological non-human primate studies
- Analyze complex neuronal signals and behavior with custom Matlab and Julia scripts
- Proficient with chronic array implantation and recordings, acute recordings, EEG recordings, and tACS

Associate Lab Director (2013-present)

- Perform and teach surgical procedures (e.g. headposts, acute recording chambers, chronic arrays)
- Ensure budgetary compliance per MIT, NIH, NSF, and industry guidelines
- Ensure biosafety and animal use compliance per MIT, USDA, and AAALAC guidelines
- Manage grant applications and progress reports

Postdoctoral Associate (2002-2007)

**McGill University Department of Physiology**, Montréal, QC, Canada

Ph.D. student under the mentorship of Kathleen E. Cullen, Ph.D.

- Investigated neuronal control of the VOR, VCR, and eye movements in alert behaving non-human primates

## Technical Consulting

**Muddled Mind Consulting LLC.**, Cambridge, MA, USA

Founder and principal consultant (2013-present)

- Provide neuroscience technical consulting services to companies
- Scope of work includes writing whitepapers, data analysis, grant writing and editing, scripts/storyboards, and educational content creation

## Mentoring

**The Picower Institute for Learning and Memory at MIT**, Cambridge, MA, USA

- Serve as collaborative mentor to new postdoctoral researchers and graduate students
- Train postdoctoral researchers and graduate students on surgical procedures
- Aid in experimental design and data analysis of projects within the laboratory

## Teaching and Outreach

**The Innovation Institute**, Newton, MA, USA

- Instruct and lead grade 4-5 students with hands-on science exploration (2019-2021)

**Science from Scientists**, Bedford, MA, USA

- Instruct grade 4 students with the mission to improve their attitudes and aptitudes in STEM fields (2014-17)

**Science Fair Judge**

- Boston Public High School Citywide Science Fair, Boston, MA, USA (2016-17, 2023-24)
- Massachusetts State High School Science and Engineering Fair, Cambridge, MA, USA (2009-23)

## Editorial Board

- Review Editor *Frontiers in Systems Neuroscience*

## Publications

### **Book**

Bundgaard, M.H. and **Roy, J.E.**, *The Motivated Brain*. Copenhagen:CreateSpace, 2014.

### **Manuscripts**

Miller, E.K., Brincat, S.L., and **Roy, J.E.** Cognition is an emergent property. *Curr. Opin. Behav. Sci.*, in press, 2024.

Bastos, A.M., Donoghue, J.A., Brincat, S.L., Mahnke, M., Yanar, J., Correa, J., Waite, A.S., Lundqvist, M., **Roy, J.**, Brown, E.N. and Miller, E.K. Neural effects of propofol-induced unconsciousness and its reversal using thalamic stimulation. *eLife*, DOI: 10.7554/eLife.60824, 2021.

Tiganj, Z., Cromer, J.A., **Roy, J.E.**, Miller, E.K., and Howard, M.W. Compressed Timeline of Recent Experience in Monkey IPFC. *J.Cogn. Neurosci*, 1-16, 2018.

Wutz, A., Loonis, R., **Roy, J.E.**, Donoghue, J.A., and Miller, E.K. Different levels of category abstraction by different dynamics in different prefrontal areas. *Neuron*, 97, 716-726, 2018.

Stanley, D.A., **Roy, J.E.**, Aoi, M.C., Kopell, N.J., and Miller, E.K. Low-beta Oscillations Turn Up the Gain During Category Judgments. *Cerebral Cortex*, 28, 116-130, 2018.

**Roy, J.E.**, Buschman, T.J., and Miller, E.K. Prefrontal Cortex Neurons Reflect Categorical Decisions About Ambiguous Stimuli. *J.Cogn. Neurosci*, 26, 1283-1291, 2014.

Buschman, T.J., Siegel, M., **Roy, J.E.**, and Miller, E.K. Neural Substrates of Cognitive Capacity Limitations. *PNAS*, 108, 11252-11255, 2011.

Cromer, J., **Roy, J.E.**, Buschman, T.J., and Miller, E.K. Comparison of Primate Prefrontal and Premotor Cortex Neuronal Activity During Visual Categorization. *J. Cogn. Neurosci*, 23, 3355-3365, 2011.

**Roy, J.E.**, Riesenhuber, M., Poggio, T., and Miller, E.K. Prefrontal Cortex Activity during Flexible Categorization. *J. Neurosci*. 30, 8519-8528, 2010.

Cromer, J., **Roy, J.E.**, and Miller, E.K. Representation of Multiple, Independent Categories in the Primate Prefrontal Cortex. *Neuron* 66, 796-807, 2010.

Cullen, K.E. and **Roy, J.E.** Signal Processing in the Vestibular System during Active versus Passive Head Movements. *J. Neurophysiol.* 91, 1919-1933, 2004.

**Roy, J.E.** and Cullen, K.E. Dissociating Self-Generated from Passively Applied Head Motion: Neural Mechanisms in the Vestibular Nuclei. *J. Neurosci.* 24, 2102-2111, 2004.

**Roy, J.E.** and Cullen, K.E. Brain Stem Pursuit Pathways: Dissociating Visual, Vestibular, and Proprioceptive Inputs during Combined Eye-Head Gaze Tracking. *J.Neurophysiol.* 90: 271-290, 2003.

**Roy, J.E.** and Cullen, K.E. Vestibuloocular Reflex Signal Modulation During Voluntary versus Passive Head Movements. *J. Neurophysiol.* 87, 2337-2357, 2002.

**Roy, J.E.** and Cullen, K.E. Selective Processing of Vestibular Reafference During Self-generated Head Motion. *J. Neurosci.* 21, 2131-2142, 2001.

**Roy, J.E.** and Cullen, K.E. A Neural Correlate for Vestibulo-Ocular Reflex Suppression During Voluntary Eye-Head Gaze Shifts. *Nature Neurosci.*1, 404-410, 1998.

## Invited Lecture

Mechanisms of Perception, Categorization, Memory and Cognition Conference, Ruhr-Universitat, Germany, 2021