

COGS171: Mirror Neuron System and Social Cognition

Spring Quarter 2017 TuTH 11:00 - 12:20 pm CSB 005

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Office Hours: M 9-11 am, CSB 107 (or by appointment)

TA: TBN

Section: F 9-9:50 am CSB 005

This class will examine the neuroanatomy, physiology, and functional correlates of the human mirror neuron system and its putative role in social cognition, e.g., action understanding, empathy, and theory of mind. We will examine the developmental, neuroimaging, electrophysiological, as well as clinical evidence for and against this hypothesis.

All students will:

1. Write a critical review or "thought" essay (no longer than 1 page) on the weeks labeled with an asterisk (Weeks 2,3,4,6,8,10) based on one of the required readings that week. See class website (or ask instructor) for a sample of a critical review. Essays are due on Tuesday of the assigned week - for a total of 6 essays, although only 5 will count towards grade (25%).
2. You will also be responsible for:
 - a term paper due at end of class (8-10 pages) on an issue relevant to mirroring and social cognition. You will work on this as a group of 3-4 students. See class website for instructions on structure of proposal. (15%)
 - an oral presentation of the term paper (10-15 minutes). (10%)
3. Take the midterm (25%) and final (25%).

- Class website is on TED. PDF versions of each of the assigned articles will be on the class website for students to download.

Week 1 4/4-4/6 IN THE BEGINNING...

G. di Pellegrino et al. Understanding motor events: a neurophysiological study. *Exp. Brain Res.*, 1992, 91: 176-180.

Mukamel, R. et al. Single-neuron responses in humans during execution and observation of actions. *Current Biology*, 2010, 20(1-7): 750-756.

Week 2* 4/11-4/13 THE ONTOGENY AND PHYLOGENY OF MIRROR NEURONS

Rizzolatti, G. and Fogassi, L. The mirror mechanism: recent findings and perspectives. *Phil. Trans.R Soc. B*, 2014, 369: 20130420.

Heyes, C. Where do mirror neurons come from? *Neuroscience and Biobehavioral Reviews*, 2010, 34, 575-583.

Gallese, V. et al. Motor cognition and its role in the phylogeny and ontogeny of action understanding. Dev. Psych., 2009, 45(1): 103-113.

Week 3* 4/18 -4/20 MIRRORING AND IMITATION

Lyons, D. E. The rational continuum of human imitation (Text p. 77).
Hari, R., et al. Human primary motor cortex is both activated and stabilized during observation of other person's phasic motor actions. *Phil. Trans.R Soc. B*, 2014, 369: 20130420.

Iacoboni, M. Imitation, empathy, and mirror neurons. Ann. Rev. Psychol., 2009, 60, 19.1-19.18.
Brass et al., Investigating action understanding: inferential processes versus action simulation. Current Biology, 2007, 17, 2117-2121.

Week 4* 4/25-4/27 MIRRORING AND HEBBIAN LEARNING

Heyes, C. Tinbergen on mirror neurons. *Phil. Trans.R Soc. B*, 2014, 369: 20130420.
Keyesers, C. and Gazzola, V. Hebbian learning and predictive mirror neurons for actions, sensations and emotions. *Phil. Trans.R Soc. B*, 2014, 369: 20130420.

Keyesers, C. and Gazzola, V. Unifying social cognition (Text p. 3).
Gallese, V. Mirror neurons and the neural exploitation hypothesis: from embodied simulation to social cognition (Text p. 163)

Week 5 5/2-5/4 ARE MIRROR NEURONS INVOLVED IN UNDERSTANDING THE MENTAL STATES OF OTHERS?

5/2 Midterm 1

Ferrari, P.F. et al. Distinct EEG amplitude suppression to facial gestures as evidence for a mirror mechanism in newborn monkeys. *J. Cog. Neurosci.*, 2012, 24:5, 1-8.
Meltzoff, A.N. and Decety, J. What imitation tells us about social cognition: a rapprochement between developmental psychology and cognitive neuroscience. *Phil. Trans. R. Soc. Lond. B.*, 2003, 358, 491-500.
Pineda, J.A. and Hecht, E. Mirroring and mu rhythm involvement in social cognition: Are there dissociable subcomponents of theory of mind. *Biological Psychology*, 2009, 80, 306-314.
Keyesers, C. and Perrett, D.I. Demystifying social cognition: a Hebbian perspective. Trends in Cognitive Sciences, 2004, 8(11), 501-507.

Week 6* 5/9-5/11 DOES MIRRORING OCCUR FOR SOUNDS?

Mooney, R. Auditory – vocal mirroring in songbirds. *Phil. Trans.R Soc. B*, 2014, 369: 20130420.
Caetano, G. et al. Actor's and observer's primary motor cortices stabilize similarly after seen or heard motor actions. *PNAS* (2007) 104(21), 9058-9062.

Kohler et al. Hearing sounds, understanding actions: Action representation in mirror neurons. Science 297, 846 (2002).
J'ancke The dynamic audio–motor system in pianists. Ann. N.Y. Acad. Sci. 1252 (2012) 246–252

Week 7 5/16-5/18 IS EMPATHY A FUNCTION OF MIRRORING?

Pineda, J.A. et al. Hierarchically organized mirroring processes in social cognition: the functional neuroanatomy of empathy (Text p. 135).

Schulte-Ruther, M. et al., Gender differences in brain networks supporting empathy. *Neuroimage*, 2008, 42, 393-403.

Schulte-Ruther, M. et al., Mirror neuron and theory of mind mechanisms involved in face-to-face interactions: a functional magnetic resonance imaging approach to empathy. J. Cognitive Neuroscience, 2007, 19:8, 1354-1372.

Week 8* 5/23-5/25 EMOTIONS AND MIRRORING

Montgomery, K.J. and Haxby, J.V. Mirror neuron system differentially activated by facial expressions and social hand gestures: A functional magnetic resonance imaging study. *J. Cogn. Neuroscience*, 2008, 20(10), 1866-1877.

Winkielman, P. Niedenthal, P.M. and Oberman, L.M. Embodied perspective on emotion-cognition interactions (Text p. 235).

Freedberg, D. and Gallese, V. Motion, emotion and empathy in esthetic experience. Trends in Cognitive Sciences, 2007, 11(5), 197-203.

Week 9 5/30-6/1 DISORDERS OF MIRRORING

Oberman, L.M., et al. EEG evidence for mirror neuron dysfunction in autism spectrum disorders. *Cog. Brain Res.*, 24(2): 190-198, 2005.

Dapretto, M. et al., Understanding emotions in others: mirror neuron dysfunction in children with autism spectrum disorders. *Nature of Neuroscience*, 2006, 9(1), 28-30.

Pineda, J.A. et al. Neurofeedback training produces normalization in behavioural and electrophysiological measures of high-functioning autism. *Phil. Trans.R Soc. B*, 2014, 369: 20130420.

Bernier, R. and Dawson, G. The role of mirror neuron dysfunction in autism (Text p. 261).

Hadjikhani, N. et al., Anatomical differences in the mirror neuron system and social cognition network in autism. Cerebral Cortex, 2006, 16, 1276-1282.

Week 10* 6/6-6/8 QUESTIONS AND ALTERNATIVE VIEWS

Hickok, G. Eight problems for the mirror neuron theory of action understanding in monkeys and humans. *J. Cognitive Neuroscience*, 2009, Jan 13, 1-15.

Turella et al., Mirror neurons in humans: consisting or confounding evidence? *Brain & Language*, 2009, 108, 10-21.

Gallagher, S. Neural simulation and social cognition (Text p. 355).

Southgate, V., Gergely, G. and Csibra, G. Does the mirror neuron system and its impairment explain human imitation and autism? (Text p. 331).

6/13 FINAL Tu 11:30-2:30 pm