

## COGS171: Mirror Neuron System and Social Cognition

Fall Quarter 2011 TuTH 3:30-4:50 pm WLH 2204

**Instructor:** J. A. Pineda, Ph.D.  
Office Hours: T 9-11 am, CSB 205

**TA:** Mike Datko, GSR  
TBD

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.

**Week 0**      **9/22**                      **INTRODUCTION**

**Week 1**      **9/27-9/29**                      **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**      **10/4-10/6**                      **THE ONTOGENY AND PHYLOGENY OF MIRROR NEURONS**

**Lyons, D. E.** The rational continuum of human imitation (**Text p. 77**).

**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.*

*Oberman, L.M. and Ramachandran, V.S. Reflections on the mirror neuron system: their evolutionary functions beyond motor representation (Text: p. 39).*

**Week 3\***      **10/11-10/13**                      **UNIFYING SOCIAL COGNITION**

**Hurley, S.** The shared circuits model (SCM): how control, mirroring, and simulation can enable imitation, deliberation, and mindreading. *Behavioral and Brain Sciences*, 2008, 31, 1-58.

*Keysers, 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 4\***      **10/18 -10/20**                      **IS MIRRORING THE SAME AS SIMULATION? (Mike Datko)**

**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.

Brass, M. and Heyes, C. *Imitation: is cognitive neuroscience solving the correspondence problem?* *Trends in Cognitive Sciences*, 2005, 9(10), 489-495.  
Semin, Gun R. and Cacioppo, J. T. *From embodied representation to co-regulation (Text p. 107).*

**Week 5**      **10/25**                      **MIDTERM**

**10/27**                      **DOES MIRRORING OCCUR FOR SOUNDS? (Matt Schalles)**

**Catmur et al.** Through the looking glass: counter-mirror activation following incompatible sensorimotor learning. *European J. Neuroscience*, 2008, 28, 1208-1215.

**Del Giudice et al.** Programmed to learn? The ontogeny of mirror neurons. *Developmental Science*, 2009, 12:2, 350-363.

*Kilner et al., Predictive coding: an account of the mirror neuron system. Cogn Process, 2007, 8, 159-166.*

*Kilner, J.M. et al. The mirror-neuron system: a Bayesian perspective. NeuroReport, 2007, 18(6): 619-623.*

**Week 6\*\***      **11/1-11/3**                      **ARE MIRROR NEURONS INVOLVED IN UNDERSTANDING THE MENTAL STATES OF OTHERS?**

**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.

*Keysers, C. and Perrett, D.I. Demystifying social cognition: a Hebbian perspective. Trends in Cognitive Sciences, 2004, 8(11), 501-507.*

**Week 7\***      **11/8-11/10**                      **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\*\***      **11/15-11/17**                      **EMOTIONS AND MIRRORING (Mike Datko)**

**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\*      11/22                      DISORDERS OF MIRRORING (Mike Datko)**

**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.

*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.*

**11/24-11/25**

**THANKSGIVING HOLIDAY Thursday 11/24**

**Week 10\*      11/29-12/1                      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).*

**12/05                      FINAL                      3-6 pm**

All students will:

1. Write a critical review or "thought" essay (no longer than 1 page) on the weeks labeled with an asterisk (Weeks 3,4,7,9,10) based on one of the readings that week. Readings in bold are required reading. 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 5 essays (20%).
2. Have an option to work in groups or individually
3. If you choose group work (4-6 students) you will be responsible for:
  - a class presentation on one of the readings. Each group will provide both the pro and con points of view. Presentations may start as early as Week 2. See TA/Instructor or class website for instructions on class presentations. (5%)
  - a research proposal (8-10 pages) for an experiment that addresses an issue relevant to mirroring and social cognition. Proposal is due at the end of the quarter (no later than Thursday of Week 10). Each student will be graded for the part of the proposal they are assigned and you will also receive an overall group grade. See class website for instructions on structure of proposal. (25%)
4. If you choose individual work then you will be required to write the research proposal on your own. Additionally, you will be required to do two extra critical reviews (on weeks labeled with a double asterisk - \*\*; for a total of 7 instead of 5. One is to make up for the class presentation and the other is to make up for group work itself.
4. Take the midterm (20%) and final (30%).

■ A pdf version of each of the assigned articles will be on the class website (<http://cogsci.ucsd.edu/~pineda/COGS171/index.html>) for students to download.

