This syllabus is subject to change.
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Cognitive Science, Psychology 430/530
Mon, Wed 2:00-3:20 p.m., 110 Willamette
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WWW Course Page: http://darkwing.uoregon.edu/~bfmalle/CogSci/

Cognitive Science Psychology 430/530

Syllabus

- How do we think?
- Are there brain systems dedicated to social interaction?
- How did the mind evolve?
- What is consciousness?
- Is there freedom of the will?

In this course you will learn about research and theories in the interdisciplinary field of cognitive science, which draws on psychology, philosophy, linguistics, evolution, neuroscience, and computer science to help us understand how the human mind works—and how it differs from the minds of animals and from machines.

Expect to work hard in this course. You will read literature from a variety of disciplines, think about and discuss some difficult problems, and write a considerable number of short papers. In return for your work you will gain access to an exciting field of science and better understand how humans think and make sense of the world.

Topics

What is cognitive science?
How do we think?
Rationality and emotion
Cognition of other minds
Perception and action
Is there freedom of the will?
What is language?
Learning and comprehending language
Evolution of cognition
Is there artificial intelligence?
Mind-machine relations
How are mind and brain related?
Folk psychology
What is consciousness?
Dreaming, hallucinations, psychosis
Cognitive science of art and music
Cognitive science of morality

Course Components

Lecture: I strive to make class sessions informative, engaging, and thought-provoking. Because we have no textbook, there is no substitute for class sessions and they represent the foundation for the course material. I take role at random intervals. For review or if you do have to miss a class, you can listen to an mp3 file of the lecture on the Blackboard (Bb) course page.

Handouts: Prior to each lecture, a handout will be available on Bb to prepare for the material. However, actual lectures often deviate a bit from these handouts, because I update them the night before the session. Updated handouts that incorporate the additional material covered in class will be available within a few days of the corresponding class session. These handouts provide the second foundation for the course material

Readings: Absent a textbook, the original readings provide the third foundation for the material in this course. To prepare for each topic you need to work through the readings before class. At least skim them so you have a sense of the material and arguments. There are occasional challenge questions in class (which are part of your participation) that require you to have worked through the readings. Reviewing the articles in detail after the corresponding class will allow you to integrate lecture material with the readings and prepare you for exams.

All readings are available electronically on Bb and *only* electronically. Try to download the readings when on campus, or anywhere else with a fast internet connection (some files are several megabytes large). Let me know immediately if you have problems downloading the files.

After each set of *Required Readings*, the Bb E-reader has a substantial number of *Further Readings*. These allow you to go deeper into topics of particular interest to you or reach more clarity about a certain issue. They are also the basis of your reaction papers (see below).

Electronic Resources: The course encourages active use of electronic resources. A variety of material is available on the Blackboard page, including this syllabus, lecture handouts, required and further readings, and links to web resources. I also encourage the use of Email throughout the term to complement in-person communication during office hours.

Exams (2/11, 3/19) cover material from the lectures, discussions, web resources, and readings up to (but excluding) the exam date. The questions will be in multiple-choice and short-answer format.

If you know you are not able to complete a Exam at a scheduled time (e.g., collegiate athletes' away games), you must talk to me **before** the exam date. In case of unforeseen events such as illness or death of a close relative, special arrangements can be made if documentation is provided. No other exceptions will be made.

I do not tolerate any form of cheating. Students who cheat fail the class.

I will provide study questions before each exam, and TA Andrew Monroe will hold a review session.

Participation includes (but is not limited to): verbal questions and discussion contributions in class; short written responses to in-class challenge questions; emailed questions or comments; discussion during office hours. If you prefer a different, more private method, you can write a *term diary* (an electronic notebook with ideas, questions, musing about our course topics).

Office hours: I will have office hours on Tuesday 1-2 pm and by appointment. I am also happy to address questions by email. If I don't respond to my email within 3 days please send it again (With several dozen messages each day, I am grateful for reminders.)

Course Performance

Course performance is based on numerous components, allowing each student multiple opportunities to show his or her strengths and effort. Your final grade is based on the summed points you receive from all assignments:

Midterm Exam	150 points
Final Exam	200 points
5 reaction papers	5 × 100 points
Study group participation	100 points
Individual participation	50 points

The cut-off point for As is around 900, for Bs around 800, for Cs around 700, for Ds around 600. In determining the exact cut-off I always look for gaps in the point distribution that most justify a categorical letter grade distinction.

Reaction Papers

Over the next 10 weeks you will make many new observations and have many new ideas about the science of the mind. I want you to develop these ideas and communicate them. Therefore you will write 5 short reaction papers in response to required *and further readings* available in the E-reader. You need to respond to a minimum of *three* Further Readings. This way, you continuously monitor and document your thinking and learn to communicate it. We will give you detailed feedback on the first few papers to help you improve as you go along.

Submission. Papers must be submitted by the respective deadline (1/23, 2/6, 2/20, 3/5, 3/19), either as paper copies or electronic files sent by E-mail. Turning in a paper late leads to point deductions. Within 24 hours of the due date, the on-time points from the points scheme are forfeited; for each day beyond that, an additional 5 points will be deducted. There is one exception: You have a 1-day grace period for **one** of your papers (because perhaps sometimes dogs really do eat papers). If you face serious personal challenges (health, death of close one) or are traveling for intercollegiate athletic events, you need to talk with us *before* the due date to arrange for an adjusted due date. If you have a documented disability and anticipate needing accommodations for the response paper assignment, please contact me soon and bring your verification letter from Disability Services.

E-mail submission. If you choose to submit one or more of your papers by E-mail, acceptable file formats are **.doc** (not .docx) or **.rtf**. The **Subject header** of your E-mail must say "Reaction paper #" (where # stands for the paper number, from 1 to 5). The **file name** itself must have the last four digits of you student ID, underline, and the paper number—e.g., 1234_4 (fourth paper).

Format. Each reaction paper must have a **cover page** that shows your student ID (no names, please) and an APA-style **reference** for the article you are responding to. The actual reaction fits on *one* page (which is the second page after the cover), between **400 and 600** words. You can adjust line spacing to fit the writing on one page.

Contents. Each reaction paper has the following parts:

(1) No more than half of the paper (ideally less) is used to **summarize** the point of the article or, if it is a complex article, the main point that you are responding to.

(2) The other half (ideally more) develops your **response.** Describe at least one **constructive** thought that the article stimulated in you. For example, use the article's concepts or

findings to analyze an everyday situation; develop a possible application in education, business, clinical, law, etc.; or propose an additional experiment or direction of research. Describe at least one **critical** thought the article provoked in you. For example, critique the clarity of the theory, the logic of the argument; the adequateness of the methods (if the article is empirical); or the support for the interpretation or conclusion. Do not remain superficial (a separate document describes examples of inadequate critiques.) Think through the authors' points, develop a careful critique, perhaps give the author a voice to response, perhaps reply again.

You need to think deeply about your response topics. Inspirations and ideas that are not your own must be acknowledged by source, and all quotes must be referenced (but minimize quotes). All writing assignments will be checked with **anti-plagiarism software**.

Writing quality. You will need to write clearly and concisely. Every sentence must be understandable grammatically and in content, and sentences must be logically connected to each other. Begin each paragraph with a one-sentence précis of what you will say in more detail in the paragraph. Whenever you make a **claim** (e.g., that the article can be applied to a certain domain or has a certain problem), you must **back up** your claim—with evidence in the paper, with research or literature, with logic, or with a compelling example. Don't be vague but precise. Re-read and edit your paper multiple times. And don't forget to spell-check.

Reaction paper grading. Each paper earns up to 100 points. Points are awarded as follows:

Turned in on time	+5
Correct cover page format	+5
One page reaction and within length requirement	+5
No major spelling errors	+5
No major or numerous grammatical errors*	+10
Understandable sentences and sentence transitions	+10
Clarity, accuracy, and relevance in Summary part	+30
Clarity, relevance, backing of claims, and creativity in Response part; at least half of the paper's length.	+30

* Second-language English speakers are graded more leniently on grammar. Please alert us by sending an E-mail.

Challenges (and how to overcome them). If you have little practice in writing (especially writing short papers), you will find this assignment difficult at first. Make use of the Academic Learning Center and heed the feedback from your study group members (see below). Also look at the writing resources on our Blackboard page and on www.uoregon.edu/~bfmalle/456.html. Read and edit your papers repeatedly. Put yourself in a reader's perspective and keep asking yourself: Is this clear? Would they know what I mean? And heed our feedback on early papers.

The last of the three parts, the critique, is the hardest. Keep these guidelines in mind: Never attack the authors; instead, critique the theory, argument, data, or interpretation that the article presents. Do not say that the article was unclear to you; if it was, choose a different one. Do not merely suggest that more data should be collected; say what kind of studies would address your criticism. Do not critique the size of the study sample (in empirical papers) unless it created real problems for the statistical analysis. Do not critique the composition of the sample (e.g., only college students) unless it seriously undermines the paper's main conclusion. Do not vaguely refer to possible factors that could have influenced the results (e.g., personality differences); describe how such differences provide an **alternative explanation** of the findings. Do not simply say: This finding or claim is not true of me (every finding in psychology is true of many

but not all people); if you think that the finding is not true of *most* people, describe your evidence or how one could collect such evidence.

Developing one's own ideas and communicating them clearly is one of the achievements of a good college education. I value this achievement very highly and therefore put great emphasis on thinking and writing. You can expect three things: you will need to put a lot of effort into these papers to earn your points; you will receive careful and critical feedback from us; and you will improve your thinking and writing over the course of the term.

Study Groups

During the first week we will form Study Groups that serve two functions: (1) You meet to discuss the required readings; (2) you exchange reaction papers and give each other critical feedback before turning them in.

To monitor group activities, a group leader is chosen by each group (the leader role can rotate across members). The group leader **reports on Bb** about (a) group meetings that took place and especially about interesting questions or difficulties that emerged from the discussion of the readings and (b) about the paper exchange and editing process. Any problems that arise in the group should be E-mailed **privately** to Andrew. Even though the leader writes the reports, the group a whole is responsible for being active and for documenting its progress.

The initial group formation are arbitrary, but once each group has settled on a meeting time and **posted that meeting time on Blackboard**, students can switch groups to accommodate their schedule. Trouble with schedules is not an acceptable reason for lack of progress either of an individual group member or the group as a whole.

The first report is due Monday, **January 14**. Thus, you have to meet at least briefly with your group this week to exchange schedules, find a meeting time, and select your leader, who then reports about this first meeting and the group's meeting time on Bb.

At the end of the term each member of a group evaluates each other member of that group so we get consensual evidence for who contributed to the group and who didn't.

Graduate Course

Students enrolled in 530 complete all course components outlined above and also write a scholarly book review. A list of possible books will be available on Blackboard.

Broadcast Component

The UO has a psychology program in Bend that allows students to receive a UO degree while residing in Bend. As part of that program, some courses in Eugene are broadcast to Bend, and this is one of them.

In order to make this a successful experience for everybody, a few things should be kept in mind.

- There is a slight audio delay, so communication works best when one speaker lets the other finish, then responds. (Simultaneous speaking is inaudible.) Non-verbal signals that invite the other speaker to respond are helpful.
- Students in Bend should sit close to the camera and in the same seat each session to allow us to recognize each person individually.
- Students in Bend should inform me promptly when data transmission degrades in quality or partially disappears.

- I try to be alert to students raising their hands, in both Eugene and Bend, but the broadcast screen isn't big or clear enough to guarantee it. For students in Bend, please make yourself heard by voice to make it easier for us to call on you.
- Eugene students must speak clearly and loudly when asking a question or contributing to discussion in class. If the contributions are difficult to hear in Bend, I am happy to repeat the question; just let me know.
- Please refrain from side conversations during lecture, especially in Eugene, because they are likely to be captured by the sensitive microphones.
- If Bend students have a question at the end of class please le me know immediately so the technicians don't sever the connection before we get to talk.

I will visit Bend at least once during the term and broadcast a lecture back to Eugene. In addition, I will be reachable outside of class via a broadcast link or desktop video connection by appointment.

Communication

Because this course is work-intensive from the first week on, it is important that we communicate effectively with each other inside and outside the classroom. Come to class and contribute; see me in my office; make sure that you check your Email and Bb several times a week. If any problems or issues arise, approach me or Andrew. In my experience, there are few problems that cannot be solved by open and effective communication.

Students with Disabilities

If you have a documented disability and anticipate needing accommodations in this course, please meet with me soon and bring along your verification letter from Disability Services.

Schedule at a Glance

Week 1: What is Cognitive Science? January 7 and 9	**Week 2: How Do We Think?** January 14 and 16
Week 3: Other Minds January ~~21~~ 23 [Paper1 due]	**Week 4: Other Minds** January 28 and 30
Week 5: Perception, Action, Will February 4 and 6 [Paper2 due]	**Week 6: Language and Mind** February 11 **[Midterm Exam]** and 13
Week 7: Evolution of Cognition, Artificial Intelligence February 18 and 20 [Paper3 due]	**Week 8: All Brain?** February 25 and 27
Week 9: Consciousness March 3 and 5 [Paper4 due]	**Week 10: Expanding Cognitive Science** March 10 and 12
Finals Week Wed, Mar 19, 3:15 p.m. **[Final Exam]** [Paper5 due]	**Week 10: Expanding Cognitive Science** March 10 and 12

Psy 430/530: Cognitive Science

Schedule and Readings

Week 1: What is Cognitive Science?

January 7 and 9

- **History, disciplines, questions, challenges**

  Stein, D. J. (1992). Excerpt form *Cognitive Science and Psychiatry: An overview.* Unpublished manuscript. Retrieved 12 Sep 2007 from http://cogprints.org/1185/.

  Thagard, P. (2007). Cognitive Science In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy.* Retrieved form http://plato.stanford.edu/archives/win2003/entries/davidson/.

  Gardner, H. (1987). Excerpt from *The Mind's New Science: A History of the Cognitive Revolution.* Basic Books.

  Bruner, J. S. (1990). Excerpt from *Acts of Meaning.* Harvard University Press.

Further reading:

Holden, C. (1986). The rational optimist; will computers ever think like people? This expert on artificial intelligence and cognitive science asks, why not? *Psychology Today, 20,* 54-60.

Crowther-Heyck, H. (1999). George A. Miller, language, and the computer metaphor and mind. *History of Psychology*, *2*, 37-64.

The Pre-History of Cognitive Science Website: http://www.rc.umd.edu/cstahmer/cogsci/ Includes resources on philosophers Berkeley, Hobbes, and Locke as the "ancestors" to modern cognitive science questions.

Website explaining and illustrating the operation of a Turing machine. http://ironphoenix.org/tril/tm/help/

Literature Recommendation

Lodge, D. (2001). *Thinks…* New York, NY: Viking. See www.amazon.com/Thinks-David-Lodge/dp/0670899844 and also http://archive.salon.com/books/review/2001/06/22/lodge/.

Week 2: How Do We Think?

January 14 and 16

- **Representation and memory**

  Thagard, P. (2005). Representation and computation. In P. Thagard, *Mind. Introduction to cognitive science* (2nd Edition, pp. 3-22). Cambridge, MA: MIT Press.

  Eichenbaum, E. (1997). How does the brain organize memories? *Science, 277,* 330-332.

- **Analogy**

  Holyoak, K. J., Gentner, D., & Kokinov, B. N. (2001). Introduction: The Place of Analogy in Cognition [abridged]. In D. Gentner, K. J. Holyoak, and B. N. Kokinov (Eds.), *The Analogical Mind: Perspectives from Cognitive Science* (pp. 1-19). Cambridge MA: MIT Press.

- **Imagery**

  Pylyshyn, Z. (2003). Return of the mental image: Are there really pictures in the brain? *Trends in Cognitive Sciences, 7*, 113-118.

- **Rationality vs. emotion?**

  Gardner, H. (1987). How rational a being? In H. Gardner, *The mind's new science: A history of the cognitive revolution* (ch. 11). New York: Basic Books.

  Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275*, 1293-1295. [see debate in Maia and McClelland (2004), Bechara et al. (2005), and Maia and McClelland (2005), referenced below]

Further Reading:

Adolphs, R., & Damasio, A. R. (2001). The interaction of affect and cognition: A neurobiological perspective. In J. P. Forgas (Ed), *Handbook of affect and social cognition*. (pp. 27-49). Erlbaum.

Barnes, A., & Thagard, P. (1996) Emotional decisions. *Proceedings of the Eighteenth Annual Conference of the Cognitive Science Society* (pp. 426-429). Erlbaum.

Eich, E., & Schooler, J. W. (2000). Cognition/emotion interactions. In E. Eich, J. F. Kihlstrom, G. H. Bower, J. P. Forgas, & P. M. Niedenthal, *Cognition and Emotion* (pp. 3-29). Oxford University Press.

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, *49*, 709-724.

Evans, J. St. B. T. (2003). In two minds: Dual-process accounts of reasoning. *Trends in Cognitive Sciences, 7*, 454-459.

Greco, A. (1995) The concept of representation in psychology. *Cognitive Systems, 4*, 247-256. http://cogprints.org/652/00/COGSY95B.HTM

Linton, K. (2004). Out of mind, out of sight: An introduction to change blindness. Carleton University Cognitive Science Technical Report 2004-08. http://www.carleton.ca/ics/TechReports/files/2004-08.

Maia, T. V., & McClelland, J. L. (2004). A reexamination of the evidence for the somatic marker hypothesis: What participants really know in the Iowa gambling Task. *Proceedings of the National Academy of Science, 101,* 16075–16080.

Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (2005). The Iowa Gambling Task and the somatic marker hypothesis: Some questions and answers. *Trends in Cognitive Sciences, 9*, 159-162.

Maia, T. V., & McClelland, J. L. (2005). The somatic marker hypothesis: Still many questions but no answers. *Trends in Cognitive Sciences, 9*, 162-164.

Samuels, R., Stich, S., & Tremoulet, P. D. (1999). Rethinking rationality. From bleak implications to Darwinian modules. [Abridged version]. Full-length original available at: http://ruccs.rutgers.edu/ArchiveFolder/Research%20Group/Publications/Rethink/rethink.html

Thagard, P. (2003). Why wasn't O. J. convicted: Emotional coherence in legal inference. *Cognition and Emotion, 17,* 361-383. [interesting analysis but difficult, so be patient!]

Resource page on *Imagination, Mental Imagery, Consciousness, Cognition*: http://www.imagery-imagination.com/

Resource page on *Emotion*: http://emotion.nsma.arizona.edu/emotion.html

Movie Recommendations

Re *Memory:*

1. Memento (2000, Director: Christopher Nolan)
2. Eternal Sunshine of the Spotless Mind (2004, Director: Michel Gondry)
3. Code 46 (2004, Director: Michael Winterbottom)
4. Total Recall (1990, Director: Paul Verhoeven)

Re *Emotion:* Equilibrium (2002, Director: Kurt Wimmer)

Weeks 3 and 4: Other Minds

January 23, 28, and 30

- **Elements of social cognition**

  Malle, B. F. (in press). The fundamental tools, and possibly universals, of social cognition. In R. Sorrentino and S. Yamaguchi (Eds.), *Handbook of motivation and cognition within and across cultures.* Elsevier/Academic Press.

- **Theory of mind**

  Malle, B. F. (2004). Foundation: The folk theory of mind. In B. F. Malle, *How the mind explains behavior* (chapter 2). Cambridge, MA: MIT Press.

  Baldwin, D. A., Baird, J. A., Saylor, M. M., & Clark, M. A. (2001). Infants parse dynamic action. *Child Development, 72,* 708-717.

  Malle, B. F. (2008). *Overview of approaches and themes in the development of social cognition.* Unpublished support document for Psy 430/530, Cognitive Science, Winter 2008.

  Barr, D, J., & Keysar, B. (2005). Mindreading in an exotic case: The normal adult human. In B. F. Malle, & S. D. Hodges (Eds), *Other minds: How humans bridge the divide between self and others* (pp. 271-283). New York: Guilford Press.

Further Readings

Gergely, G., & Csibra, G. (2003). Teleological reasoning in infancy: The naive theory of rational action. *Trends in Cognitive Sciences, 7*, 287-292.

Baldwin, D. A., & Baird, J. A. (2001). Discerning intentions in dynamic human action. *Trends in Cognitive Sciences, 5*, 171-178.

Lozano, S. C., Hard, B. M., & Tversky, B. (2007). Putting action in perspective. *Cognition, 103*, 480-490.

Woodward, A. L., Sommerville, J. A., & Guajardo, J. J. (2001). How infants make sense of intentional action. In B. F. Malle, L. J. Moses, & D. A. Baldwin (Eds.), *Intentions and intentionality: Foundations of social cognition* (pp. 149-170). Cambridge, MA: MIT Press.

Wilkerson, W. S. (1999). From bodily motions to bodily intentions: The perception of bodily activity. *Philosophical Psychology, 12*, 61-77.

FitzGerald, T. (2006). Tips welcome: Shrewd NFL defenders look sharp, eager to take whatever offense gives away. *San Francisco Chronicle,* Sunday, January 22, 2006. Retrieved from http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2006/01/22/SPG4OGRAB61.DTL&type=printable [A good sports article on football players' attempts to read other players' intentions from subtle clues in their behavior]

http://anthropomorphism.org/img/Heider_Flash.swf or QuickTime movie on Bb.
[From Heider, F. & Simmel, M. (1944). An experimental study of apparent behavior. *American Journal of Psychology, 57,* 243-59.]

Meltzoff, A. N., & Brooks, R. (2001). "Like me" as a building block for understanding other minds: Bodily acts, attention, and intention. In B. F. Malle, L. J. Moses, & D. A. Baldwin (Eds.), *Intentions and intentionality: Foundations of social cognition* (pp. 171-191). Cambridge, MA: MIT Press.

Resource Page from NEH Seminar on Mental Simulation
http://www.umsl.edu/~philo/Faculty/Gordon/MindSeminar99/papers.html

Goldman, A. I. (1993). The psychology of folk psychology. *Behavioral and Brain Sciences, 16*, 15-28. http://www.ecs.soton.ac.uk/~harnad/Papers/Py104/goldman.psyc.html.

Van Boven, L., & Loewenstein, G. (2005). Empathy gaps in emotional perspective taking. In B. F. Malle and S. D. Hodges (Eds.), *Other minds: How humans bridge the divide between self and others* (pp. 284-297). New York, NY: Guilford Press.

Preston, S. D., & de Waal, F. B. M. (2001). Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences, 25,* 1-20. [also at http://www.bbsonline.org/Preprints/Preston/Referees/]

Andrews, K. (2005). Chimpanzee theory of mind: Looking in all the wrong places? *Mind and Language, 20*, 521-536.

Hare, B., Brown, M., Williamson, C., & Tomasello, M. (2002). The domestication of social cognition in dogs. *Science, 298,* 1634-1636.

NEW Malle, B. F., & Knobe, J. (1997a). The folk concept of intentionality. *Journal of Experimental Social Psychology, 33,* 101-121.

NEW Malle, B. F. (2001). Folk explanations of intentional action. In B. F. Malle, L. J. Moses, & D. A. Baldwin (Eds.), Intentions and intentionality: Foundations of social cognition (pp. 265-286). Cambridge, MA: MIT Press.

NEW Malle, B. F. (2005). Three puzzles of mindreading. In B. F. Malle & S. D. Hodges (Eds.), *Other minds: How humans bridge the divide between self and other* (pp. 18-35). New York: Guilford Press.

NEW Adolphs, R., Sears, L., & Piven, J. (2001). Abnormal processing of social information from faces in autism. *Journal of Cognitive Neuroscience, 13*, 232-240.

NEW Langdon, R. (2005). Theory of mind in schizophrenia. In B. F. Malle & S. D. Hodges, *Other minds: How humans bridge the divide between self and others* (pp. 323-342). New York: Guilford.

NEW Schiffman, J., Lam, C. W., Jiwatram, T., Ekstrom, M., Sorensen, H., Mednick, S. (2004). Perspective-taking deficits in people with schizophrenia spectrum disorders: A prospective investigation. *Psychological Medicine, 34*, 1581-1586.

Brüne, M. (2005). "Theory of mind" in schizophrenia: A review of the literature. *Schizophrenia Bulletin, 31*, 21-42.

Week 5: Perception, Action, Will

February 4 and 6

- **Perception and action**

  Gallese, V., Keysers, C., & Rizzolatti, G. (2004). A unifying view of the basis of social cognition. *Trends in Cognitive Sciences, 8*, 396-403.

  Blakemore, S.-J., Wolpert, D. M., & Frith, C. D. (2000). Why can't you tickle yourself? *Neuroreport*, *11*, R11-R16.

  PBS 14-minute video segment on mirror neurons, with a number of exaggerated claims: http://www.pbs.org/wgbh/nova/sciencenow/video/3204/i01.html

Further Readings on Perception and Action

Decety, J., & Grezes, J. (2006). The power of simulation: Imagining one's own and other's behaviour. *Cognitive Brain Research*, 1079, 4-14.

Blakemore, S. J. (2003). Deluding the motor system. *Consciousness and Cognition, 12*, 647–655.

Frey, S. H., & Gerry, V. E. (2006). Modulation of neural activity during observational learning of actions and their sequential orders. *Journal of Neuroscience, 26,* 13194-13201.

Csibra, G. (2005). Mirror neurons and action observation. Is simulation involved? http://www.interdisciplines.org/mirror/papers/4/3

Hickock, G. (2007). Mirror neurons—rock stars or backup singers? Scientific American Blog *Mind Matters.* http://science-community.sciam.com/thread.jspa?threadID=300005636

A critical analysis of a study on "gay mirror neurons": http://129.199.80.1/~alphapsy/blog/?2006/09/29/42-porn-neurons

SuperDuperWalker artificial agent movement framework: hampshire.edu/lspector/superduperwalker.html

♦ Is there freedom of the will?

Wegner, D. M., & Wheatley, T. P. (1999). Apparent mental causation: Sources of the experience of will. *American Psychologist, 54*, 480–492.

Malle, B. F. (2006). Of windmills and strawmen: Folk assumptions of mind and action. In S. Pockett, W. P. Banks, & S. Gallagher (Eds.), *Does consciousness cause behavior? An investigation of the nature of volition* (pp. 207-231). Cambridge, MA: MIT Press. Further Readings.

Roskies, A. L. (2006). Neuroscientific challenges to free will and responsibility. *Trends in Cognitive Science, 10*, 419-423.

Further Readings on Freedom of the will

Bargh, J. A. (2005). Bypassing the will: Towards demystifying behavioral priming effects. In R. Hassin, J. S. Uleman, and J. A. Bargh *(Eds.), The new unconscious* (pp. 37-58). New York: Oxford University Press.

Di Filippo, P. (2007). Personal Jesus. In G. Mann (Ed.), *The Solaris Book of New Science Fiction* (pp. 115-130). Solaris. [A cool short story in which issues of free will and omniscience show up.]

Mele, A. R. (in press). Free will. In W. Banks (Ed.), *Encyclopedia of Consciousness*. Elsevier. [A compact by still detailed description of the philosophical positions and debates around free will.]

Mele, A. R. (2007). Decisions, intentions, urges, and free will: Why Libet has not shown what he says he has. In J. Campbell, M. O'Rourke, and D. Shier (Eds.), *Explanation and causation: Topics in contemporary philosophy* (pp. 241-263). Cambridge, MA: MIT Press. [A philosophical critque of the oft-cited Libet studies]

Lloyd, P. B. *Glitches Reloaded.* Published on KurzweilAI.net June 1, 2003. http://www.kurzweilai.net/meme/frame.html?main=/articles/art0581.html [A critical analysis of questions raised by *Matrix Reloaded,* with the free will question being one of them.]

McKenna, M. (2003). *Neo's freedom… Whoa!* Retrieved from http://whatisthematrix.warnerbros.com/rl_cmp/new_phil_mckenna.html. [Part of a collection of philosophical analyses in response to the Matrix trilogy.]

Pelham, B. W., Mirenberg, M. C., Jones, J. T. (2002). Why Susie sells seashells by the seashore: Implicit egotism and major life decisions. *Journal of Personality and Social Psychology, 82,* 469-487. [Remarkable data on the impact of preferences for the letters in one's own name on decisions about what job to take, where to live, etc.]

Movie recommendations

The Matrix Reloaded (2003, Directors: Andy and Larry Wachowski)

Week 6: Language and Mind

February 11 and 13

- **Language I: Phonetics, syntax, and comprehension**

  Bloom, P. (2000). Language and thought: Does grammar makes us smart? *Current Biology*, *10*, R516-R517.

  Richardson, D. C., Spivey, M. J., Barsalou, L. W., & McRae, K. (2003). Spatial representations activated during real-time comprehension of verbs. *Cognitive Science, 27*, 767-780.

  Werker, J. F., & Lalonde, C. E. (1988). Cross-language speech perception: Initial capabilities and development change. *Developmental Psychology, 24*, 672-683.

- **Language II: Acquisition, evolution, and discourse**

  Bloom, P. (2002). Mindreading, communication and the learning of names for things. Mind and Language, 17, 37-54.

  Morgan, J. L. (1978). Toward a rational model of discourse comprehension. Proceedings of the theoretical issues in natural language processing 2 (pp. 109-114). Urbana-Campaign, Illinois, United States.

  Pinker, S. (2003) Language as an adaptation to the cognitive niche. In M. Christiansen & S. Kirby (Eds.), Language evolution: States of the art. New York: Oxford University Press.

Further Readings

Baldwin, D. A. (1993). Early referential understanding: Infants' ability to recognize referential acts for what they are. *Developmental Psychology*, *29*, 832-843.

Clark, H. H., & Krych, M. A. (2004). Speaking while monitoring addressees for understanding. *Journal of Memory and Language*, *50*, 62-81.

Gibbs, R. W. (1983). Do people always process the literal meanings of indirect requests? *Journal of Experimental Psychology: Learning, Memory, and Cognition, 9*, 524-533.

Goldin-Meadow, S., & Mayberry, R. I. (2001). How do profoundly deaf children learn to read? *Learning Disabilities Research and Practice, 16*, 222-229.

Hamblin, J. L., & Gibbs, R. W., Jr. (2003). Processing the meanings of what speakers say and implicate. *Discourse Processes*, *35*, 59-80.

Iverson, J. M., & Goldin-Meadow, S. (2001). The resilience of gesture in talk: Gesture in blind speakers and listeners. *Developmental Science*, *4*, 416-422.

Malle, B. F. (2002a). The relation between language and theory of mind in development and evolution. In T. Givón & B. F. Malle (Eds.), *The evolution of language out of pre-language* (pp. 265-284). Amsterdam: Benjamins.

Wilson, N. L., & Gibbs, R. W., Jr. (2007). Real and imagined body movement primes metaphor comprehension. *Cognitive Science: A Multidisciplinary Journal, 31*, 721-731.

Week 7: Evolution of Cognition and Artificial Intelligence

February 18 and 20

- **Evolution of cognition**

  Reader, S. M., & Laland, K. N. (2002). Social intelligence, innovation, and enhanced brain size in primates. *Proceedings of the National Academy of Sciences, 99*, 4436-4441. **http://www.pnas.org/cgi/content/full/99/7/4436**

  Calvin, W. H. (2001). Pumping up intelligence: Abrupt climate jumps and the evolution of higher intellectual functions during the ice ages. In R. J. Sternberg (Ed.), *The Evolution of Intelligence* (pp. 97-115). Erlbaum. http://cogprints.org/3219/01/1999intelligence-chapter.htm

Further Readings

Humphrey, N. (1976). The social function of intellect. In P. P. G. Bateson and R. A. Hinde, *Growing Points in Ethology* (pp. 303- 317). Cambridge: Cambridge University Press. http://cogprints.org/2694/01/SocialFunctionTxt.

Cruse, H. (2003). The evolution of cognition—a hypothesis. *Cognitive Science, 27,* 135–155.

Insel, T. R., & Fernald, R. D. (2004). How the brain processes social information: Searching for the social brain. *Annual Review of Neuroscience*, *27*, 697-722.

Krachun, C. (2002). Are apes conscious? An overview of inconclusive evidence. Carleton University Cognitive Science Technical Report 2002-10. http://www.carleton.ca/ics/TechReports/files/2002-10.

Vallortigara G, Snyder A, Kaplan G, Bateson P, Clayton N. S., & Rogers, L. J. (2008). Are animals autistic savants? PLoS Biol 6: e42. doi:10.1371/journal. pbio.0060042

Ybarra, O., Burnstein, E., Winkielman, P., Keller, M. C., Manis, M., Chan, E., & Rodriguez , J. (2008). Mental exercising through simple socializing: Social interaction promotes general cognitive functioning. *Personality and Social Psychology Bulletin, 34*, 248-259.

- **Artificial intelligence: Do machines have minds?**

  McCarthy, J. (2000). What is AI? Retrieved from http://www.kurzweilai.net/meme/frame.html?main=/articles/art0088.html

  Searle, J. R. (1980). Minds, brains, and programs. *Behavioral and Brain Sciences, 3*, 417-424.

  Adams, B., Breazeal, C., Brooks, R. A., & Scassellati, B. (2000). Humanoid robots: A new kind of tool. *IEEE Intelligent Systems and Their Applications: Special Issue on Humanoid Robotics, 15*, 25-31.

  Brooks, R. (2001). The relationship between matter and life. *Nature, 409,* 409-411.

Further Readings

Bringsjord, S. (1992), *What robots can and can't be.* Boston: Kluwer. [Précis]

Dennett, D. (1997). Consciousness in human and robot minds. In M. Ito, Y. Miyashita, & E. T. Rolls (Eds.), *Cognition, Computation, and Consciousness*. Oxford: Oxford University Press.

Horn, R. E. (n. d.). Can computers think? and many other extensive maps of argument. Retrieved from http://www.macrovu.com/CCTGeneralInfo.html

Kurzweil, R. (2002). The evolution of mind in the twenty-first century. In J. W. Richards (Ed.), *Are we spiritual machines?: Ray Kurzweil vs. the critics of Strong A.I.* Discovery Institute. or http://www.kurzweilai.net/meme/frame.html?main=/articles/art0500.html

Searle, J. R. (2002). I married a computer. In J. W. Richards (Ed.), *Are we spiritual machines?: Ray Kurzweil vs. the critics of Strong A.I.* Discovery Institute. or http://www.kurzweilai.net/meme/frame.html?main=/articles/art0499.html [Note: Searle responds to Kurzweil (2002).]

Spector, L. (2006). Evolution of artificial intelligence. *Artificial Intelligence, 170*, 12561-1253.

Website on KISMET, the sociable robot: http://www.ai.mit.edu/projects/humanoid-robotics-group/kismet/kismet.html See especially: http://www.ai.mit.edu/projects/sociable/videos.html

Asimov's three laws of robotics explained, with access to a host of articles and discussions, such as about the film *I, Robot*. http://www.asimovlaws.com/about/

♦ Forward evolution: Toward singularity?

Moravec, H. (2000). Robots, re-evolving mind. Retrieved from http://www.kurzweilai.net/meme/frame.html?main=/articles/art0145.html

SIAI (n.d.). *What is the singularity?* Retrieved from the Singularity Institute for Artificial Intelligence website, http://www.singinst.org/overview/whatisthesingularity [this website has a host of links to readings, such as http://www.singinst.org/reading/artificialgeneralintelligence]

Further Readings

Greenemeier, L. (2007). The year in robots. *Scientific American*, December 2007. Retrieved from http://www.sciam.com/article.cfm?id=2007-year-in-robots&print=true [Summary of 2007 advancements in robotics]

Kurzweil, R. (2002). The evolution of mind in the twenty-first century. In J. W. Richards (Ed.), *Are we spiritual machines?: Ray Kurzweil vs. the critics of Strong A.I.* Discovery Institute. or http://www.kurzweilai.net/meme/frame.html?main=/articles/art0500.html

Warwick, K. (2003). *The Matrix—Our future?* Retrieved from http://whatisthematrix.warnerbros.com/rl_cmp/new_phil_warwick.html. [Asks whether the movie *The Matrix* depicts a likely future for humanity.]

Kelly, J. P. (2001). On the net: Singular. *Asimov's, 25.* Retrieved from http://www.asimovs.com/_issue_0206/onthenet.shtml. [this short introduction to the idea of the singularity has many links for further reading]

Movie recommendations

I Robot: http://imdb.com/title/tt0343818/

2001: A Space Odyssey (1968, Director: Stanley Kubrick)

Colossus: The Forbin Project (1970, Director: Joseph Sargent)

Many other titles listed at http://homepages.inf.ed.ac.uk/rbf/AIMOVIES/AImovies.htm

Literature recommendations

Stross, C. (2005). *Accelerando*. New York: Ace Books. [See also http://en.wikibooks.org/wiki/Accelerando_Technical_Companion!]

Asimov, I. (1963/1941). *Reason*. In I. Asimov, *I, Robot* (pp. 59-77). Garden City, NY: Doubleday. [Originally published in the April 1941 issue of *Astounding Science Fiction*] ✓

Week 8: All Brain?

February 25 and 27

- **Insights into cognition and perception**

  Society for Neuroscience (2002). *Brain facts.* Washington, DC: The Society for Neuroscience. Retrieved from http://web.sfn.org/baw//brainfacts..

  Barinaga, M. (1997). Visual system provides clues to how the brain perceives. *Science, 275*, 1583-1585.

Further Readings

Harpaz, Y. (2002). *Misunderstanding in cognitive brain imaging.* Unpublished manuscript, available at http://human-brain.org/imaging.html

Blakemore, S., Winston, J., & Frith, U. (2004). Social cognitive neuroscience: Where are we heading? *Trends in Cognitive Sciences, 8,* 216-222.

- **The demise of folk psychology?**

  Brief overview of Churchland's attack on folk psychology: http://www.hku.hk/philodep/courses/rm/phil2230/phil2230l13.html

  Nichols, S. (2002). Excerpts from: Folk psychology. Originally appeared in *Encyclopedia of Cognitive Science*. London: Nature Publishing Group.
  Entire original available at http://www.cofc.edu/~nichols/FolkPsychologyFinal.htm

Further Readings

Conee, E. (1984). A defense of pain. *Philosophical Studies, 46,* 239-248.

- **The mind-body problem**

  Introduction to the philosophical mind-body problem. Excerpted and abridged from: Duniho, F. (1991). *The Mind/Body problem and its solution.* Unpublished Master's Thesis. Troy, NY: Rensselaer Polytechnic Institute.

  Damasio, A. (2002). How the brain creates the mind. *Scientific American Special Edition, 12*, 4-9.

  Minsky, M. (2002). *Minds are simply what brains do.* Retrieved from http://www.leaderu.com/truth/2truth03.html

Further Readings

Astakhov, V. (2008). Continuum of consciousness: Mind uploading and resurrection of human consciousness. Is there a place for physics, neuroscience and computers? Paper to be presented at the conference *Toward a Science of Consciousness,* April 8-12, 2008. Retrieved form http://arxiv.org/abs/0710.2556.

For more material on mind-uploading, see http://www.ibiblio.org/jstrout/uploading/

Chalmers, D. J. (2000). [Excerpt from:] What is a neural correlate of consciousness? In T. Metzinger (Ed.), *Neural Correlates of Consciousness: Empirical and Conceptual Questions*. Cambridge, MA: MIT Press.

Humphrey, N. (2000). How to solve the mind-body problem. *Journal of Consciousness Studies*, *7*, 5-20. http://www.humphrey.org.uk/papersonline/2000MindBodyProblem.

McGinn, C. (1989). Can we solve the Mind-Body problem? *Mind, 98*, 349-366.

Taylor, E. (1992). Biological consciousness and the experience of the transcendent: William James and American functional psychology. In R. H. Wozniak (Ed.), *Mind and Body: Rene Déscartes to William James*. Bethesda, MD & Washington, DC by the National Library of Medicine and the American Psychological Association. http://serendip.brynmawr.edu/Mind/James.html

Tye, M. (1999). Phenomenal consciousness: The explanatory gap as cognitive illusion. *Mind, 108,* 705-725. http://www.utexas.edu/cola/depts/philosophy/faculty/tye/Phenomenal.html

Velmans, M. (2002). How could conscious experiences affect brains? *Journal of Consciousness Studies, 9*, 3-29.

Literature Recommendations

Gibson, W. (1984). *Neuromancer*. New York: Ace Books.

Nagata, L. (1995). *The Bohr Maker*. Bantam Spectra

Mighton, J. (1988). *Possible worlds*. Toronto: Playwrights Canada Press. [also a movie, difficult to get]

Movie Recommendations

Re: **Mind in machine**:

1. Star Trek, New Generation: The Measure of a Man (Air Date: 02.13.1989, Production # 135, Season: 2 Episode: 9, DVD Disc: 3)
2. Ghost in the shell (1995, Director: Mamoru Oshii). http://www.imdb.com/title/tt0113568/
3. Blade Runner (1982, Director: Ridley Scott) [New "Final cut," 2008]

Re: **Extreme virtual reality**

1. The thirteenth floor (1999, Director: Josef Rusnak)
2. Existenz (1999, Director: David Cronenberg)

Re: **The mind-body problem**:

1. Star Trek: Spock's Brain
2. Outer Limits: The Human Factor

Week 9: Consciousness

March 3 and 5

- **What is consciousness?**

  P. Thagard (2005). [Draft of] Consciousness. In P. Thagard, *Mind: Introduction to Cognitive Science* (2nd ed.). Cambridge, MA: MIT Press. [For references, see http://cogsci.uwaterloo.ca/Bibliographies/cogsci.bib.html]

  Koch, C., & Tsuchiya, N. (2007). Attention and consciousness: two distinct brain processes. *Trends in Cognitive Sciences, 11,* 16-22.

  Chalmers, D. (2002). The puzzle of conscious experience. *Scientific American Special Edition, 12*(1), 90-100.

- **Dreams, hallucinations, psychosis**

  Dennett, D. C. (1991). How are hallucinations possible? In D. C. Dennett, *Consciousness explained*. Boston: Little, Brown and Co.

  Winson, J. (2002). The meaning of dreams. *Scientific American Special Edition, 12*, 54-61.

Hartmann (2006). Ask the Expert: Why do we dream? *Scientific American,* July 10, 2006. Retrieved form http://www.sciam.com/biology/article/id/why-do-we-dream/ref/rss [very short; see longer theoretical statement under *Further Readings*]

International Association for the Study of Dreams (2003). Common questions about dreams. Retrieved from http://www.asdreams.org/subidxeduq_and_a.htm [very short]

Further Reading:

Baars, B. J. (2002). The conscious access hypothesis. *Trends in Cognitive Science, 6*, 47-52.

Carruthers, P. (2000). The evolution of consciousness. In P. Carruthers and A. Chamberlain (eds.), *Evolution and the Human Mind* (pp. 254-275). Cambridge: Cambridge University Press.

Hartmann, E. (1996). Outline for a theory on the nature and functions of dreaming. *Dreaming, 6,* 147-170.

Schwitzgebel, E., Huang, C., & Zhou, Y. (2006). Do we dream in color? Cultural variations and skepticism. *Dreaming, 16*, 36-42.

Sergent, C., & Dehaene, S. (2004). Is consciousness a gradual phenomenon ? Evidence for an all-or-none bifurcation during the attentional blink. *Psychological Science 15*, 720-728.

McGinn, C. (2003). *The matrix of dreams.* Retreived from http://whatisthematrix.warnerbros.com/rl_cmp/new_phil_mcginn.html. [Takes the setup in the movie *The Matrix* as a starting point for an analysis of what dreams are like.]

Some dream-related resources by Lee Spector: http://helios.hampshire.edu/lspector/courses/cs104f99.html

Chalmers, D. J. (2004). How can we construct a science of consciousness? In M. Gazzaniga (Ed.), *The Cognitive Neurosciences III.* MIT Press. http://consc.net/papers/scicon.html

Clark. A, (2003). *The twisted matrix: Dream, simulation or hybrid?* Retrieved from http://whatisthematrix.warnerbros.com/rl_cmp/new_phil_clark.html. [Similarly takes *The Matrix*'s setup as a starting point of analyzeing the differences between dreams, simulations, virtual realities, etc.]

McGinn on consciousness (introduction): http://cogweb.ucla.edu/Abstracts/McGinn_99.html

McGinn on consciousness and space (and transcending intuitions): http://www.nyu.edu/gsas/dept/philo/courses/consciousness97/papers/ConsciousnessSpace.html

Carruthers, P. (2000). Précis of Carruthers, P. (2000). *Phenomenal Consciousness.* Cambridge: Cambridge University Press. http://www.swif.uniba.it/lei/mind/forums/forum2.htm

W. Lycan, Representational theories of consciousness: http://plato.stanford.edu/entries/consciousness-representational/

Losing Consciousness (from Conversations with Neil's Brain" The Neural Nature of Thought & Language, by William H. Calvin and George A. Ojemann). http://williamcalvin.com/bk7/bk7ch2.htm

Dretske on the mind's self-awareness: http://www.nyu.edu/gsas/dept/philo/courses/consciousness97/papers/dretske.html

Block on neural correlates of consciousness: http://www.nyu.edu/gsas/dept/philo/faculty/block/papers/NeuralCorrelate.html

Patricia Churchland on non-neural theories of conscious experience: http://philosophy.ucsd.edu/EPL/nonneural.html

Movie Recommendations

Re Hallucinations:

Altered states (1980, Director: Ken Russell).

Re *Dreams*:

Paprika (2007, Director: Satoshi Kon)
Abre Los Ojos (1997, Director: Alejandro Amenábar)
Brainstorm (1983, Director: Douglas Trumbull)

Re *Psychosis:*

A beautiful mind (2001, Director: Ron Howard)

Jacob's ladder (1990, Director: Adrian Lyne)
K-Pax (2001, Director: Iain Softley)
The jacket (2005, Director: John Maybury)
The machinist (2004, Director: Brad Anderson)

Re *Collective or merged consciousness:*

Being John Malkovich (1999, Director: Spike Jonze)
Star Trek, New Generation: I, Borg (Air Date: 05.11.1992, Production #223, Season: 5 Episode: 23, DVD Disc: 6).
Documentary about the Borg:
http://www.startrek.com/startrek/view/features/documentaries/article/5299.html, click on picture in left bottom corner, "The Full Borg Documentary."

Week 10: Expanding Cognitive Science

March 10 and 12

- **Cognitive science of music and visual art**

De Sousa, R. (2004). Is art an adaptation? Prospects for an evolutionary perspective on beauty. *Journal of Aesthetics and Art Criticism, 62*, 109-118.

Lopes, D. M. M. (1999). Pictorial color: aesthetics and cognitive science. *Philosophical Psychology, 12,* 415-428,

Levitin, D. J. (2000). In search of the musical mind. *Cerebrum, 2*, 1-24.

Trainor, L. J., Tsang, C. D., & Cheung, V. H. W. (2002). Preference for sensory consonance in 2- and 4-month-old infants. *Music Perception*, *20*, 187-194.

Further Reading

Krumhansl, C. L. (2002). Music: A link between cognition and emotion. *Current Directions in Psychological Science, 11*, 45-50.

Masataka, N. (2007) Music, Evolution and Language. *Developmental Science* 10, 35-39.

O'Callaghan, C. (in press). Sounds. In T. Bayne, A. Cleeremans, and P. Wilken (Eds.), *Oxford Companion to Consciousness*. Oxford University Press.

Spector, L. (2003). Genetic programming to construct music: Retrieved form http://hampshire.edu/lspector/genbebop.html

Brown, S., Merker, B., & Wallin, N. L. (2000). An Introduction to Evolutionary Musicology. In N. L. Wallin, B. Merker, and S. Brown (Eds.), *The origins of music.* Cambridge, MA: The MIT Press.

Carroll, N. (2004). Art and human nature. *Journal of Aesthetics and Art Criticism, 62*, 95-107.

Cross, I. (1999). Is music the most important thing we ever did? Music, development and evolution. In Suk Won Yi (Ed.), *Music, mind and science*. Seoul: Seoul National University Press. http://www.mus.cam.ac.uk/~ic108/MMS/

Freeland, C. (1997). *Cognitive science and film theory.* Paper presented at the American Society for Aesthetics Panel on Cognitive Science and the Arts. October 31, 1997, Santa Fe, NM.

Humphrey, N. (1998). Cave art, autism, and the evolution of the human mind. *Cambridge Archaeological Journal, 8,* 165-191.

Steele, K. M. (2003). Do rats show a Mozart effect? *Music Perception, 21*, 251–265.

Further resources:
http://www.aesthetics-online.org/ideas/freeland.html,

http://www.aesthetics-online.org/ideas/freeland2.html,
http://www.aesthetics-online.org/ideas/freeland3.html,

Journal Music Perception http://caliber.ucpress.net/loi/mp

- **Cognitive science of morality**

  Stich, S. (1993). Moral philosophy and mental representation. In M. Hechter, L. Nadel, & R. E. Michod (Eds.), *The origin of values* (pp215-228). New York: Aldine de Gruyter. http://ruccs.rutgers.edu/ArchiveFolder/Research%20Group/Publications/MPMR/MPAMR.html

  Greene, J. D. (2003). From neural 'is' to moral 'ought': What are the moral implications of neuroscientific moral psychology? *Nature Reviews Neuroscience*, *4*, 847-850.

  Rethorst, J. (1997). Art and imagination: Implications of cognitive science for moral education. *Philosophy of Education*. http://www.ed.uiuc.edu/EPS/PES-Yearbook/97_docs/rethorst.html

Further Readings

Sheppard, S. (1997). Education and the cognitive revolution: Something to "think" about, *Philosophy of Education*. http://www.ed.uiuc.edu/EPS/PES-Yearbook/97_docs/sheppard.html

Flack J. C., & de Waal F. B. M. (2000). 'Any animal whatever'. Darwinian building blocks of morality in monkeys and apes. *Journal of Consciousness Studies*, *7*, 1-29.

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science, 293*, 2105-2108.

Newberg A. B., & d'Aquili E. G. (2000). The neuropsychology of religious and spiritual experience. *Journal of Consciousness Studies*, *7*, 251-266.

Movie Recommendations

Re *Morality:* Minority Report (2002, Director: Steven Spielberg)
Twelve angry men (1957, Director: Sidney Lumet)