
Introduction to Cognitive Science (Fall 2009)

What, When, & Where

Course #s : Cognitive Science 110a, Psychology 130a
Distro Group : Social Sciences
When : Fall 2009, Mondays & Wednesdays, 2:30 - 3:45 pm
Where : Yale Art Gallery Auditorium (Entrance on High Street just north of Chapel Street)
Webpage : https://webpace.yale.edu/cgsc110_f09/

Instructor Info

Professor : Brian Scholl (Associate Professor, Dept. of Psychology; DUS, Cognitive Science)
Office : SSS 304 (at the corner of College/Prospect Streets & Grove Street)
Email : brian.scholl@yale.edu
Web : <http://www.yale.edu/perception/>
Phone : 432 - 4629 (but email is strongly preferred)
Office Hours : Thursdays from 4:30 - 6 pm, just after many classes, or by appointment

Teaching Fellows

Alice Albrecht : alice.albrecht@yale.edu (*Perception & Cognition Laboratory*)
Yoona Kang : yoona.kang@yale.edu (*Social Cognitive Neuroscience Lab*)
Brandon Liverence : brandon.liverence@yale.edu (*Perception & Cognition Laboratory*)
Neha Mahajan : neha.mahajan@yale.edu (*Infant Cognition Laboratory*)
Sarah Shultz : sarah.shultz@yale.edu (*Human Neuroscience Laboratory*)

Note: This list may change as the semester begins. Check the class webpage for up-to-date information!

Course Description

Welcome! This course will provide you with an overview of the theoretical and empirical approaches that constitute cognitive science. Cognitive scientists explore the nature of mental processes such as perception, reasoning, memory, attention, language processing and acquisition, and problem-solving. Our goal is to understand (1) the representations and processes in our minds that underwrite these capacities, (2) how they are acquired, and how they develop, and (3) how they are implemented in underlying hardware (biological or otherwise). Stated more simply, our goal is to understand **how the mind works!** Trying to understand our own minds is one of the most ambitious and exciting (and difficult) projects in all of science, and this project requires tools drawn from fields including experimental psychology, developmental science, computer science, linguistics, vision science, philosophy, and neuroscience (among others). This course will introduce you to some of the major tools and theories from each of these areas, and will relate them to each other. In sum, this course will expose you to cognitive science, the assumptions on which it rests, and the more important results obtained so far. By the end of the course, you should have gained important new insights into ... *what you are and how you work!*

Expected Work and Grading

1. (20%) Questions on Daily Readings

To get the most out of this course, it is essential that you carefully and critically study the readings associated with each lecture. To encourage this — and to give the instructor feedback as to what you thought of the material — you will be asked to respond to a brief question concerning each reading. A sample (if boring) question might be: “Which of the two theories discussed in this article do you think is right, and why?” Your answers to each question — which you must email to your specified TF no later than one hour before the start of the class wherein that reading will be discussed — need be no longer than 1 or 2 paragraphs, and should take no longer than 15 minutes to write after you have read the material. The questions due for each class will be assigned at the end of the previous class, starting during our 3rd week. I will use these comments to gauge your reactions to (and understanding of) the ideas we’ll discuss, and I will occasionally spend the first part of the following class responding to some of the issues you raise in these comments. Note that a significant portion of your grade (20%) will be based on these questions, and that late submissions will not be accepted for any reason.

2. (60%) Two Exams

60% of your course grade will be determined by two examinations. The first exam will be on Monday, October 12th, and will cover material from September 2nd through October 7th. The second exam will be on Wednesday, December 2nd (our last class meeting), and will cover material from October 14th through November 30th. The exam on which you do the best will count for 35% of your grade; the other will count for 25%. There will be no exam during the final exam period. The nature of these exams will be described more fully later. Make-up exams will be given only in exceptional circumstances, and in all cases may involve completely new questions, possibly in other formats. (Advice: you really want to avoid having to take a make-up exam.) To do well on these exams, you’ll have to attend the lectures — especially since our readings and lectures will rarely overlap by more than ~ 25%.

3. (20%) Short Paper

You will be required to write one short (6 - 8 page) paper for this course, on an assigned topic which is discussed near the end of this syllabus. This paper is due no later than one hour before class on Wednesday, November 18th (our last class before the break).

Readings

I have a rather low opinion of all extant introductory cognitive science textbooks. As a result, the readings for this course have been drawn from many different sources, and are available in a reading packet from *Audobon’s*, located at 48 Whitney Ave. You should pick up a copy ASAP (starting September 2nd); *Audobon’s* typically has them ready 1 day after your place your order. Many of the readings come from the primary literature in cognitive science. This is a good thing, since they will help to capture the vitality and excitement of scientific discovery. (This includes work that hasn’t yet filtered into textbooks. For example, many of our readings were only published last year.) These readings may also be challenging, though, and they will often use terms and refer to ideas with which you are unfamiliar. Don’t be discouraged by this! Though the readings have been carefully chosen to be accessible, I don’t expect you to fully understand every aspect of the readings. Overall, I think you’ll get more out of reading the primary literature in this way than by reading the watered-down and less exciting secondary literature, and I will frequently provide guidance about what you should try to get out of especially challenging readings.

Preliminary Course Outline

Here's a preliminary outline of the material we'll cover in this course. The readings are included in the following order in your reading packet, and the full references are listed at the very end of the syllabus. Some of these readings will be optional; these will be noted as the semester progresses. Others will be added as the semester progresses, and will be made available online. Note that we'll start out by spending a few weeks on the major assumptions and themes of cognitive science as a whole, after which we'll branch out to a representative selection of the various tools cognitive scientists use, and the topics we study. The exact timing of these lectures is subject to change: we may end up spending more time than is listed here on topics which strike you as especially interesting or difficult. Overall, I encourage you to interact with me regarding this material: If there are any topics you would like to add, or to cover in more depth, let me know!

W 9/2: How to Study the Mind

[No Readings]

M 9/7: What's Within?: Innateness and 'Cognitive Architecture'

Hershberger (1970), "Attached-shadow orientation perceived as depth by chickens in an environment illuminated from below"

Bouchard (2008), selection from "Genes and human psychological traits"

Sugita (2008), "Face Perception in Monkeys Reared with No Exposure to Faces"

W 9/9: Modularity: Pieces of Mind

Carston (1996), "The Architecture of Mind: Modularity and Modularization"

Gallistel (2000), "The Replacement of General-Purpose Learning Models with Adaptively Specialized Learning Modules"

M 9/14: Computation, Cognitive Science, and the Chinese Nation

Pinker (1997), selection from "Standard Equipment"

Pylyshyn (1999), "What's In Your Mind?"

W 9/16: ~ 400,000 Years Later: Evolution and the Mind

Churchland (1988), chapter 2 of *Matter and Consciousness (2nd Ed.)*

Nilsson & Pelger (1994), "A Pessimistic Estimate of the Time Required for an Eye to Evolve"

Bloom (2004), "The Duel Between Body and Soul" (*NYTimes*)

M 9/21: My Brain Made Me Do It: Cognitive Neuroscience

Quiroga et al. (2005), "Invariant Visual Representation by Single Neurons in the Human Brain"

Rosen (2007), "The Brain on the Stand" (*NYTimes*)

Miller (2008), "Growing Pains for fMRI"

W 9/23: This is Your Brain on Slides: Neuroimaging

Greene et al. (2001), "An fMRI Investigation of Emotional Engagement in Moral Judgment"

Hasson et al. (2004), "Intersubject Synchronization of Cortical Activity During Natural Vision"

Iacobini and various unhappy people (2007), "This is Your Brain on Politics" (*NYTimes*)

M 9/28: Goo goo, ga ga: Infant Cognition

Wynn (1992), "Addition and Subtraction by Human Infants"

Baillargeon (2004), "Infants' Physical World"

Onishi & Baillargeon (2005), "Do 15-Month-Old Infants Understand False Beliefs?"

Talbot (2006), "The Baby Lab" (*New Yorker*; optional)

W 9/30: "Goo goo, ga ga": Language Acquisition

Jackendoff (1994), Chapters 8 - 10 of *Patterns in the Mind*

Wade (2002), "Language Gene is Traced to Emergence of Humans" (*NYTimes*)

McNeil (2004), "Did the Cat Really Say 'I Want to Be Alone'?" (*NYTimes*)

M 10/5: This seems like it might be a pretty neat lecture: Language and Statistical Learning

Saffran et al. (1996), "Statistical Learning by 8-Month-Old Infants"

Hespos & Spelke (2004), "Conceptual Precursors to Language"

Kinzler et al. (2007), "The Native Language of Social Cognition"

W 10/7: Now Hear This!: Linguistics

Pinker (1994), chapters 4 - 5 of *The Language Instinct*

M 10/12: MIDTERM EXAMINATION! <—————

W 10/14: Colorless Green Ideas Sleep Furiously: Syntax

Stillings et al. (1995), "Syntax" and "Universals"

M 10/19: Seeing: It's Not What You Think (Visual Perception Part #1)

Marr (1982), "The Philosophy of the Approach" (from *Vision*)

Flombaum et al. (2004), "Dynamic Object Individuation in Rhesus Macaques"

W 10/21: She Blinded Me With Science (Visual Perception Part #2)

New & Scholl (2008), "Perceptual Scotomas: A Functional Account of Motion-Induced Blindness"

Gao et al. (2009), "Perception of Animacy Irresistibly Influences Interactive Behavior"

M 10/26: Attention & Consciousness

Simons & Levin (1998), "Failure To Detect Changes to People in a Real-World Interaction"

Most et al. (2001), "How Not to Be Seen"

W 10/28: Artificial Intelligence and Social Robotics [Guest Lecture: Scanz]

[Readings TBA]

M 11/2: Monkeying Around: Comparative Cognition [Guest Lecture: Laurie Santos]

Hare & Tomasello (2005), "Human-like Social Skills in Dogs?"

[Other readings TBA]

W 11/4: Deep Thought: The Roles of Philosophy in Cognitive Science

Turing (1950/1981), "Computing Machinery and Intelligence"

Searle (1980/1981), "Minds, Brains, and Programs"

Bisson (1991), "They're Made Out of Meat"

Kasparov (1996), "The Day I Sensed a New Kind of Intelligence" (*Time Magazine*)

McDermott (1997), "Yes, Computers Can Think" (*NYTimes*)

M 11/9: Elementary, My Dear Watson: Reasoning and Rationality

Osherson (1995), "Probability Judgment"

Groopman (2007), "Mental Malpractice" (*NYTimes*)

<ALTERNATE PAPER
TOPICS DUE!>

W 11/11: Make Up Your Mind: The Cognitive Science of Decision-Making

Shafir & Tversky (1995), "Decision Making"

Cassidy (2006), "Annals of Economics: Mind Games" (*New Yorker*; optional)

Wald (2008), "Crazy Money"

M 11/16: Crossed Wires: Neuropsychology and Brain Damage

Rafal (1998), "Balint Syndrome"

Sacks (2004), "Speed" (*New Yorker*; optional)

Coltheart (2007), "Cognitive Neuropsychiatry and Delusional Belief"

W 11/18: Ooh la la: The Evolutionary Psychology of Love, Sex, & Attraction <PAPERS DUE!>

Berglund & Rosenqvist (1993), "Selective Males and Ardent Females in Pipefishes"

Penton-Voak et al. (1999), "Menstrual Cycle Alters Face Preference"

(M 11/23 & W 11/25: FALL RECESS . . . Happy Thanksgiving!)

<http://www.tofurky.com/products/tofurkyfeasts.htm>

M 11/30: Cognitive Science: Past, Present, and Future

[Readings TBA]

W 12/2: FINAL EXAMINATION!

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Assigned Paper Topic: Cognitive Science and Ecological Validity

When we inquire about the 'ecological validity' of a scientific enterprise, we are essentially asking: *Who cares?* In this short (6 - 8 page) paper, you'll discuss the ecological validity of a part of cognitive science. How does (or should) the research in this area of cognitive science impact the real world, and everyday life? Why should the 'person on the street' care about it? (Sometimes a research project will have direct implications for everyday life — e.g. for how children should be educated. Other times the usefulness of this research will be mediated by certain technological applications — e.g. research on attention leading to better-designed airplane cockpits.) This topic and our expectations for this paper will be described in more detail when the due date approaches.

Comment on the ecological validity of one or two ideas or areas of cognitive science which we have covered in this course. Discuss both (1) how the issue of ecological validity was addressed (or wasn't addressed!) in the relevant readings and discussion, and (2) what you yourself think about the ecological validity of this area. Discuss what you would say to proponents of positions other than the one you have chosen to defend. Play the 'devil's advocate' to generate arguments for these other positions, and then try to counter them.

(Note also that although this is the 'assigned topic' for the paper, I am open to letting you write on another topic of your own choosing, if you are particularly engaged by some other idea. If you wish to pursue an independent topic, however, you must get it approved by me, *no later than Monday, November 9th.*)

Full References for Readings

Baillargeon, R. (2004). Infants' physical world. *Current Directions in Psychological Science*, 13, 89 - 94.

Berglund, A., & Rosenqvist, G. (1993). Selective males and ardent females in pipefishes. *Behavioral Ecology & Sociobiology*, 32, 331 - 336.

Bisson, T. (1991). They're made out of meat. *Omni*, April 1991.

Bloom, P. (2004). The duel between body and soul. *New York Times*, 9/10/04.

Bouchard, T. (2008). Genes and human psychological traits. In P. Carruthers, S. Laurence, & S. Stich (Eds.), *The innate mind: Foundations and the future* (pp. 69 - 90). Oxford University Press.

Carston, R. (1996). The architecture of mind: Modularity and modularization. In D. Green et al. (Eds.), *Cognitive science: An introduction* (pp. 53 - 83). Cambridge, MA: Blackwell.

Cassidy, J. (2006). Mind games: What neuroeconomics tells us about money and the brain. *New Yorker*, September 18th.

Churchland, P. (1988). "The ontological problem (the mind-body problem)." Chapter 2 of *Matter and Consciousness*, Revised Ed. (pp. 7 - 49). MIT Press.

- Coltheart, M. (2007). Cognitive neuropsychiatry and delusional belief. *Quarterly Journal of Experimental Psychology*, 60, 1041 - 1062.
- Flombaum, J. I., Kunder, S. M., Santos, L. R., & Scholl, B. J. (2004). Dynamic object individuation in rhesus macaques: A study of the tunnel effect. *Psychological Science*, 15, 795 - 800.
- Gallistel, C. R. (2000). The replacement of general-purpose learning models with adaptively specialized learning modules. In M. Gazzaniga (Ed.), *The new cognitive neurosciences* (pp. 1179 - 1191). Cambridge, MA: MIT Press.
- Gao, T., McCarthy, G., & Scholl, B. J. (2009). Perception of animacy irresistibly influences interactive behavior. Manuscript submitted for publication.
- Greene, J., Sommerville, R. B., Nystrom, L., Darley, J., & Cohen, J. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science*, 293, 2105 - 2108.
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- Hasson, U., Nir, Y., Levy, I., Fuhrmann, G., & Malach, R. (2004). Intersubject synchronization of cortical activity during natural vision. *Science*, 303, 1634 - 1640.
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- Hespos, S. J., & Spelke, E. S. (2004). Conceptual precursors to language. *Nature*, 430, 453 - 456.
- Iacobini, M. et al. (2007). This is your brain on politics [with response]. *New York Times*, 11/11/07.
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- Kasparov, G. (1996). The day that I sensed a new kind of intelligence. *Time Magazine*, 3/25/96, p. 55.
- Kinzler, K., Dupoux, E., & Spelke, E. (2007). The native language of social cognition. *Proceedings of the National Academy of Sciences*, 104, 12577 - 12580.
- Marr, D. (1982). "The philosophy of the approach". Chapter 1 of *Vision*. New York: W. H. Freeman.
- McDermott, D. (1997). Yes, computers can think. *New York Times*, 5/14/97, Section A.
- McNeil, D. G. (2004). Did the cat really say 'I want to be alone'? Sorry, it said meow. *New York Times*, 9/7/04.
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- Most, S. B., Simons, D. J., Scholl, B. J., Jimenez, R., Clifford, E., & Chabris, C. F. (2001). How not to be seen: The contribution of similarity and selective ignoring to sustained inattention blindness. *Psychological Science*, 12(1), 9 - 17.
- New, J. J., & Scholl, B. J. (2008). 'Perceptual scotomas': A functional account of motion-induced blindness. *Psychological Science*, 19, 653 - 659.
- Nilsson, D.-E., & Pelger, S. (1994). A pessimistic estimate of the time required for an eye to evolve. *Proceedings of the Royal Society, Biological Sciences*, 256(1345), 53 - 58.
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- Pinker, S. (1994). "How language works" and "Words, words, words". Chapters 4 - 5 of *The language instinct* (pp. 83 - 157). Harper.
- Pinker, S. (1997). "Standard equipment." Chapter 1 of *How the Mind Works* (pp. 3 - 36). W. W. Norton.
- Pylyshyn, Z. W. (1999). What's in your mind? In E. Lepore & Z. Pylyshyn (Eds.), *What is cognitive science?* (pp. 1 - 25). Oxford: Blackwell. [A preprint version is included in the reading packet.]
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- Rafal, R. D. (1997). Balint syndrome. In T. Feinberg & M. Farah (Eds.), *Behavioral neurology and neuropsychology* (pp. 337 - 356). New York: McGraw-Hill.
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- Searle, J. (1980). Minds, brains, and programs. Reprinted in D. Hofstadter & D. Dennett (Eds.), *The Mind's I* (pp. 353 - 382). Bantam.
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