



# Philosophy and Cognitive Science

## Professor William Seeley

### Syllabus Proposal

#### Course Description:

Cognitive science is an interdisciplinary field in which theories and methods from psychology, computer science, neuroscience, linguistics, and philosophy are used to study cognitive phenomena, e.g. thinking, rationality, perception, language learning, and language comprehension. In its broadest form cognitive science is the study of how organisms acquire, represent, manipulate, and use information. In this context the goal of the cognitive science is to provide an account of the sorts of mental computations that underlie intelligent performance. Traditionally computational theories of mind have been central to this project. In this course we will evaluate the computational model of mind and discuss its application to three areas of cognitive research: vision, artificial intelligence, and language learning and comprehension. We will conclude by discussing several challenges to traditional cognitive science and evaluating the relationship between the computational model of mind and new research in cognitive neuroscience.

#### Course Goals:

The goals of this course are threefold: first, to introduce students to the computational theory of mind and evaluate the role philosophers play in the interdisciplinary study cognitive science; second, to introduce students to interdisciplinary research methods in cognitive science through the study of computational models of vision, artificial intelligence, and language comprehension; third, to evaluate philosophical issues concerning the nature of mind, consciousness, and rationality that emerge from empirical research in cognitive science.

#### Requirements:

- Three 3 page (750-900 word) analysis papers (chosen from the assigned topics listed on the syllabus). The due dates of response papers will be determined by our progress through the syllabus. I will announce the dates in class as we move through the material, but in general they will be due one week after we wrap up discussion of the pertinent topic. Response paper cannot be late. If you miss the due date you forfeit the opportunity to write on that topic. (20%)
- A 6 page (1800 word) mid-term paper on an assigned topic synthesizing the material covered in the first half of the semester. You will be given a choice between two paper topics. This paper will be due the day before the beginning of the mid-term break. (30%)
- An 8 -10 page final paper on a topic of your choosing. All students must clear final paper topics with me one month before the last day of classes. The final paper is due at the first day of the exam period. (50%)
- Class participation in the form of discussions of response paper topics is mandatory. As a result poor attendance will have an effect on your grade. (+/-10%)

#### Texts:

- *Mindware*, Andy Clark (New York: Oxford University Press, 2001). **(MI)**
- *Mind Design II*, ed. John Haugeland (Cambridge, MA: MIT Press, 1997). **(MD)**
- *How Children Learn the Meanings of Words*, Paul Bloom (Cambridge, MA: MIT Press, 2002). **(MW)**
- *The Big Book of Concepts*, George L. Murphy (Cambridge, MA: MIT Press, 2004). **(BBC)**
- *Furnishing the Mind*, Jesse J. Prinz (Cambridge, MA: MIT Press, 2002). **(FM)**
- *How the Body Shapes the Way We Think*, Rolf Pfeifer and Josh Bongard (Cambridge, MA: MIT Press, 2007) **(PB)**
- Electronic resources and pdf files on **(LYCEUM)**

## Schedule of Readings:

### Topic 1: The Computational Theory of Mind

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Clark	Dualism, Functionalism, Behaviorism, and Beyond <b>(MI)</b> Meat Machines <b>(MI)</b> Symbol Systems <b>(MI)</b>
Marr	The Philosophy and the Approach <b>(LYCEUM)</b>
Block	The Computer Model of Mind <b>(LYCEUM)</b>

**Response Topic 1:**      **Is the notion of multiple realizability introduced by the computational theory of mind plausible? (supplementary reading: Bechtel and Mundale (1999, "Multiple Realizability Revisited"))**

### Topic 2: Artificial Intelligence: GOFAI and Connectionist Models

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Newell & Simon	Computer Science as Empirical Enquiry: Symbols & Search <b>(MD)</b>
John Searle	Minds, Brains, and Programs <b>(MD)</b>
Copeland	The Chinese Room from a Logical Point of View <b>(LYCEUM)</b>
Minsky	Why People Think Computers Can't <b>(LYCEUM)</b>

**Response Topic 2:**      **What exactly is Searle's Chinese Room Argument? Is it sound?**

Clark	Connectionism <b>(M)</b>
Smolensky	On the Proper Treatment of Connectionism <b>(MM)</b>
Fodor & Pylyshyn	Connectionism and Cognitive Architecture <b>(MM)</b>
Ramsey, Stich & Garon	Connectionism, Eliminativism, and the Future of Folk Psychology <b>(MM)</b>
Clark	Connectionist Minds <b>(MM)</b>

**Response Topic 3:**      **TBA**

### Topic 3: Language, Memory, & Concepts

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Bloom	<i>How Children Learn the Meanings of Words</i> (excerpts) <b>(MW)</b> Word learning and Theory of Mind Concepts and Categories naming and Representation
Murphy	<i>The Big Book of Concepts</i> <b>(BBC)</b> Chapter 1: Introduction Chapter 2: Typicality and the Classical View of Categories Chapter 3: Theory
Prinz	<i>Furnishing the Mind</i> <b>(FM)</b> Desiderata on a Theory of Concepts Traditional Philosophical Accounts Similarity-Based Accounts Maximal and Minimal Accounts
Medin, Ross, & Markman	Memory Systems and Knowledge <b>(LYCEUM)</b>

**Response Topic 4:**      **TBA**

**Topic 4: Perception**

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Clark	Perception, Action, and the Brain <b>(M)</b>
Palmer	Theoretical Approaches to Vision <b>(LYCEUM)</b>
Marr & Nishihara	Visual Information Processing: Artificial Intelligence & the Sensorium of Sight <b>(LYCEUM)</b>
Tarr & Bulthoff	Image-Based Object Recognition in Man, Monkey, and Machine <b>(LYCEUM)</b>
Dennis Proffitt	Embodied Perception and the Economy of Action <b>(LYCEUM)</b>
Kathleen Akins	Of Sensory Systems and the Aboutness of Mental States <b>(LYCEUM)</b>

**Response Topic 5:** Is ‘mis-representation’ a misnomer in some contexts? Discuss and evaluate the possibility that what we have called in class “constructive mis- representation” plays a productive role in action planning and cognition.

**Topic 5: Minds, Images, and Cognitive Neuroscience**

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Kosslyn	Mental Imagery” <b>(eDisk)</b>
Pylyshyn	Return of the Mental Image: Are There Really Pictures in the Head? <b>(LYCEUM)</b>
Anderson	Arguments Concerning Representations for Mental Imagery <b>(LYCEUM)</b>
Kosslyn	If Neuroimaging Is the Answer, What Is the Question?” <b>(eDisk)</b>
Umiltà	Localization of Cognitive Functions in the Brain Does Allow One to Distinguish between Psychological Theories” <b>(eDisk)</b>

\*Supplemental: Kosslyn, “Visual Mental Images in the Brain: Overview of a Theory **(eDisk)**

**Response Topic 6:** Does cognitive neuroscience tip the balance in the imagery debate? What does your answer suggest about the role imaging studies can/cannot play in the study of cognition? Make sure to make use of the supplemental reading listed for this section in composing your answer.

**Topic 6: Emotions**

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Prinz	Emotion <b>(LYCEUM)</b>
Vuilleumier	How Brains Beware <b>(LYCEUM)</b>

**Response Topic 7:** TBA

**Topic 7: Challenges to the Computational Theory of Mind**

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Brooks	"Intelligence without Representation” <b>(MD)</b>
Van Gelder	“Dynamics & Cognition” <b>(MD)</b>
Pfeifer	<i>How the Body Shapes the Way We Think</i> <b>(PB)</b>
	Prerequisites for a Theory of Intelligence
	Intelligent Systems: Properties and Principles
	Development: From Locomotion to Cognition

**Response Topic 8:** TBA

**Some Miscellaneous Notes and Guidelines:**

The reading list for this class is arranged in topics as opposed to individual sessions. You can find a detailed bibliography of the readings below. I will announce the particular readings for each class as we go along. This will allow us some flexibility in discussion so that we can spend more time on issues of interest to the class. I will occasionally upload supplementary materials to EDisk for students interested in pursuing particular issues beyond class discussion. I also reserve the right to make changes to the syllabus which reflect our class interests.

Analysis papers are designed to give students a chance to stretch their legs a bit with the material and give me a chance to assess your understanding of the material. These papers should offer a philosophical defense of your take on the issue at hand. But this does not mean that they are a free forum for opinions. Rather, your evaluation should be based on the logic grounding the arguments in the debate. Make sure that your papers set out the philosophical issues germane to the question and that your responses relative virtues and shortcomings of theoretical positions discussed in class.

Finally, moral behavior is the grounds for, and the framework of, a healthy society. In this regard it is each of our responsibility as an individual within the community of our classroom to act responsibly. This includes following the rules and guidelines set out by the College for academic behavior. Plagiarism is a serious matter. It goes without saying that each of you is expected to do his or her own work and to cite EVERY text that is used to prepare a paper for this class. In general philosophy papers are NOT research papers. Your response papers should not involve any outside research and you should be able to manage your final papers using only material from the syllabus, assigned supplemental readings, and class discussion. As a general rule, I ask that you not use the internet for your research except as assigned in class.

**Bibliography:**

**Topic 1: The Computational Theory of Mind**

- Andy Clark, "Appendix 1: Some Backdrop: Dualism, Functionalism, Behaviorism, and Beyond," *Mindware*, (New York: Oxford University Press, 2001), 162 -170.
- Andy Clark, "Chapter 1: Meat Machines," *Mindware*, (New York: Oxford University Press, 2001), 7-27.
- Andy Clark, "Chapter 2: Symbol Systems," *Mindware*, (New York: Oxford University Press, 2001), 28-42.
- David Marr, "The Philosophy and the Approach," *Vision* "New York: W. H. Freeman & Company, 1982), 8-40.
- Ned Block, "The Computer Model of Mind," in Alan Goldman, *Readings in Philosophy and Cognitive Science* (Cambridge, MA: MIT Press, 1993), 818-831

**Topic 2: Artificial Intelligence: GOFAI and Connectionist Models**

- Allen Newell & Herbert A. Simon, "Computer Science as Empirical Enquiry: Symbols & Search," in ed. John Haugeland, *Mind Design II*, (Cambridge, MA: MIT Press, 1997), 81-110.
- John Searle, "Minds, Brains, and Programs," in ed. John Haugeland, *Mind Design II* (Cambridge, MA: MIT Press, 1997), 183-204.
- Jack Copeland, Jack Copeland, "The Chinese Room from a Logical Point of View," in eds. John Preston & Mark Bishop, *Views into the Chinese Room* (New York: Oxford University Press, 2002), 109-122.
- Marvin Minsky, "Why People Think that Computers Can't," *AI Magazine*, 3(4), 1982, 3-15.
- Andy Clark, "Chapter 4: Connectionism," *Mindware*, (New York: Oxford University Press, 2001), 62-83.
- Paul Smolensky, "On the Proper Treatment of Connectionism," in eds. Cynthia Macdonald and Graham Macdonald, *Connectionism*, Blackwell Publishers, 1995), 28-89.
- Jerry Fodor & Zenon Pylyshyn, "Connectionism and Cognitive Architecture: A Critical Analysis," in ed. John Haugeland, *Mind Design II* (Cambridge, MA: MIT Press, 1997), 309-350.
- William Ramsey, Stephen Stich, & Joseph Garon, "Connectionism, Eliminativism, and the Future of Folk Psychology," in ed. John Haugeland, *Mind Design II* (Cambridge, MA: MIT Press, 1997), 351-376.
- Andy Clark, "Connectionist Minds," in eds. Cynthia Macdonald and Graham Macdonald, *Connectionism*, Blackwell Publishers, 1995), 339-356.

**Topic 3: Language and Memory**

- Paul Bloom, *How Children Learn the Meanings of Words* (Cambridge, MA: MIT Press, 2002), 55-88 & 145-190.
- Douglas Medin, Brian Ross, & Arthur Markman, "Memory Systems and Knowledge," *Cognitive Psychology* (New York: John Wiley & Sons, 4<sup>th</sup> edition, 2005), 174-207.
- George L. Murphy, *The Big Book of Concepts* (Cambridge, MA: MIT Press, 2004), 1-64..
- Jesse J. Prinz, *Furnishing the Mind* (Cambridge, MA: MIT Press, 2002), 1-102.

*Supplemental:*

- Paul Bloom, "Intention, History, and Artifact Concepts," *Cognition* 60(1), 1996, 1-29.
- Barbara Landau, Linda Smith, & Susan Jones, "Object Perception and Object Naming in Early Cognitive Development," *Trends in Cognitive Science*, 2(1), 1998, 19-24.
- Endel Tulving, "How many Memory Systems," *American Psychologist*, 40(4), 1985, 385-398.

**Topic 4: Perception**

- Andy Clark, "Chapter 5: Perception, Action, and the Brain," *Mindware* (Cambridge, MA: MIT Press) 84-102.
- Stephen Palmer, "Theoretical Approaches to Vision," *Vision Science* (Cambridge, MA: MIT Press, 1999), 45-93
- David Marr & Keith Nishihara, "Visual Information Processing: Artificial Intelligence and the Sensorium of Sight," *Technology Review*, 81, 1978, 2-23.
- Michael Tarr & Henrich Bülthoff, "Image-Based Object Recognition in Man, Monkey, and Machine," *Cognition*, 67(1-2), 1-20.
- Dennis Proffitt, "Embodied Perception and the Economy of Action," *Perspectives on Psychological Science*, 1(2), 2006, 110-122.
- Kathleen Akins, "Of Sensory Systems and the Aboutness of Mental States," *Journal of Philosophy*, 93 (7), 1996, 337-372.

**Topic 5: Minds, Images, and Cognitive Neuroscience**

- Stephen Kosslyn, "Mental Imagery," in eds. Stephen Kosslyn and Daniel Osherhorn, *Visual Cognition* (Cambridge, MA: MIT Press, 1995), 265-296.
- Zenon Pylyshyn, "Return of the mental image: Are there really pictures in the head?" *Trends in Cognitive Science*, 7(3), 2003, 113-118.
- John Anderson, "Arguments Concerning Representations for Mental Imagery," *Psychological Review*, 85(4), 1978, 249-277.
- Stephen Kosslyn, "If Neuroimaging is the Answer, What Is the Question?" *Philosophical Transactions of the Royal Society, London B*, 354, 1283-1294.
- Carlos Umiltà, "Localization of Cognitive Functions in the Brain Does Allow One to Distinguish between Psychological Theories," *Cortex*(2006) 42(3): 399-401.

*Supplemental:*

- Stephen Kosslyn, William Thompson, & Giorgio Ganis, "Visual mental Images in the Brain, Overview of a Theory," *The Case for Mental Imagery* (New York: Oxford University Press, 2006), 134-173.

**Topic 6: Emotions**

- Jesse Prinz, "Emotion," in ed. Paul Thagard, *Philosophy of Psychology and Cognitive Science* (Amsterdam: North Elsevier, 2007).
- Patrick Vuilleumier, "How Brains Beware: Neural Mechanisms of Emotional Attention," *TRENDS in Cognitive Science*, 9(12), 2005, 585-593.

*Supplemental:*

- Luiz Pessoa, Sabine Kastner, and Leslie G. Ungerleider, "Attentional Control of the Processing of Neutral and Emotional Stimuli," *Cognitive Brain Research*, 15, 2002, 31-45.
- Adam K. Anderson, "Affective Influences on the Attentional Dynamics Supporting Awareness," *Journal of Experimental Psychology: General*, 134(2), 2005, 258-281
- Taylor W. Schmitz, Eva De Rosa, and Adam K. Anderson "Opposing Influences of Affective State Valence on Visual Cortical Encoding," *The Journal of Neuroscience*, 29(22), 2009, 7199-7207.

**Topic 7: Challenges to the Computational Theory of Mind**

- Rodney Brooks, "Intelligence without Representation," in ed. John Haugeland, *Mind Design II* (Cambridge, MA: MIT Press, 1997), 95-420.
- Timothy van Gelder, "Dynamics & Cognition," in ed. John Haugeland, *Mind Design II* (Cambridge, MA: MIT Press, 1997), 421-450.
- Rolf Pfeifer and Josh Bongard, *How the Body Shapes the Way We Think* (Cambridge, MA: MIT Press, 2007), 61-176).