

COGNITIVE SCIENCE: A MULTIDISCIPLINARY INTRODUCTION

Fall Semester 2008

01:185:201; Index Number: 09038

Tuesdays, 10:20 a.m. to 1:00 p.m.

ARC 203 (<http://maps.rutgers.edu/building.aspx?NUM=3878>)

(Please note that on some days we may end a little early to accommodate the RuCCS colloquium series held on Tuesdays.)

Discussion Sections:

Thursdays (a:10:20-11:20, b: 12:20-1:20)

in A139 (RuCCS “playroom”), Psychology Building Annex, Busch Campus

INSTRUCTOR: Kristen Syrett

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Office: A351 (note the change) Psychology Building Annex – pink wing, Busch Campus

Office Hours: Wednesdays 10-11:30 a.m. (and by appointment, if necessary)

TEACHING ASSISTANT: Sarah Murray

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Office: A128 (then A106) Psychology Building Annex – pink wing, Busch Campus

Office Hours: By appointment as necessary (Make full use of discussion sections)

COURSE DESCRIPTION

From the Rutgers Course Schedule:

Introduction to computational, linguistic, philosophical, and psychological approaches taken within cognitive science, through a survey of topics such as reasoning, language, and vision.

More details:

This course is an introduction to the field of Cognitive Science. To capture the interdisciplinary nature of this field, we will address a range of topics and research programs from a variety of disciplines, including philosophy, computer science, cognitive and developmental psychology, and linguistics. The goals of this course are to introduce you to the foundations of Cognitive Science, help you appreciate the development of this field over the years, and allow you to explore the investigations and lively debates that have taken place within and across the disciplines that make up the field of Cognitive Science.

The pre- or corequisite for this course is a course in computer science, linguistics, philosophy, or psychology; or a permission number. This course and/or ‘Advanced Topics in Cognitive Science’ are mandatory prerequisites for a Cognitive Science minor at Rutgers. The minor requires a minimum of 18 credits. This course counts for 4 credits.

ASSESSMENT

Your grade in this course will be based on the following components:

Attendance and participation: 5%

This is by far the easiest part of your grade. Come to class *and* the discussion section prepared to participate. (The course will be much better anyway if you do!)

Reaction comments/discussion postings: 10%

This is also a very easy part of your grade! Each week, you will post something – a comment, a reflection, a response to someone else’s posting – based on questions given at the end of class. These are DUE the SUNDAY NIGHT before the following class. It need not be elegant or sophisticated, but it will require some thought. (You are not going to get credit for comments like “Cool question,” “I agree,” “What does he mean by that?” or “I had the same reaction.”)

In-class assessments: 10%

There will be 10 of these throughout the course, administered during the first 10 minutes of class. The best 8 will count towards your grade. They will be short and fairly easy *if you attended the prior class and have done the required reading for that day!*

Paper: 25%

You will be asked to write a 6- to 8-page paper (double-spaced) on a topic to be assigned later in the course.

Exams (2): 50%

The better of the two grades will count for 30%, the other 20%.

The Mid-term will cover material in the first half of the course. The Final will cover material from the entire course. The Final will be on Monday, December 15 from 12 to 3 p.m. See <http://scheduling.rutgers.edu/fallfinals.htm>.

RUTGERS POLICY ON ACADEMIC INTEGRITY

Rutgers has a very detailed policy on Academic Integrity and Code of Student Conduct, which I encourage you all to read carefully. It’s posted at the following web address: <http://academicintegrity.rutgers.edu/integrity.shtml>. (At the bottom of that page are some very helpful citation resources.) Note that violations include cheating, fabrication, plagiarism, denying information to or misleading others, or facilitating these violations. Trust me, you don’t want to be caught doing any of these things! If you have any questions about this policy, or as it applies to this class, please see me.

READINGS

There is no assigned textbook for this course. Readings consist of articles written on topics in Cognitive Science and chapters from edited books and textbooks on Cognitive Science. The reading load is fairly heavy. There are required readings, as well as optional background readings that may be helpful or interesting if you find yourself wanting to read more about that topic. *Do not skip or skim the required readings.* Your discussion questions, in-class assessments, and exams will be based on these readings and material addressed in class. (Note: Where the indicated pages start and stop corresponds with natural section breaks/headings in the text.)

TOPICS

INTRODUCTION TO COGNITIVE SCIENCE

What Is Cognitive Science?

PHILOSOPHICAL FOUNDATIONS

The Mind-Body/Mind-Brain Problem, Consciousness
Innateness

THE BRAIN, COMPUTERS, AND ARTIFICIAL INTELLIGENCE

Can Computers Think?
Is the Brain Like a Computer?

COGNITION AND PERCEPTION

Introduction to Cognitive Neural Science
Split-Brain Research, Brain Lesions, and the Hemispheres

SENSATION AND PERCEPTION

Visual Perception
Representations, Descriptions, Process

COGNITION IN INFANCY – THE PHYSICAL WORLD

Initial Knowledge
Physical Knowledge and Events

LANGUAGE

Linguistic Representations and Cognition
Language Acquisition and Development (Verb Learning and Errors, Statistical Learning)

CONCEPTS & CATEGORIZATION

Concepts and Categories
Prototypes and Exemplars

REASONING & DECISION MAKING

Decision Making and Judgments Under Uncertainty

SCHEDULE

I have left room for some flexibility in the schedule, depending on time constraints and class interests. Proceed with readings in the order listed, including within a day.

DATE	MAIN TOPIC	SUB-TOPIC	REQUIRED READING	OPTIONAL READING
SEPTEMBER				
(1)	2	INTRODUCTION	What is Cognitive Science?	(33) (40)
(2)	9	PHILOSOPHICAL FOUNDATIONS	The Mind-Body Problem, Consciousness	(9)a, b, (4) (6), (5), (27)
(3)	16	PHILOSOPHICAL FOUNDATIONS	Innateness	(32), (21), (13) (19)
(4)	23	BRAIN, COMPUTERS, AI	Can computers think? Is the brain like a computer?	(7)a, (37), (17), (24) (7)b, (38), (42), (30)
(5)	30	COGNITION & PERCEPTION	Cognitive Neural Science; Split-Brain Research, Lesions, Hemispheres	(16)a, b, c, (11), (3)
OCTOBER				
(6)	7	COGNITION & PERCEPTION, SENSATION & PERCEPTION	<i>Secrets of the Mind</i> ; Visual Perception	(44), (2)
(7)	14	SENSATION & PERCEPTION	Visual Perception, Representations, Description	(23) (28), (18)
(8)	21	**MIDTERM**		
(9)	28	COGNITION IN INFANCY	Initial Knowledge, Physical Knowledge & Events	(39), (1) (41)
NOVEMBER				
(10)	4	LANGUAGE	Linguistic Representations & Cognition; Language Acquisition & Development	(14), (20), (31) (10), (15), (8)
(11)	11	LANGUAGE	Language Acquisition & Development	(36), (22) (29)
(12)	18	CONCEPTS & CATEGORIZATION	Concepts & Categories, Prototypes and Exemplars	(25), (26) (35)
(13)	25	**PAPER DUE** NO CLASS – Rutgers Thursday class schedule (Happy Thanksgiving!)		
DECEMBER				
(14)	2	REASONING	Decision Making, Judgments	(43) (12)
(15)	9	OPEN		
Last day of Rutgers classes: December 10; Reading days: December 11, 12				
	15	**FINAL 12-3 p.m.**		

READINGS

- (1) Baillargeon, R. (2004). Infants' physical world. *Current Directions in Psychological Science*, 13, 89-94.
- (2) Beaumont, J.G. (1988). Sensation and perception. In G. Beaumont & E.F. Rogers (Eds.), *Understanding Neuropsychology* (pp. 36-65). Cambridge, MA: Wiley-Blackwell. (pp. 36-39, 41-44, 48-52 only)
- (3) Beeman, M.J., & Chiarello, C. (1998). Complementary right- and left-hemisphere language comprehension. *Current Directions in Psychological Science*, 7, 2-7.
- (4) Bloom, P. (2004). The duel between body and soul. *New York Times*, Sept. 10.
<http://www.nytimes.com/2004/09/10/opinion/10bloom.html>.
- (5) Chalmers, D.J. (1995). The puzzle of conscious experience. *Scientific American*, 273, 80-86.
- (6) Churchland, P. (1988). *Matter and Consciousness*. Cambridge, MA: MIT Press.
Chapter 2: The Ontological Problem (the Mind-Body Problem) (pp. 7-22 only)
- (7) Davis, M. (2000). *The Universal Computer: The Road from Leibniz to Turing*. New York, NY: W.W. Norton & Company.
 - a. Chapter 7: Turing Conceives of the All-Purpose Computer (pp. 139-175)
 - b. Chapter 9: Beyond Leibniz's Dream (pp. 199-207)
- (8) Dell, G.S. (1995). Speaking and Misspeaking. In L.R. Gleitman & M. Liberman (Eds.), *An Invitation to Cognitive Science, Vol. 1, Language* (pp. 183-208). Cambridge, MA: MIT Press.
- (9) Descartes, R. (1641). *Meditations on the First Philosophy*.
<http://oregonstate.edu/instruct/phl302/texts/cartes/meditations/meditations.html> OR Trans. by J. Veitch (1901) <http://www.classicallibrary.org/cartes/meditations/>
 - a. Meditation II: Of the Nature of the Human Mind; and that It Is More Easily / Better Known than the Body
 - b. Meditation VI: Of the Existence of Material Things, and Of the Real Distinction between the Mind and Body (of Man)
- (10) Fodor, J.A. (1966). How to learn to talk: Some simple ways. In F. Smith & G. Miller (Eds.), *The Genesis of Language: A Psycholinguistic Approach (Proceedings of the Conference on Language Development in Children)* (pp. 105-122). Cambridge, MA: MIT Press.
- (11) Gazzaniga, M. (1998). The split brain revisited. *Scientific American Magazine*, 279, 35-39.
- (12) Groopman, J. (2007). Mental malpractice. *New York Times*, July 2.
<http://www.nytimes.com/2007/07/07/opinion/07groopman.html>.
- (13) Hume, D. (1748). *An Essay Concerning Human Understanding*. Harvard Classics, Vol. 37, P.F. Collier & Son (1910). <http://18th.eserver.org/hume-enquiry.html>.
Section II: Of the Origin of Ideas
- (14) Jackendoff, R. (2002). *Foundations of Language*. Oxford: Oxford University Press.
Chapter 2: Language and a Mental Phenomenon (Sections 1.1, 1.2 only + pg. 6)
- (15) Jusczyk, P. (2000). *The Discovery of Spoken Language*. Cambridge, MA: MIT Press.

Chapter 2: A Brief Historical Perspective on Language Acquisition Research (pp. 17-28 only)

- (16) Kandel, E.R., Schwartz, J.H., & Jessell, T.M. (1995). *Essentials of Neural Science and Behavior*. New York, NY: McGraw-Hill.
 - a. Chapter 18: From Nerve Cells to Cognition (pp. 322-324 only)
 - b. Chapter 2: Nerve Cells and Behavior (pp. 21-27, 39-40 only)
 - c. Chapter 1: Brain and Behavior (all)
- (17) Kasparov, G. (1996). The day that I sensed a new kind of intelligence. *Time Magazine*, March 25. <http://www.time.com/time/magazine/article/0,9171,984305-1,00.html>.
- (18) Koffka, K. (1963). *Principles of Gestalt Psychology*. New York, NY: Harcourt, Brace and Company.

“Why do things look as they do?” (pp. 75-85, 98-101 only)
- (19) Leibniz, G.W. (1704/1764). *New Essays on Human Understanding, Book I*. Trans. by J. Bennett (2006). <http://www.earlymoderntexts.com/pdfbits/ne1.pdf>.

Book 1: Innate Notions (pp. 13-32)
- (20) Leslie, A.M. (2001). Learning: Association or computation? Introduction to a special section. *Current Directions in Psychological Science*, 10, 124-127.
- (21) Locke, J. (1690). *An Essay Concerning Human Understanding*. http://oregonstate.edu/instruct/phl302/texts/locke/locke1/Essay_contents.html.

Book II: Of Ideas, Chapter 1: Of Ideas in General
- (22) Marcus, G.F., Vijayan, S., Bandi Rao, & Vishton, P.M. (1999). Rule learning by 7-month-old infants. *Science*, 283, 77-80.
- (23) Marr, D.E. (1983). *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information*. San Francisco, CA: W.H. Freeman.

Chapter 1: The Philosophy and the Approach (Section 1.2 only)
- (24) McDermott, D. (1997). Yes, computers can think. *The New York Times*, May 14. <http://query.nytimes.com/gst/fullpage.html?res=9902EEDD1F39F937A25756C0A961958260>.
- (25) Medin, D., Ross, B., & Markman, A. (2005). *Cognitive Psychology*. Malden, MA: John Wiley & Sons.

Chapter 10: Concepts and Categories: Representation and Use (pp. 318-320, 323-332 only)
- (26) Murphy, G. (2002). *The Big Book of Concepts*. Cambridge, MA: MIT Press.

Chapter 3: Theories (pp. 41-51 only)
- (27) Nagel, T. (1974). What is it like to be a bat? *The Philosophical Review*, 83, 435-450.
- (28) Palmer, S.E. (1999). *Vision Science: Photons to Phenomenology*. Cambridge, MA: MIT Press.

Sections 6.3 (pp. 280-287) and 6.4 (pp. 287-300) only
- (29) Peña, M., Bonatti, L.L., Nespor, M., & Mehler, J. (2002). Signal-driven computations in speech processing. *Science*, 298, 604-607.
- (30) Penrose, R. (1989). *The Emperor's New Mind: Concerning Computers, Minds, and Laws of*

Physics. Oxford: Oxford University Press.

Chapter 2: Algorithms and Turing Machines (pp. 30-51 only)

- (31) Pinker, S. (1999). *Words and Rules: The Ingredients of Language*. New York, NY: Basic Books.
Chapter 7: Kids Say the Darnedest Things (pp. 189-210)
For a lecture by Pinker on this book, see <http://mitworld.mit.edu/video/143/>.
- (32) Plato. (380 B.C.E.). *Meno*. Trans. by B. Jowett (2006). <http://classics.mit.edu/Plato/meno.html>.
- (33) Pylyshyn, Z.W. (1999). What's in your mind? (Alternate version: What is cognitive science?) In E. Lepore & Z. Pylyshyn (Eds.), *What Is Cognitive Science?* (pp. 1-25). Oxford: Blackwell.
- (34) *Secrets of the Mind*. (2001). NOVA program. Featuring V.S. Ramachandran. First aired on PBS Oct. 23.
- (35) Rosch, E. (1978). Principles of categorization. In E. Rosch & B. Lloyd (Eds.) *Cognition and Categorization* (pp. 189-206). Hillsdale, NJ: Lawrence Erlbaum Associates. (especially pp. 196-201)
- (36) Saffran, J.R., Aslin, R.N., & Newport, E.L. (1996). Statistical learning by 8-month-old infants. *Science*, 274, 1926-1928.
- (37) Searle, J.R. (1980). Minds, brains, and programs. *Behavioral and Brain Sciences*, 3, 417-457.
- (38) Searle, J.R. (1990). Is the brain's mind a computer program? *Scientific American*, 262, 26-31.
- (39) Spelke, E. (1994). Initial knowledge: Six suggestions. *Cognition*, 50, 431-445.
- (40) Stillings, N., Weisler, A., Chase, C., Feinstein, M., Garfield, J., & Rissland, E. (1995). *Cognitive Science: An Introduction*. Cambridge, MA: MIT Press.
Chapter 8: Philosophy: Foundations of Cognitive Science (pp. 331-355)
- (41) Talbot, M. (2006). The baby lab. *New Yorker*, Sept. 4, 90-101.
- (42) Turing, A.M. (1950). Computing machinery and intelligence. *Mind*, 59, 433-460.
- (43) Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185, 1124-1131.
- (44) Wolfe, J.M., Kluender, K.R., Levi, D.M., Bartoshuk, L.M., & Herz, R.S. (2005). *Sensation and Perception*. Sunderland, MA: Sinauer Associates Incorporated. *Mind*, 59, 433-460.
Chapter 4: Perceiving and Recognizing Objects (pp. 75-88 only)