

# Psych/Ling/Phil/CS&E 612

## Introduction to Cognitive Science

Course Syllabus, Autumn 2008

- Course:** Psych /CS&E 612  
**Call number:** 18640-8 (Psych 612) or 22868-1 (CS&E 612)  
**Credits:** 3  
**Dates:** Sep 24–Dec 3, 2008  
**Times:** Mondays and Wednesdays 09:30–11:18 a.m.  
**Room:** Baker Systems Engineering BE, Room 198  
**Prerequisites:** Graduate standing, permission of instructor, or at least 12 credit hours from at least two of the following four areas: computer science, linguistics, philosophy, and psychology.  
**Websites:** <https://carmen.osu.edu> and <http://alexpetrov.com/teach/cogintro/>  
**Textbook:** Michael Dawson (1998). *Understanding Cognitive Science*. Malden, MA: Blackwell Publishers. ISBN 0-631-20894-1.  
**Instructor:** Dr. Alexander Petrov  
(614) 247-2734 [psych612@cogmod.osu.edu](mailto:psych612@cogmod.osu.edu)  
200B Lazenby Hall Office hours: M, W 11:20–12:00

### Course Overview

What is cognition and how does it emerge from the brain? This course introduces you to the exciting interdisciplinary field of cognitive science. Researchers in philosophy, neuroscience, psychology, artificial intelligence, and linguistics realized that they were asking many of the same questions about the nature of the human mind/brain, that they had developed complementary and synergistic methods of investigation, and that the evidence led them to compatible answers to their questions. This course introduces cognitive science through a representative sample of such questions, methods, and answers. It is not a special-topic course for students who seek detailed knowledge in a specific area of cognitive science. We will try not to lose sight of the forest for the trees but we will take a closer look at a few trees too because science is in the details. Along the way, we will introduce the constituent disciplines and their respective contributions to the study of cognition. We will discuss the foundational concepts of *computation* and *representation* from multiple points of view. Three unifying themes are emphasized throughout: 1. Information processing: The mind/brain is viewed as a complex system that receives, stores, retrieves, transforms, and transmits information. 2. Neurological grounding: Explicit effort is made to show how mental phenomena emerge from the interactions of networks of neurons in the brain. 3. Cognitive architecture: The emphasis is on functionally complete systems rather than disjoint empirical phenomena.

## Intended Audience. Prerequisites

This course is cross-listed in the Departments of Computer Science and Engineering, Linguistics, Philosophy, and Psychology. It is intended for graduate and advanced undergraduate students in these departments. Interested students from related areas are welcome too. The formal prerequisites for taking the course are: graduate standing in any of these departments **or** permission of the instructor **or** at least 12 undergraduate-level credit hours from at least two of the four disciplines. The informal prerequisites are: willingness to step outside the confines of one's area of specialization, willingness to read the professional literature (as opposed to textbooks) with help from the instructor and one's peers, willingness to participate in open discussions, and the ability to write clearly and concisely about topics outside one's area of specialization.

## Course Objectives

Upon successful completion of the course, the students will:

- Appreciate the interdisciplinary nature of cognitive science, the diversity of viewpoints, the controversies and the areas of nascent consensus.
- Appreciate the contribution of each of the five constituent disciplines and be familiar with its methods, key concepts, and focus of investigation.
- Be proficient in the *lingua franca* of cognitive science—the language of information processing.
- Have basic familiarity with brain anatomy and physiology.
- Know multiple definitions of the foundational concepts of *computation* and *representation* and be able to discuss them from multiple points of view.
- Understand the basic cognitive architecture—how perception, memory, language, motor control, and so forth come together to produce adaptive behavior.
- Know a multitude of specific concepts, theories, and experimental results covered in course. The lecture plan below lists some relevant keywords.
- Be able to read and discuss research papers from multiple disciplines.
- Be able to write critical essays on topics outside one's area of specialization.

## Course Materials

The main textbook is *Understanding Cognitive Science* (Dawson, 1998). We will supplement the textbook with additional readings listed in the bibliography below. All required readings (except the textbook itself) will be distributed in class in Xerox form; they are also posted in PDF on the Carmen website <https://carmen.osu.edu/>

## Teaching Method

As we will learn in the course, people remember much better when they study on a regular basis rather than cramming for a final exam. Also, people remember better when they actively process the material rather than just sit and listen. The course organization capitalizes on these important properties of memory. In addition to the lectures, it is arranged that you read something every week, discuss something every week, and write something every other week. In addition to the main textbook, the course is organized around seven *target articles*. Some of them are classic publications in the research

literature that have stood the test of time and are recognized to have lasting value and importance in cognitive science. Other target articles are recent reviews or reports of cutting-edge research. You are required to read each target article carefully before its assigned date in the calendar below and come to class prepared to discuss it in detail. For some target articles, you will also be required to write a 500-word summary paper.

## Evaluation

Your grade will depend on four components in the following proportions:

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|---|-----|
| • Summary papers (4 papers worth 8% each)     | 32% |
| • Attendance and participation in discussions | 10% |
| • Midterm Exam (Thursday, 10/30/2007)         | 24% |
| • Final Exam (Tuesday, 12/09/2007)            | 34% |

Grades are based on absolute cutoffs: A=90-100%, B=80-89%, C=70-79%, D=60-69%.

**Summary papers:** There are 7 target articles listed below. Thirty-two percent of your final grade will be based on your summary papers of 4 of these 7 articles. You decide which particular target articles to *write* about, but you are expected to *read* all and come to class prepared to discuss them. Each summary paper contributes up to 8 points toward your final grade. For extra credit, you may write a fifth summary paper, worth up to 5 points. You cannot submit more than five summary papers; if you do, only the first five submissions will be graded.

Guidelines for writing good summary papers:

- Begin with an introductory paragraph that states the purpose, motivation, or goal of the target article.
- The paper should summarize two major issues or problems that are discussed in the target article. If there are more than two issues, then pick the two that you think are most relevant and important.
- Your summary paper must represent your own synthesis of information.
- The paper should include your own critical reactions to the target article. For example, you may disagree with the author(s) in certain points, or may have alternative viewpoints and/or new suggestions. Those critical reactions must be supported by concisely stated arguments and/or evidence.
- Avoid plagiarism. It is good to bring empirical evidence or arguments in support of your case, but you must cite your sources and thereby give proper credit to the original author(s).
- Each summary paper must be 400–600 words long and must be double-spaced, properly formatted, and proofread. No separate title page is required. On the upper-left corner of the first page, write the title of the target article, your name, submission date, and the number of words. A Word template is available on Carmen to assist you in the formatting.
- The paper will be graded as a weighted sum of scores on three categories:
  - 50%: Thoroughness and correctness of the summary (25% for each issue).
  - 30%: Ability to critically examine the target article in your own terms.

- 20%: General understanding of the concepts and issues involved; clarity of presentation (organization, clear writing, paper format).
- Note that PSY 612 is not a writing course and hence extensive editorial or stylistic comments on your summaries will not be offered.

Each summary paper must be submitted in electronic form on the Carmen website (<https://carmen.osu.edu/>). There are 7 Dropboxes—one for each target article. Your papers must be uploaded to the corresponding Dropbox in MS Word (.doc), plain text (.txt), PDF, HTML, or RTF format. Assignments in other formats are not acceptable and will not be graded. In particular, .wps, .wpd, .odt, and .docx files are not supported. **The only way to submit your homework is to upload it to its corresponding Dropbox on Carmen.** Files dropped in a wrong Dropbox, sent by email, slipped under a door, and so on will not be accepted without prior permission. The Course Calendar lists a submission deadline corresponding to each target article. Typically, it is one week after the article is discussed in class. After a two-day grace period, the corresponding Dropbox closes. There is no penalty for late submissions as long as the Dropbox is still open. **There is no way to obtain credit for an assignment after the grace period has passed and the corresponding Dropbox has closed.** If you write a sixth paper for extra credit, it must be submitted by the regular deadline for the corresponding target article. Once you have submitted five papers, you cannot submit additional ones to make up for low scores on earlier submissions. There are no exceptions to the rules printed in boldface above.

At the end of the quarter, the credit points for summary papers are determined as follows. If you have submitted 4 papers, the credit is simply the sum of their scores (max=32). If you have submitted 5 papers, the credit is the sum of the top 4 scores plus EC, where EC is either 5 pts or the lowest (fifth) score, whichever is less. Thus, with extra credit you can obtain a maximum of 37 points for summary papers. If you have submitted 6 or more papers, those submitted after the fifth will not be graded and bring no additional points.

**Attendance and participation in discussions:** Participation in the class discussions is an integral element of this course. You are required to read all 7 target articles and to attend and actively contribute to all discussions, including those you have chosen not to write summaries of. Attending the lectures is strongly encouraged. There will be 10 checks of attendance, worth 1 point each. Seven checks will be made on the 7 target-article discussions; three more checks will be made at random.

**Exams:** Both the Midterm Exam (10/27) and the Final Exam (12/03) are closed-book and consist of short-answer and essay questions. Sample questions will be given in class. The Final Exam is not cumulative, except that the topics covered in the second half of the course depend on concepts and facts introduced in the first half. No make-up exams will be given, except in the case of documented illness or emergency. All make-up exams will be oral. In the event of a last-minute emergency, you **must** call Dr. Petrov (247-2734) or the office associate for the cognitive area (Sheena Riepenhoff, 292-1123) **on the same day as the exam**, preferably before the exam begins. Acceptable excuses for missing an exam are a death in your family, personal illness or the illness of your child or spouse, and unforeseen accidents like your car breaking down or getting stuck in an elevator. Please obtain documented proof of these events should they occur. If you are late for an

exam, you will be allowed to take it but you will have to submit your answers by the closing time like everybody else.

## **Academic Ethics**

All students enrolled in OSU courses are bound by the Code of Student Conduct ([http://studentaffairs.osu.edu/resource\\_csc.asp](http://studentaffairs.osu.edu/resource_csc.asp)). The instructor and course assistants are committed to maintaining a fair assessment of student performance in this course. Suspected violations of the Code will be dealt with according to the procedures detailed in the Code. Specifically, any alleged cases of misconduct will be referred to the Committee on Academic Misconduct.

There are two major ethical considerations in this course. First, both exams are closed book. No notes may be used during the examinations and you may not confer with your fellow students or look at other examinations for answers during the exam period. Prior to the examinations, you are encouraged to study in small groups. However, once you enter the examination room, you are expected to work alone. Second, you are expected to work alone on your homework assignments. You may not turn in anything that you did not *completely* write. Be careful about plagiarism; attribute quotes and ideas that others have previously published where appropriate. A very comprehensive website that describes most aspects of plagiarism has been produced by Northwestern University (<http://www.northwestern.edu/uacc/plagiar.html>).

## **Accommodations for Students with Special Needs**

The policy of The Ohio State University is to provide every reasonable, appropriate, and necessary accommodation to qualified disabled students. The University's colleges and academic centers evaluate and judge applications on an individual basis and no categories of disabled individuals are automatically barred from admission. The privacy rights of each disabled person are honored to the fullest extent possible. The University's interest in a student's disabilities are only for the purpose of accommodating his/her specific disability, thereby providing an academically qualified disabled student access to programs and activities accorded all other qualified students. Whenever generally accessible facilities do not adequately accommodate a specific disability, the University makes every reasonable accommodation and program or facility adjustment to assure individual access. These policies are fully supported and practiced in this class.

If you have a disability documented with the Office of Disability Services (<http://www.ods.ohio-state.edu>, 150 Pomerene Hall, 614-292-3307), please contact Dr. Petrov privately ([petrov.11@osu.edu](mailto:petrov.11@osu.edu), 200B Lazenby Hall, 614-247-2734) by the end of the second week of classes (10/03/2008) so that any accommodations can be made.

## Course Calendar

1. **W 09/24 – Introduction.** Information processing. Interdisciplinary approach. Philosophical beginnings. Reading: Textbook Chapter 1 (pp. 1-12).
2. **M 09/29 – Mind-body problem.** Cartesian dualism. Supervenience. Physicalism.
3. **W 10/01 – Formal systems. Finite State Machines.** Logic. Digital circuits. Readings: Haugeland (1997), Textbook Chapter 2.
4. **M 10/06 – Turing Machines. Turing Test.** Multiple realizability. Marr’s tri-level hypothesis. Functionalism. Discussion of Turing (1950), *Computing machinery and intelligence*. **Short paper #1 due 10/13.**
5. **W 10/08 – Classical View of Information Processing.** Physical symbol systems. Design-Belief-Action principle. Language of Thought. Computer architecture. Discussion of Newell & Simon (1976), *Computer science as empirical inquiry: Symbols and search*. **Short paper #2 due 10/15.** Reading: Newell (1990).
6. **M 10/13 – Brain Anatomy and Physiology.** Reading: Kolb & Whishaw (2006).
7. **W 10/15 – A Case Study in Cognitive Neuroscience.** Discussion of Romo & Salinas (2003), *Flutter discrimination: Neural codes, perception, memory and decision making*. **Short paper #3 due 10/22.**
8. **M 10/20 – The Appeal of Parallel Distributed Processing.** Point neuron approximation. *Emergent* simulator. Constraint satisfaction. Discussion of McClelland, Rumelhart, & Hinton (1986). *The appeal of PDP*. **Short paper #4 due 10/27.** Reading: Textbook Chapter 3.
9. **W 10/22 – Biological Basis of Learning. Hebbian Learning.** Long-term potentiation and depotentiation. NMDA receptors. Pattern associator. Readings: Textbook pp. 180-197; McClelland (2000, pp. 583-587).
10. **M 10/27 – Midterm Exam** – Same time, same place (9:30-11:18, BE 198).
11. **W 10/29 – Networks as Universal Function Approximators.** Behaviorism. Conditioning. Blocking effect. Delta rule. XOR problem. Generalized delta rule. GeneRec and Leabra. Readings: O’Reilly (1998); Textbook pp. 85-93.
12. **M 11/03 – Representations.** Intentionality. Misrepresentation. Detectors. Distributed representations. Compositional semantics. Isomorphism. Dynamic systems. Reading: Bechtel (2008), *Representations and mental mechanisms*.
13. **W 11/05 – Cognitive Architectures I.** Definitions. Horizontal and vertical integration. ACT-R: A (neo)classical architecture. Discussion of Anderson & Lebiere (2003), *The Newell Test for a theory of cognition*. **Short paper #5 due 11/12.** Reading: Anderson (2007).
14. **M 11/10 – Multiple Memory Systems.** Amnesia. Catastrophic interference. Conjunctive coding. Hippocampal-cortical model. Consolidation. Power law of practice. Discussion of Eichenbaum (2002), *Amnesia: Learning about memory from memory loss*. **Short paper #6 due 11/17.** Reading: McClelland (2000, pp. 587-594).

15. **W 11/12 – Working Memory.** Serial position curves. Modal model. Baddeley's model. Role of prefrontal cortex (PFC) in memory. Reading: Textbook Chap. 5.
16. **M 11/17 – Executive Control.** Stroop model. Guided activation theory of prefrontal cortex. Active gating in the basal ganglia. Reinforcement learning. Dynamic discipline. Reading: TBA.
17. **W 11/19 – Cognitive Architectures II.** Subsumption architecture. Tripartite architecture. Synthesis of ACT-R and Leabra. Readings: O'Reilly & Munakata (2000, pp. 211-225); Textbook Chapter 6.
18. **M 11/24 – Linguistics.** What is language? Components of a grammar. Syntax and productivity. Readings: Whitney (1998), *What language users must know*.
19. **W 11/26 – Nature and Nurture. Language acquisition.** Sensitive periods. "Language Wars". Discussion of Senghas, Kita, & Özyürek (2004), *Children creating core properties of language: Evidence from an emerging sign language in Nicaragua*. **Short paper #7 due 12/03.** Readings: Feldman (2006); Textbook pp. 66-84, 234-242.
20. **M 12/01 – Advanced Topics.** Reading: TBA
21. **W 12/03 – Final Exam** – Same time, same place (9:30-11:18, BE 198).

The above calendar is subject to change at the discretion of the instructor, depending on the rate of progress through the material, student interest in alternative topics, and/or scheduling constraints.

### Additional Readings

In addition to Dawson's (1998) textbook, which is the main text for this course, the following required readings supplement and amplify some topics of particular importance. The list of readings is subject to change at the discretion of the instructor.

1. Anderson, John R. (2007). Cognitive architecture. Chapter 1 in *How can the human mind occur in the physical universe?* (pp. 3-39). New York: Oxford University Press. Main text for Lecture 13.
2. Anderson, John R. & Lebiere, Christian (2003). The Newell Test for a theory of cognition. *Behavioral and Brain Sciences*, 26, 587-640. **Discussion paper #5, due 11/12.**
3. Bechtel, William (2008). Representations and mental mechanisms. Chapter 5 in *Mental Mechanisms: Philosophical Perspectives on Cognitive Neuroscience*. New York: Routledge. ISBN 0-8058-6334-6. Main text for lecture 12.
4. Eichenbaum, Howard (2002). Amnesia: Learning about memory from memory loss. Chapter 1 in *The Cognitive Neuroscience of Memory: An Introduction*. Boston, MA: Oxford University Press. **Discussion paper #6, due 11/17.**
5. Feldman, Jerome (2006). The language wars. Chapter 22 in *From Molecule to Metaphor: A Neural Theory of Language* (pp. 271-282). Cambridge, MA: MIT press. Text for lecture 19.

6. Haugeland, John (1997). What is mind design? In J. Haugeland (Ed.), *Mind Design II: Philosophy, Psychology, Artificial Intelligence*. Cambridge, MA: MIT Press. Text for Lecture 3.
7. Kolb, Brian & Whishaw, Ian (2006). How does the nervous system function? (pp. 34-73). Chapter 2 in *An Introduction to Brain and Behavior* (2<sup>nd</sup> Ed.). New York: Worth Publishers. Main text for Lecture 6.
8. McClelland, James L. (2000). Connectionist models of memory. In E. Tulving & F. Craik (Eds.), *The Oxford Handbook of Memory* (pp. 583-596). Oxford Univ. Press. Text for lectures 9 and 14.
9. McClelland, J. L., Rumelhart, D. E., & Hinton, G. E. (1986). The appeal of Parallel Distributed Processing. In D. E. Rumelhart, J. L. McClelland, and the PDP Research Group (Eds.), *Parallel Distributed Processing: Explorations in the Microstructure of Cognition, Vol. I: Foundations* (pp. 3-44). **Discussion paper #4, due 10/27.**
10. Newell, Allen (1990). Human cognitive architecture (pp. 111-131). Excerpt from Chapter 3 in *Unified Theories of Cognition*. Cambridge, MA: Harvard University Press. Text for Lecture 5.
11. Newell, Allen & Simon, Herbert A. (1976). Computer science as empirical inquiry: Symbols and search. *Communications of the Association for Computing Machinery*, 19, 113-126. **Discussion paper #2, due 10/15.**
12. O'Reilly, Randall C. (1998). Six principles for biologically based computational models of cortical cognition. *Trends in Cognitive Sciences*, 2 (11), 455-462. Text for Lecture 11.
13. O'Reilly, Randall C. & Munakata, Yuko (2000). Large-scale brain area functional organization (pp. 205-225). Chapter 7 in *Computational Explorations in Cognitive Neuroscience: Understanding the Mind by Simulating the Brain*. Cambridge, MA: MIT Press. Text for Lecture 17.
14. Romo, Ranulfo & Salinas, Emilio (2003). Flutter discrimination: Neural codes, perception, memory and decision making. *Nature Reviews Neuroscience*, 4, 203-218. **Discussion paper #3, due 10/22.**
15. Senghas, A., Kita, S., & Özyürek, A. (2004). Children creating core properties of language: Evidence from an emerging sign language in Nicaragua. *Science*, 305, 1779-1782. **Discussion paper #7, due 12/03.**
16. Turing, Alan M. (1950). Computing machinery and intelligence. *Mind*, 59, 433-460. [Available on-line <http://loebner.net/Prizel/TuringArticle.html>] **Discussion paper #1, due 10/13.**
17. Whitney, P. (1998). What language users must know (pp. 31-71). Chapter 2 in *The Psychology of Language*. Boston, MA: Houghton Mifflin Co. Main text for Lect. 18.

## Recommended Books

If you want to learn more, the following books are good, thoughtful starting points:

1. Anderson, John R. (2004). *Cognitive Psychology and Its Implications* (6<sup>th</sup> Ed.). New York: Worth Publishers. ISBN 0716701103.
2. Anderson, John R. (2007). *How can the human mind occur in the physical universe?* New York: Oxford University Press. ISBN 978-0-19-532425-9.
3. Bechtel, William (2008). *Mental Mechanisms: Philosophical Perspectives on Cognitive Neuroscience*. New York: Routledge. ISBN 0-8058-6334-6.
4. Blackmore, Susan (2004). *Consciousness: An Introduction*. New York: Oxford University Press. ISBN 0-19-515343-X.
5. Carroll, David W. (2008). *Psychology of Language* (5<sup>th</sup> Ed.). Belmont, CA: Thompson. ISBN 0-495-09969-4.
6. Chalmers, David J. (2002). *Philosophy of Mind: Classical and Contemporary Readings*. New York: Oxford University Press. ISBN 0-19-514581.
18. Churchland, Patricia S. & Sejnowski, Terrence J. (1994). *The Computational Brain*. MIT Press. ISBN 0-262-53120-8.
19. Dennett, Daniel C. (1981). True believers: The intentional strategy and why it works. In A. F. Heath (Ed.), *Scientific Explanation*, Oxford: Oxford University Press. [Reprinted in Haugeland (1997) and Chalmers (2002).]
7. Eichenbaum, Howard (2002). *The Cognitive Neuroscience of Memory: An Introduction*. Boston, MA: Oxford University Press. ISBN 978-0-19-514175-7.
8. Feynman, Richard (1984/1996). Feynman Lectures on Computation (Edited by T. Hey and R. W. Allen). Cambridge, MA: Perseus Publishing. ISBN 0-7382-0296-7.
9. Flanagan, Owen (2007). *The really hard problem: Meaning in a material world*. Cambridge, MA: MIT Press. ISBN 987-0-262-06264-0.
10. Friedenberg, Jay & Silverman, Gordon (2006). *Cognitive Science: An Introduction to the Study of the Mind*. Thousand Oaks, CA: Sage Publications. ISBN 1-4129-2568-1. [Comprehensive but superficial. Basically, it's a giant glossary.]
11. Gluck, M. A., Mercado, E., & Myers, C. E. (2008). *Learning and Memory: From Brain to Behavior*. New York: Worth Publishers. ISBN 0-7167-8654-0.
12. Harris, D. M. & Harris, S. L. (2007). *Digital Design and Computer Architecture*. San Francisco, CA: Morgan Kaufmann. ISBN 0-12-370497-9.
13. Haugeland, John (1985). *Artificial Intelligence: The Very Idea*. MIT Press. ISBN 0-262-58095-0.
14. Haugeland, John (Ed.) (1997). *Mind Design II: Philosophy, Psychology, Artificial Intelligence* (2<sup>nd</sup> Ed.). Cambridge, MA: MIT Press. ISBN 0-262-58153-1.
15. Hofstadter, Douglas R. (1985). Review of *Alan Turing: The Enigma*. Chapter 12 in *Metamagical Themas: Questing for the Essence of Mind and Pattern* (pp. 483-491). Basic Books.

16. Kim, Jaegwon (2006). *Philosophy of Mind* (2<sup>nd</sup> Ed.). Cambridge, MA: Westview. ISBN 0-8133-4269-4.
17. Kolb, Brian & Whishaw, Ian (2008). *Fundamentals of Human Neuropsychology* (6<sup>th</sup> Ed.). New York: Worth Publishers. ISBN 0-7167-9586-8.
18. Kolb, Brian & Whishaw, Ian (2006). *An Introduction to Brain and Behavior* (2<sup>nd</sup> Ed.). New York: Worth Publishers. ISBN 0-7167-1187-7.
19. Lakoff, George & Johnson, Mark (1980). *Metaphors We Live By*. Chicago: The University of Chicago Press. ISBN 0-226-46801-1.
20. LeDoux, Joseph (2002). *The Synaptic Self: How Our Brains Become Who We Are*. New York: Viking Penguin. ISBN 0-670-03028-7.
21. Newell, Allen (1990). *Unified Theories of Cognition*. Cambridge, MA: Harvard University Press. ISBN 0-674-92099-6.
22. O'Grady, W., Archibald, J., Aronoff, M., & Rees-Miller, J. (2005). *Contemporary Linguistics: An Introduction* (5<sup>th</sup> Ed.). New York: Bedford/St. Martin's. ISBN 0-312-41936-8.
23. O'Reilly, Randall C. & Munakata, Yuko (2000). *Computational Explorations in Cognitive Neuroscience: Understanding the Mind by Simulating the Brain*. Cambridge, MA: MIT Press. ISBN 0-262-65054-1.
24. Palmer, Stephen E. (1999). *Vision Science: Photons to Phenomenology*. Cambridge, MA: MIT Press. ISBN 0-262-16183-4.
25. Posner, Michael I. (Ed.) (1989). *Foundations of Cognitive Science*. Cambridge, MA: MIT Press. ISBN 0-262-66086-5.
26. Russell, Bertrand (1946). *History of Western Philosophy*. Routledge Classics.
27. Russell, Stuart & Norvig, Peter (2003). *Artificial Intelligence: A Modern Approach* (2<sup>nd</sup> Ed.). Upper Saddle River, NJ: Prentice Hall. ISBN 0-13-080302.
28. Smolensky, Paul & Legendre, Géraldine (2006). *The harmonic mind: From neural computation to optimality-theoretic grammar*. Cambridge, MA: MIT Press. ISBN 0-262-19526-7. [Warning: Very technical, but some chapters are more accessible.]
29. Stillings, N. A., Weisler, S. E., Chase, C. H., Feinstein, M. H., Garfield, J. L., & Rissland, E. L. (1995). *Cognitive Science: An introduction* (2<sup>nd</sup> Ed.). Cambridge, MA: MIT Press. ISBN 0-262-19353-1.
30. Whitney, Paul (1998). *The Psychology of Language*. Boston, MA: Houghton Mifflin Co. ISBN 0-395-75750-9.

Finally, welcome to the course. I hope that you will enjoy the class and learn valuable information and skills. I look forward to seeing you on September 24.

Alex Petrov

Syllabus612-au08.doc, last updated 01 October 2008