

**Cognition  
Psychology 215  
Emory University  
Spring 2008**

**Time and Location**

Tuesdays and Thursdays, 11:30–12:45 PM  
White Hall 205

**Instructor and Teaching Assistant**

Instructor: **Lawrence W. Barsalou**  
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**Overview**

This course aims to provide students with two levels of knowledge about cognitive psychology:

- basic theoretical constructs and established empirical findings
- examples of state-of-the-art research

By mastering the material in this course, you will acquire a basic vocabulary about the constructs of cognition and the methods for measuring them. Because these constructs and methods are often adopted in other sub-fields of psychology (e.g., social, developmental, and clinical), in other disciplines (e.g., neuroscience, computer science, and linguistics), and in numerous applications (e.g., education, industry, and business), learning about them will be useful, and often instrumental, for learning about related areas.

The following perspectives organize presented material:

- cognition can only be understood properly by grounding it in the neural mechanisms that underlie cognitive abilities
- cognition is not detached computation but arises out of the need for embodied agents to function intelligently in situated action

These two themes will permeate most of the material presented in this course.

**Syllabus**

The syllabus can be found on the Blackboard site for the course by going to:

<http://classes.emory.edu/>

Once you have logged onto this site and found Psychology 215, you will find the syllabus under Course Documents.

**Readings**

The reading assignments for the course are listed with the course schedule, with the full references provided in the reference section. All readings are on electronic reserve at Woodruff Library. To access these readings, log onto Euclid, go to Reserves Direct, and look up this course.

Optional readings are also available electronically on Emory's Reserves Direct. Most of these articles are discussed in the lectures. The references for most articles covered in the lectures are listed at the end of each day's lecture notes. Not all of the articles referenced, however, are

on electronic reserve. Only the most central ones are present. Students interested in pursuing lecture material further are encouraged to explore these readings, and the articles cited in them. The instructor and TA will also be glad to suggest additional readings.

Readings must be done by the due date, given that the in-class exercises (described shortly) typically require having read them. If a student hasn't read the relevant reading, and cannot perform the exercise, credit for the exercise will not be given.

### **Take-Home Assignments**

Over the course of the semester, there will be five take-home assignments. The purpose of these assignments is to get you thinking about the course material in creative ways. Each assignment will typically involve a short writing assignment of 2-3 pages, along with other activities.

As the time for each assignment approaches, it will be discussed in class. Assignments may be turned in to the TA any time prior to the due date, not only on that day. All take-home assignments will be graded on a scale of 1 to 10 points. Assignments will lose 1 point for each additional day turned in late, unless there is a valid and documented reason.

The forms for the assignments will *not* be distributed in class, but must be downloaded from the course's Blackboard site, under Course Documents.

### **In-Class Exercises**

During each of the 26 lectures, we will have an in-class exercise that aims to help students actively understand and relate to the course material. Much research has found that active processing greatly promotes learning, relative to passive memorization. During each exercise, students will write on an in-class exercise sheet to be turned in at the end of class. Often, these exercises will be related to reading assignments and take-home assignments. They will also often draw on individual experience and interests.

Participating in and completing a satisfactory exercise form for 22 or more of the 26 in-class exercises (85% completion) counts for extra credit in the course. Students who successfully meet this criterion will have 5% of the total course points added to their final course points. For example, if a student earned 88% of the regular course points, his or her grade would be raised to 93%. Similarly, if a student earned 79% of the regular course points, his or her grade would be raised to 84%.

It is essential to note the following: Not participating in 22 or more in-class exercises will *not* hurt a student's grade. As described later, final grades will first be computed and assigned based only on the exams and take-home assignments. Once the final grades have been given, all students receiving extra credit will have 5% of the total course points added to their score. If this raises their grade, the higher grade will be given. Students can receive an A based solely on the exams and take-home assignments. Achieving 100% of the course points is possible without doing the in-class exercises. Meeting the extra credit criterion will only raise a student's grade (up to a maximum of 105 percentage points). Failing to meet the extra credit criterion will not lower a grade. Again, however, students are strongly encouraged to perform the in-class exercises, given that they will not only help learn the material, but also help in learning to use it creatively, to see its applications, etc.

In-class exercises will not be graded but will simply be scored as completed or not completed in class. If a student performs an exercise half-heartedly, it will be scored as not completed. On the other hand, if a student makes a serious attempt to complete an exercise but cannot, it will be scored as complete. If you have trouble completing an exercise, please describe the problem you had on the exercise sheet. If you turn in an exercise that we score as incomplete,

and if you disagree, we will be happy to discuss it with you. In-class exercises will not be returned but can be reviewed in the TA's office if desired.

## Lecture Outlines

Each student should download the 26 lecture outlines from the Course Documents section of the Blackboard site for the course, and then print the outlines. Because the outline files are rather large (up to 17 MB each), it is best to download them over a fast connection, such as via a University computer, or a DSL line.

Using PowerPoint's printing and formatting functions, you can place whatever number of slides you want on each page, and then print them out, either in color or black and white. Printing out the larger slides has two advantages: (1) You can see more detail in the slides. (2) You have more space for writing notes, which will be necessary for doing well on the exams. Also, if you print out the slides in color, they will show detail that will be easier to see than in the black and white slides.

Bring the outlines to the lectures, given that they will enhance your ability to follow the lectures and to take notes. Because the outlines contain information that would take much time and energy to copy from class room screen, bringing them to class will make following the lectures much easier.

Importantly, the outlines are *not* complete accounts of the lecture material. Many areas are left blank where notes need to be taken. If you see a blank area, there is material presented that you will be responsible for on exams. *Whenever you see a heading in an outline without material below, view this as a cue for taking notes on the relevant material presented in the lecture.* In general, the outlines contain the following material:

- headings and sub-headings of the material to be covered, so that the organization is clear
- detailed information about research methods
- detailed information about research methods
- detailed information about complex concepts

Typically, the outlines do *not* contain the following material, where notes should be taken:

- the general issues in an area
- the hypotheses that motivated an experiment
- interpretations and implications of experimental results
- other issues associated with an experiment or a research area

Taking notes in these sections will help you organize and interpret the more detailed information that you will be receiving about methods and results. By understanding the high-level points that go in these sections and writing them down, you will greatly enhance what you learn from the course. Exam questions will often draw on the points in these sections, although you are responsible for knowing the general structure of the methods and results as well.

Often, we will start a new lecture on the same day that we end a lecture, so please bring all outlines for class that will be relevant for the current day.

## Audio Recordings of the Lectures

The instructor will take audio recordings of the lectures and place them on Blackboard. Students are also welcome to audio record the lectures.

## Obtaining Missing Notes

If you miss class and thus are not able to take notes, you should obtain them from another student. The instructor and TA will not go over a lecture or provide you with the missing notes. What we will do any time is answer specific questions about parts of a lecture that you do not understand or would like to know more about. We recommend that, at the start of the

course, you find other students whom you can work with to share notes when one of you cannot attend class.

### **Answering Questions About Course Lectures, Readings, Assignments, and Exams**

The instructor and TA will be happy to answer questions after class, during scheduled office hours, and during appointments. However, we will not answer questions about material in the lectures or readings by email. We will answer questions about assignments and exams by email.

### **Cell Phones and Conversation**

Please turn off all cell phones during class, and refrain from conversation and all other activities that create distractions for nearby students. Students who consistently violate this policy will be asked to leave.

### **Exams**

There will be 4 quizzes during regular class meetings. Each of the first 3 quizzes only covers the previous 3 topics and their readings (i.e., the previous 6 lectures). The final quiz covers the previous 4 topics and their readings (i.e., the previous 8 lectures). In other words, the quizzes are *not* cumulative. Each quiz will begin promptly at the beginning of the scheduled class period, and last 30 minutes. A lecture that begins the next topic will follow for the remainder of the period (except following Quiz #4).

Unlike the quizzes, the final *will* be cumulative across all topics, lectures, and readings in the course.

All exams will only contain multiple-choice questions. Questions will *not* be about the names and dates of studies, although names and dates will be given along with other information to help you remember the material. In general, the exams will test major points of understanding rather than picky details.

Each quiz will contain 3 multiple choice questions for each lecture. Thus, the first 3 quizzes will each have 18 multiple choice questions (6 lectures X 3 questions each). The 4<sup>th</sup> quiz will have 24 multiple choice questions (i.e., because it covers 4 topics instead of the usual 3, there will be 3 questions for each of 8 lectures). The final will contain 2 multiple choice questions for each lecture (for a total of 52 questions).

### **Preparing for Exams Effectively**

(1) Take good notes in class. If there are gaps in your notes, fill them with help from other students, or by meeting with the instructor or TA.

(2) Go over the notes thoroughly within a day or two after the class session. If you wait too long, your memory will fade. Make sure you understand *everything*, and that your notes are complete. *Add additional notes that integrate points and add further detail.* At this point in time, you want to be sure that you have a complete set of notes for the lecture that will not need any additions later. Also view this study session as an opportunity to relearn the material and to strengthen it in memory.

(3) One to two weeks before an exam, go over the relevant course notes several times carefully. The last time should be the day before the exam, or perhaps the same day, if there's time, and it's not too tiring. The other two times should be separated from the last day and from each other by at least one day, and perhaps even two or three. Spacing studying in this manner helps memory, and also allows you to study for other exams that you may have.

(4) Learn from previous exams. In particular, students tend to learn a lot from the first quiz. If you do not do well on the first quiz, use the experience to adjust your preparation strategy,

and you are likely to do much better on later exams. Every year, many students adjust after the first quiz and do much better thereafter.

(5) It takes discipline and organization to follow this strategy. Generally, however, students who follow it do very well on exams.

## Make-Up Policies

**In-class exercises.** Because you receive 5% extra credit by completing 22 of the 26 in-class exercises, there are no make-ups for in-class exercises missed due to absence. If you miss an occasional class, for whatever reason, you should still be present often enough to do 22 in-class exercises, thereby receiving extra credit.

If you must miss many classes for a justifiable and documented reason, an alternative means for handling the associated in-class exercises will be arranged. Valid excuses for being allowed to make up in-class exercises include medical illness, family obligation (e.g., a death in the family), extra-curricular activity (e.g., athletic competition), etc. Verification will be required in *every* case, and could be a note from a physician, a medical form, an obituary in a newspaper, etc. No make-ups will be allowed without valid verification. Religious holidays count as a valid excuse, but must be arranged a minimum of 2 weeks in advance.

Please direct all requests and justification for making up in-class exercises to the *TA and not to the instructor*. The TA will make *all* decisions about making up in-class exercises.

**Take-home exercises and quizzes.** If you cannot perform a take home exercise or a quiz on time for a justifiable and documented reason, an arrangement for performing it later will be arranged. Again, valid excuses include medical illness, family obligation, extra-curricular activity, etc. Verification will be required in *every* case, and could be a note from a physician, a medical form, an obituary in a newspaper, etc. No make-ups will be allowed without valid verification. Religious holidays count as a valid excuse, but must be arranged a minimum of 2 weeks in advance.

Please direct all requests and justification for making up a take-home exercise or a quiz to the *instructor and not to the TA*. The instructor will make *all* decisions about making up take-home exercises and quizzes.

**The final.** The final must be taken at the scheduled time unless you have a justifiable and documented reason. Having one other final the same day, two finals the day before, two finals the day after, etc. are not adequate reasons. According to the College Office, having two other finals the same day is a justified reason for taking the in final on a different day. If you have two other finals the same day as this final, please contact the College's Office for Undergraduate Education as described below, and request a make up. They will contact me with a request to change the day of your final, and I will grant it.

**When and where to make up a quiz or the final.** Making up a quiz or the final will be proctored by staff in the Department of Psychology. Arrange a time to make up the exam with the instructor. Then present yourself to the receptionist in the Psychology office, say that you're taking a make up exam for Psychology 215, and the receptionist will handle the quiz from there.

**Making up quizzes or the final without a valid excuse.** If you miss a quiz or the final and do *not* have a valid excuse, you may still take a make-up. The points that you receive for the exam, however, will be reduced by 50%. For example, if you receive 6 of 8 points on a make-up quiz, you will actually only receive 3 points. If you don't make up the exam, you will lose

all points for it. Of course, students with a valid excuse will receive full credit for all the points that they earn on a make-up exam.

**Please note that a strict policy for make up exams is followed in large part out of fairness to students who take exams on time. It would be unfair to allow students without valid excuses to take exams at later times than everyone else.**

**Consulting with the College's Office for Undergraduate Education (OUE).** If you like, you may consult with OUE about making up any course requirement. Note, however, that OUE *cannot require* that the TA or instructor grant a request for making up an in-class exercise, take-home exercise, or quiz. For each of these course requirements, it is the TA or instructor who has the jurisdiction to make the final decision, not OUE. You may still consult OUE, and ask that OUE make a recommendation to the TA or instructor about making up one of these requirements. Again, however, the final decision rests with the TA or instructor.

OUE can only *require* that the instructor allow a make up for the *final*, if OUE determines that the student has a valid excuse (e.g., two other finals the same day). Essentially, you should primarily consult OUE if you request a make-up final from the instructor first (with no point reduction for lack of an adequate excuse), and the instructor does not grant your request. If the instructor grants your request, there is no need to consult OUE.

Here is the contact information for OUE if you would like to consult them about a make-up:  
Office For Undergraduate Education (OUE)  
Emory College Office (White Hall 300)  
(404) 727-6069

### **Students with Disabilities**

Following standard College procedures, students with disabilities may arrange for alternative forms of instruction and testing. Please let the instructor know about the need for making such arrangements at the start of the course.

## **Grading**

### **Take-Home Assignments**

Each take-home assignment will be graded on scale from 0 to 10 points. Assignments will lose 1 point for each additional day turned in late without a valid excuse (see Make-Up Policies). Take home assignments count for 30% of the final grade, such that each assignment counts for 6%.

### **Quizzes**

The quizzes will count for 32% of the final grade, such that each quiz counts for 8%. Please note that the actual number of points on a quiz will not be 8 (i.e., this is the percent of the grade, not the actual number of quiz points). For each of the first 3 quizzes the total number of quiz points will be 18 (i.e., 1 point for each of 18 multiple-choice questions). For the 4<sup>th</sup> quiz, the total number of points will be 24 (i.e., 1 point for each of 24 multiple-choice questions).

### **Final**

The final will count for 38% of the final grade. The total number of points is 52 (i.e., 1 point for each of 52 multiple-choice questions).

### **In-Class Exercises**

Each in-class exercise will receive 1 point if completed, and 0 if not. See the earlier sections on In-class Exercises and Make-Up Policies for details about grading and make ups. Again, students receive extra credit if they successfully complete a minimum of 22 in-class exercises, where extra credit is 5% of the total course points added to the final grade.

## Final Grades

The composition of the final grades will be as follows:

<u>Graded Activity</u>	<u>Points</u>
5 take-home assignments	33.33
4 quizzes	33.33
final	33.33
total	100

Final grades are not determined strictly by absolute levels of performance (e.g., an A is not necessarily 90% of the total points), nor strictly by curve (e.g., an A is not necessarily any student in the top 33% of the class). Typically, both factors are taken into account, depending on the particular group of students taking the course. If many students achieve high levels of performance, absolute grading criteria will dominate grading on the curve, such that more students receive higher grades. If few students achieve high levels of performance, absolute criteria may be relaxed, and grading on the curve may dominate to ensure that a reasonable number of students receive good grades. These are only rules of thumb, with the particular grading policy adopted reflecting the attitudes and abilities of the students taking the course, as well as any other relevant circumstances surrounding it.

**Extra credit.** Students who meet the extra credit criterion—successful completion of 22 more in-class exercises—will have 5 points added to their scaled points for the exams and take-home exercises. If this raises a student's grade, the higher grade will be given.

## Grades on Blackboard

Scores for the take home assignments, quizzes, and final will all be posted on Blackboard's grade book for the course. We will also post the total number of in-class assignments that we've received from you as a running total, *once after each of the four quizzes*. Please note that all these scores will be posted as *raw points*, not as the *scaled points* defined above for how various things are weighted. If you want to know your weighted scores, you can compute them yourself using the weights above.

At the end of the course, once we've computed the final grades, we'll also post the total number of *scaled* course points you received (out of 100), both before and after we apply any benefit of receiving extra credit for the in-class exercises. We will also post the final letter grade that you received for the course. If you turned in 22 or more of the in-class assignments, your letter grade will reflect this.

## Doing Well in the Course

There are two keys for doing well. First, come to class regularly, and turn assignments in on time. Second, take good notes, and study them well. This course is designed around regular student participation. If you come to class regularly, do all your assignments, and study well, you are very likely to receive an A or at least a B in the course. Almost always, students who don't come to class regularly are the ones who do poorly.

## Honor Code

All students are expected to adhere to the Emory Honor Code. Prior to each exam, students will be asked to sign a sheet indicating that they agree to follow the honor code at all points in the exam process. Students suspected of violating the honor code will have their cases sent to the appropriate University committee.

All students are also expected to write the five take-home assignments independently, although discussions beforehand with other students and the instructors are appropriate and desirable.

Similarly, students are encouraged to discuss the in-class exercises when doing so is appropriate for the exercise. However, filling out an in-class exercise sheet for another student will be considered a violation of the Honor Code. Handwriting will be compared between sheets to ensure that this doesn't happen. It is also a violation of the honor code to fill out an in-class exercise form outside of class, unless approved by the instructor or TA.

### **Classroom Procedures When Taking Quizzes**

When arriving in the class room to take a quiz, first take all packs, purses, and other containers to the front of the classroom and leave them there. When you take a seat, there should be no one sitting next to you in the chair on either side. You should have nothing at your seat except the quiz and a pencil or pen. Also, please leave cell phones and headsets in your packs and purses. Use of a cell phone or headset during the quiz will be considered a violation of the Honor Code.

Upon completing a quiz, turn it over on your desk, and *do not pass it in* until requested. When the time for the quiz is over, each row will be asked, one at a time, to pass in the quizzes. You *may not continue working on your* quiz as the quizzes in your row are passed in. Marking of a quiz as it is passed in will be considered a violation of the Honor Code.

During a quiz, you will not be allowed to leave your seat (e.g., to visit the rest room) until all quizzes have been turned in.

Following each quiz, we will take a short break. At this time, please come forward, retrieve your belongings, and return to your seat. The next lecture will follow shortly.

**The instructor and TA sincerely apologize for having to follow this procedure. Please understand, however, that we only do so to ensure that all students take a quiz under equal conditions, and that no one has an unfair advantage on the curve when final grades are given. Our primary aim is to ensure that students who follow the rules do not receive lower grades because of students who don't follow the rules. Our general strategy is to prevent problems from arising in the first place, which is why we follow the above rules.**

### **Classroom Procedures When Taking the Final**

When arriving in the class room to take the final, first take all packs, purses, and other containers to the front of the classroom and leave them there. When you take a seat, there should be no one sitting next to you in the chair on either side. You should have nothing at your seat except the final and a pencil or pen. Also, please leave cell phones and headsets in your packs and purses. Use of a cell phone or headset during the final will be considered a violation of the Honor Code.

Upon completing the final, raise your hand for permission to bring the exam forward. Do not turn in your exam until the instructor or TA has indicated that you should do so. Once you receive permission, please turn in your exam, pick up your belongings, and depart through the front door of the class room. Handing anything to a student as you leave will be considered a violation of the Honor Code.

During the final, you may only leave your seat when you turn in your final. You may not leave your seat to visit the rest room.

**Again, we sincerely apologize for having to follow this procedure, and only do so to ensure that no one has an unfair advantage in the curve when final grades are given.**

**Again, the primary purpose of these rules is to prevent problems from arising in the first place.**

**Psychology Major Breadth Requirement and NBB Elective Requirement**

This course satisfies the Cognition and Development breadth requirement for Psychology majors.  
This course counts as an NBB elective.

**Writing Requirement**

This course does *not* satisfy the Emory College writing requirement.

## Course Schedule

Topic	Date	Sub-topic	Assignment due
<b>1. Introduction</b>			
	Jan. 17	The study of cognition (history and background)	
	Jan. 22	Cognition as embodied and situated	Clark readings (3)
<b>2. Perception and action</b>			
	Jan. 24	Perceptual systems	
	Jan. 29	The motor system	Barsalou et al. article
<b>3. Attention</b>			
	Jan. 31	Selective attention	Brain coloring assignment #1
	Feb. 5	Automaticity	Bargh et al. reading
<b>4. Episodic memory</b>			
	Feb. 7	Memory systems	<b>Quiz on Topics 1-3</b>
	Feb. 12	Memory processes	Loftus reading
<b>5. Working memory</b>			
	Feb. 14	Structure and function	
	Feb. 19	Imagery	Amnesia assignment #2
<b>6. Categorization</b>			
	Feb. 21	The variability problem and categorization models	Biederman reading
	Feb. 26	The neural bases of categories	
<b>7. Concepts and knowledge</b>			
	Feb. 28	Conceptual structure	<b>Quiz on Topics 4-6</b>
	Mar. 4	Conceptual processes	Imagery Assignment #3
<b>8. Construal</b>			
	Mar. 6	Construal in perception	Ramachandran and Hirstein reading
	Spring Break (March 10-14)		
	Mar. 18	Construal in cognition	
<b>9. Language</b>			
	Mar. 20	Properties of language	
	Mar. 25	Language comprehension	Zwaan and Madden reading
<b>10. Thought</b>			
	Mar. 27	Decision making	<b>Quiz on Topics 7-9</b>
	Apr. 1	Reasoning	Newspaper assignment #4
<b>11. Learning and plasticity</b>			
	Apr. 3	Learning in problem solving	
	Apr. 8	Plasticity	Elman et al. reading
<b>12. Social cognition</b>			
	Apr. 10	Emotion, individuals, and the self	
	Apr. 15	Implicit social cognition	
<b>13. Cultural cognition</b>			
	Apr. 17	Cultural universals	Gentner & Levinson readings (2)
	Apr. 22	Cultural divergences	Decision making assignment #5
<b>14. Other</b>			
	Apr. 24	Quiz only, no lecture	<b>Quiz on Topics 10-13</b>
	May 6	Final, Tuesday, 8:30 – 11:00 AM, White Hall 205	<b>Cumulative Final</b>

## Required Readings on Electronic Reserve (in assigned order)

- Clark, A. (1997). *Being there: Putting brain, body, and world together again*. Cambridge, MA: MIT Press. [pp. xi-xiii, and pp. 1-33]  
Includes three separate entries in the reserves:  
Preface: Deep thought meets fluent action (pp. xi-xiii)  
Introduction: A car with a cockroach brain (pp. 1-8)  
Ch. 1: Autonomous agents walking on the moon (pp. 11-33)
- Barsalou, L.W., Niedenthal, P.M., Barbey, A., & Ruppert, J. (2003). Social embodiment. In B. Ross (Ed.), *The Psychology of Learning and Motivation*, Vol. 43 (pp. 43-92). San Diego: Academic Press.
- Bargh, J.A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, 71, 230-244.
- Loftus, E.F. (2003). Make-believe memories. *American Psychologist*, 58, 864-873.
- Biederman, I., & Shiffrar, M.M. (1987). Sexing day-old chicks: A case study and expert systems analysis of a difficult perceptual-learning task. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 13, 640-645.
- Ramachandran, V.S., & Hirstein, W. (1998). The perception of phantom limbs: The D.O. Hebb lecture. *Brain*, 121, 1603-1630.
- Zwaan, R.A., & Madden, C.J. (2005). Embodied sentence comprehension. In D. Pecher and R. Zwaan (Eds.), *Grounding cognition: The role of perception and action in memory, language, and thinking* (pp. 224-245). New York: Cambridge University Press.
- Elman, J.L., Bates, E.A., Johnson, M.H., Karmiloff-Smith, A., Parisi, D., & Plunkett, K. (1996). *Rethinking innateness: A connectionist perspective on development*. Cambridge, MA: MIT Press. [Ch. 1, New perspectives on development, 1-46]
- Gentner, D. & Goldin-Meadow, S. (2003). Whither Whorf. In D. Gentner & S. Goldin-Meadow (Eds.), *Language in mind* (pp. 3-14). Cambridge, MA: MIT Press.
- Levinson, S. (2003). S.C. In D. Gentner & S. Goldin-Meadow (Eds.), *Language and mind: Let's get the issues straight*. *Language in mind* (pp. 25-46). Cambridge, MA: MIT Press.

## Optional Readings on Electronic Reserve

### 1. Introduction

- Beer, R.D., & Chiel, H.J. ((1993). Simulations of locomotion and escape. In R.D. Beer, R.E. Ritzmann, & T. McKenna (Eds.), *Biological neural networks in invertebrate neuroethology and robotics* (267-285). San Diego: Academic Press.
- Clark, A. (1997). *Being there: Putting brain, body, and world together again* (pp. 34-69 optional). Cambridge, MA: MIT Press.
- Lachman, R., Lachman, J.L., & Butterfield, E.C. (1979). *Cognitive psychology and information processing: An introduction* (Ch. 1, Sciences and paradigms, pp. 1-34). Mahway, NJ: Lawrence Erlbaum Associates.
- Lachman, R., Lachman, J.L., & Butterfield, E.C. (1979). *Cognitive psychology and information processing: An introduction* (Ch. 2, Psychology's contribution to the information processing paradigm, pp. 35-59). Mahway, NJ: Lawrence Erlbaum Associates.

Lachman, R., Lachman, J.L., & Butterfield, E.C. (1979). *Cognitive psychology and information processing: An introduction* (Ch. 3, Contributions of other disciplines to information processing psychology, pp. 36-87). Mahway, NJ: Lawrence Erlbaum Associates.

Lachman, R., Lachman, J.L., & Butterfield, E.C. (1979). *Cognitive psychology and information processing: An introduction* (Ch. 4, The information processing paradigm, pp. 88-129). Mahway, NJ: Lawrence Erlbaum Associates.

Trachtman, P. (2000). Redefining robots. *Smithsonian Magazine*, 2 (Feb), 97-112.

## 2. Perception and action

Gazzaniga, M.S., Ivry, R.B., & Mangun, G.R. (1998). Chapter 4. Perception and encoding (pp. 212-162). *Cognitive neuroscience: The biology of the mind*. New York: Norton.

Gazzaniga, M.S., Ivry, R.B., & Mangun, G.R. (1998). Chapter 5. Higher perceptual functions (pp. 163-206). *Cognitive neuroscience: The biology of the mind*. New York: Norton.

Gazzaniga, M.S., Ivry, R.B., & Mangun, G.R. (1998). Chapter 10. Motor control (pp. 371-422). *Cognitive neuroscience: The biology of the mind*. New York: Norton.

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## 3. Attention

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