



Psychology 471

Auditory Cognitive Neuroscience

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Lecture Location: ES 054
Lecture Days/Time: MWF 11:00-11:50

Office: A260
Office Hours: Mondays 2-3

Course Description and Goals

This course will take a multidisciplinary approach to understand the neural systems that contribute to auditory perception, using music and speech as domains of inquiry. We will explore this from an **auditory cognitive neuroscience** perspective. Students will master topics in acoustics, psychophysics, cognitive psychology, neurophysiology, and neuropsychology. Hands-on exercises in sound manipulation and experimentation also will constitute a means of learning about auditory processing. Throughout, the focus will be upon understanding general cognitive and perceptual challenges in perceiving and producing complex sounds like speech and music.

- In this course, we will use music and speech as a means of understanding auditory processing from a neuroscience perspective.
- A primary goal is intellectual synthesis. Strive to organize disparate facts into coherent wholes.
- Learn foundations of acoustics, sound, and auditory processing.
- Think about the broad theoretical questions and about research methods available to address these questions.
- Review the literature, read articles and synthesize the material, thinking critically about scientific information.
- Develop your scientific writing skills.
- Prepare a coherent thesis and argue for it with citations from the scientific literature.

Prerequisites

Psyc 312 – Experimental Design and Quantitative Methods
Psyc 369 – Sensation and Perception

Required Text

Plack, C.J. (2005). *The Sense of Hearing*. Lawrence Erlbaum Associates: Mahwah, New Jersey.

This course is reading intensive. Be prepared to read a number of primary source articles and chapters and to turn in summaries for some of them (see class schedule). A full reference list of course readings will be provided on Blackboard.

Evaluation

Exam 1 (25% of final grade; Oct 12): will cover material from Sept 10 – Oct 10.

Exam 2 (25% of final grade; Nov 23): will cover material from Oct 17 – Nov 21.

Exams will be short answer and essay style questions. Material from lectures, discussions, hands-on exercises, and readings will be covered. No study aids will be permitted during exams.

Written Summaries (20% of final grade - 4% each, to be turned in during class)

As noted on the Class Schedule, you are expected to write a critical summary (approx. one page) of assigned papers (total of 5). Each summary should be titled with the full reference of the paper reviewed. A "critical summary" entails three parts: first, a synopsis of the article which should illustrate both your understanding of the text's salient arguments as well as your ability to summarize these points succinctly and clearly. In general, this should be accomplished in about 1 paragraph. The second part should contain your assessment of the article's weaknesses and strengths and/or its relationship to other articles for the week. Strive to synthesize the "big picture" theoretical questions and relate them to themes in the course. Finally, suggest several questions for discussion. Bullet points are fine for this section; this need not be a thesis, but it should illustrate your understanding of the material. You should keep a "notebook" of these summaries; if you do them well, they will be very helpful in preparing for the exams. (More detailed info below)

Hands-On Exercises (10% of final grade – 5% each, upload to Blackboard using drop box)

Two exercises will be completed when we visit the computer lab (see schedule). They include manipulating sound files and creating acoustic stimuli. The first exercise may require some additional time outside of the class to complete (5% of final grade) and will be due by **noon on Oct 22, 2012**, the second will be completed during class time (5% of final grade) and will be submitted by **noon on Dec 07, 2012**. See schedule below for details. All exercises will be uploaded to Blackboard using the digital drop box. **No late exercises will be accepted.**

Final Review Paper (20% of final grade; due 12/07/12 by 5:00pm; drop in Psych 'Green Box')

At the end of the semester, you will submit a paper reviewing a research topic relevant to the course goals. You may use this as an opportunity to investigate a topic in auditory processing that we have not discussed in class or to investigate more deeply one of the topics of the course; you should follow your own interests. **No late papers will be accepted**

Grading Scale

A+	96-100%	B+	80-84%	C+	67-71%	D+	54-58%
A	90-95%	B	76-79%	C	63-66%	D	50-53%
A-	85-89%	B-	72-75%	C-	59-62%	F	0-49%

As stated in the University Calendar, it is at the instructor's discretion to round off either upward or downward to determine a final grade when the average of term work and final examinations is between two letter grades. **In this course there will be no rounding up of final grades**, especially in light of the opportunities students have to increase their final grade via research participation.

Tentative Lecture Schedule

Week	Date	Topic	Assigned Reading	Other Assignments
1	09/10 09/12 09/14	Course Introduction Methods Overview		
2	09/17 09/19	Music from a Cognitive Neuroscience Perspective	Peretz & Zatorre (2005). Sacks (2006). Zatorre (2005).	Come to class <i>ready to discuss</i> assigned reading (see Reading List document for advice on how to prepare) <i>Prepare Written Summary</i> for Sacks 2006 (see Syllabus for instructions) and turn in at beginning of class.
*	09/21	ROBERT ZATORRE TALK	12:00 Clara Christie theater HSC	<u>Sept 21: Last day to drop a course with no W grade and tuition refund.</u>
3	09/24 09/26 09/28	What is Sound? (Part 1) If a tree falls in the woods...does it make a sound? Describing sound physically Describing sound mathematically Describing sound psychologically Waves The Simplest Sound	Plack, C. J. Chapter 1, 2	Please come to class having read Chapters 1 and 2 of "The Sense of Hearing". <u>Sept 24: Last day for add or swap courses.</u>
4	10/01 10/03	What is Sound? (Part 2 & 3) More Complex Sounds Visualizing Sound Harmonics and Noise Frequency and Amplitude Modulation Production, Propagation & Processing Resonance	Plack, C. J., Chapter 2, 3, 7 Stainsby, T., & Cross, I. (2009) 47-58. Bendor D & Wang X. (2006).	You will probably need to read Chapter 2 again to get a good handle on it...There is a lot of content in this short chapter. Please come to class having read Chapter 3 of "The Sense of Hearing" <u>Prepare Written Summary</u> of Bendor & Wang (see below for instructions) and turn in at beginning of class on 10/03.
5	10/10 10/12	What is Sound? (Part 3) Intro to Music Acoustics Fourier Analysis EXAM 1		
6	10/17 10/19	Hands-on Exercise #1: Making Math "Sing"	Location TBD	<u>Please bring a pair of headphones</u> (ipod style is fine) to class today.

				If needed, work outside of class to complete Hands-on Exercise #1 assignment, due at noon 10/22/12 if not completed during lab time.
7	10/22 10/24 10/26	Music Acoustics	Strong, W. J. & Plitnik, G. R. (1992) Chapter 33 Ross, D. A., Gore, J. C., & Marks, L. E. (2005). Levitin, D. J., & Rogers, S. E. (2005).	Prepare Written Summary of Ross et al. 2005 (see below for instructions) and turn in during class on 10/24. <i>For fun:</i> Take an online test of absolute pitch: http://degrave.net/nblume/perfect-pitch/
8	10/29 10/31 11/02	Voice Acoustics: Speech & Singing	Plack, C. J., Chapter 11,	<i>For fun...</i> Speech to Song Illusion: http://www.acoustics.org/press/156th/deutsch.html
9	11/05 11/07	The Auditory System (Part 1) From Cochlea to Cortex – An Overview	Plack, C. J., Chapter 4.	Download the Auditory System Coloring Book and familiarize yourself with the anatomical terms. Please bring these documents to class.
Reading Days Nov 9 - 12				
10	11/14 11/16	The Auditory System (Part 2) Higher-order Auditory Processing Anatomy Overview Methods Overview	Kaas JH, Hackett TA, & Tramo MJ. (1999). Staeren N, Renvall H, De Martino F, Goebel R, Formisano E. (2009).	Prepare Written Summary of Staeren et al. 2009 (see below for instructions) and turn in during class on 11/14.
11	11/19 11/21	Tutorial #11: Auditory Processing - Sound Objects & Sequences The problem of sound source segregation What counts as an "auditory object"?	Plack, C. J., Chapter 10. Deutsch D. (2007) van Zuijlen TL, et al. (2004)	
	11/23	EXAM 2		
12	11/26 11/28 11/30	Music and Language	Wong PCM, et al. (2007). Chan AS, Ho YC & Cheung MC. (1998). Patel, A. (2009) Racette A, Bard C & Peretz I. (2006). Deutsch, D. et al. (2006). Deutsch, D. (2006). Tervaniemi M, et al. (2006).	Prepare Written Summary of Deutsch et al. 2006 (see below for instructions) and turn in during class on 11/26.
13	12/03 12/05 12/07	Hands-on Exercise #2: Sound Synthesis: Making an Auditory Illusion	Location TBD	Hands-on Exercise #2: assignment, due end of class 12/07/12.

Additional Course Information

Written Summaries

Strive to describe the answers to these questions in very general terms that someone outside the field could understand. Imagine you are writing a *New York Times* science article, for example. Here are some questions to help motivate your discussion:

- What is the paper about?
- What justifies or motivates the present research?
- What is surprising about the results?
- What is the primary hypothesis tested in the experiment(s)? Was it confirmed or disconfirmed?
- How was the hypothesis tested? Using what experimental design? What kind of data was collected? How was it analyzed?
- Which figure provides the strongest evidence for the hypothesis? Be prepared to describe this figure and why it provides support for the authors' claims.
- Are there any serious design flaws or confounds with this study? If you were reviewing this article, would you have any criticisms?
- If the paper is a review paper or a position paper, what stance does the author take? What alternatives might you imagine? Do you think the author supports his/her position well? Why or why not?
- Suggest a way in which this paper relates to other work we have discussed in class or to other research you have read. Are the results consistent with other studies? Do they provide evidence for the primary hypothesis?
- Motivate a hypothesis for a follow-up study based on these results.
- What can this work tell us about auditory cognitive processing more generally? What does it tell us generally about human behavior?

These summaries should be about 1 page, typewritten and printed as a hard copy. Bring them with you to class. Please be sure your name is on the document.

Final Review Paper

You will write a short review paper on a topic of your own choosing related to the course themes.

- Strive to make this a creative synthesis of some topic of research related to auditory processing from a cognitive neuroscience perspective.
- 10-12 double-spaced pages
- Fully referenced with >10 sources
- Structure your paper in the style of a review article (see *Nature Neuroscience Reviews*, *Trends in Cognitive Sciences*, etc)
- Highlight the major points of debate surrounding the issue
- Note the open questions for future research
- Indicate the ways in which questions are being addressed

Hints on Reading Primary-Source Literature

This course is reading-intensive. Nearly all of this reading will draw from primary sources; that is, they will be journal articles that are “first reports” of significant findings. Other readings are chapters and reviews of primary literature. For some of you, this sort of literature will be quite unfamiliar. It can be a bit difficult to make the transition from reading textbooks to reading primary sources. Here are a few tips:

1. Most importantly, read with a notebook handy. Jot down thoughts and questions and bring them to class. We will spend part of each class clearing up questions. Use these to formulate your Written Summaries.
2. Don't worry if you don't understand some of the terminology. Every field has its own vocabulary. By the end of the semester, you will be a pro. As you read, look up terms and brain areas on the internet to get a deeper understanding.
3. Journal articles are written with the intention that the methods described can be replicated. As you read, stop occasionally and be sure that you really understand what the authors are doing in each experiment. Why did they do X and not Y? Why were certain choices made?
4. Be a critical reader. Don't just passively absorb what the author is arguing. Are the authors' conclusions merited? Do the data really suggest what they claim? What are the broader issues that these experiments attempt to address? Do they do so? If you were going to follow up on this work, what might the next experiment be?

There is an extensive, rich scientific literature on each of the weekly topics we will discuss. The papers you are assigned to read were chosen from these literatures to pull together some of the important methods, concepts, theoretical arguments, and empirical data regarding auditory cognitive neuroscience. Consider this in reading these assignments. As you read the papers, try to pull together the ideas they present and consider them as a whole. Do the arguments presented in the articles conflict? Are they complementary? What central issues do they address? How do they relate to the “big picture”? How do the data relate to what we have discussed in other sections?

Reappraisal of Grades

A student who feels that a piece of graded term work (e.g., term paper, essay, test) has been unfairly graded, may have the work re-graded as follows. The student shall discuss the work with the instructor within 15 days of being notified about the mark or of the item's return to the class. If not satisfied, the student shall immediately take the matter to the Head of the department offering the course, who will arrange for a reassessment of the work within the next 15 days. The reappraisal of term work may cause the grade to be raised, lowered, or to remain the same. If the student is not satisfied with the decision and wishes to appeal, the student shall address a letter of appeal to the Dean of the faculty offering the course within 15 days of the unfavourable decision. In the letter, the student must clearly and fully state the decision being appealed, the grounds for appeal, and the remedies being sought, along with any special circumstances that warrant an appeal of the reappraisal. The student should include as much written documentation as possible.

Plagiarism and Other Academic Misconduct

Intellectual honesty is the cornerstone of the development and acquisition of knowledge and requires that the contribution of others be acknowledged. Consequently, plagiarism or cheating on any assignment is regarded as an extremely serious academic offense. Plagiarism involves submitting or presenting work in a course as if it were the student's own work done expressly for that particular course when, in fact, it is not. Students should examine sections of the University Calendar that present a Statement of Intellectual honesty and definitions and penalties associated with Plagiarism/Cheating/Other Academic Misconduct.

Academic Accommodation

It is the student's responsibility to request academic accommodations. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 403-220-8237. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation. You are also required to discuss your needs with your instructor no later than 14 days after the start of this course.

Absence From A Test/Exam

Makeup tests/exams are NOT an option without an official University medical excuse (see the University Calendar). A completed Physician/Counselor Statement will be required to confirm absence from a test/exam for health reasons; the student will be required to pay any cost associated with this Statement. Students who miss a test/exam have 48 hours to contact the instructor and to schedule a makeup test/exam. Students who do not schedule a makeup test/exam with the instructor within this 48-hour period forfeit the right to a makeup test/exam. At the instructor's discretion, a makeup test/exam may differ significantly (in form and/or content) from a regularly scheduled test/exam. Except in extenuating circumstances (documented by an official University medical excuse), a makeup test/exam must be written within 2 weeks of the missed test/exam.

Freedom of Information and Protection of Privacy (FOIP) Act

The FOIP legislation disallows the practice of having student's retrieve tests and assignments from a public place. Therefore, tests and assignments may be returned to students during class/lab, or during office hours, or via the Department Office (Admin 275), or will be made available only for viewing during exam review sessions scheduled by the Department. Tests and assignments will be shredded after one year. Instructors should take care to not link students' names with their grades, UCIDs, or other FOIP-sensitive information.

Course Credits for Research Participation (Max 2% of final grade)

Students in most psychology courses are eligible to participate in Departmentally approved research and earn credits toward their final grades. **A maximum of two credits (2%) per course, including this course, may be applied to the student's final grade. Students earn 0.5% (0.5 credits) for each full 30 minutes of participation.** The demand for timeslots may exceed the supply in a given term. Thus, students are not guaranteed that there will be enough studies available to them to meet their credit requirements. Students should seek studies early in the term and should frequently check for open timeslots. Students can create an account and participate in Departmentally approved research studies at <http://ucalgary.sona-systems.com>. The last day to participate in studies and to assign or reassign earned credits to courses is **Dec 7, 2012**

Evacuation Assembly Point

In case of an emergency evacuation during class, students must gather at the designated assembly point nearest to the classroom. The list of assembly points is found at <http://www.ucalgary.ca/emergencyplan/assemblypoints>
Please check this website and note the nearest assembly point for this course.

Student Organizations

Psychology students may wish to join the Psychology Undergraduate Students' Association (PSYCHS). They are located in Administration 170 and may be contacted at 403-220-5567.

Student Union VP Academic: Phone: 403-220-3911 suvpaca@ucalgary.ca

Student Union Faculty Rep.: Phone: 403-220-3913 socialscirep@su.ucalgary.ca

Important Dates

The last day to drop this course with no "W" notation and **still receive a tuition fee refund** is **September 21, 2012**. Last day for registration/change of registration is **September 24, 2012**. The last day to withdraw from this course is **December 7, 2012**.