

SPRING 2022

01:185:413:01 Advanced Topics in CogSci: Cognitive Neuroscience

The Cognitive Neuroscience of Sound

Class: Monday/Thursday 12:10 PM – 1:30 PM
SEC 217

Index Number: 07389

Instructor: Mimi Phan, PhD

Office Hours: By arrangement via zoom/google meet.

Email contact: mphan@scarletmail.rutgers.edu

Mask Mandate In order to protect the health and well-being of all members of the University community, masks must be worn by all persons on campus when in the presence of others (within six feet) and in buildings in non-private enclosed settings (e.g., common workspaces, workstations, meeting rooms, classrooms, etc.). Masks must be worn during class meetings; any student not wearing a mask will be asked to leave.

Masks should conform to CDC guidelines and should completely cover the nose and mouth:
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-facecoverings.html>

Each day before you arrive on campus or leave your residence hall, you must complete the brief survey on the My Campus Pass symptom checker self-screening app (<https://coronavirus.rutgers.edu/symptom-checker/>)

Overview A simple sound - air-pressure waves striking our eardrums - conveys a lot of information that our brain readily, easily, and effortlessly transform into a percept that we can remember, identify, and assign a value to. This course is an exploration of how sound is processed in the brain, providing an introduction to the stages of information processing from the ears to auditory cortex and beyond. Methods of data acquisition (e.g., fMRI, electrophysiology, psychoacoustics) are introduced along with their advantages and pitfalls. Sound and auditory perception are discussed, starting with the basic properties such as frequency, loudness, pitch, and timbre, progressing to human speech and music. We will explore what parts of the brain are necessary and sufficient to understand spoken, seen, or imagined words, jam to music, or recognize even your friend's voice. We will investigate how our brain processes the perceptual constancies of sound despite variations in acoustic features (e.g., your roommate's voice here, there, and everywhere throughout last semester). We will touch upon how congenital or acquired diseases (deafness, aphasia, dyslexia, and amusia) alter the underlying molecular substrates and neural circuitry of sound perception and coding. The class format will be mixed (enrollment size determined): lectures, journal-club-like presentation of papers, and group oral and written presentations.

Students are expected to have a basic understanding of psychobiology and topics covered in general psychology before taking this class.

Learning Objectives The objective of this course is to provide a thorough introduction to the biological and psychological study of sound, and the computational and neural mechanisms that underlie its sensation and perception. After participation in the course, the students will have developed a familiarity and appreciation of the behavioral and neuronal dynamics associated with the cognitive neuroscience of sound.

Required book Schnupp, Nelken, and King (2012). *Auditory Neuroscience - Making Sense of Sound*. Cambridge: MIT Press. Also see the **associated web site**: <http://auditoryneuroscience.com/>

Online text for borrowing here:

<https://ebookcentral-proquest-com.proxy.libraries.rutgers.edu/lib/rutgers-ebooks/detail.action?pq-origsite=primo&docID=3339190>

Technology/Software Requirements

Software:

Rutgers Box account: (<https://box.rutgers.edu/>)

Rutgers Zoom Account: (<https://it.rutgers.edu/zoom/>)

Technology:

Computer: Laptop or desktop computer. A tablet may be used in some cases.

Internet Connectivity: Preferably a high-speed connection. You may also use a wireless hotspot through your mobile provider.

Microphone (optional): This may be built into your device, but an external microphone or headset will provide better sound.

Webcam (optional): Many computers have one built in, but you can easily connect an external USB camera.

Remote Learning Technology/Software Requirements (Week of 1/17/2022 and 1/24/2022)

Learning remotely presents new challenges. For assistance with learning how to address these challenges, please consult the resources available here: https://rlc.rutgers.edu/remote_instruction

Please visit the [Rutgers Student Tech Guide](#) page for resources available to all students. If you do not have the appropriate technology for financial reasons, please email Dean of Students deanofstudents@echo.rutgers.edu for assistance. If you are facing other financial hardships, please visit the Office of Financial Aid at <https://financialaid.rutgers.edu/>.

The Division of Student Affairs Diversity & Inclusion Statement

Excerpted (<http://inclusion.rutgers.edu/>):

“The Division of Student Affairs works to create an environment of inclusion which respects and affirms the inherent dignity, value, and uniqueness of all individuals, communities and perspectives. Our practices reflect awareness and understanding of the complexity of identity and the increasing interconnectedness of our world. It is our responsibility to promote and maintain a community of compassion, embracing the rich dimensions of diversity, and facilitating opportunities for understanding and the expression of both individual and shared truths.”

In other words, We understand that our members represent a rich variety of backgrounds and perspectives. The Psychology Department is committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value each other’s opinions and communicate in a respectful manner
- use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the Rutgers U. community

Course requirements

There will be weekly quizzes/blogs on the first day of class of each week (typically on Mondays). Each quiz will cover the material from the previous week or based on the additional readings from the primary scientific literature. Each student will give an individual journal club presentation. In addition, each student must complete a final group presentation and a final report on the presentation. No provision will be made to “make-up” missed quizzes and final presentations. There will be no mid-term or final exams.

Weekly quizzes/Blogs

Either the first or last 10-15 minutes of the first class of each week, there will be a multiple-choice / brief answer quiz on the material covered in the previous week or based on additional readings from the primary scientific literature. This quiz/blog will be closed book. Anyone who is not present for the quiz will receive a zero

(no exceptions). The lowest 2 (of a planned 10) quiz grades will be automatically dropped and the remaining grades averaged to determine the final weekly quiz grade.

Journal Article Presentations

The ability to read, understand, interpret, synthesize, and present the scientific literature is important for both scholar and layman. Throughout your academic career and beyond, you will be expected to read and interpret journal articles/data/reports, and summarize their content for colleagues and collaborators, in presentations, proposals, and publications. Students will be required to give an oral presentation of a scientific journal article. The presentation should be 30 mins long and include at least 5-10 PowerPoint slides. This may include a title slide, outline slide, and questions slide. The journal article topic will either supplement lectures or be related to the student's group project.

Final presentations and Written Report

Each student must participate in a final project that culminates in an oral presentation to the class on the final few meeting days of the semester. Each group must be 3-4 students. Each group must select a topic, either from the suggestions listed below, or of their own choosing (in consultation with the instructor). Groups are responsible for researching this topic on their own throughout the semester, developing a reading list covering the topic, creating an outline of the final presentation, and then presenting their material to the class (see handout for due dates for each). Grading of the final presentations will be determined by the instructor, the average peer grade assigned by classmates, and individual contributions to the group.

A written report is also part of the evaluation. Reports should be typed, single-spaced, using 12 point Times New Roman font with 1 1/2 -inch margins and no more than 5 pages. Please include a cover page with your paper's title, your name and ID#, my name, the date, and course (this should be the only page of the report showing your name). Every page of the term paper should be numbered at the bottom right-hand corner and have your *student ID# only* in the top right-hand corner. I will give specific guidelines about the structure and format of the paper in a separate handout, but in essence, it will follow your class presentation/lecture.

Grading scale and policy

Final grades will be determined by a weighted average of the following grades:

1. 5% Weekly quizzes/blog
2. 25% Journal Article Presentations

15% your presentation (Rubric will be covered in class)

10% your contribution to the discussion and your peer evaluation of the journal article presentation

3. 30% Final report (Rubric will be covered in class)
4. 40% Final presentations: see below for grade breakdown:

Each group will receive a letter grade for the final presentations; however, individual grades will also depend on the contributions of each person to the group effort and peer evaluations.

Group Effort (10%): Specifically, each group participant must allocate points to members of the group to reflect the contributions of that member. Each group member will be given 100 points that they can assign amongst the group members (excluding themselves).

Instructor Evaluations (10%): Points will be tallied in a rubric (created by me) that will outline all the essential components of an effective presentation (i.e., for effective communication of your content) like speaking style, slide organization, slide appearance, pace, use of technology (like laser pointers, slide animations, etc.) in addition to the content of your talk. Part of this assessment will be based on the timeliness of adherence to deadlines (see schedule).

Peer Evaluations (15%): The peer evaluation will be anonymous and determined from the total number of points allocated to you by 3 of your classmates (randomly selected). Points will be tallied in a rubric (created by me) that will outline all the essential components of an effective presentation (i.e., for effective communication of your content) like speaking style, slide organization, slide appearance, pace, use of technology (like laser pointers, slide animations, etc.) in addition to the content of your talk. I will review each and every peer evaluation to verify that all assessments are fair and balanced. (5%) – your own participation in providing the peer evaluation.

Grade Conversion

The following scale and its numerical equivalents to letter grades:

90% or above	A
85- 89%	B+
80- 84%	B
75- 79%	C+
70- 74%	C
60-69%	D
Below 60%	F

Current Academic Integrity Policy and Honor Pledge:

Overview: Rutgers University takes academic dishonesty very seriously. By enrolling in this course, you assume responsibility for familiarizing yourself with the Academic Integrity Policy and the possible penalties (including suspension and expulsion) for violating the policy. As per the policy, all suspected violations will be reported to the Office of Student Conduct. Academic dishonesty includes (but is not limited to):

- Cheating
- Plagiarism
- Aiding others in committing a violation or allowing others to use your work
- Failure to cite sources correctly
- Fabrication
- Using another person's ideas or words without attribution—re-using a previous assignment
- Unauthorized collaboration
- Sabotaging another student's work; in doubt, please consult the instructor

Honor pledge: All students will need to sign the Rutgers Honor Pledge on every major exam, assignment, or other assessment as follows:

- *On my honor, I have neither received nor given any unauthorized assistance on this examination (assignment).*

Summary:

<http://nbacademicintegrity.rutgers.edu/home-2/academic-integrity-policy/>

Resources for Students:

<http://nbacademicintegrity.rutgers.edu/home-2/for-students/>

Accommodations for students with disabilities:

In compliance with the Rutgers University policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with the RU Office of Disability Services to verify their eligibility for appropriate accommodations and provide me with appropriate documentation.

<https://ods.rutgers.edu/>

<http://health.rutgers.edu/>

Policy on attendance

Please use COVID common sense if you are feeling unwell. It is expected for students to isolate thanks to covid or other ailments and flexibility will be built in. HOWEVER, students are expected to attend class lectures and final presentations. Failure to attend the final presentation series will negatively affect your grade. In the case of a medical emergency or other extreme circumstances, it is the student's responsibility to **contact another student**, determine what material / announcements they missed, and take appropriate action to catch up, as necessary. It is not the instructor's responsibility to provide make-up materials to the student.

Policy on collaboration

As discussed above, much of the work for the class will be done in groups; in general, cooperation is encouraged. The exception to this rule are the weekly quizzes, which should reflect each student's knowledge and understanding of the course materials.

SCHEDULE OF LECTURES (subject to change)

		Topics	Scheduling notes
week1	1/17/2022	Why Things Sound the Way They Do.	Remote: zoom* link below
week2	1/24/2022	Do We Need to Pay Attention? Part 1	Remote: zoom* link below
week3	1/31/2022	The Ear. Subcortical coding.	weekly quizzes/blog begin
week4	2/07/2022	Periodicity and Pitch Perception: Physics, Psychophysics, and Neural Mechanisms.	project groups & topic requests due
week5	2/14/2022	Hearing Speech. Auditory Scene Analysis.	journal article presentations begin
week6	2/21/2022	Auditory Scene Analysis. / Neural Basis of Sound Localization.	small group meetings
week7	2/28/2022	Development, Learning, and Plasticity.	small group meetings
week8	3/7/2022	Cortical processing; Attention Part 2.	project reading list due
week9	3/14/2022	Spring Break	
week10	3/21/2022	Sound Perception Across the Senses.	
week11	3/28/2022	Sound Perception Across the Animal Kingdom.	Draft presentation due
week12	4/04/2022	Auditory Prostheses: From the Lab to the Clinic and Back Again.	small group meetings
week13	4/11/2022	Final Presentations	
week14	4/18/2022	Final Presentations	
week15	4/25/2022	Final Presentations	
week16	5/02/2022	Monday, May 02,2022 – last day of class Final Reports Due Monday, May 02,2022 at 11:00 PM EST	Catchup/overview

Project Ideas:

Ototoxic drugs
Auditory nerve and brainstem implants
Biosonar
Human echolocation
Vocal learning
Flash-beep illusion
Ventriloquism effect
Sonification
Simulating auditory nerve responses
fMRI data analysis
EEG data analysis
Auditory neural plasticity
Aging
American Sign Language vs Language

Zoom Link:

Topic: 01:185:413:01

Join Zoom Meeting

<https://rutgers.zoom.us/j/99323458903?pwd=REJURUK4bXN2elhmWjBZc0I3cGFkdz09>

Join by SIP

99323458903@zoomcrc.com

Meeting ID: 993 2345 8903

Password: 725947

One tap mobile

+16465588656,,99323458903# US (New York)

+13017158592,,99323458903# US (Washington DC)

Join By Phone

+1 646 558 8656 US (New York)

+1 301 715 8592 US (Washington DC)

+1 312 626 6799 US (Chicago)

+1 669 900 9128 US (San Jose)

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

Meeting ID: 993 2345 8903

Find your local number: <https://rutgers.zoom.us/u/acDuP1LDwz>

Join by Skype for Business

<https://rutgers.zoom.us/skype/99323458903>

If you have any questions, please [contact the Office of Information Technology Help Desk](https://it.rutgers.edu/help-support/)