

To get direct experience of what we're reading about, the course will include a substantial lab component consisting of homework assignments and a major semester project. The project will involve making and analyzing field recordings of the song of the American Robin.

Prerequisites

The only prerequisite for this class is Linguistics 30, Introduction to Language, or the equivalent. A knowledge of high-school algebra is assumed.

Course requirements

Final grades for the course will be calculated as follows:

Attendance and participation	10%
Homework (problem sets and labs)	35%
Exams (three)	30%
Final project	25%

Attendance and participation: Students are supposed to come to class, do the assigned readings on time, and participate in class activities and discussion. Missing classes will make it hard to keep up. It will also lower your participation grade (unless due to illness or other unavoidable events, which it is your responsibility to document).

If you miss a class, it is your responsibility to get missed materials from me or other students. Always check the website if you have been absent.

Students are expected to come to class having done the readings and listened to the assigned audio files.. If I start getting the impression that people aren't doing the readings, I'm going to institute pop quizzes. These are annoying because they waste class time, but coming to class without having done the reading wastes even more class time.

Homework: Homework includes problem sets and labs, of which there will be about 6. You'll get detailed information about each one when it's assigned, but there are some general points that apply to all of them.

When you hand in homework, it can be handwritten, word-processed, or even typed, but it has to be (1) neat, (2) legible, (3) on paper, and (4) well-organized.

Homeworks will be graded as follows:

- 4 points: It's complete, and the answers are correct
- 3 points: It's complete, and the answers are mostly correct, or it's mostly complete, and the answers are correct.
- 2 points: Not a 3 or 4, but at least it's complete.
- 1 point: Not a 4, 3, or 2, but at least you handed something in.

0 points: Anything else.

Exams: There will be two midterms and a final, both in class, both cumulative from the first day of the course.

Final project: To get direct experience of animal-communication research, we will investigate the combinatorial structure of the song of the American Robin (*Turdus migratorius*). Robins are common around Chapel Hill, easy to recognize, and voluble. Their song is complex enough to be interesting but not so complex as to be unmanageable in a semester project. Best of all, hardly anything is known about it. We will formulate a research question, then design, execute, and analyze a field experiment to answer it, and finally present the question and the results to the class. This will take place in several steps, and I'll be giving details as each one comes up.

The Carolina Honor Code is in effect in this class, and I will treat violations seriously. If you haven't read it, it's at <http://instrument.unc.edu>. If you have questions about interpretation, you should bring them to me. **Everything you hand in must be accompanied by a signed statement that you have complied with the requirements of the Honor Code in everything relating to that work**, e.g., "We completed this assignment in full compliance with the Honor Code."

Partnerships

Most of the assigned work in this class will be done with a partner, for a shared grade. There are several reasons for this.

One is purely practical. The final project is going to take more work than one person can reasonably be asked to do, so you will have to work with someone in order to finish the project on time and do a good job. *But*, the final project shouldn't be the first time you and your partner work together. Collaboration on homeworks during the first part of the semester gives you the opportunity to get the bugs out of the partnership.

Another reason is pedagogical. Again and again throughout the semester, each of you is going to find yourself having to explain something to your partner. Both of you will understand it better as a result.

Finally, this is how real research is done! You work with other people, share the ideas, share the labor, spot opportunities or mistakes that the other person overlooked, present the results together, and share the credit (or ignominy). It's none too early to start getting used to this aspect of research culture.

I will be assigning partners, on the basis of questionnaires, to insure that there is a fair distribution of skills and backgrounds among the partnerships. It is your job to insure that there is a fair distribution of work within each partnership. For the final project, this is mandatory: your project proposal must include an account of how you have agreed to divide up the work. Explicit agreements are not required for the homework, but informal ones are a darn good idea.

Partners will work together on the homeworks and the final project, but not on the in-class exams. Partners are jointly responsible for handing in the assignment; that is, if it doesn't show up on time, it counts against both people.

Collaboration and citation

You and your partner are encouraged to discuss assignments with others in the class, but each partnership must write up its assignment independently. If you use any reference materials that aren't officially part of this course, you are required to list them in the write-up. (There's no shame in using them—you're just supposed to give them credit, and let anyone reading your work know where they can find the same information you used.)

Late-assignment policy

As a general rule, *no late assignments will be accepted for credit*. Exceptions may be made if

- (1) You got *advance* permission (by asking me *before* the due date) to hand an assignment in late.
- (2) You couldn't come to campus on the day the assignment is due because of a serious illness or other unexpected emergency. You need to get the assignment in at the earliest possible opportunity with a *written explanation* of the situation. Email is best, because it's fastest.

Again, partners are jointly responsible for getting things in on time, so (1) and (2) are contingent on your partner's also being unable to hand in the assignment.

Equipment and software

You're going to need a computer for this course. You will be installing downloaded software. If this is a problem for you, come see me at once.

Audio equipment: Most assignments (including the "reading" assignments) will involve listening to audio files, either from Blackboard or on the Web. You'll hear better if you have a pair of headphones or earphones. The kind used with portable tape/CD/MP3 players are fine. The headphones will plug into the headphone or speaker jack on your laptop or desktop computer.

To record, you'll need a microphone. For recording humans, I'll issue each partnership with a headset microphone (due back at the end of the semester) which plugs into your computer.. For recording wild animals, we'll be using more sophisticated equipment which students can sign out from the Beasley Multimedia Center.

Speech analysis software: Thanks to the generosity of the Government of the Netherlands, a very nice speech-analysis package called Praat is available free for download from the Institute of Phonetic Sciences in Amsterdam. There are versions for PC, old Mac, new Mac, and Linux. I'll be handing out details on how to download and install it.

A mirror: Once or twice I'll ask you to bring a small mirror to class, for observing your articulators. The best kind is the folding pocket mirror, the kind which has a regular mirror and a magnifying mirror hinged together (so you can see around corners). However, a plain old hand mirror is fine.

Course schedule (approximate)

			Topics of the week	Major events of the week
1	1/11	W	Organization. Overview. Sound. Praat. <i>Johnson 2003: Ch. 1.</i>	Installing Praat.
	1/13	F		
Unit 1: Vocal production				
2	1/18	W	Human vocal production. Source/filter theory. Larynx and glottal wave.	
	1/20	F		
3	1/23	M	Resonance; harmonics vs. formants. Acoustic theory of schwa. Studio recording with Praat. <i>Johnson 2003: Ch. 5.</i>	
	1/25	W		
	1/27	F		
4	1/30	M	Perturbation theory. Supralaryngeal VT anatomy. Vowel space. <i>Denes & Pinson 1993: Ch. 4.</i> <i>Johnson 2003: Ch. 6.</i>	
	2/1	W		
	2/3	F		
5	2/6	M	Primate vocal production: Non-humans, pre-humans. <i>Hauser 1996:175–186.</i> <i>Fitch 2000.</i> <i>Frayser & Nicolay 2000, Boë et al. 2002.</i>	
	2/8	W		
	2/10	F		
6	2/13	M	Avian vocal production. <i>Suthers 1999.</i>	MIDTERM 1
	2/15	W		
	2/17	F		
Unit 2: Combinatorial structure				
7	2/20	M	Levels of structure. Finite-state machines and regular languages. <i>Sipser 1997: Ch. 1.</i> <i>Honda & Okanoya 1999.</i>	
	2/22	W		
	2/24	F		
8	2/27	M	Markov processes. Combinatorial structure of bird vocalizations. <i>Kroodsma 2005:255–267.</i> <i>Hailman et al. 1997.</i> <i>Clucas et al. 2004.</i>	
	3/1	W		
	3/3	F		
9	3/6	M	Combinatorial structure of primate vocalizations. Project plan. <i>Robinson 1979, 1984.</i> <i>Geissmann 2004.</i>	
	3/8	W		
	3/10	F		
10	3/20	M	Human-language syntax. Context-free languages. Field recording. <i>Chomsky 1957: Ch. 2.</i> <i>Culy 1985.</i>	MIDTERM 2
	3/22	W		
	3/24	F		
Unit 3: Semantics and acquisition				
11	3/27	M	Acquisition and innateness; “instinct to learn”. Critical periods. <i>Gallistel et al. 1991, Marler 1999, Newport 2002.</i>	
	3/29	W		
	3/31	F		
12	4/3	M		

	4/5	W	Acquisition of minimal meaningful units. <i>Cheney & Seyfarth 1990:Chapter 4. Cairns 1996:Chapter 5.</i>	
	4/7	F		
13	4/10	M	Acquisition of combinatorial structure. <i>Kroodsmma 2005, Chapter 2. Cairns 1996:Chapter 4.</i>	
	4/12	W		
14	4/17	M	More on combinatorial structure. Statistical learning. <i>Okanoya 2004. Newport et al. 2004. Fitch & Hauser 2004.</i>	
	4/19	W		
	4/21	F		
15	4/24	M	Trained-animal studies. Project results. <i>Savage-Rumbaugh et al. 1993.</i>	
	4/26	W		
	4/28	F		
				FINAL EXAM

Readings

- Boë, L. J., J. L. Heim, K. Honda, and S. Maeda. 2002. The potential Neanderthal vowel space was as large as that of modern humans. *Journal of Phonetics* 30:465–484.
- Cairns, Helen Smith. 1996. Acquisition of language, 2nd ed. PRO-ED Studies in Communicative Disorders.
- Chomsky, Noam. 1957. Syntactic structures. The Hague: Mouton.
- Cheney, Dorothy L., and Robert M. Seyfarth. 1990. How monkeys see the world: inside the mind of another species. Chicago: University of Chicago Press.
- Clucas, Barbara A., Todd M. Freeberg, and Jeffrey R. Lucas. 2004. Chick-a-dee call syntax, social context, and season affect vocal responses of Carolina chickadees (*Poecile carolinensis*). *Behavior, Ecology, and Sociobiology* 57:187–196.
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- Hauser, Marc D. 1996. *The evolution of communication*. Cambridge: MIT Press.
- Honda, E., and K. Okanoya. 1999. Acoustical and syntactical comparisons between songs of the white-backed munia *Lonchura striata* and its domesticated strain, the Bengalese finch *Lonchura striata* var. *domestica*. *Zoological Science* 16:319–326.
- Johnson, Keith. 2003. *Acoustic and auditory phonetics*, 2nd ed. Blackwell.
- Kroodsma, D. 2005. *The singing life of birds*. Houghton Mifflin.
- Lieberman, Philip, and Sheila E. Blumstein. 1988. *Speech physiology, speech perception, and acoustic phonetics*. Cambridge: Cambridge University Press.
- Marler, Peter. 1991. The instinct to learn. In: Susan Carey and Rochel Gelman, *The epigenesis of mind*, 37–66. Hillsdale: Erlbaum.
- Marler, Peter. 1999. On innateness: Are sparrow songs “learned” or “innate”? In: Marc D. Hauser and Mark Konishi (eds.), *The Design of Animal Communication*, 293–318.
- Newport, Elissa L. 2002. Critical periods in language development. In: L. Nadel (ed.), *Encyclopedia of Cognitive Science*, 737–740.
- Newport, Elissa L., Marc D. Hauser, G. Spaepen, and R. N. Aslin. 2004. Learning at a distance: II. Statistical learning of non-adjacent dependencies in a non-human primate. *Cognitive Psychology* 49:85–117.
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