

## Overall Guidelines for a Term Project

Over the course of the semester, each one of you will conduct an original research project relating to some topic in phonetics. We will have you work in groups of three or four for the purposes of reducing the load time on the limited numbers of machines in the lab. Although the research itself will be a group effort, each student is expected to submit his or her own write-up of the experiment. Group members will discuss their results and may share any graphs or tables, but the paper itself should be an independent effort. The reasons for this approach are two fold: 1) having individual write-ups encourages you all to understand what the research is showing - there have been cases in which two of three group members really had no idea what the project was for, and 2) this will give you your own independent record of the project for future reference. One final note about these projects is that they generally yield interesting and novel results and hence can easily form the core (or at least seed) of publishable research.

### Doing the Research:

While doing the research, keep a careful log of what you are doing and why. Do this at every step of the research, including sketching out the topics of interest. This will be invaluable for you later on when you write up the research report. You will be surprised at how much you have forgotten in the space of five or six weeks.

**1) Formulate a research question** relating to a topic in phonetics. Interesting phonetic topics come in many varieties. Here are a few suggestions:

A. Try to figure out some aspect of the acoustic (or articulatory) manifestation of a funny contrast. Note that 'funny' does not preclude familiar.

*Example:* voiced and voiceless stops in English. Varieties of this topic would take into account differences in the manifestation of a contrast in different syllable positions or in different prosodic locations, or examine the effect of focus on a contrast.

B. The topics in A can be applied to the manifestation of a single sound as well.

*Example:* tense mid vowels in English and the manifestation of diphthongization. Note also, you can ask questions as to how such phonetic events vary with respect to factors such as region or social context.

C. Post-lexical phonological rules are often potentially recodified as indirect phonetic effects of rate, stress, coarticulation with neighboring sounds, or what not. Investigate a phonological rule to see if speakers really behave that way, and see how the rule might be sensitive to various prosodic or pragmatic factors.

*Example:* word-final devoicing in German. One course project back in the late seventies on this topic turned into a research program which is still being pursued today up at SUNY Buffalo.

D. There are a host of questions related to foreign accented speech.

*Example:* how Korean speakers deal with word-final stop contrasts. Or how Japanese speakers deal with rising pitch accents in English.

E. Finally, each of the above questions can be pursued further by asking how speakers express contrasts or apply phonological rules under different prosodic or conversational conditions. It is often the case that what speech looks like varies by such factors, and this variability is the most interesting part.

Topics should be developed in consultation with the instructors (i.e., Prof. de Jong and Yen-Chen) before research is begun. You should also be consulting other previous work on the subject, if available.

**2) Procure appropriate speakers and elicit appropriate speech from them.** During speech you must collect the appropriate records of some aspect of the speech. Usually, this simply involves acoustic recordings in a quiet atmosphere, though articulatory approaches might use other kinds of recording techniques (such as palatography or video-taping).

**3) Analyze the records you have obtained.** Many analyses will make use of spectral analysis software, often the software in the Phonetics Lab. The exact nature of the analysis will depend, of course, on the topic. Things that are relatively straight-forward to measure are durations of events, formant frequencies of vowels and sonorants (except nasals, which present their own sets of problems), and fundamental frequency of sonorants. Other very doable possibilities, such as change in fundamental frequency or the relative timing of various events also can be done quite easily. Think carefully about which factors you want to vary, since adding questions to your research agenda causes phonetic corpora to grow very rapidly. Of course, if you wish to do articulatory work, the analysis technique will be quite different. The important things are that the measurement and analyses are fairly straightforward to do, and provide part of the answer to your original questions.

**4) Compile and make sense of your analyses.** Your data should be presented in some interpretable form, including relevant graphs or tables. In my experience, graphical devices which show relationships between measurements provide the most information. Statistics may be used to give an indication of the reliability of your answer, though at this stage, this is not a major point of concern.

**5) Present your work to the rest of the universe.** A thoughtfully-written description of the project is an under-rated portion of the research. Research is not completed until you are able to tell someone about it. Also, you will find that writing up a project convinces you that you found out something different than you thought you found out.

### **Tips for setting up and running a phonetics experiment.**

**Illustrative suggestions of topics:** Following are examples of topics. Um, the exact topics listed below are actually ones which have been done quite a bit, but extending them to other languages is likely to be novel.

1. Effect of phonemic voicing on vowel duration and obstruent duration in German (or English or...). This is generally an interesting topic, and is especially interesting in German where there is phonemic merger of the voiced and voiceless stops. Another angle on durational studies is to vary speech rate, stress, or focus to see how it affects the contrasts you are investigating.

- pick 3 or 4 minimal pairs; get 4 repetitions from three speakers for a total of 60 tokens. Measure the stop, fricative and vowel durations.

2. Effect of high-vowel devoicing on timing in Japanese.

- pick 2 minimal pairs like /kakusi/ and /kakesi/, get 5 repetitions from three speakers. Then have them focus on the relevant word. Measure the durations of the various parts of the words and when and where devoicing happens and whether it is affected by speaker attention.

3. What is the relevant dimension of contrast corresponding to [ATR] in Twi?

- pick 2 or three minimal pairs for 3 of the five vowels, get 5 repetitions from two or three speakers. Measure the formant values and durations in the various vowels.

4. Effect of speech rate or prosodic position on diphthongization of American vowels.

- pick a subset of vowels, perhaps tense/lax pairs, which may or may not diphthongize. Put them in various prosodic positions and compare formant values from the first half and last half of the vowel, as well as rate of change.

More complicated designs (careful to make them simple):

5. Compare pharyngealized and unpharyngealized vowels in Arabic in two conditions; one condition in which pharyngealization is clear, and one in which you're not sure. What makes this complicated is the number of linguistic conditions which could be compared. Back in the 1980's there was a cottage industry in formulating rules for feature spreading, such as is involved in this case.

6. Compare affricates and fricatives in language X. The relevant measure here would be how quickly the frication turns on. What makes this more complicated is you need to come up with a measure which is not typical in phonetic studies.

Other directions for thought:

7. Do a description of some aspect of an undocumented language; for example, plot out the vowel space.

8. Find out if the fricatives in Korean are really the same as those in English. Use a small number of tokens and measure fricative quality, and/or make palatograms of one or two speakers.

9. Documenting foreign accent. Any topic – probably has not been done.