

**6.542J, 24.966J, HST.712J LABORATORY ON THE PHYSIOLOGY,  
ACOUSTICS, AND PERCEPTION OF SPEECH  
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Kenneth N. Stevens

Joseph S. Perkell

Stefanie Shattuck-Hufnagel

*Possible Term Projects*

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**SOME POSSIBLE TERM PROJECTS**

1. Speech synthesis. Use the speech synthesizer to synthesize the singing voice of a well-known soprano or tenor. Demonstrate by synthesizing a phrase from an aria.
2. Synthesize a spoken phrase (say three words) as produced by two speakers (maybe two females). Then generate various interpolations of synthesis parameters to shift from one speaker to another. Which parameters have the greatest influence on speaker identity?
3. Analyze consonant or consonants that are not used in English but are used in another language. Interpret in terms of articulation features. Examples: nasal vowels in French; trilled /r/; pharyngeal consonants in Hebrew, Arabic; clicks in some African languages; retroflex and palatal fricatives in Mandarin Chinese or in Polish.
4. Acoustic study of vowels produced by American English speakers. Particularly examine the diphthongs.
5. Extend study of the perception of consonants in different noise environments or in presence of reverberation. Interpret in terms of what you know about the acoustics of the sounds and the type of noise.
6. Acoustic study of certain singing styles (e.g., nasal twang of country singers, Chinese opera, Tibetan Lamas, etc.).
7. Extend study of casual speech. For example, is /t/ really deleted in sequences like “list some” or “perfect memory” or “bat man”, or does some trace remain? This could also be studied using the microbeam data from Lab 7.
8. Vowels like /u/, /ʊ/, and /o/ are often modified considerably when they are preceded and/or followed by alveolar consonants (as in the word “suit” or “juice”). Is this effect speaker dependent or language dependent? There is room for some research on this topic.

9. Sequences of /tr/ and /dr/ in American English are frequently affricated, especially (though not exclusively) when they are followed by the vowel /i/. Of interest are two comparisons with these sequences. First, compare the affrication found on these affricated sequences to the affrication on the underlying affricates /č/ and /j/. Second, compare the amount of affrication of /t/ and /d/ when they are followed by a high vowel. Affrication before high vowels is mentioned briefly in the phonetic literature but not discussed in detail. Relevant comparisons can be made among sets of words like: tea, tree, chee(k); and tap, trap, chap. (Suggested by Lisa Lavoie.)
10. Further acoustic studies of children's speech (e.g. 2-4 years age). For example, compare children's production of nasal consonants compared with adults. A database of children's utterances is available.
11. Synthesis of consonant clusters with Hlsyn, illustrating overlap of gestures for the consonants. To what extent can the synthesis be achieved by concatenating parameters for each consonant with proper timing?
12. More detailed study of /h/ in sentences or casual speech. When is it voiced? When is it voiceless? When it appears to be deleted, is it really deleted? (As in I saw his face.)