

**6.542J, 24.966J, HST.712J LABORATORY ON THE PHYSIOLOGY,  
ACOUSTICS, AND PERCEPTION OF SPEECH  
Fall 2001**

Lab 1

09/06/01

**Part 1. Recording Speech in a Sound-Treated Room**

**Reference**

Beranek, L.L. (1954) *Acoustics*, McGraw-Hill, New York, NY, pages 1-15; pages 92-93.

**Procedure**

Recordings will be made of speech materials on the attached pages. Each lab group member will read the list of words and phrases while inside the sound-treated room. One partner will operate the tape recorder and monitor for pronunciation errors or non-fluencies (these items should be repeated immediately if possible, otherwise at the end of the tape session).

While in the room, use the sound level meter to determine the background noise level. Measure using both the C scale (flat frequency response) and the A scale. Compare this level with that in the Speech Group seminar room. For two of the utterances (the *putt* and the *bug*) make a recording with the speaker's lips at several different distances from the microphone: 3", 6", 12", and 3 ft. Measure the peak sound level (C scale) for these words at each of the distances. The speaker should try to say the words with exactly the same level each time. Does the level change with distance in the expected way? Can you explain any differences from the expected change with distance?

The recordings you make will be used in future labs.

## Part 2. Spectral Analysis and Waveform Editing by Computer

The main purpose of this laboratory is to get you familiar with the various speech analysis and editing tools that are available in the Speech Group. You will digitize some of the utterances that you recorded in Part 1, and you will use various analysis methods to examine the sounds.

On the VAX computers, you can log in as LABCOURSE. Each laboratory has a subdirectory in this account, named group1, group2, etc. To get in your subdirectory after logging in, type *set def [.groupx]*. You can create further subdirectories under [.groupx] by typing *cre/dir [.name]*.

**1. Digitizing an utterance** For purposes of this laboratory, you will only need to digitize a few of the utterances that you recorded in Lab 1. Two of these should be the utterances “the supper” and “the shutter”. At one of the VAX terminals, connect the tape recorder output through the line input, amplifier, and low-pass filter to the a/d input. Follow the attached instructions for RECORD. The default sampling rate is 10 kHz, and this sampling rate should be used for male speakers, with the low-pass filter set at 4.8 kHz. For female speakers, use a sampling rate of 13 kHz, with the low-pass filter set at 6.2 kHz. Store the two utterances “the supper” and “the shutter” as two separate files. (They will appear in your directory as *supper.wav* and *shutter.wav*.)

**2. Making a spectrogram of an utterance** Make a spectrogram of each utterance by typing *lspecto supper (CR)*. When the spectrogram is calculated, it will be in the form of a ps file, i.e., *supper.ps*. To print the spectrogram type *lpr/del supper.ps*. (/del simply deletes the ps file when printing is done.) On the spectrogram, measure the durations of the following segments: [s], [f], [ʌ], [p], and [t].

Name

Date

**Materials to be recorded (read the numbers too):**

## A. English vowels

- |    |       |        |    |    |
|----|-------|--------|----|----|
| 1. | beat  | bit    | i  | I  |
| 2. | bait  | bet    | e  | ε  |
| 3. | pot   | but    | α  | Λ  |
| 4. | boat  | bought | o  | ɔ  |
| 5. | put   | boot   | ʊ  | u  |
| 6. | bat   | Bert   | æ  | ɜ̃ |
| 7. | buy   | boy    | ɑɪ | ɔɪ |
| 8. | about |        | ə  | αʊ |

## B. English consonants

- |     |            |             |   |   |
|-----|------------|-------------|---|---|
| 9.  | the putt   | the bug     | p | b |
| 10. | the tug    | the duck    | t | d |
| 11. | the cut    | the gut     | k | g |
| 12. | the mug    | the nut     | m | n |
| 13. | the fuss   | the vanilla | f | v |
| 14. | the thug   | the “the”   | θ | ð |
| 15. | the supper | the shutter | s | ʃ |
| 16. | the rug    | the lug     | r | l |
| 17. | the wonder | the young   | w | y |
| 18. | the chump  | the jump    | č | ǰ |

19. the hut            sung a song    h        ŋ  
 20. the /zə/            the /ʒə/        z        ʒ

## C. Sentences

21. teacher  
 22. He wanted to rebel.  
 23. school  
 24. high school teacher  
 25. He stopped the rebel.  
 26. school teacher  
 27. tall school teacher  
 28. Was he a high school teacher?  
 29. The tall school teacher left early.  
 30. teach  
 31. We live in Cambridge and we study at MIT.  
 32. He won those shoes.

## D. Rainbow passage

**INSTRUCTIONS: Please read the following aloud.**

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for a pot of gold at the end of the rainbow.

## E. Spontaneous speech

Describe in detail the object in the left hand corner of the room (hesitations, ah 's, etc., are normal).

