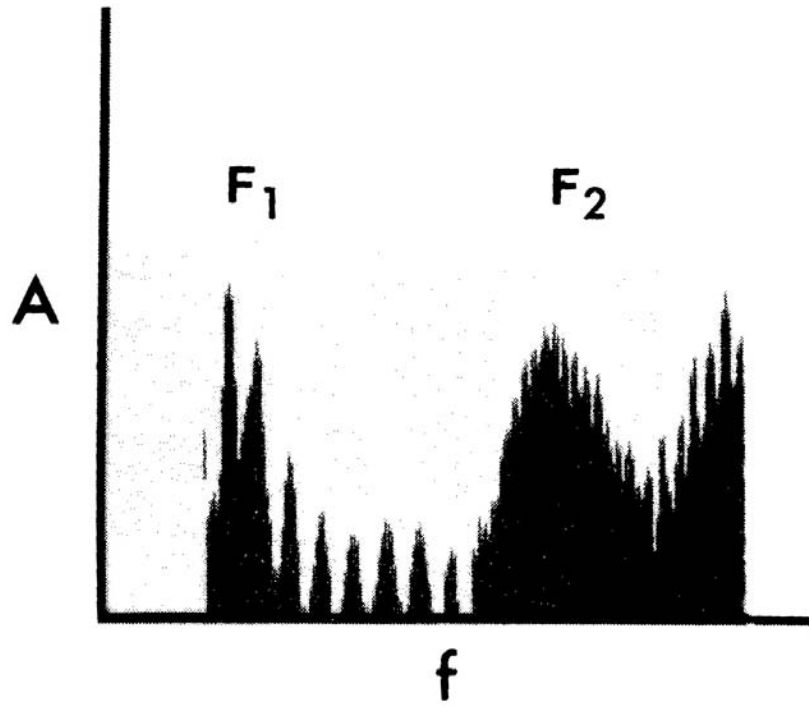


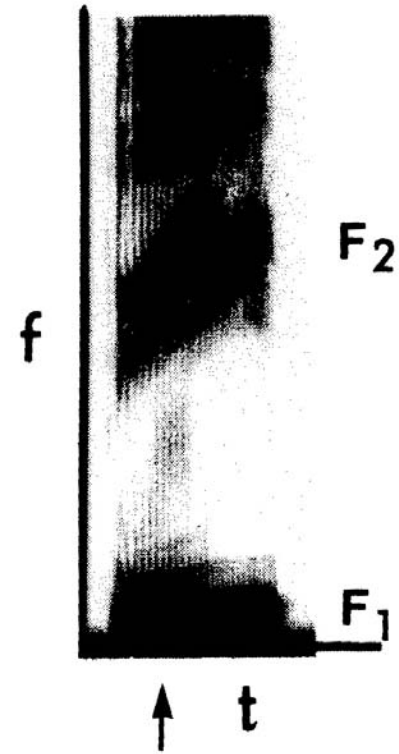
Figure 4-1. The vocal tract; places of articulation: 1 = bilabial, 2 = labiodental, 3 = dental, 4 = alveolar, 5 = palatoalveolar, 6 = palatal, 7 = velar, 8 = uvular, 9 = glottal (from Fromkin & Rodman, 1974).

### SPECTRUM



a section of one moment  
during /i/

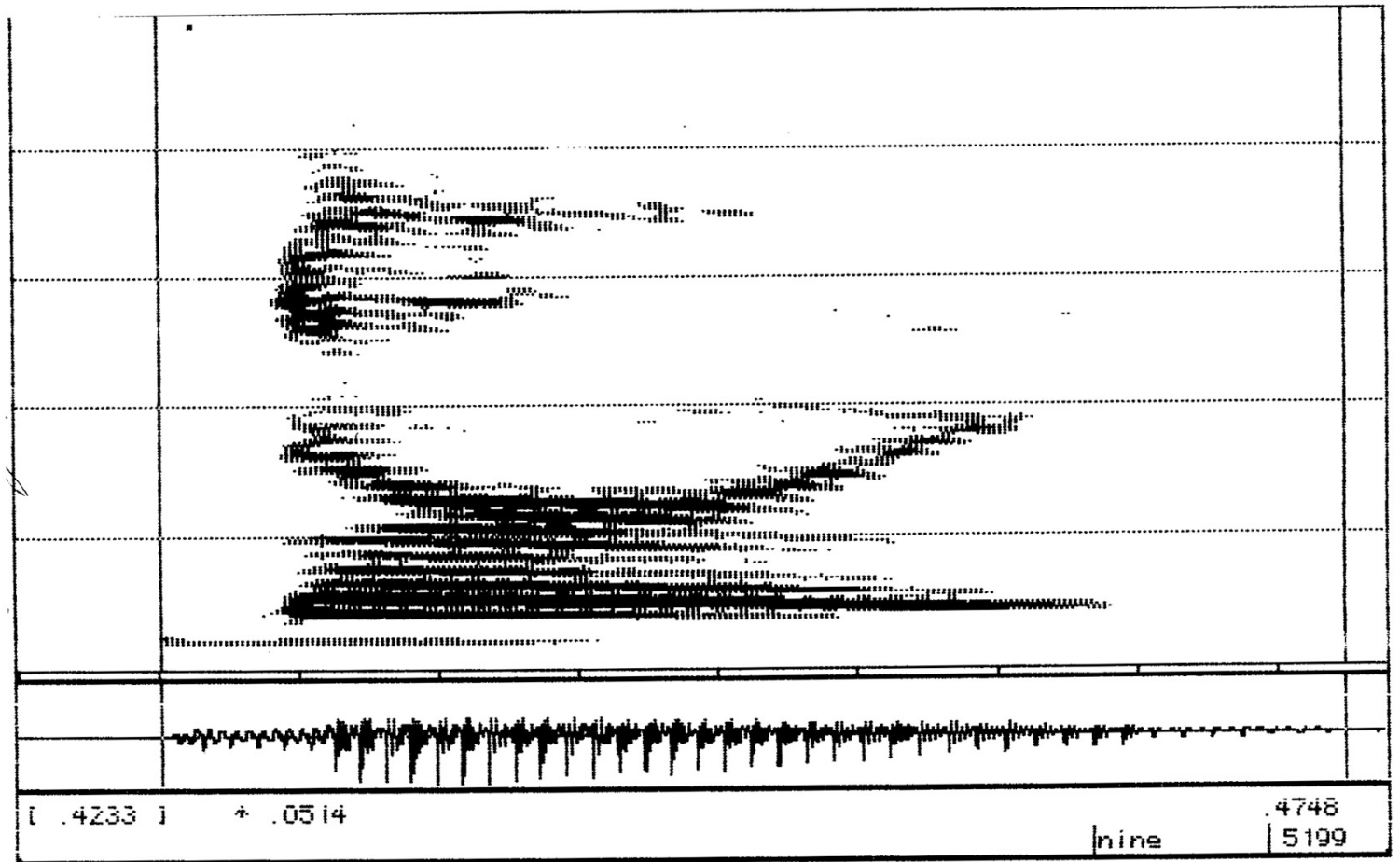
### SPECTROGRAM





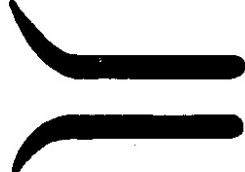






/i/ in the word 'beat'

# Spectrogram of the word "nine"

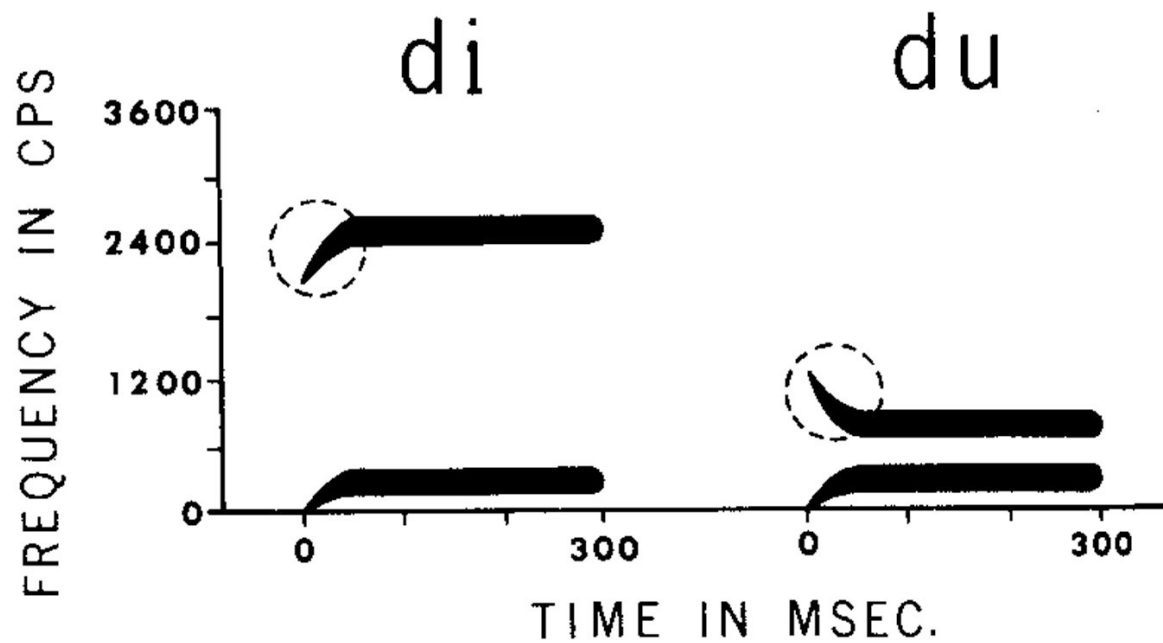
frequency



time

		PLACE OF ARTICULATION		
		FRONTAL	MIDDLE	BACK
MANNER OF ARTICULATION	VOICED STOPS	 <b>ba</b>	 <b>da</b>	 <b>ga</b>
	UNVOICED STOPS	 <b>pa</b>	 <b>ta</b>	 <b>ka</b>
	NASALS	 <b>ma</b>	 <b>na</b>	 <b>ŋa</b>

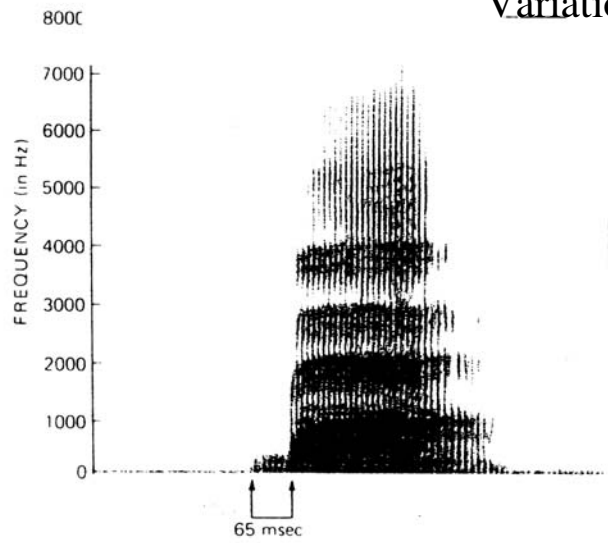
**Figure 5.18.** Summary figure showing synthetic patterns for consonants varying in place and manner of articulation. (Reprinted with permission from A. M. Liberman *et al.*: *Journal of Experimental Psychology*. 52, © 1956, American Psychological Association.)



**Figure 5.31.** Synthetic patterns showing the syllables /di/ and /du/. Notice the difference in the direction of the  $F_2$  transition. (Reprinted with permission from A. M. Liberman: *Cognitive Psychology*. 1, 1970.)

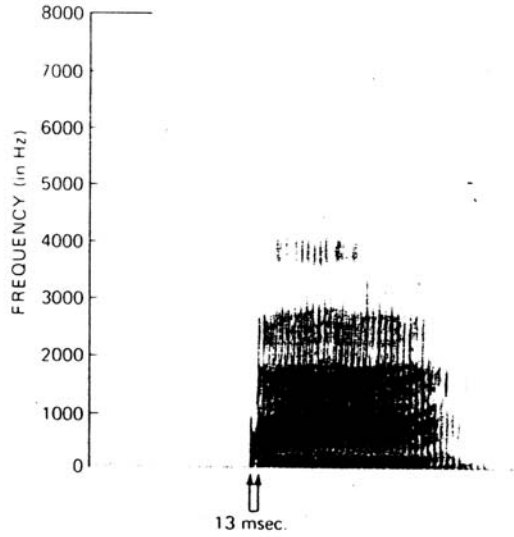
  
 da

# Variations in Voice Onset Time

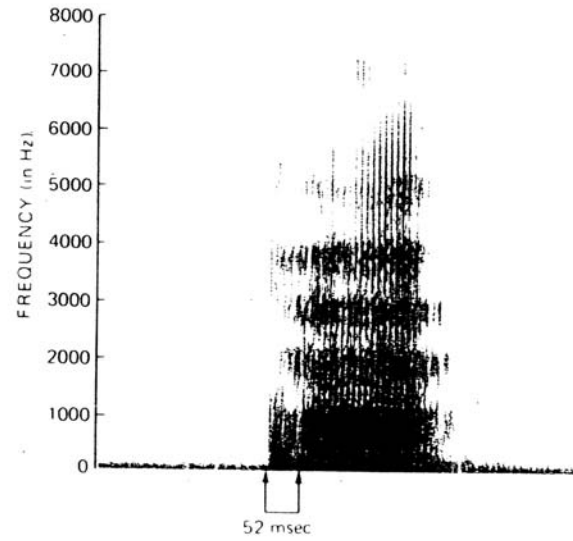


Prevoiced - 65 ms

Figure 3-4A

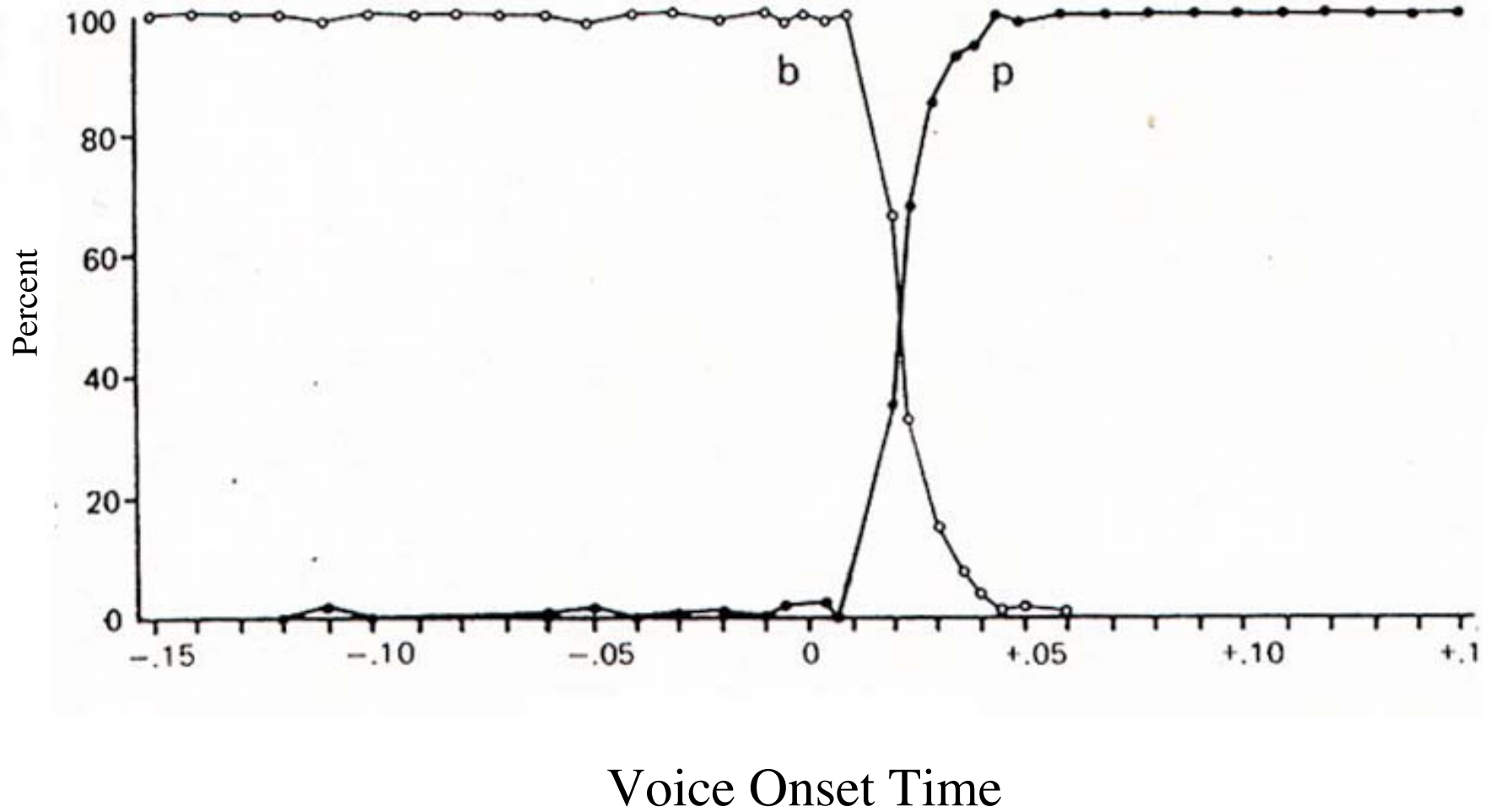


Voiced /di/ - 13 ms

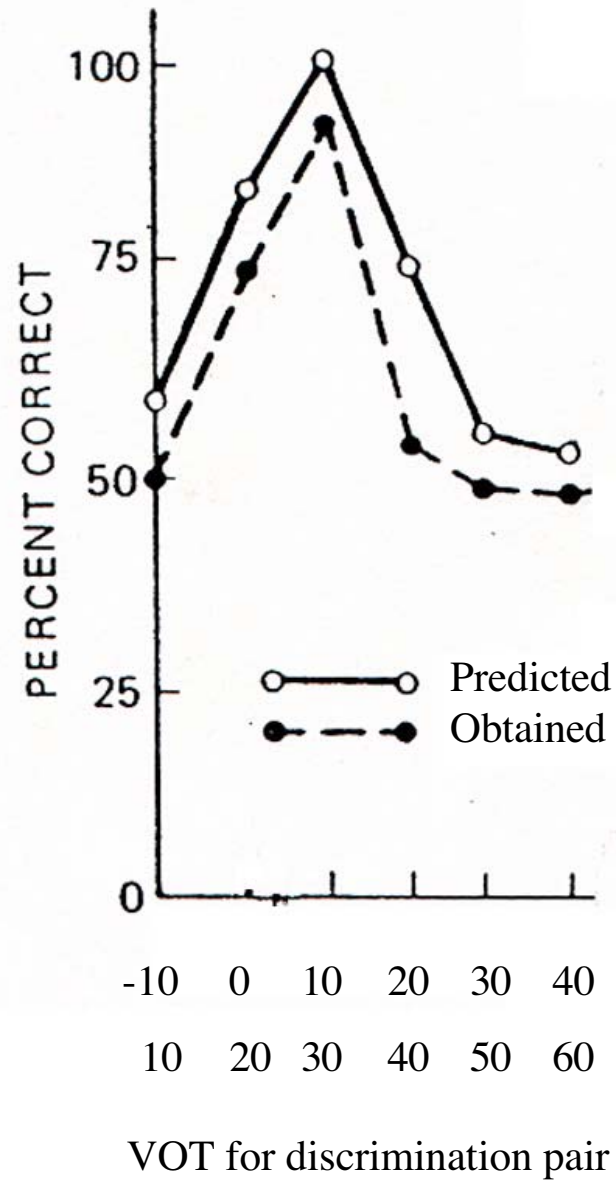


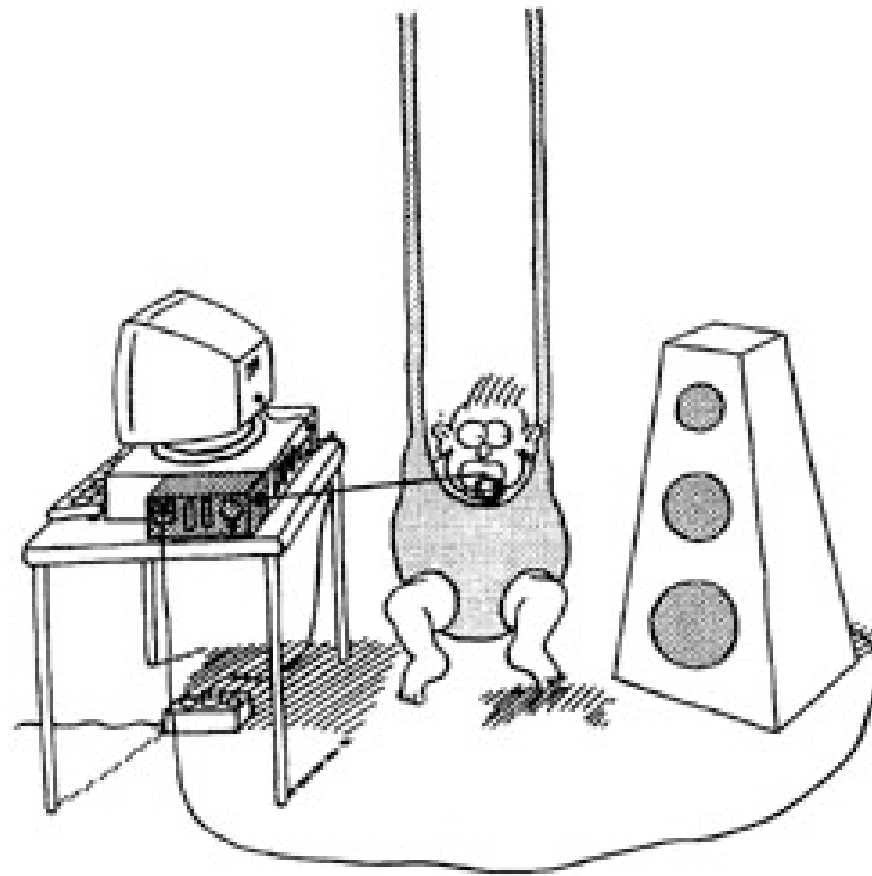
Voiceless /ti/ - 54 ms

# Identification of stimuli varying on voice onset time as ba or pa



## Discrimination of ba-pa stimuli





<http://psych.rice.edu/mmtbn/>

# Can Infants Perceive Speech?

