Excerpts (pp. 359, 360, 363-365) from:
Browman, C. & Goldstein, L. (1990). "*Tiers in articulatory phonology with some implications for casual speech*", in J. Kingston & M. Beckman (eds) Papers in laboratory phonology I, pp. 341-376. Cambridge, CUP.

19.3 Generalizations about casual speech

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Segments are routinely elided, inserted, and substituted for one another. The examples in (5) (taken from Brown 1977) show (a) consonantal deletion, (b) consonant assimilation, and (c) simultaneous deletion and assimilation.

(5)	(a) /**mʌst bi**/	→	[**mʌsbi**]	(“must be”)
	(b) /**hʌndrəd paʊndz**/	→	[**hʌndrəbpaʊndz**]	(“hundred pounds”)
	(c) /**graʊnd prɛʃɚ**/	→	[**graʊmprɛʃɚ**]	(“ground pressure”)

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We propose that most of the phonetic units (gestures) that characterize a word in careful pronunciation will turn out to be observable in connected speech, although they may be altered in magnitude and in their temporal relation to other gestures. In faster, casual speech, we expect gestures to show decreased magnitudes (in both space and time) and to show increasing overlap. We hypothesize that the types of casual speech alternations observed (segment insertions, deletions, assimilations and weakenings) are consequences of these two kinds of variation in the gestural score.

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Example (5a) is described as an example of segment deletion. However, looking at this change in terms of the gestures involved, we hypothesize that the alveolar closure gesture for the /t/ is still present in the fluent speech version, but that it has been completely overlapped, or “hidden,” by the bilabial closure gesture. This means that the movement of the tongue tip towards the alveolar ridge and away again may occur entirely during the time that the lips are closed (or narrowed), so that there will be no local acoustic evidence of the alveolar closure gesture.

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19.3.1.1 EVIDENCE FOR HIDDEN GESTURES

If our analysis of the changes involved in examples like (5) is correct, then it should be possible to find articulatory evidence of the “hidden” alveolar gesture. We examined the AT&T X-ray database (described in section 2) for examples of consonantal assimilations and deletions of this kind, by listening to the sentences with candidate consonant sequences.
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For example, figure 19.13a shows the vertical displacements of lead pellets placed on the velum, tongue dorsum rear, tongue blade, lower lip and lower teeth, along with the acoustic signal, for the utterance “perfect memory,” spoken as a sequence of two words separated by a pause. The phonetic

transcription aligned with the acoustic waveform indicates that the /t/ at the end of “perfect” is completely audible and its release is visible in the waveform. The time-course of the velar closure gesture associated with the /k/ in “perfect” is assumed to be reflected in the vertical displacement of the tongue dorsum (tongue rear) pellet. The relevant portion of this pellet trajectory is underlined in the figure and is labeled with the appropriate gestural symbol. Similarly, the portion of the tongue blade displacement associated with the alveolar closure gesture of the /t/ in “perfect”, and the portion of the lower lip displacement associated with the bilabial closure gesture for the initial /m/ in “memory” have been marked and labelled in the figure. Note that the velar and alveolar gestures partially overlap, indicating that velar closure is not released until the alveolar closure is formed. Thus, the *onset* of the alveolar gesture is acoustically “hidden” (it takes place during the velar closure), but its release is audible. Note the large amount of time between the release of the alveolar gesture and the onset of the bilabial gesture.

Figure 19.13b shows the same two word sequence spoken as part of a sentence. Here, the final/t/ in perfect is deleted in the traditional sense - careful listening reveals no evidence of the /t/, and no /t/ release can be seen in the waveform. However, the alveolar gesture can still be seen quite clearly in the figure. It is even of roughly the same magnitude as in figure 19.13a. What differs here is that the bilabial gesture for the initial /m/ now overlaps the release of the alveolar gesture. Thus, both the closure and release of the alveolar gesture are now overlapped and there is, therefore, no acoustic evidence of its presence.

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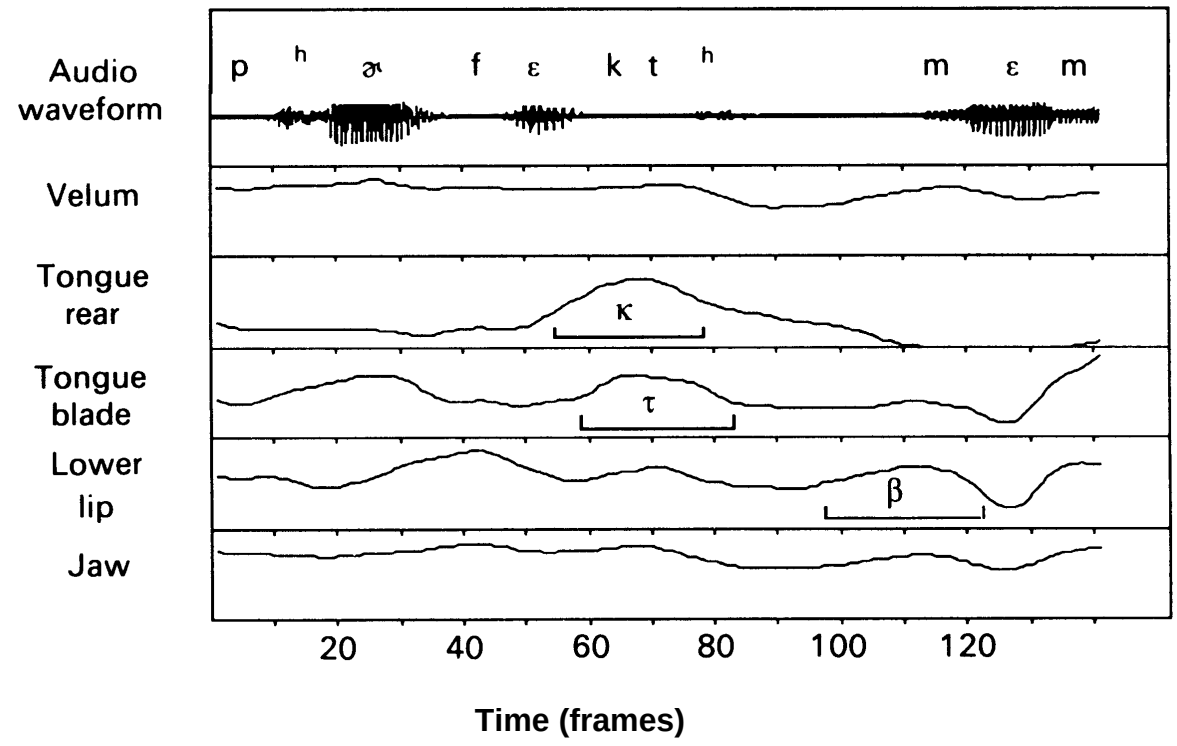
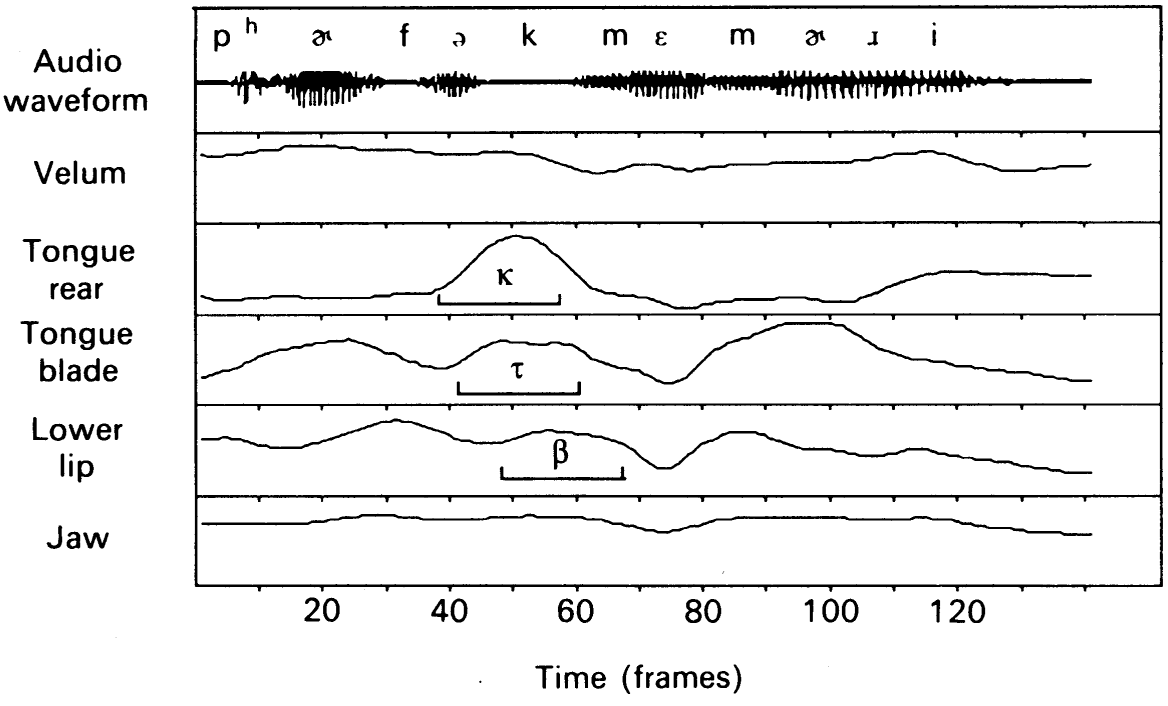
Another example of alveolar stop “deletion” where the alveolar closure gesture remains can be seen in figure 19.14. The same pellet trajectories are shown as in the previous figure. Here, the speaker (the same one shown in the previous figure) is producing the phrase “nabbed most” in a sentence. As indicated by the phonetic transcription, the /d/ at the end of “nabbed” has been deleted. The bilabial gestures associated with the /b/ of “nabbed” and the /m/ of “most” here overlap (forming a continuous closure), and the alveolar closure gesture, while quite robust kinematically, is once again irrelevant acoustically.

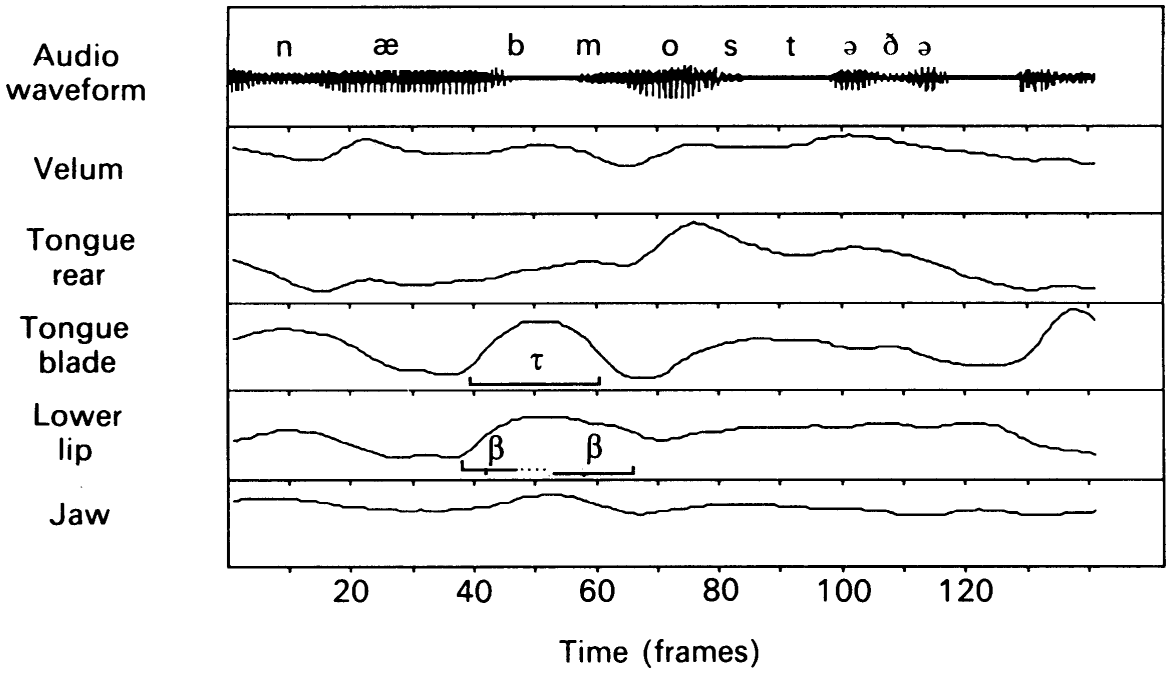


(a)



(b)

Figure 19.13 X-ray pellet trajectories for “perfect memory.” (a) Spoken in a word list ([**pəˑfɛkt# mɛm**...]), (b) spoken in a phrase ([**pəˑfɛkmɛm**...])



(b)

Figure 19.14 X-ray pellet trajectories for “nabbed most” ([**nɑæbmost**]), spoken in a phrase.