Coarticulation

When producing a word like *pan*, we do not first make the [p] and then make the [æ] and then make the [n]. Rather, the articulators overlap in a phenomenon known as *coarticulation*. Figures 2.4 to 2.6 in the book showed how aspiration results from coarticulation. Figure 1 below shows some more complex aspects of coarticulation. Here, some of the articulatory organs involved in the production of the word *pan* are represented. Reading from top to bottom, the actions of the lips, tongue, velum, and larynx are shown. The bold black line in each box represents the state of articulation listed to the right of the box.

![Diagram of coarticulation](image)

**Figure 1** Coarticulation among several articulatory parameters of the word *pan*

**Lips**

The raised line in the upper box indicates that the lips are closed for the articulation of the initial [p] of *pan*. In order to articulate the vowel, the lips are opened—as represented by the change in the position of the line—and they stay open during the articulation of the [n].
Tongue

The tongue body is lowered in anticipation of the low front vowel [æ] during articulation of the word–initial consonant. As the vowel articulation ends, the tongue tip is raised to articulate the final [n] of the word.

Velum

You have seen how nasal consonants are produced with the velum lowered to allow air to pass through the nasal cavities. The raising and lowering of the velum is not always precisely coordinated with other speech production activity. Speakers often anticipate lowering the velum for nasal consonants and, consequently, produce a nasal vowel before a nasal consonant. Many English speakers do this consistently in natural speech when they pronounce words like pan [pʰæn] or bank [bæŋk] (the tilde [~] over the vowel indicates nasality). This is reflected in Figure 1, in which the line representing velic closure changes to the open (lowered) position during the articulation of the vowel, before the tongue tip raises to articulate the word–final [n].

Glottis

You have already seen in Section 5.5 how aspiration results from a delay in voicing after the release of a voiceless stop. Aspiration is shown in Figure 1 by the black line remaining in the voiceless position even after the lips have opened and the vowel articulation is in place.

Consonant coarticulation with vowels

All speech is characterized by the kind of complex coarticulation among the articulatory organs illustrated in Figure 1. Another typical coarticulation phenomenon occurs when we pronounce the sound [k] before the vowel [i] in words such as keys and keel. The [k] we articulate before [i] is pronounced with the back of the tongue so far forward it nearly touches the palate (it is transcribed as [k̪]). It is scarcely a velar articulation at all for many speakers. The [k] we pronounce before the vowels [ɔ] and [ow] in words such as call and cold is articulated further back and is a true velar. These adjustments are made in anticipation of the tongue position that will be needed for the vowel in
question: front for the [i] and back for the [ɔ] and [ow]. The [k] pronounced before the vowel [u] in a word such as *cool* also shows lip rounding in anticipation of the following (back) rounded vowel and is transcribed as [kʰ].

You are now ready to do the exercise on coarticulation.