

less [ʍ] (an “upside-down” w), and in the second word it is voiced [w]. The position of the tongue and the lips for [w] is similar to that for producing the vowel sound in *lute* [lut], but the [w] is a glide because the tongue moves quickly to the vowel that follows.

Phonetic Symbols for American English Consonants

The place and manner properties of speech sounds make it possible to distinguish each consonant sound from all others that occur in American English. Table 6.4 lists the consonants by their phonetic features. The rows stand for manner of articulation and the columns for place of articulation. Symbols for aspirated stops and the glottal stop are not included since this is a minimal list of symbols by which all morphemes and words can be distinguished. Thus the symbol [p] for the voiceless bilabial stop is sufficient to differentiate the word *peat* [pit] from the voiced bilabial stop symbol [b] in *beat* [bit]. If a more detailed phonetic transcription of these words (sometimes referred to as a **narrow** phonetic transcription) is desired, the symbol [p^h] can be used as in [p^hit].

TABLE 6.4 Minimal Set of Phonetic Symbols for American English Consonants

	Bilabial	Labiodental	Interdental	Alveolar	Palatal	Velar	Glottal
Stop (oral)							
voiceless	p			t		k	
voiced	b			d		g	
Nasal (stop)	m			n		ŋ	
Fricative							
voiceless		f	θ	s	ʃ		h ¹
voiced		v	ð	z	ʒ		
Africate							
voiceless					ç		
voiced					ǰ		
Glide							
voiceless	ʍ					ʌ	h ¹
voiced	w ²				j	w ²	
Liquid				l r			

- [h] is sometimes classified as a fricative because of the hissing sound produced by air or noise at the glottis. It is also sometimes classified with the glides because in many languages it combines with other sounds the way that glides do.
- [w] is classified as both a bilabial because it is produced with both lips rounded and as a velar because the back of the tongue is raised toward the velum.

Examples of words in which these sounds (and their phonetic symbols) occur are given in Table 6.5.

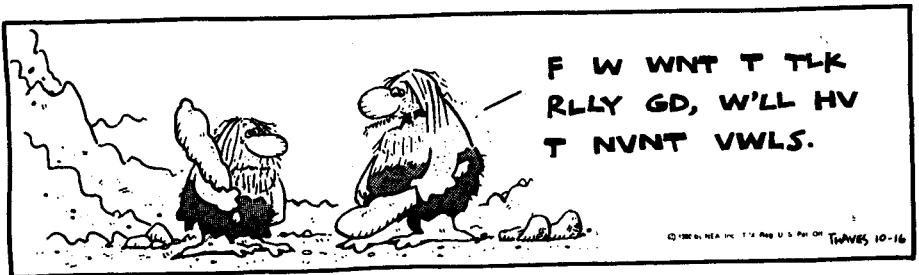
TABLE 6.5 Examples of Consonants in English Words

Bilabial	Labiodental	Interdental	Alveolar	Palatal	Velar	Glottal
[p]ie [b]uy			[t]ie [d]ie		[k]ite [g]uy	
	[f]ie [v]ie	[θ]igh [ð]y	[s]igh [z]ion	me[ʃ]er mea[ʒ]ure		[h]igh
				[ç]ime [j]iant		
[m]y			[n]igh		si[ŋ]	
			[l]ie [r]ye			
[w]hy				[j]ou		

Vowels

- HIGGINS: Tired of listening to sounds?
- PICKERING: Yes. It's a fearful strain. I rather fancied myself because I can pronounce twenty-four distinct vowel sounds, but your hundred and thirty beat me. I can't hear a bit of difference between most of them.
- HIGGINS: Oh, that comes with practice. You hear no difference at first, but you keep on listening and presently you find they're all as different as A from B.

G. B. Shaw, *Pygmalion*



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The quality of a vowel is determined by the particular configuration of the vocal tract in the production of that sound. Different parts of the tongue may be raised or lowered. The lips may be spread or pursed. The passage through which the air travels, however, is never so narrow as to obstruct the free flow of the airstream.

Vowel sounds carry pitch and loudness; you can sing vowels. They may be long or short. Vowels can “stand alone”—they can be produced without any consonants before or after them. You can say the vowels of *beat*, [bit], *bit* [bit], or *boot* [but] for example, without the initial [b] or the final [t].

There have been many different schemes for describing vowel sounds. They may be described by articulatory features, as in classifying consonants. Many beginning students of phonetics find this method more difficult to apply to vowel articulations than to consonant articulations. In producing a [t] you can feel your tongue touch the alveolar ridge. When you make a [p] you can feel your two lips come together, or you can watch your lips move in a mirror. Because vowels are produced without any articulators touching or even coming close together, it is often difficult to figure out just what is happening. One of the authors of this book, at the beginning of her graduate work, almost gave up the idea of becoming a linguist because she could not understand what was meant by “front,” “back,” “high,” and “low” vowels.

These terms do have meaning, though. If you watch an X-ray movie of someone talking, you can see why vowels have traditionally been classified according to three questions:

1. How high is the tongue?
2. What part of the tongue is involved; that is, what part is raised or lowered?
3. What is the position of the lips?

Tongue Position

The three diagrams in Figure 6-4 show that the tongue in the production of the vowels in the words *he* [hi] and *who* [hu] is very high in the mouth; in [hi] it is the front part of the tongue that is raised, and in [hu] it is the back part of the tongue. (Prolong the vowels of these words and try to feel your tongue rise.)

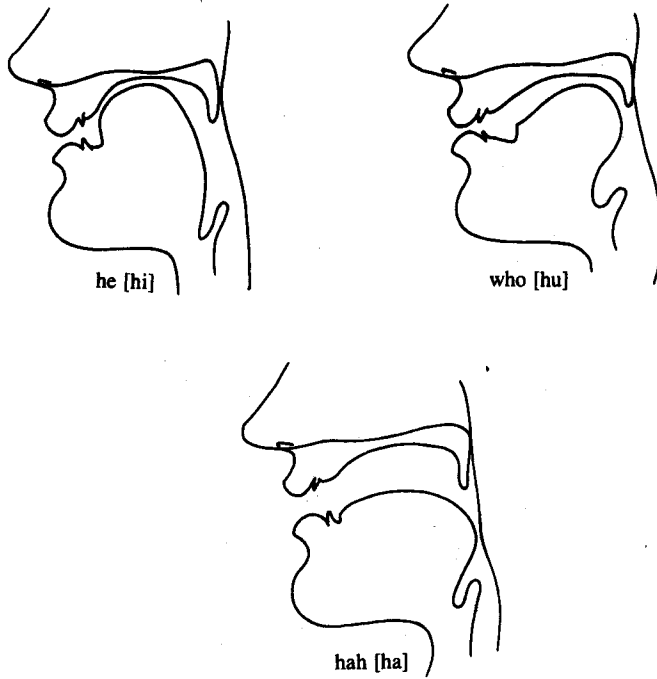
To produce the vowel sound of *hah* [ha], the back of the tongue is lowered. (The reason a doctor examining your throat may ask you to say “ah” is that the tongue is low and easy to see over.) This vowel is therefore a low, back vowel.

The vowels [ɪ] and [ʊ] in the words *hit* [hit] and *put* [put] are similar to those in *he* [hi] and *who* [hu] with slightly lowered tongue positions.

The vowel [æ] in *hat* [hæt] is produced with the front part of the tongue lowered, similar to the low vowel [a], but with the front rather than the back part of the tongue lowered.

The vowels [e] and [ɒ] in *bait* [bet] and *boat* [bot] are *mid vowels*, produced by raising the tongue to a position midway between the high and low vowels discussed above. [e] and [ɔ] in the words *bet* [bet] and *bore* [bɔr] are also mid vowels, produced with a slightly lower tongue position than [e] and [ɒ].

To produce the vowel [ʌ] in the word *butt* [bʌt] or the *schwa* vowel [ə] which occurs in the second syllable of the words *sofa* [sofə] or *Rosa* [rozə], the tongue is neither high nor low, front nor back. These are lower mid, central vowels as shown in Figure 6-5. The vowels on the chart show the part of the tongue from front to back on the horizontal axis that is involved in the articulation of the vowel, and the height of the tongue on the vertical axis.

FIGURE 6-4 Position of the tongue in producing the vowels in *he*, *who*, and *hah*.

Lip Rounding

Vowels also differ as to whether the lips are rounded. The vowels [u], [ʊ], [o], [ɔ], in *boot*, *put*, *boat*, and *bore* are **rounded vowels** produced with the lips pursed, or rounded, and the back of the tongue at decreasing heights, as shown in Figure 6-5. The low vowel [a] in the words *bar*, *bah*, *aha* is the only English back vowel that occurs without lip rounding. All nonback vowels in English are also unrounded.

This is not true of all languages. French and Swedish, for example, have both front and back rounded vowels. In English, a high back unrounded vowel does not occur, but in Mandarin Chinese, in Japanese, in the Cameroonian language Fe?Fe?, and in many other languages, this vowel is part of the phonetic inventory of sounds. There is a Chinese word meaning “four” with an initial [s] followed by a vowel similar to the one in *boot* but with nonrounded spread lips. This Chinese word is distinguished from the word meaning “speed” pronounced like the English word *sue* with a high back rounded vowel.

Diphthongs

Many languages, including English, have vowels called **diphthongs** that can also be described as a sequence of two sounds, vowel + glide. The vowels we have studied so

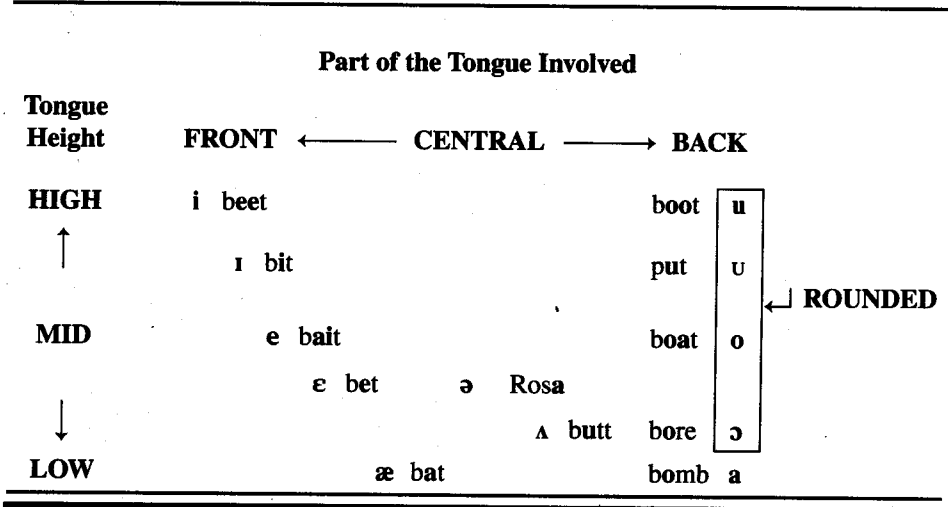
far are all simple vowels called **monophthongs**. The vowel sounds in the words *bite* [bajt] and *rye* [raj] are produced with the [a] vowel sound of *father* followed by the [j] glide, resulting in [aj]. The vowels in *bout* [bawt], *brow* [braw], and *hour* [awr] are produced by some speakers of English with a similar [a] sound followed by the glide [w], [aw]. Some speakers of English produce this diphthong as [æw], with the front low unrounded vowel instead of the back vowel. The third diphthong that occurs in English is the vowel sound in *boy* [bɔj] and *soil* [sɔjl] which is the vowel that occurs in *bore* (without the [r]) followed by the palatal glide [j], [ɔj].

Nasalization of Vowels

Vowels, like consonants, can be produced with a raised velum that prevents the air from escaping through the nose, or with a lowered velum that permits air to pass through the nasal passage. When the nasal passage is blocked, **oral** vowels are produced; when the nasal passage is open, **nasal** or **nasalized** vowels are produced. In English, nasal vowels occur before nasal consonants in the same syllable, and oral vowels occur before oral consonants.⁴

The words *bean*, *bin*, *bane*, *been*, *ban*, *boon*, *bun*, *bone*, *beam*, *bam*, *boom*, *bing*, *bang*, and *bong* are examples of words that contain nasalized vowels. To show the nasalization of a vowel in a phonetic transcription, a **diacritic mark** [̃] is placed over the vowel, as in *bean* [bīn] and *bone* [bōn]. In English, these would only be necessary for a highly detailed transcription, sometimes referred to as a narrow phonetic transcription.

FIGURE 6-5 Classification of American English vowels



⁴ In fast colloquial speech some speakers drop the nasal consonant when it occurs before voiceless stops such as in *hint* or *camp*, leaving just the nasal vowel, but the words originate with nasal consonants.

In languages like French, Polish, and Portuguese, nasalized vowels may occur when no nasal consonant is adjacent. In French for example, the word meaning “year” is *an* [ã] and the word for “sound” is *son* [sõ]. The *n* in the spelling is not pronounced but indicates in these words that the vowels are nasalized.

Tense and Lax Vowels

Figure 6-5 shows that the vowel [i] is produced with a slightly higher tongue position than [ɪ]. This is also true for [e] and [ɛ], [u] and [ʊ], and [o] and [ɔ]. The first vowel in each pair is often produced with greater tension of the tongue muscles than their counterparts and are often somewhat longer in duration. These vowels can be distinguished from the shorter and less tense vowels by the phonetic features **tense** and **lax** as shown in the following:

Long (Tense)		Short (Lax)	
i	beat	ɪ	bit
e	bait	ɛ	bet
u	boot	ʊ	put
o	boat	ɔ	bore

Some speakers of English may diphthongize the tense vowels slightly. For these speakers, the tense front vowels are followed by a short [j] glide [ij], [ej], and the tense back vowels by a short [w] glide [uw] and [ow]. These are sometimes written as [iʲ], [eʲ], [uʷ], and [oʷ].

In some languages there are vowels and/or consonants that differ phonetically from each other only by duration, or **length**. That is, neither height of the tongue nor tenseness distinguishes the vowel from its counterpart in pairs of words that contrast in meaning. It is customary to transcribe this difference either by doubling the symbol or by the use of a diacritic “colon” after the segment, as for example [aa] or [a:], [bb] or [b:].⁵ As we noted above, the English tense vowels not only differ in length from their lax counterparts but differ qualitatively in tongue height. We are therefore using different symbols to distinguish them.

Dialect Differences

As already mentioned, but perhaps worth repeating because of the many dialects of English, the vowels in Figure 6-5 do not represent all the vowels of all dialects of English. One particular dialect spoken in England called British RP or Received Pronunciation (as the dialect spoken by the upper classes and “received” in court) has a low rounded back vowel in the word *hot* that does not occur in American English dialects and that contrasts with the unrounded low back vowel [a] in *bah*. The long tense vowels in British RP are all diphthongs. Thus the vowel in *bay* is [ej] and the vowel in *bow* is [ow], as is true for some dialects of American English. These are just a few examples of dialect differences that occur primarily in the pronunciation of vowels.

⁵ Long or doubled segments may be referred to as **geminate**.

Major Classes

All the classes of sounds described above combine to form larger, more general classes that are important in the patterning of sounds in the world's languages.

Noncontinuants and Continuants

As mentioned above, stop sounds are **noncontinuants**. They are produced with total obstruction of the airstream and can be distinguished from all other speech sounds, which are called **continuants**, because the stream of air flows continuously out the mouth. The nasal stops are noncontinuants.

Obstruents and Sonorants

The nonnasal stops, the fricatives, and the affricates form a major class of sounds called **obstruents**. Because the airstream cannot escape through the nose, it is either fully obstructed in its passage through the vocal tract, as in nonnasal stops and affricates, or partially obstructed in the production of fricatives.

Obstruents are distinguished from the major class of sounds called **sonorants**, sounds that are produced with relatively free airflow either through the mouth or nose that thus have greater acoustic energy than their obstruent counterparts. Nasal stops are sonorant because although the air is blocked in the mouth, it continues to resonate and move through the nose. Vowels, the liquids [l] and [r], and the glides [w] and [j] are sonorants because the air resonates without being stopped.

Fricatives are continuant obstruents because although the air is not completely stopped in its passage through the oral cavity, it is obstructed, causing the friction noted above.

Nonnasal stops and affricates are noncontinuant obstruents; there is complete blockage of the air during the production of these sounds. The closure of a stop is released abruptly as opposed to the closure of an affricate, which is released gradually, causing friction.

Consonants and Vowels

As stated above, the sounds of all the languages of the world fall into two major natural classes—consonants and vowels. Consonants include a number of subclasses: stops (including affricates and nasals), fricatives, liquids, and glides. The class of vowels include oral, nasal, front, central, back, high, mid, and low vowels.

Nasals and liquids, for the reasons given above, are sonorants; yet they resemble the obstruents in that the oral cavity is constricted during their articulation. Obstruents, liquids, and nasals form a natural class of consonantal sounds that differ phonetically from the vocalic (or nonconsonantal) class of vowels and glides.

Labials: [p] [b] [m] [f] [v] The class of **labial** consonants includes the class of bilabial sounds—[p] [b] [m]—as well as the labiodentals—[f] and [v]. Bilabial and labial sounds are those articulated with the involvement of the lips.

Coronals: [d] [t] [n] [s] [z] [ʃ] [ʒ] [č] [j] **Coronals** include the alveolars—[d] [t] [n] [s] [z]—the palatals [ʃ] [ʒ]—and the affricates—[č] [j]. These are sounds articulated by raising the tongue blade toward the hard palate.

Anterior: Anterior sounds are consonants produced in the front part of the mouth in front of the palato-alveolar area. They include bilabials, labiodentals, alveolars, and palatals.

Sibilants: [s] [z] [ʃ] [ʒ] [ç] [j] Another class of consonantal sounds is characterized by an acoustic, rather than an articulatory, property of its members. The friction created in the production of the fricatives in the words *sit* [sɪt], *zip* [zɪp], *shoe* [ʃu], *leisure* [liʒər], and *measure* [mɛʒər] and the affricates in the words *church* [çʌrç] and *judge* [ʤʌʤ] causes a “hissing” sound. These sounds are in a class of **sibilants**.

Syllabic Sounds

Traditionally it has been difficult to provide a precise definition of what constitutes a syllable, although speakers seem to be able to determine the syllabic structure of a word. From an auditory point of view, syllables have peaks of sonorance (which are also difficult to define). Every vowel constitutes a single syllable.

Liquids and nasals can be syllabic, as shown by the words *Rachel* [reʃl̩], *friar* [fraɪr̩], *rhythm* [rɪðm̩], and *listen* [lɪsn̩]. (The diacritic under the [l̩], [r̩] and [n̩] show that these sounds are **syllabic**.) Placing a schwa [ə] before the syllabic liquid or nasal also shows that these are separate syllables. This is the transcription we will use.

Prosodic Suprasegmental Features

Speech sounds that are identical as to their place or manner features may differ in duration (length), pitch, or loudness. A vowel can be lengthened by prolonging it. A consonant is made long by maintaining the closure or obstruction for a longer period of time.

When we speak, we also change the **pitch** of our voice. The pitch produced depends on how fast the vocal cords vibrate; the faster they vibrate, the higher the pitch. In physical or acoustic terms, pitch is referred to as the **fundamental frequency** of the sound signal.

We are also able to change the loudness of the sounds and sound sequences. In many languages, some syllables or vowels are produced more loudly with a simultaneous change in pitch (usually higher) and longer duration than other vowels in the word or sentence. They are referred to as **stressed** or **accented** vowels or syllables. For example, the first syllable of *digest*, the noun meaning “summation of articles” or a “journal” is stressed, while in *digest*, the verb meaning “to absorb food,” the second syllable receives greater stress. Stress can be marked in a number of ways: for example, by putting an accent mark over the stressed vowel.

Features like length, pitch, and the complex feature stress are used in various languages to distinguish the meaning of words and sentences. Such features are often referred to as **prosodic** or **suprasegmental** features.

Tone and Intonation

Speakers of all languages vary the pitch of their voices when they talk: The pitch produced depends on how fast the vocal cords vibrate; the faster they vibrate, the higher the pitch.

The way pitch is used linguistically differs from language to language. In English, it doesn't much matter whether you say *cat* with a high pitch or a low pitch. It will still

mean “cat.” But if you say [ba] with a high pitch in Nupe (a language spoken in Nigeria), it will mean “to be sour,” whereas if you say [ba] with a low pitch, it will mean “to count.” Languages that use the pitch of individual vowels or syllables to contrast meanings of words are called **tone languages**.

The majority of the languages in the world are tone languages. There are more than one thousand tone languages in Africa alone; many languages of Asia, such as Chinese, Thai, and Burmese, are tone languages, as are many Native American languages.

Thai is a language that has contrasting pitches or tones. The same string of segmental sounds represented by [naa] will mean different things if one says the sounds with a low pitch, a mid pitch, a high pitch, a falling pitch from high to low, or a rising pitch from low to high. Thai therefore has five linguistic tones.

[naa]	[—]	low tone	“a nickname”
[naa]	[—]	mid tone	“rice paddy”
[naa]	[—]	high tone	“young maternal uncle or aunt”
[naa]	[∩]	falling tone	“face”
[naa]	[∪]	rising tone	“thick”

Diacritics are used to represent distinctive tones in the phonetic transcriptions.

[˘]	L	low tone	
[ˉ]	M	mid tone	
[ˊ]	H	high tone	
[ˆ]	HL	falling tone	(High to Low)
[˜]	LH	rising tone	(Low to High)

We can use these diacritics placed above the vowels to represent the tonal contrasts in any language where the pitch of the vowel is important in conveying meaning as illustrated by the three contrastive tones in Nupe:

[bá]	“be sour”	[bā]	“cut”	[bà]	“count”
H		M		L	

Akan, sometimes called Twi, the major language of Ghana, has two tones, which are shown in these contrasting two-syllable words.

dù	à	[-]	“tail”	dù	á	[-]	“tree”
L	L			L	H		
kɔ̀	tɔ́	[-]	“go buy”	kɔ́	tɔ̀	[-]	“crab”
L	H			H	L		

In some tone languages the pitch of each tone is level; in others, the direction of the pitch (whether it glides from high to low or from low to high) is important. Tones that glide are called **contour tones**; tones that do not are called **level** or **register tones**. The

contour tones of Thai are represented by using a high tone followed by a low tone for a falling glide, and a low followed by a high for a rising tone.

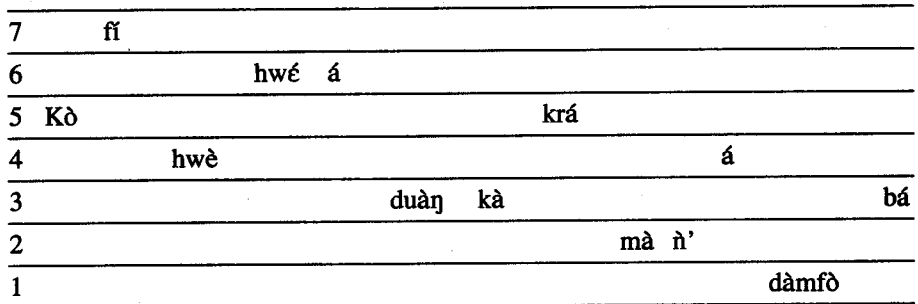
In a tone language, it is not the absolute pitch of the syllables that is important but the relations among the pitches of different syllables. After all, some individual speakers have high-pitched voices, others low-pitched, and others medium-pitched. In many tone languages we find a falling-off of the pitch, a continual downdrifting of the tones.

In the following sentence in Twi, the relative pitch rather than the absolute pitch is important.

“Kofi searches for a little food for his friend’s child.”

Kòfí	hwèhwé	áduàŋ	kàkrá	mà	̀n'	ádàm̀fò	bá
LH	L H	H L	L H	L	L H	L L	H

The actual pitches of these syllables would be rather different from each other, as shown in Figure 6-5 (the higher the number, the higher the pitch):



The lowering of the pitch is called **downdrift**. In languages with downdrift—and many tone languages in Africa are downdrift languages—a high tone that occurs after a low tone, or a low tone after a high tone, is lower in pitch than the preceding similarly marked tone. Notice that the first high tone in the sentence is given the pitch value 7. The next high tone (which occurs after an intervening low tone) is 6; that is, it is lower in pitch than the first high tone.

This example shows that in analyzing tones, just as in analyzing segments, all the physical properties need not be considered; only essential features are important in language—in this case, whether the tone is “high” or “low” in relation to the other pitches, but not the specific pitch of that tone.

Languages that are not tone languages, such as English, are called **intonation** languages. The pitch contour of the utterance varies, but in an intonation language as opposed to a tone language, pitch is not used to distinguish words from each other.

DIACRITICS

In the sections on vowel nasalization, prosodic features, and tone we presented a number of diacritic marks that can be used to modify the basic phonetic symbols. A [~] over