Chapter 6

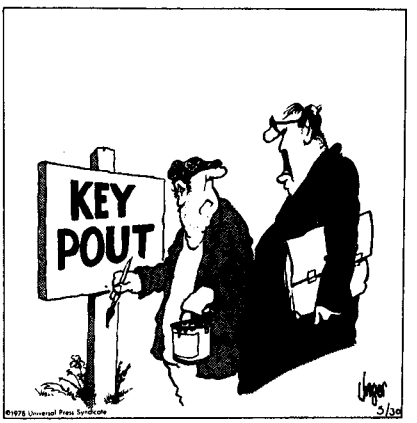
Phonetics: The Sounds of Language

Phonetics is concerned with describing the speech sounds that occur in the languages of the world. We want to know what these sounds are, how they fall into patterns, and how they change in different circumstances. . . . The first job of a phonetician is . . . to try to find out what people are doing when they are talking and when they are listening to speech.

Peter Ladefoged, *A Course in Phonetics,* 1982, 2nd Edition

Knowledge of a language includes knowledge of the morphemes, words, phrases, and sentences. It also includes knowing what sounds are in the language and how they may be "strung" together to form these meaningful units. Although the sounds of French or Xhosa or Quechua are uninterpretable to someone who does not speak those languages, and although there may be some sounds in one language that are not in another, the sounds of all the languages of the world together constitute a limited set of all the sounds that can be produced by the human vocal tract. This chapter will discuss these speech sounds, how they are produced, and how they may be characterized.

SOUND SEGMENTS



"Keep out! Keep out! K-E-E-P O-U-T."

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The study of speech sounds is called **phonetics.** To describe speech sounds it is necessary to know what an individual sound is and how each sound differs from all others.

This is not as easy as it may seem. A speaker of English knows that there are three sounds in the word *cat,* the initial sound represented by the letter *c,* the second by *a,* and the final sound by *t.* Yet physically the word is just one continuous sound. You can **segment** the one sound into parts because you know English. The ability to analyze a word into its individual sounds does not depend on knowledge of how the word is spelled. *Not* and *knot* have three sounds even though the first sound in *knot* is represented by the two letters *kn.* The printed word *psycho* has six letters which represent only four sounds—*ps, y, ch, o.*

It is difficult if not impossible to segment the sound of someone clearing their[1] throat into a sequence of discrete units. This is because these sounds are not the sounds of any morphemes in any human language; it is not because it is a single continuous sound. You do not produce one sound, then another, then another when you say the word *cat.* You move your organs of speech continuously and produce a continuous signal.

Although the sounds we produce and hear and comprehend during speech are continuous, everyone throughout history who has attempted to analyze language has recognized that speech utterances can be segmented into individual units. According to an ancient Hindu myth, the god Indra, in response to an appeal made by the other gods, attempted for the first time to segment speech into its separate elements. After he accomplished this feat, according to the myth, the sounds could be regarded as language. Indra thus may be the first phonetician.

Speakers of English can, despite the Herman cartoon, separate *keep out* into two words because they know the language. We do not, however, pause between words even though we sometimes have that illusion. Children learning a language reveal this problem. A two-year-old child when going down stairs was told by his mother to "hold on." He replied, "I'm holding don, I'm holding don," not knowing where the break between words occurred. In the course of history, the errors in deciding where a boundary falls between two words can change the form of words. At an earlier stage of English, the word *apron* was *napron;* it was misperceived in the phrase, *a napron,* as *an apron* by so many speakers, it lost its initial *n.*

Some phrases and sentences that are clearly distinct when printed may be **ambiguous** (have two meanings) when read aloud as in the children's jingle: *I scream, you scream, we all scream for ice cream.* Read the following pairs aloud and see why we often misinterpret what we hear:

grade A	gray day
It's hard to recognize speech.	It's hard to wreck a nice beach.
The sun's rays meet.	The sons raise meat.

The lack of actual breaks between words and individual sounds often makes us think that speakers of foreign languages run their words together, not realizing that we do so also. X-ray motion pictures of someone speaking make this lack of breaks in speech

[1] We will use the pronouns *they, their,* and *them* as the singular or plural form when referring generally to either male or female. This is now common usage and replaces the cumbersome use of *he or she, him or her.* This is, however, not necessarily the view of all 'prescriptivist' grammarians.

very clear. One can see the tongue, jaw, and lips in continuous motion while the "individual sounds" are being produced.

Yet, if you know a language you have no difficulty segmenting the continuous sounds. In this way, speech is similar to music. A person who has not studied music cannot write the sequence of individual notes combined by a violinist into one changing continuous sound. A trained musician, however, finds it a simple task. Every human speaker, without special training, can segment a speech signal. Just as one cannot analyze a musical passage without musical knowledge, so also linguistic knowledge, which requires no special talent or instruction, is required to segment speech into pieces.

Identity of Speech Sounds

"Boy, he must think we're pretty stupid to fall for that again."

RUBES by Leigh Rubin. By permission of Leigh Rubin and Creators Syndicate.

It is quite amazing, given the continuity of the speech signal, that we are able to understand what words are put together to form an utterance. This ability is more surprising because no two speakers ever say the "same thing" identically. The speech signal produced when one speaker says *cat* will not be exactly the same as the signal produced by another speaker's *cat* or even the repetition of the word by the same speaker. George Bernard Shaw pointed to the impossibility of constructing any set of symbols that will specify all the minute differences between sounds in his statement:

> By infinitesimal movements of the tongue countless different vowels can be produced, all of them in use among speakers of English who utter the same vowels no oftener than they make the same fingerprints.

Yet speakers understand each other because they know the same language.

Our knowledge of a language determines when we judge physically different sounds to be the same; we know which aspects or properties of the signal are linguistically important and which are not. For example, if someone coughs in the middle of saying "How (cough) are you?" a listener will ignore the cough and interpret this simply as "How are you?" Men's voices are usually lower in overall pitch than women's; some speakers speak more slowly than others; others have a "nasal twang." Such pitch or tempo differences or personal styles of speaking are not linguistically significant.

Our linguistic knowledge, our mental grammar, makes it possible to ignore nonlinguistic differences in speech. Furthermore, we are capable of making many sounds that we know intuitively are not speech sounds in our language. Many English speakers can make a clicking sound that writers sometimes represent as *tsk tsk tsk.* These sounds are not part of the English sound system. They never occur as part of the words of the utterances we produce. It is even difficult for many English speakers to combine this clicking sound with other sounds. Yet clicks are speech sounds in Xhosa, Zulu, Sotho, and Khoikhoi—languages spoken in southern Africa—just like the *k* or *t* in English. Speakers of those languages have no difficulty producing them as parts of words. *Xhosa,* the name of a language spoken in South Africa, begins with one of these clicks. Thus *tsk* is a speech sound in Xhosa but not in English. The sound represented by the letters *th* in the word *think* is a speech sound in English but not in French. The sound produced with a closed mouth when we are trying to clear a tickle in our throats is not a speech sound in any language, nor is the sound produced when we sneeze.

The science of phonetics attempts to describe all the sounds used in human language—sounds that constitute a subset of the totality of sounds that humans are capable of producing.

The way we use our linguistic knowledge to produce a meaningful utterance is complicated. It can be viewed as a chain of events starting with an idea or message in the brain or mind of the speaker and ending with a similar message in the brain of the hearer. The message is put into a form that is dictated by the language we are speaking. It must then be transmitted by nerve signals to the organs of speech articulation, which produce the different physical sounds.

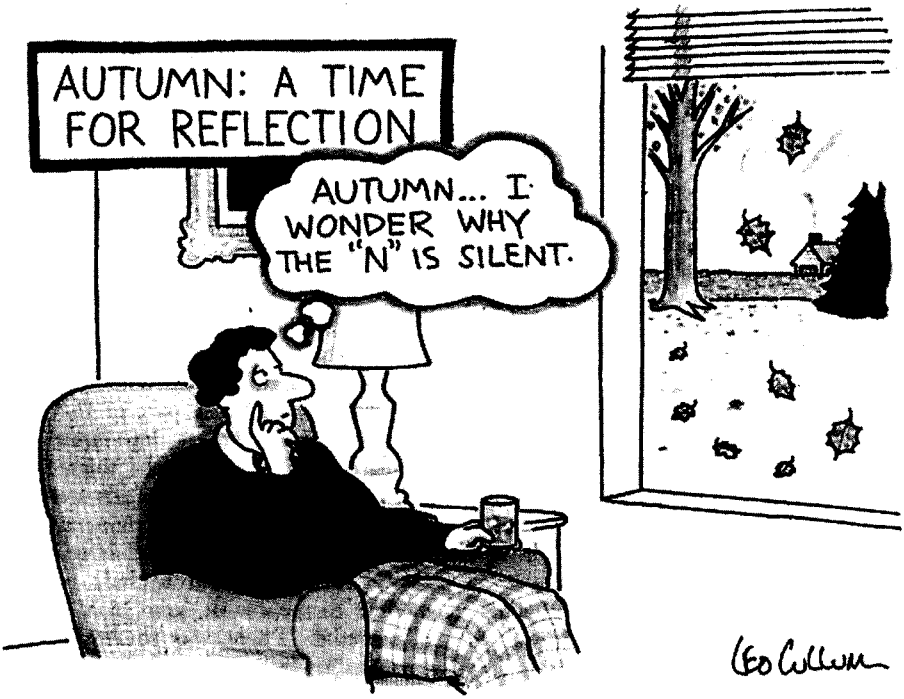
Speech sounds can be described at any stage in this chain of events. The study of the physical properties of the sounds themselves is called **acoustic phonetics.** The study of the way listeners perceive these sounds is called **auditory phonetics. Articulatory phonetics**—the study of how the vocal tract produces the sounds of language—is the primary concern in this chapter.

SPELLING AND SPEECH

The one-l lama,
He's a priest.
The two-l llama,
He's a beast.

And I will bet
A silk pajama
There isn't any
Three-l lllama.

Ogden Nash[2]



Drawing by Leo Cullum © 1988 *The New Yorker Magazine,* Inc.

Alphabetic spelling represents the pronunciations of words. But frequently the sounds of the words in a language are rather unsystematically represented by **orthography**—that is, by spelling. To discuss the way different sounds are produced, it may therefore be confusing and difficult to refer to the sounds as they are spelled in English words.

Suppose all Earthlings were destroyed by some horrible catastrophe, and years later Martian astronauts exploring Earth discovered some fragments of English writing that included the following sentence:

Did **he** bel**ie**ve that C**ae**sar could s**ee** the p**eo**ple s**ei**ze the s**ea**s?

How would a Martian phonetician decide that **e, ie, ae, ee, eo, ei,** and **ea** all represented the same sound? To add to the confusion, this sentence might crop up later:

The sil**ly** am**oe**ba stole the **key** to the mach**ine**.

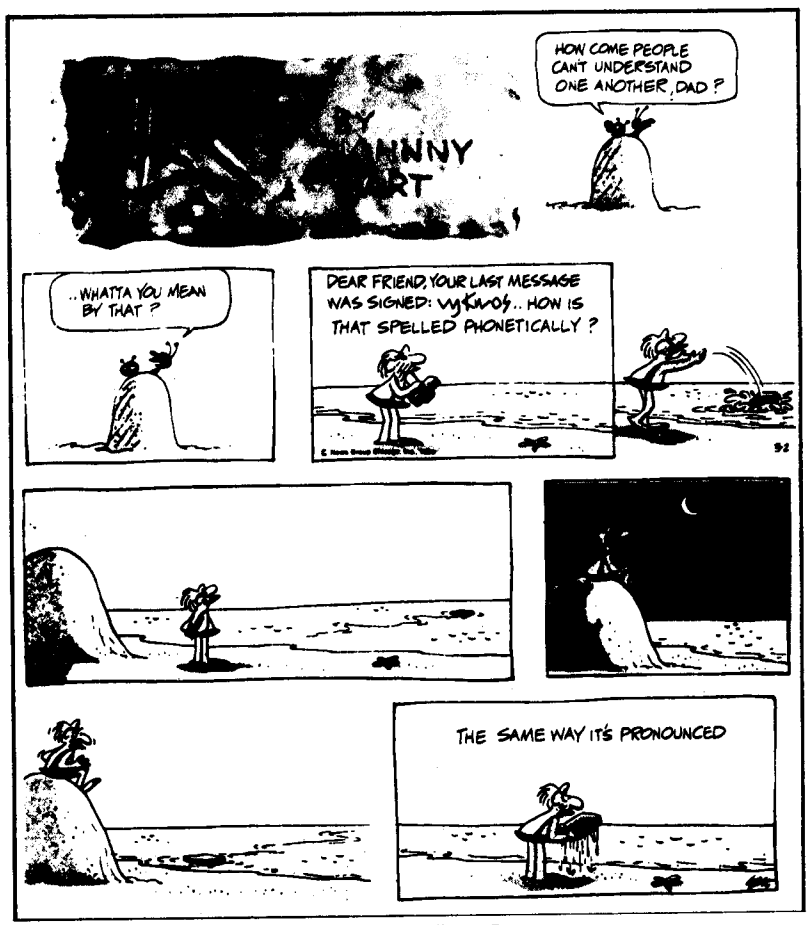
[2] "The Lama" from *Verses from 1929 On* by Ogden Nash. Reprinted by permission of Curtis Brown, Ltd., London, on behalf of the Estate of Ogden Nash.

English speakers learn how to pronounce these words when learning to read and write and therefore know that *y, oe, ey,* and *i* represent the same sound as the boldface letters in the first sentence.

The Phonetic Alphabet

> The English have no respect for their language, and will not teach their children to speak it. They cannot spell it because they have nothing to spell it with but an old foreign alphabet of which only the consonants—and not all of them—have any agreed speech value.
>
> G. B. Shaw, *Preface to Pygmalion*

The discrepancy between spelling and sounds gave rise to a movement of "spelling reformers" called orthoepists. They wanted to revise the alphabet so that one letter would correspond to one sound and one sound to one letter, thus simplifying spelling. This is a **phonetic alphabet.**



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George Bernard Shaw followed in the footsteps of three centuries of spelling reformers in England. In typical Shavian manner he pointed out that we could use the English spelling system to spell *fish* as *ghoti*—the *gh* like the sound in *enough,* the *o* like the sound in *women,* and the *ti* like the sound in *nation.* Shaw was so concerned about English spelling that he included a provision in his will for a new "Proposed English Alphabet" to be administered by a "Public Trustee" who would have the duty of seeking and publishing a more efficient alphabet. This alphabet was to have at least forty letters to enable "the said language to be written without indicating single sounds by groups of letters or by diacritical marks." After Shaw's death in 1950, 450 designs for such an alphabet were submitted from all parts of the globe. Four alphabets were judged to be equally good, and the £500 sterling prize was divided among their designers, who collaborated to produce the alphabet designated in Shaw's will. Shaw also stipulated in his will that his play *Androcles and the Lion* be published in the new alphabet, with "the original Doctor Johnson's lettering opposite the transliteration page by page and a glossary of the two alphabets." This version of the play was published in 1962.

It is easy to understand why spelling reformers believe there is a need for a phonetic alphabet. Different letters may represent a single sound:

to *too* *two* thr*ough* thr*ew* cl*ue* sh*oe*

A single letter may represent different sounds:

d*a*me d*a*d f*a*ther c*a*ll vill*a*ge m*a*ny

A combination of letters may represent a single sound:

shoot	***ch***aracter	***Th***omas	***ph***ysics
ei***th***er	de***a***l	rou***gh***	na***ti***on
co***a***t	gla***ci***al	***th***eater	pl***ai***n

Some letters have no sound at all in certain words:

mnemonic	***w***hole	resi***g***n	***gh***ost
pterodactyl	***w***rite	hol***e***	cor***ps***
psychology	s***w***ord	de***b***t	***g***naw
bou***gh***	lam***b***	i***s***land	***k***not

Some sounds are not represented in the spelling. In many words the letter *u* represents a *y* sound followed by a *u* sound:

c*u*te	(compare: *coo*t)
f*u*tile	(compare: r*u*le)
*u*tility	(compare: *U*zbek)

One letter may represent two sounds; the final *x* in *Xerox* represents a *k* followed by an *s*.

Whether we support or oppose spelling reform, it is clear that we cannot depend on the spelling of words to describe the sounds of English. The alphabets designed to fulfill Shaw's will were not the first phonetic alphabets. One of the earliest was produced

by Robert Robinson in 1617. In Shaw's lifetime, the phonetician Henry Sweet, the prototype for Shaw's character Henry Higgins in the play *Pygmalion* or the musical play or movie *My Fair Lady,* produced a phonetic alphabet.

In 1888 the interest in the scientific description of speech sounds led the **International Phonetics Association (IPA)** to develop a phonetic alphabet that could be used to symbolize the sounds found in all languages. Since many languages use a Roman alphabet like that used in the English writing system, the IPA phonetic symbols were based on the Roman letters. These phonetic symbols have a consistent value, unlike ordinary letters that may or may not represent the same sounds in the same or different languages.

The original IPA phonetic alphabet was the primary one used all over the world by phoneticians, language teachers, speech pathologists, linguists, and anyone wishing to symbolize the "spoken word" until 1989 when, from August eighteenth to the twenty-first, approximately 120 members of the association met in Kiel, West Germany, to work on revisions. The symbols that will be used in this text are those from the revised IPA alphabet unless otherwise noted.

A phonetic alphabet should include enough symbols to represent the "crucial" linguistic differences. At the same time it should not, and cannot, include noncrucial differences, since such differences are infinitely varied.

A list of the phonetic symbols that can be used to represent speech sounds of English is given in Table 6.1. The symbols omit many details about the sounds and how they are produced in different words and in different places within words. These symbols are meant to be used by persons knowing English. These are not all the phonetic symbols needed for English sounds; when we discuss the sounds in more detail later in the chapter we will add appropriate symbols.

The symbol [ə] is called a *schwa.* It will be used in this book only to represent unstressed vowels, that is, syllables in a word that are somewhat softer and shorter than other syllables. In the word *sylLAbic*, for example, the first and last vowels are unstressed while the middle vowel is stressed—with the stressed syllable printed in capital letters. (There is great variation in the way speakers of English produce this unstressed vowel, but it is phonetically similar to the wedge symbol [ʌ] in a word like *cut*, which will be used only in stressed syllables.)

TABLE 6.1 A Phonetic Alphabet for English Pronunciation

Consonants						*Vowels*			
p	pill	**t**	till	**k**	kill	**i**	beet	**ɪ**	bit
b	bill	**d**	dill	**g**	gill	**e**	bait	**ɛ**	bet
m	mill	**n**	nil	**ŋ**	ring	**u**	boot	**ʊ**	foot
f	feel	**s**	seal	**h**	heal	**o**	boat	**ɔ**	bore
v	veal	**z**	zeal	**l**	leaf	**æ**	bat		
θ	thigh	**č**	chill	**r**	reef	**ʌ**	butt	**a**	pot/bar
ð	thy	**ǰ**	Jill	**j**	you	**aj**	bite	**ə**	sofa
ʃ/š	shill	**ʍ**	which	**w**	witch	**ɔj**	boy	**aw/æw**	bout
ʒ/ž	azure								

Speakers of different English dialects pronounce some words differently from those of other speakers. For example, some of you may pronounce the words *which* and *witch* identically. If you do, the initial sound of both words is symbolized by **w** in the chart. Some speakers of English pronounce *bought* and *pot* with the same vowel; others pronounce them with the vowel sounds in *bore* and *bar,* respectively. We have thus listed both words in the chart of symbols. It is difficult to include all the phonetic symbols needed to represent all English dialect differences. We are sorry if a vowel sound in your dialect is not included in the table.

Some of the symbols in Table 6.1 are those traditionally used by linguists in the United States in place of IPA symbols; others are listed below:

U.S.		IPA
š	=	ʃ
ž	=	ʒ
č	=	tʃ
ǰ	=	dʒ
U	=	ʊ

We will use **[š]** and **[ʃ]** and **[ž]** and **[ʒ]** interchangeably since students who take other classes in linguistics may be confronted with either set. We will however, use **[č]** and **[ǰ]** instead of the IPA symbols for the first and last sounds in *church* and *judge*, respectively.

Using these symbols, we can now unambiguously represent the pronunciation of words. For example, words spelled with *ou* may have different pronunciations. To distinguish between the alphabet letters and the symbols representing sounds, we can put the phonetic symbols between brackets:

Spelling	**Pronunciation**
though	[ðo]
thought	[θɔt]
rough	[rʌf]
bough	[baw]
through	[θru]
would	[wUd]

Only in *rough* do the letters *gh* represent any sound; that is, the sound [f]; *ou* represents six different sounds, and *th* two different sounds. The *l* in *would,* like the *gh* in all but one of the words above, is not pronounced at all.

We will continue to use square brackets around the phonetic **transcription** when necessary to distinguish it from ordinary spelling.

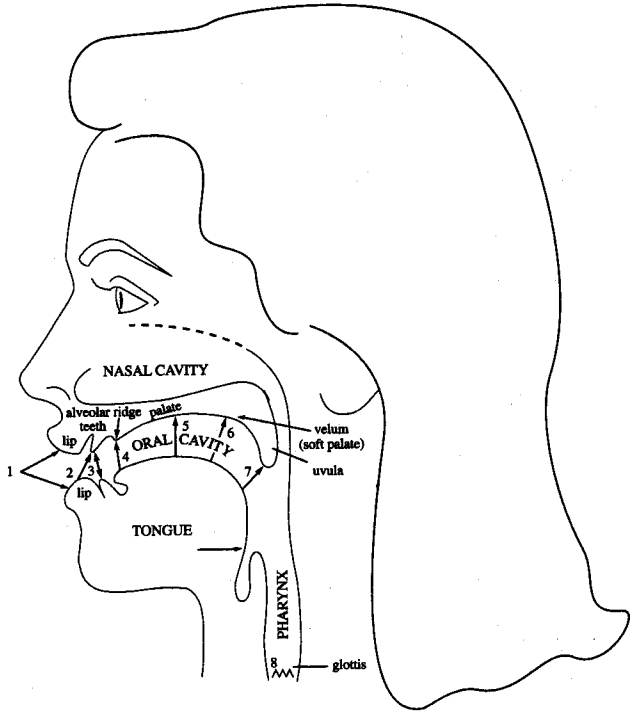
ARTICULATORY PHONETICS

The principles of pronunciation are those general laws of articulation that determine the character, and fix the boundaries of every language; as in every system of speaking, however irregular, the organs must necessarily

> fall into some common mode of enunciation or the purpose of Providence in the gift of speech would be absolutely defeated. These laws, like every other object of philosophical inquiry, are only to be traced by an attentive observation and enumeration of particulars. . . .
>
> John Walker (1823)[3]

The production of any speech sound (or any sound at all) involves the movement of air. Most speech sounds are produced by pushing lung air through the opening between the vocal cords—this opening is called the **glottis** and is located in the **larynx** (often referred to by the nontechnical term "voice box")—through the tube in the throat called the **pharynx,** out of the **oral cavity** through the mouth and sometimes also through the **nasal cavity** and out the nose.

FIGURE 6-1 The vocal tract.



Places of articulation: 1. bilabial; 2. labiodental; 3. interdental; 4. alveolar; 5. (alveo)palatal; 6. velar; 7. uvular; 8. glottal.

[3] John Walker. 1823. *A Critical Pronouncing Dictionary and Expositor of the English Language,* London: A. Wilson. The 26th edition, from which this quote is taken, was published posthumously. Walker died in 1807.