

the patterns of their arrangement. Different languages include different sounds, and no language includes all possible sounds. Languages that include the same sounds often have different patterns for combining them. While phonetics is concerned with spoken language as a whole, phonology is concerned with the sound patterns governing individual languages and with accounting for similarities in the sound systems of different languages. As these selections show, describing the physical properties of individual sounds and explaining the patterns of relationships among sets of sounds are interrelated. In fact, current research indicates that the boundary between phonetics and phonology is not clear-cut. Investigating phonological issues calls for phonetic descriptions, and examining the features of sounds presumes phonological analysis.

In "Phonetics," Edward Callary introduces the study of speech sounds by discussing *articulatory phonetics* (the production of speech sounds) and *acoustic phonetics* (the features of the sounds themselves). He also presents the principles of phonetic transcription, which allows us to accurately represent the specific sounds of any language. The exercises within the article give readers an immediate opportunity to apply phonetic concepts to words in spoken and written American English.

In the next selection, "The Form of the Message," Nancy Bonvillian relies on contemporary research methods emphasizing interviews, on-site observations, and recordings of natural language to discuss how we produce, respond to, and understand the full range of sounds that make up a language. Her discussion helps form the bridge between phonetics and phonology by emphasizing the purpose of isolating phonetic features of human language as a basis for communicative behavior.

Finally, in "What Is Phonology? Language Sounds and Their Rules," we turn to one of the most successful approaches to describing general linguistics. The *Language Files* began as a collection of lecture notes, exercises, and other materials developed by Ohio State instructors for teaching language study at the undergraduate level. In this selection, from the ninth edition, we are guided in doing phonological analysis, forming hypotheses about how sounds influence each other, and investigating the systematic nature of language sounds.

Phonetics

Edward Callary

Phonetics is one of the most studied subfields of linguistics because some knowledge of phonetics is essential for understanding other areas of this discipline. Written especially for the third edition of this book (1981), the following selection, by Professor Edward Callary of Northern Illinois University, still provides a valuable introduction to articulatory and acoustic phonetics. Callary explores two aspects of the grammar of phonetics, both known by all native speakers of English: (1) the permissible sequences of sounds in English and how they can be described in terms of general rules and (2) the regular changes in sounds speakers make due to the contexts of the sounds. The exercises that appear throughout the essay reinforce and clarify the author's points, and you can use them to discuss applications of these principles and methods for interpreting other sound systems.

Phonetics is that part of linguistics concerned with the sounds and sound systems of language; it deals with how sounds are produced, their physical properties, and how the rules of language organize and change sounds from one context to another.

The study of phonetics provides information with practical applications in a variety of areas. Knowledge of how sounds are produced, perceived, and understood is necessary for clinicians who diagnose and remediate speech disorders; for language specialists who teach a nonnative language; for engineers who design more efficient telephones and create voice-based identification and security systems; and for linguists who analyze the properties common to all human languages.

As part of their work, phoneticians (people who study phonetics) analyze the characteristics of the sounds that make up the syllables, words, and sentences of spoken language. For a particular language, they ask the following: How many sounds are there (this is not as easy to answer as it sounds)? What is the best way to describe these sounds? How does the language organize sounds (how do the sounds change from one situation to another and how are they added to or deleted from words)? Ultimately, phoneticians want to know not only about individual languages but about language in general—those characteristics that are common to all

languages and what they reveal about the structure and functioning of the human mind.

Since this is an introductory selection, the examples and the problems are simplified and English examples are used almost exclusively; however, the principles are applicable to all languages, since human languages differ only in their details, although the details themselves are infinitely interesting.

It is extremely important to keep the following point in mind while reading this selection: many of the ideas about language that we have assimilated are in conflict with the facts of how language actually works. In this essay on phonetics, it is especially important to emphasize that language is *sound*, not *writing*. As educated people who have spent years learning to read and spell correctly, we may have the mistaken notion that writing is somehow "real" language and that speech is an often poor attempt to express the sounds that letters naturally possess. The idea that letters "have" sounds is not only mistaken but misleading as well, since it tends to blind us to the principles and rules of our spoken language. Rather than saying, for instance, that the letter *c* has the sound [s] or [k], it is truer to the facts of language to say that, in the English spelling system, the sounds [s] and [k] are sometimes represented by the letter *c*. (For the sake of clarity, square brackets enclose sounds, and italics indicate letters of the regular alphabet.) Remember, we learn to speak and understand a complex language well before we learn to read or write that language. Many languages, even those in use today, have never been recorded in writing and are just as legitimate (and just as phonetic) as those that have been written for centuries.

ENGLISH SPELLING AND THE PHONETIC ALPHABET

In order to communicate sounds in print, we need to be able to represent them in a way that all readers can understand. This is why alphabets were invented in the first place, to assign a permanence to the ephemeral air of speech. Unfortunately, the alphabet we already know and have spent such a long time learning, the familiar ABCs or Roman alphabet, is not adequate for this task.

The relationship between sounds and their spellings is not perfect in any living language, but in English it is particularly deceiving. If you have studied a language such as Spanish or Swahili, you know that your chances of correctly pronouncing a word on first sight are quite good and, conversely, your chances of correctly spelling a word on hearing it the first time are also good. But in English there are so many different ways to represent sounds and so many unsystematic spelling "rules" that reading mistakes and spelling mistakes are common.

While there are reasons for the many discrepancies between sound and spelling in English, two are particularly important. First, with the introduction of the printing press in England in the fifteenth century, spelling began to be standardized and standard spelling reflected the pronunciation of that time. However, pronunciation has changed dramatically in the past 500 years and spelling has not. Many of the "silent letters" in contemporary English represent pronunciations of the past; for instance, the *gh* of *light*, the *k* of *knee*, and the *h* of *whale* were pronounced in earlier times.

Second, today we often have either multiple spellings for the same sound or instances where the same letter represents first one sound and then another because of adoption. When we adopt a word from a foreign language, we often adopt its spelling as well. For example, the letter *i* represents one sound in *ice* (a native English word) and a completely different sound in *police* (adopted from French).

There have been a number of attempts to modify English spelling in order to bring it into line with English pronunciation, such as writing *night* as *nite* and *though* as *tho* (the *Chicago Tribune* of the 1930s and 1940s was an especially active advocate of spelling reform); but these have come to naught and, with the advent of the spell checker, there is even less motivation for spelling reform than before, despite the fact that attempts to represent the approximately forty sounds of English using the twenty-six letters of the regular alphabet are bound to create problems.

The inconsistencies of English spelling require an unambiguous alphabet with a consistent relationship between sound and spelling—where a given sound is always represented by the same symbol and where a given symbol always represents the same sound. Such an alphabet is called a *phonetic alphabet*. Many phonetic alphabets have been devised over the years (unfortunately the symbols they use are not consistent from one phonetic alphabet to another). The phonetic alphabet this text employs is based on the most famous phonetic alphabet currently in use, the International Phonetic Alphabet (IPA), which was developed by a group of European phoneticians toward the end of the nineteenth century. One of the developers of the IPA was the English phonetician Henry Sweet, the model for Professor Henry Higgins in George Bernard Shaw's *Pygmalion* (and its musical offspring *My Fair Lady*). Higgins, who devises a universal alphabet in the play, could (according to Shaw) identify more than 130 vowels! The IPA is complex; it has been revised several times and now contains more than 100 symbols, plus diacritics and other specifying marks. This text uses far fewer symbols, since the aim is to represent the sounds of only a single language, English, and not to attempt to provide symbols for every sound in all languages, as the IPA does.

The symbols of our phonetic alphabet that represent English consonants follow, along with several words illustrating their sound values.

Notice the different ways in which many of the sounds are spelled. Most of the symbols are already familiar to you, since they have the values you might expect from the way they are represented in the regular alphabet. Five symbols use modified Roman letters: *ʃ*, *č*, *ʒ*, *ʒ*, and *ŋ*. Since these are single sounds in English, a single letter represents each one.

PHONETIC SYMBOL	AS IN:	PHONETIC SYMBOL	AS IN:
p	pit, happen	θ	thin, bath
b	bit, rubber	ð	this, bathe
t	bet, thyme	s	sincere, science
d	did, maddest	z	haze, lose
k	sheikh, catch	ʒ	sure, shine
g	gone, ghost	ʒ	treasure, azure
f	stuff, phone	č	itch, concerto
v	of, savvy	ʃ	jam, gem
m	thumb, simmer		
n	none, foreign		
ŋ	bring, thanks		
l	pale, tall		
r	berry, rhythm		
y	yet, million		
w	with, suede		
h	help, who		

The consonant symbols shouldn't present problems, since most of them are drawn from the regular alphabet and are closely related to the values we might expect. The vowels, however, present some difficulties because there are not enough vowel letters to cover all sound values. As you can see from the list below, contrary to what you learned in elementary school, there are more than a dozen vowels in English, not five. Look at the symbols and their sound values and try to pronounce the sounds (not the words) several times. Pay particular attention to the symbol [ə]; this symbol is called *schwa* and it represents one of the most frequent sounds in English. In the regular alphabet *schwa* is spelled using all the vowel letters: *ability*, *blasphemy*, *easily*, *connect*, *cup* and by using many combinations of vowel letters.

PHONETIC SYMBOL	AS IN:	PHONETIC SYMBOL	AS IN:
i	each, machine	e	able, they
ɪ	sieve, system	ɛ	said, guest
æ	at, plaid	o	load, foe
ə	about, son	ɔ	raw, fought
u	move, ooze	a	father, honor
ʊ	book, full	ay	sigh, buy
		aw	shout, cow
		oy	soy, lawyer

PHONETIC TRANSCRIPTION

One of the first things you must learn is how to represent words phonetically; that is, how to write words using the symbols of our phonetic alphabet. This is easy; all it requires is a little practice and a willingness to think phonetically rather than orthographically (in terms of standard spelling). Once you learn to transcribe words, you can explore more interesting areas, such as how a language organizes sounds and how sounds fit into general patterns as defined by the rules of that language.

In order to transcribe phonetically, you first need to determine how many sounds there are in a particular word. Then you need to determine the phonetic symbol from the previously provided lists that represents each of these sounds. Remember, there are exactly the same number of symbols as there are sounds. Use the word *shake* as an example. It has five letters, but only three sounds, so use three symbols to write it phonetically. From the consonant list you see that [ʃ] represents the first sound, [e] represents the vowel, and [k] represents the final sound, so the word transcription is [šek]. (Remember that phonetic symbols are enclosed in square brackets.) As a second example, the word *knee*, although spelled with four letters, is transcribed [ni] because it is composed of two sounds.

EXERCISE 1

Transcribe each of the following words using the appropriate phonetic symbols from the consonant and vowel lists.

Group 1: Monosyllabic Words

shut	noise	scene	juice
eye	guess	owe	piece
wrong	ouch	phrase	school
gym	who	those	friend
tight	tongue	now	was
quick	rhyme	rough	those
shook	why	ache	one
axe	cheese	month	lounge
doubt	debt	of	off
says	moist	cheese	

Group 2: Bisyllabic Words

echo	unique	many	okay
hygiene	onion	penguin	champagne
biscuit	extinct	antique	although
chronic	healthy	physics	croquet
monkey	caffeine	issue	

The pronunciation of the words in these two groups varies little; generally, they are pronounced the same way throughout the country and in most situations. But many words have more than one pronunciation; one pronunciation is used in some parts of the country while another pronunciation is used in other parts. For example, large sections of the country pronounce *don* and *dawn* the same way, while other large sections do not. Most often, however, different pronunciations are the result of different contexts; we pronounce a word one way in one social setting and another way in a different social setting. For instance, the word *literature* is likely to be pronounced one way when we are talking informally with our friends and another way when we are giving a formal class presentation. The words *candidate* and *history*, as well, usually have formal and informal pronunciations. Can you describe them?

Unfortunately, Americans have long labored under the misguided assumption, especially where language is concerned, that there is one right way to do something, and all other ways are wrong. This is regrettable since, just as we wear different clothes for different occasions and use different words in different circumstances (you might say "shucks" or "darn it" when talking with your parents or other elders; this might differ from what you would say to your dormitory friends!), we use different pronunciations for different occasions. One is not right and the others wrong; each pronunciation is appropriate in its place, and to use variations of pronunciation interchangeably might label us as snooty, pretentious, or ignorant of the English language. It is impossible to over-stress this point, since many people, no matter how well educated or well intentioned, honestly believe that informal pronunciation is sloppy, slovenly, ungrammatical, illiterate, lazy, and ignorant, or all of these. This is not true: most Americans pronounce the word *today* at least two ways, [təde] and [tude], and the phonetic alphabet also expresses both pronunciations. In addressing a formal gathering we might say "I am pleased to be here [tude]." But outside such a setting we are more likely to say "It's good to be here [təde]."

In the exercises below, it is important that you transcribe each of the words as you generally would pronounce them in informal American English. You may not use the informal pronunciations all the time or even most of the time; you may even regard some pronunciations as "wrong," but be aware of the fact that they are characteristic of American English. And be particularly wary of schwa. This exercise will seem artificial, since usually you do not pronounce in isolation; otherwise you might tend to substitute a different vowel for schwa. For instance, it is tempting to transcribe a word like *polite* as [polayt]. But it is important to recognize that, informally, it is usually pronounced [pəlayt]. Is it wrong to transcribe the word *salami* as [salami]? Or should it be [səlamɪ]? The answer is yes—and no. It depends upon the pronunciation you want to represent. If you want to indicate the pronunciation used by your third grade teacher while giving a spelling test, [salami] is correct; if you want to represent the pronunciation of *salami* used by most Americans in

general conversation, then [səlamɪ] is correct. The differences will become clearer to you with practice.

EXERCISE 2

In this exercise, transcribe to represent informal American pronunciation.

Group 3

among	column	extra	achieve
Asia	supply	fatigue	command
succeed	Canada	mosquito	iguana
kangaroo	Miami	Achilles	apathy
bungalow	cathedral	odyssey	coincide
Hiawatha	macaroni	alfalfa	oxygen
business	brilliant	moustache	baloney

Group 4

zucchini	postpone	family	chestnut
buzzed	seconds	consumes	trucks
clothes	Wednesday	atom	atomic
relaxed	adjective	coughed	physicist

ARTICULATORY PHONETICS

In order to understand how language uses sounds, it is important to understand how sounds are produced by the human vocal apparatus; in other words, to know something about *articulatory phonetics*, so called because sounds are described by the actions (articulations) of the vocal tract as they are produced. Figure 6.1 is a diagram of the human vocal tract, with those areas that are especially important in speech production labeled. Refer to this diagram while reading this chapter as often as necessary and try to locate the relevant areas of your own vocal tract with your tongue or finger.

We produce speech sounds by modifying a stream of air as we push it by the lungs through the trachea and ultimately out of the oral or nasal cavities, or both. We modify the airstream by changing the size or shape, or both, of the cavities in which the airstream resonates. Just as we produce sounds of different pitches when we blow over the openings of different size bottles, we produce different sounds by changing the size and shape of the resonating cavities. With [i], for instance, we use a tiny resonating cavity, and the result is a high-pitched sound; the opposite is true for [a], where we open our mouth fully.

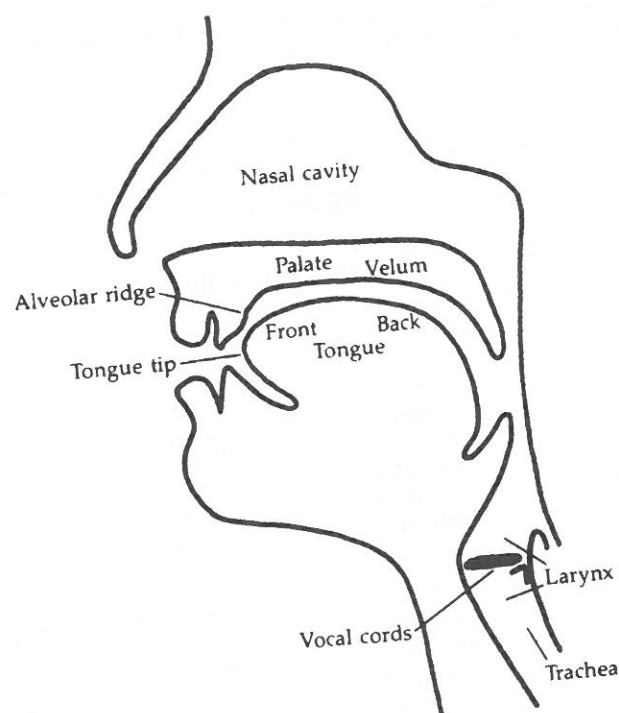


FIGURE 6.1 Human Vocal Tract.

Stated this way the production of speech sounds seems trivial, obvious, and incredibly easy. But the facts of articulation prove otherwise. The production of even the simplest sound is the result of a marvelously complex activity that involves the coordination of dozens of muscles, all acting with the precision and timing of a ballet. The fact that this occurs unconsciously, thousands of times a day, is all the more remarkable.

CONSONANTS

Consonants are sounds created by obstructing airflow, either completely as in the first sound of *dine*, or partially, as in the first sound of *fine*. Consonants are classified by three factors: (1) the location of the obstruction within the oral tract; (2) the nature of the obstruction; and (3) the state of the vocal cords. The sites in the vocal tract where we set up obstructions are called the *points of articulation*, and one way of describing consonants is by referring to these points. For English, there are six points of articulation:

1. *Bilabial* (bi, "two" + labia, "lips"). By completely blocking the airstream with both lips you produce [p], [b], or [m]. Therefore,

[p], [b], and [m] are called *bilabial sounds*. Make each of these sounds, as well as those that follow, several times and pay particular attention to the action of your tongue and lips as you do.

2. *Labio-dental*. These sounds are made by bringing your lower lip into contact with your upper teeth. The sounds [f] and [v] are labio-dentals.
3. *Interdental*. As the term suggests, interdental sounds are made by placing your tongue tip between your teeth. There are two interdental sounds in English: [θ] and [ð]; both are usually spelled *th*.
4. *Alveolar*. The alveolar ridge is the bony crest that lies where your teeth join your palate. Most languages have a number of sounds articulated in the alveolar area; English has six: [t], [d], [n], [s], [z], and [l].
5. *Palatal*. The roof of the mouth is made up of two distinct parts: a hard, front part called the palate (from the Latin word for "plate," as in an artist's palette), and a soft, back part, called the velum. You can easily find the dividing line between the palate and the velum by sliding your tongue over your palate. In English there are six palatal sounds: [ç], [j], [š], [ž], [r], and [y].
6. *Velar*. As noted, the velum is the soft, fleshy area lying to the rear of the palate. Check its location in figure 6.1. In English, velar sounds are articulated by bringing the back of the tongue into contact with the velum; velar sounds are [k], [g], and [ŋ].

Point of articulation is only one parameter of consonant articulation, however; another is *manner of articulation*. Manner of articulation refers to the way in which the airstream is obstructed at any given point of articulation. In all languages there are several ways to obstruct the airstream; four of the major manners of articulation are:

1. *Stops* (an older term, but one you may still hear, is *plosive*, since these sounds are exploded). As the term suggests, stop refers to a complete blockage of the airstream. There are six stops in English: the bilabials, [p] and [b], in which the lips block the airstream; the alveolars, [t] and [d], where blockage is between the tongue tip and alveolar ridge; and the velars, [k] and [g], where the back of the tongue contacts the velum. (Make these sounds several times.)
2. *Fricatives* (related to the word *friction*). To produce fricatives, you narrow the vocal tract at one point and force air through the opening, setting up a turbulent airstream. In English, there are the labio-dental fricatives, [f] and [v]; the interdental fricatives, [θ] and [ð]; the alveolar fricatives [s] and [z]; and the palatal fricatives, [š] and [ž]. Other languages have different fricatives; if you have studied Spanish, you know that the *b* in *Cuba* is a bilabial fricative, made by bringing both lips close together and forcing air through the narrowing.
3. *Affricates* (not to be confused with fricatives). Affricates are combination sounds made by articulating a stop and a fricative

in rapid succession, almost simultaneously. Affricates are found in the first sounds in *chin* and *gin*, and the final sounds in *itch* and *edge*. The affricate of *chin* is a combination of the stop [t] and the fricative [ʃ], and the affricate of *gin* is a combination of the stop [d] and the fricative [ʒ]. You can think of affricates as single sounds since they function as single units in English; therefore, you represent them using single characters from the phonetic alphabet.

4. *Nasals*. The velum acts as a kind of drawbridge in articulation, allowing or prohibiting airflow into the nasal cavity when necessary. If the velum is lowered, the pathway to the nasal cavity is open and air can resonate in both the oral and nasal cavities; if the velum is raised, it shuts off access to the nasal cavity. Sounds made with resonance in the nasal cavity are called *nasal sounds*; all other sounds are *oral sounds*. In English there are three nasals: [m], [n], and [ŋ].

The last item to consider in the production of sounds is the action of the vocal cords as a sound is articulated. This action is particularly important, since it is important in phonetic rules. Within the larynx, the cartilaginous structure known as the Adam's apple, lie two sheets of elastic tissue called the *vocal cords*, or *vocal folds* or *vocal bands*. For the purposes of describing speech sounds in this text, we will consider that the vocal cords assume one of two positions: relaxed and relatively far apart, or tensed and drawn close together, so that there is only a narrow opening (called the *glottis*) between them. The vocal cords are in the relaxed position when we make sounds such as [f] or [s], and in the tensed position when we articulate [v] or [z]. When we articulate [s] or [f], the vocal cords remain relatively still, but for [z] and [v] they vibrate rapidly; they open and close several thousand times each second. This vocal cord vibration is called *voice* and sounds produced with vocal cord vibration are called *voiced sounds*; all other sounds are *voiceless*.

You can easily check for the presence of voice by placing your fingers in your ears and articulating first one sound and then another. The buzzing you hear with some sounds but not others is voice. Try making a long ssssss, then a long zzzzzz. Now make a long [θ] and a long [ð]. Which of these sounds is voiced, [s] or [z]? [θ] or [ð]? Is [m] voiced? How about [l]?

Each sound can be described as a combination of: (1) its point of articulation (bilabial, palatal, etc.), (2) its manner of articulation (fricative, nasal, etc.), and (3) whether or not it is voiced. For instance, [f] is a voiceless labio-dental fricative; [j] is a voiced palatal affricate.

This information is summarized in figure 6.2, which shows each sound and indicates its point of articulation, its manner of articulation, and whether it is voiced or voiceless. The points of articulation appear as horizontal headings and the manners of articulation appear as vertical

	Bilabial	Labio-dental	Interdental	Alveolar	Palatal	Velar
Stop	p b			t d		k g
Fricative		f v	θ ð	s z	ʃ ʒ	
Affricate					č ǰ	
Nasal	m			n	ŋ	

FIGURE 6.2 English Obstruents.

headings at the left. Not all consonants are included in figure 6.2, only those called *obstruents*, sounds that result from obstructing airflow: stops, fricatives, affricates, and nasals. Notice that each cell in figure 6.2 is divided into two parts: a top part for the voiceless member of a pair and a bottom part for the voiced member. Since all nasals are voiced, the cells in this row are not divided.

Figure 6.2 shows clearly that sounds are not indivisible units but are made up of the smaller, fundamental components of point of articulation, manner of articulation, and voicing, which combine in unique ways to create different sounds. From this perspective, a phonetic symbol (or the sounds it represents) is merely a convenient way to represent a specific combination of a point of articulation, a manner of articulation, and voicing. Further discussion of this notion follows later, and there are many references to figure 6.2 in the following pages, since it provides information vital to understanding how English organizes its sounds into groups and changes those groups systematically from one context to another. For now, use figure 6.2 to grasp a general sense of how the sounds are arranged and how they relate to one another.

VARIATION IN SOUNDS

The opening paragraphs of this chapter mentioned that determining the number of sounds in a language is not as easy as it might seem; it is, in fact, often difficult and phoneticians argue frequently over what they consider to be a sound in a particular language. The reasons for the debate arise in part because it is difficult in many cases to determine if a sound is basic to the sound system of a language or if it should be considered a variant of another sound. There is a great deal of variability among sounds and, to illustrate the problems involved, consider the "sound" *t*. Notice that there are no brackets around *t*; we will see the reason for this shortly. Look at how we pronounce *t* in the set of words where *t* occurs initially—words like *top* and *tuck*—and contrast this pronunciation with that of *t* in the set of words in which *t* follows [s], such as *stop* and *stuck*.

Put your fingers on your lips as you first say *top* and then *stop*, *tuck* and then *stuck*. Do this several times. You should notice that the *t* in one of these sets of words is accompanied by a puff of air (called aspiration), while the *t* of the other set is not. Which word has an aspirated *t*? *Top* or *stop*, *tuck* or *stuck*?

Now consider the *t* in the word *metal*. Is it more like the *t* of *top* or the *t* of *stop*? Is it different from both of these? Say the word to yourself several times and compare your pronunciation of *metal* with your pronunciation of *medal*. Are *metal* and *medal* pronounced identically or differently? In general conversation most Americans pronounce them exactly alike. Remember, if two words are pronounced the same they must be transcribed the same way. Would you say that the medial (middle) sound of both *metal* and *medal* is more like [t] or more like [d]?

As a final example, look at words like *pot* and *right*, where a final *t* occurs. In this case, English provides an option: you can pronounce *pot* with a puff of air accompanying the *t* as with *top*, or you can just block the airstream at the alveolar ridge and not release it at all. (You can see this nonrelease more clearly with a final *p*, as in *cup*, than with final *t*.)

These examples illustrate that *t* can appear in a number of different forms: sometimes it is accompanied by a puff of air and at other times it is not; sometimes it is pronounced more like [d] than [t], and sometimes it is not released at all. So, how many *t* sounds are there? One or four?

All sounds in all languages have variants such as those of *t*; usually these are called *positional variants*; that is, different forms of a sound occur at different positions in a word; in the case of the *t* variants, aspirated *t* occurs only at the beginning of a syllable, unaspirated *t* follows *s*, unreleased *t* can occur at the end of a word, etc. Notice that each of these phonetically different sounds is, in an important way, the "same" sound; each has an essential "*t*-ness" at its core; even the most different, the *t* of *metal*, appears as aspirated *t* in the related word *metallic*.

Phoneticians explain the relationships among these different sounds by saying that a language consists of a set of basic sounds, technically called *phonemes*, and a set of related variants, technically called *allophones*. The phoneme/allophone distinction is one of the most important concepts in linguistics; an analogy may help you understand it more fully. Among other devices, the English spelling system makes use of uppercase and lowercase letters, and italics—for example, *Q*, *q*, *Q*, and *q* (roman and italic). In an obvious way, these are all different, but in another sense they are all expressions of the same letter, since all have a basic "*q*-ness." We express both their differences and their similarities by the names we give them: capital *q*, lowercase *q*, capital italic *q*, lowercase italic *q*. For our purposes, it is important to remember that each can occur only in specific environments: we use capital italic *q* at the beginning of a sentence or a proper name that we want to emphasize, lowercase italic *q* for other emphasis, capital *q* at the beginning of a nonemphasized sentence or proper name, and lowercase *q* elsewhere. These usages lead us to conclude that there is a relatively

abstract component that unites the four *qs* that we represent as *Q*, *q*, *Q*, or *q* (uppercase and lowercase roman and italic); the rules of English writing instruct us when to use each. Similarly, the phoneme /t/ includes the allophones aspirated *t*, unaspirated *t*, unreleased *t*, etc., and the rules of English pronunciation tell us when to pronounce each allophone.

Phoneticians call phonemes *contrastive units*, since they can distinguish one word from another: *top* is not *cop* is not *pop*, so /t/, /k/, and /p/ are separate phonemes. The particular variants of a phoneme, however, are not contrastive; substituting one for another does not result in a different word, but only a word that sounds unusual, as if it were spoken by an individual unfamiliar with the rules of the language. Try using the *t* of *top* (aspirated [t]) in the word *city*. It sounds odd, doesn't it? But you still recognize the word as *city*, not as *sissy* or *sicky*, so aspirated *t* and flap *t* (what phoneticians call the /t/ of *city*, *water*, *bitter*, and the like, since your tongue tip flaps once against your alveolar ridge) are variants of the phoneme /t/. Notice that the phoneme /t/ is placed between slant lines, while a particular allophone of [t] is enclosed in square brackets.

SOME ENGLISH ALLOPHONES

All languages have rules for the pronunciation of phonemes; they indicate which variant to use under which circumstances, when to use aspirated [t], when to use flap [t], etc. A study of several of the rules of English pronunciation follows, but first we need a clear definition of the term "rule." One of the problems in phonetics (and language study in general) is its terminology, and one of the more difficult terms is "rule." Linguists use the term "rule" differently from nonlinguists. Linguists regard rules as descriptions of the way language operates and not as evaluations of "good" or "bad" language use. The rules that linguists use concisely state the principles of a language. For instance, one rule in English is that the phoneme /t/, when it occurs between vowels, is usually pronounced as a voiced flap. This is a rule of American English only; the rules of British English are slightly different, and a speaker of British English might pronounce *city* with aspirated /t/. When you violate language rules, you don't necessarily make social errors, you just sound odd, or your words don't form sentences. Violating phonetic rules usually results in odd pronunciations, as if you learned English from a book but never heard it spoken. You can experience this by saying "Betty makes better butter" using all aspirated *t*'s. You were never taught the rules of English; you just picked them up as a child and you know them so well that you apply them repeatedly without a thought. Linguistics attempts to state rules formally in order to illustrate how a language works.

With phonemes, allophones, and rules in mind, let's look again at aspiration and write a descriptive rule that explains, first, which sounds are aspirated and, second, under what circumstances they are aspirated.

In English three phonemes have aspirated allophones: /p/, /t/, and /k/; they are aspirated whenever they occur at the beginning of a syllable—for example, *pin*, *tin*, *kin*, *upon*, *octane*, *occur*. We could simply state that /p/, /t/, and /k/ are aspirated at the beginning of a syllable; but we also want the rule to identify the set of which /p/, /t/, and /k/ are members and to specify why these particular phonemes, as opposed to others, should appear together and function as a group. To do this we need to consult figure 6.2 and examine the point of articulation, manner of articulation, and voicing for /p/, /t/, and /k/. We want to reduce these three sounds to a common factor. Notice that figure 6.2 indicates that /p/, /t/, and /k/ are stops and that they are voiceless; in fact, these three sounds are the only sounds that meet this description. We can use this information to conclude that English has a rule that all voiceless stops are aspirated at the beginning of a syllable.

Using figure 6.2, explain why it would be difficult to write a rule that refers to /p/, /m/, and /j/ as a group.

EXERCISE 3

- Write a rule using the following information. In English, some vowels are held longer in some circumstances than in others. Say the words below out loud several times, paying particular attention to how long you sustain the vowel in each word as you speak. You should be able to put each of these words into one of two groups: a group with "shorter" vowels and a group with "longer" vowels. For instance, the [i] of *heed* is longer than the [i] of *heat*. (The actual length is not important; what is important is to recognize that some vowels are relatively longer than others.)

made	mate	edge	etch
dose	doze	pot	pod
prove	proof	pig	pick
seed	seat	ice	eyes

- Make a list of those words with the longer vowels and another list of those words with the shorter vowels.
- Now we need to determine the environment in which a vowel is lengthened. Look at the words with the longer vowels and consider the consonant at the end of each word. Using figure 6.2, determine the common component for all the consonants and write a rule that describes when a vowel is lengthened. Your rule should begin, "A vowel is lengthened when. . ."

There are many more allophonic rules in English, but these examples give you an appreciation for the systematic variability of sounds and an understanding of how the rules of English transform a phoneme into a related group of sounds that we actually speak and hear.

VARIATION IN MORPHEMES

We can summarize this brief consideration of phonemes and their allophones as follows:

The sound system of language is made up of a relatively small number of abstract items (phonemes) that occur in a variety of forms (allophones), and the phonetic rules of a language describe where each allophone occurs. What is true for phonemes is also true for words, or, more precisely, for the parts of words called *morphemes*. Morpheme is another term with a precise meaning in linguistics. Your teacher can explain it further; for now we define a morpheme as the smallest part of a word that has a meaning. For instance, *lend* is a one-morpheme word; *lender* is a two-morpheme word consisting of *lend*+*er*; and *lenders* is a three-morpheme word, *lend*+*er*+*s*, where *-er* means "one who does" the verb and *-s* means plural. A particular morpheme may be expressed by one group of phonemes in one instance and by a different group of phonemes in another—yet we recognize it as the same morpheme in both instances. A morpheme often is spelled differently depending on the circumstances, but spelling is not a reliable guide to the identification of morphemes.

We are all familiar with morphemes and their different forms, called *alternates*. One common example is the morpheme we spell *the*, which appears as [ði] in the phrase *the apple*, *the end*, and *the outsider* but as [ðə] in *the city*, *the quarterback*, and *the visitor*. What determines the form?

The concept of alternates (and alternation) is important in linguistics, so we will consider a second example. There is a group of words in English that is built on the morpheme *pel*, which has the general meaning of "push" or "drive": *compel*, *repel*, *expel*, *propel*. This morpheme appears not only as *pel* but also as *pul* in words such as *compulsive*, *repulsion*, and *expulsion*. *Pel* and *pul* represent the same morpheme, and the rules of English tell us when to pronounce each (and, in this case, when to spell them differently). This situation is directly analogous to that of *Q* and *q*, in which the rules of English spelling indicate when to use the two representations of the same letter.

Now we can apply these concepts to another morpheme: the morpheme that means "5." (Notice the use of the numeral rather than the letters in order to allow the morpheme to remain rather abstract). In English we assume the spelling of the numeral 5 is *five*. Actually, this is not entirely true. How about when we are using ordinals—*first*,

second, third, fourth, fifth (fifth, not fiveth)? When we multiply 5 times 10 we get fifty, not fivety. Therefore, the morpheme 5 has two different forms: one spelled *five* and pronounced [fayv]; the other spelled *fif* and pronounced [fɪf]. We are concerned here only with the consonant change, so ignore the vowel difference between *five* and *fif*. Thus, the morpheme 5 has two variants that alternate with one another: [fayv] and [fɪf]. We will assume that *five* [fayv] is the basic form, and we want to know exactly what the change is and why it changes. To do this we notice that the only consonant difference between [fayv] and [fɪf] is that *fif* contains [f] where *five* contains [v]. The first thing we need to do is determine the phonetic difference between [f] and [v]. From figure 6.2, we see that the only difference between [f] and [v] is in voicing; [f] is voiceless and [v] is voiced. Notice that [f] occurs only when the morpheme 5 precedes the suffix [θ] or the suffix [tɪ]; in other words, when we add [θ] or [tɪ] to *five*, [fayv] changes to [fɪf] (we also change the spelling, which makes the phonetic change easier to see, but many phonetic changes do not include a change in spelling). Why do these words contain [f] rather than [v]? Why does the voiced sound [v] become the voiceless [f] in *fifty* and *fifth*? The reason for the change is *assimilation*, another important concept in linguistics. In phonetics, assimilation refers to the process in which a sound changes in such a way that it becomes more like another (usually neighboring) sound. In this case, the voiced [v] of *five* becomes voiceless in order to become more like the voiceless [θ] or [tɪ] of the suffix; in the process [v] in effect becomes [f]. Whenever there is assimilation, there is one sound (or one group of sounds) that causes the assimilation and another sound that changes, or undergoes the assimilation. In this example, the [tɪ] of *fifty* and the [θ] of *fifth* are the causes of the assimilation, and the final [v] of *five* is the sound that undergoes the assimilation.

Assimilation is a common and natural process that is found in all languages. The reasons for assimilation are simple. As speakers we try, whenever possible, to reduce the effort required for articulation, and we find that it is easier to pronounce some sequences of sounds than others. One way to make articulation easier is to produce one sound as much like a neighboring sound as possible. Consider the articulatory effort required to pronounce *fifty* (if the [v] were not assimilated). We would have to vibrate the vocal cords for the [v] and quickly stop the vibration for [tɪ]. We can make the articulation easier by anticipating the voicelessness of [tɪ] and extending voicelessness over both sounds. Since voice is the feature involved, this particular instance is an example of assimilation in voice.

The following is another example of assimilation in which the spelling helps to identify the sounds involved.

We have a number of ways of negating adjectives in English; one way is to use a prefix, but the form of the prefix can vary. We say *indecent*, yet we say *impartial*, because the rules of English do not allow us to say

**indecent* or **impartial*. (Linguists use * to mark nongrammatical forms.) Two forms of this prefix are shown below:

Prefix Form	Examples
im-	imperfect, immature, implausible, improper
in-	indecent, intolerant, innumerable, indistinct

In order to understand why *imperfect* and *indecent* are spelled as they are (as opposed to **indecent* and **imperfect*), look at the adjectives to which each form is attached and determine specifically what they have in common. Notice that all the adjectives to which *im-* are attached begin with either /m/ or /p/. Comparing /m/ and /p/ by using the articulatory characteristics of these sounds as shown in figure 6.2 indicates that /m/ and /p/ are both bilabial. To determine the characteristics of the adjectives to which *in-* attaches, it is necessary to ask why *im-*, and not *in-*, precedes the first group, while *in-*, and not *im-*, precedes the second group. Using figure 6.2, you will note that /m/, like /p/, is bilabial and /n/, like /t/ and /d/, is alveolar; in other words, the consonant of the prefix must have the same point of articulation as the first consonant of the adjective to which it is attached. This is an example of assimilation in point of articulation.

Many speakers, especially in more relaxed speech situations, use another form, /ɪŋ/ to negate adjectives like *complete*, *corruptible*, and *glorious*. Although spelled *in-*, this prefix is pronounced [ɪŋ] ([ɪŋkəmplit]). Consider [ɪŋ] and the adjectives to which it is attached. How does this group fit into the pattern we saw with *im-* and *in-*? Explain.

Other forms of this prefix are as follows:

Prefix Form	Examples
ir-	irregular, irresponsible, irrelevant
il-	illegal, illegible, illogical

In what ways do *ir-* and *il-* fit the pattern and in what way are they slightly different? Are they actually more assimilated to their adjectives than *im-*, *in-*, or [ɪŋ]?

One way of looking at assimilation is to see it as a kind of phonetic agreement. You are already familiar with grammatical agreement—for example, English subjects and verbs must agree in number and Spanish articles and nouns must agree in gender. Just as there is grammatical agreement, there is phonetic agreement. Sounds must agree in voicing or point of articulation; several sounds must share the same point of articulation, or they must all be voiced (or voiceless). There are other phonetic agreements, but point of articulation and voicing agreement are probably the most common.

We are now ready to examine phonetic agreement and how we form the regular plural in English (there are a number of irregular plurals that do not follow particular patterns). In elementary school you probably

learned that to form a plural noun you add "s" or "es." This is indeed how we write most plurals, but this rule obscures the way we actually form plurals when we speak. There is a single plural morpheme, and it takes several different forms.

EXERCISE 4

1. Listed below is a group of plural nouns, most of which you have seen before. Transcribe them, paying particular attention to how the plural is indicated for each word. What two variants are used to indicate the plural? (A discussion of an important third variant follows later.)

caves	tacks	cuffs	tags
smiths	buds	globes	loops
scouts			

2. Make a list of the singular nouns to which each of the two variants is attached and, using figure 6.2, determine the common components for the singulars in each group. Describe the agreement. Is the cause of the assimilation the singular or the plural morpheme? Is the assimilation in point of articulation or in voicing?
 3. Transcribe each of the following words, again paying attention to the plural marker of each one:
- | | | | | | |
|------|-------|-------|------|------|-------|
| bees | lambs | cells | cars | tons | sighs |
|------|-------|-------|------|------|-------|
4. Noting the pattern of assimilation you gathered from the words in the first group, what can you say about the sounds /i/, /m/, /l/, /r/, /n/, and /ay/?

MORPHEMES IN CONTEXT

Earlier you transcribed words written in standard spelling using the symbols of our phonetic alphabet. As mentioned then, these were artificial exercises since it is unusual to encounter words in isolation. We don't say one (pause) word (pause) at (pause) a (pause) time (big pause). In normal speech words and sounds run together; one word affects another word, one sound affects another sound, and our everyday encounters with language sound closer to "jeet?" "na chet" and "haef tuh?" "god-duh" than "did you eat?" "not yet" and "have to?" "got to." In real speech there are no spaces between words and no capital letters at the beginning of sentences or periods at the end. When we put one word next to another in context, a number of changes may occur in one word or the

other, or both. In addition to the assimilation that changes sounds, sounds may be added to or deleted from words, or several sounds may be blended together. Usually these changes affect the sounds at the beginnings or ends of words. These changes are the result of the normal operation of phonetic rules. But be warned: our schooling and particularly our literacy can delude us into believing that a word is a word is a word (or that it should be). On the contrary, phonetically, a word in one context may be a different (phonetic) word in another context, and yet a different (phonetic) word in still another context. The point is that these differences are anything but arbitrary; they are the natural results of the regular rules of language. As mentioned earlier, there is often a considerable difference between the way we pronounce a word in isolation and the way we pronounce it in context. The word *a* in isolation is [e], but in context it is either [e] or [ə].

DISSIMILATION (SIMPLIFICATION)

We saw earlier that assimilation is a phonetic process that tends to make neighboring sounds more alike. Many phonetic rules are assimilating rules, which minimize the articulatory differences between sounds. However, it does not follow that sequences of sounds that are most alike are always easiest to pronounce. Sounds can be so much alike that they are nearly impossible to pronounce in sequence or even close to one another. Tongue twisters are wonderful examples. Try saying, at normal speed, "the sixth sick sheik's sixth sheep's sick," one of the worst (or best, depending upon your point of view) tongue twisters ever devised, as listed in the *Guinness Book of World Records*. When faced with a sequence of too-similar sounds, speakers regularly break up the sequence in one of two ways: by deleting one of the offending sounds or by inserting a sound (in English, usually schwa) into the sequence so that the troublesome sounds are separated. *Cupboard*, for instance is [kəbəd]; [kəpbərd] is non-English. Since there are two bilabial stops adjacent to one another, English speakers simplify the cluster by deleting [p].

English allows a maximum of three consonants at the beginning of a word (*stream*, *split*) and up to three consonants at the end (*desks*). (Many American dialects, however, allow only two consonants at the end of a word.) As a general rule, and depending on the specific sounds involved and other phonetic, grammatical, and social factors, English speakers tolerate at most two adjacent consonants in the middle of a word. When we form a compound or add a suffix that increases the number to three or more, we are phonetically overwhelmed and usually respond by dropping one of the three consonants. Thus, the word *sand* and the word *box* present no problems but *sandbox* is another matter; the usual pronunciation is [sənbaks], not [sændbaks]. This pronunciation is neither capricious nor idiosyncratic; a rule of English phonetics allows the deletion of this

particular consonant only; to delete any of the others would not reflect English phonetics: [*sædbaks] or [*sændaks].

Once again, remember that pronunciations such as [sænbaks] are not "incorrect" and pronunciations such as [sændbaks] are not "correct." It is true that some speakers pronounce more formally than others, but it is misguided to believe that [sændbaks] is a "better" pronunciation than [sænbaks]. It is a social rather than a linguistic judgment to label one person a "better" pronouncer than another, and it ignores the facts of language. The rules of English provide the possibilities; they specify what can and cannot be done within the context of spoken English. Those who participate most fully in the richness of English know the rules and use the rules for their maximum effect.

EXERCISE 5

The examples below are either compounds or include suffixes that create three or more consonants medially. But in normal, rapid conversation, one of the consonants is usually deleted. Mark the deleted consonant in each word and state the English rule for deleting the consonant.

first grade	kindness	government	Christmas
second place	handbag	guest towel	waistcoat

Earlier, you did an exercise on English plurals; there was a discussion of two alternates and a third was mentioned. Words such as *judges*, *matches*, *classes*, and *sneezes* illustrate this third alternate. Refresh your memory of the general rule. Which of the two alternates is found in these words? Why does it not attach directly to the singular?

The English past tense marker has three regular variants or *allomorphs*: /t/, /d/, and /əd/ (or [ɪd]). They are illustrated by the words below:

/t/	/d/	/əd/
AS IN:	AS IN:	AS IN:
coughed	saved	sifted
touched	judged	waded
passed	buzzed	heated
flapped	rubbed	bounded
marked	sagged	divided
mashed	sealed	coated
asked	dimmed	handed
dressed	pleased	directed
faked	played	sorted
moped	labored	provided

In which environment do you find each of the three alternates? Why are they grouped this way? Are assimilation, simplification, or both involved?

This chapter provides you with only the barest outline of phonetics and a brief sample of the kinds of issues with which phoneticians concern themselves. As with all language study, phonetics attempts to understand the dimensions of human language, the kinds of rules that characterize languages, and what people know about their own language—the rules they carry around in their heads. Because these rules are complex, there is much to learn, and phoneticians will be busy for decades to come.

FOR DISCUSSION AND REVIEW

1. Callary says that "many discrepancies between sound and spelling in English exist." Why is this the case?
2. Define the terms *point of articulation*, *manner of articulation*, and *voicing (sound)*. Give two original examples of how an understanding of these concepts could be helpful to you.
3. Examine the charts of English consonant and vowel phonemes. Explain why it is significant that not every slot (or cell) is filled.
4. Explain the relationship between phonemes and allophones and their differing roles within a language.
5. Both *assimilation* and *dissimilation* are important phonetic processes. Define each term, and give two original examples of each.
6. How could you put phonetics to work in learning a second language?
7. What would be some advantages and disadvantages of changing English spelling to bring it more into line with pronunciation?
8. Do you think spell checkers will increase or decrease the likelihood of spelling reform? What are your reasons?
9. The following sentences were written by elementary school students:
 - a. "I haf to go now."
 - b. "Why won chew be my friend?"
 - c. "I went to see my grampa."

From what you know about phonetics, how can you explain their spelling errors?