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FUNDAMENTALS OF
PHONETICS
A Practical Guide for Students

5e

Brief Contents

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Preface

The idea to create this textbook began in 1996. I needed a phonetics textbook that would coincide with the lecture material I used when teaching my own phonetics course. So I began to write my own book. Little did I know I would be revising the text for this fifth edition more than twenty years later!

One of the guiding principles I followed when writing the first edition was to ensure that anyone could pick up the book and understand the material. I have tried to follow this principle in all subsequent editions. This fifth edition is quite similar to earlier editions in terms of basic layout and organization. Each chapter has been revised with updated material and new exercises. The book is filled with a wealth of exercises to assure that students become experts in basic phonetic transcription of American English. Answers to most of the exercises can be found in the back of the book so that students can immediately receive feedback on their progress.

It is not possible to learn phonetic transcription without having an abundance of listening exercises. Therefore, audio recordings of many of the exercises are available as Audio Practice files in the e-textbook. These recordings are essential in helping students learn the subtleties of pronunciation, both in relation to the segmental and suprasegmental characteristics of speech.

New to This Edition

- Learning Objectives have been updated in each chapter to reflect changes in content.

- *Chapter Summaries* that shadow the Learning Objectives have been added to the end of each chapter.

- Existing embedded exercises have been revised, and new ones have been added throughout the text.

- New material has been added to Chapter 2, *Phonetic Transcription of Speech*, including an expanded section on spelling versus sound. Additional information relating to word stress and consonant and vowel patterns in syllables also has been added to the chapter.

- New anatomical figures have been created for Chapter 3, *Anatomy and Physiology of the Speech Mechanism.* A discussion of the source-filter theory of speech production also has been added.

- A new section on the application of speech acoustics in clinical practice has been added to Chapter 6, *Acoustic Characteristics of Vowels and Consonants.*

- Chapter 9, *Dialectal Variation,* has been revised and updated with current census data relative to the population demographics of the United States. Additional material has been added on sociolinguistics and regional dialects.

- Online Resources have been updated to include additional websites that should prove beneficial to students' understanding of phonetics.

- References have been updated to reflect current philosophies and best practices in the speech, language, and hearing professions.

- Starting with this edition, the IPA symbol /ɹ/ ("turned r") will be used when transcribing consonantal English "r" as in the words "rabbit" /ɹæbɪt/ and "star" /stɑɹ/. In previous editions, the symbol /r/ was used when transcribing consonantal "r." (The IPA symbol /r/ is a trill, a sound not part of the English

sound system; /r/ has been used in phonetic transcription over the years by many speech and hearing professionals.) In order to remain consistent with the principles of the IPA, and to avoid confusion, turned r will be used when transcribing consonantal "r."

• Supplemental audio recordings, called Audio Practice, are embedded in many of the e-textbook chapters for transcription practice (the audio files also are available for the print version of this text).

Acknowledgments

I would not have been able to write this new edition without the assistance of many individuals who made the first four editions possible. First of all, I must thank the Department of Communication Sciences and Disorders at Ohio University (Athens) for providing the learning environment necessary for me to become knowledgeable in the area of phonetics. Specifically, I would like to thank my mentor Dr. Zinny Bond for her unfaltering support and friendship throughout the years.

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A final thank you goes to the reviewers for this fifth edition whose contributions greatly assisted me in the editing process: Andy McMillin from Portland State University; Barabara Prakup from Cleveland State University; Joy E. Good from Arkansas State University, Jonesboro; Mary Dale Trabue Fitzgerald from Tennessee State University; and William F. Katz from University of Texas at Dallas.

Chapter 1
Phonetics: A "Sound" Science

<div style="border-bottom">

∨ Learning Objectives

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After reading this chapter you will be able to:

1.1 Explain the importance of the study of phonetics and the International Phonetic Alphabet (IPA).

1.2 State the reasons for variation in phonetic transcription practice.

1.3 State the benefits of using a Unicode font for phonetic transcription.

Phonetics and the International Phonetic Alphabet

As adults, you are all familiar with the speaking process. Speaking is something you do every day. In fact, most people find speech to be quite automatic. It is safe to say that most of us are experts at speaking. We probably have been experts since the time we were 3 or 4 years old. Yet we never really think about the process of speech. We do not, as a rule, sit around thinking about how ideas are formed and how their encoded forms are sent from the brain to the speech organs, such as the teeth, lips, and tongue. Nor do we think about how the speech organs can move in synchrony to form words. Think about the last party you attended. You probably did not debate the intricacies of the speech process while conversing with friends. Speaking is something we learned during infancy, and we take the entire process for granted. We are not aware of the speech process; it is involuntary—so involuntary that we often are not conscious of what we have said until after we have said it. Those of you who have "stuck your foot in your mouth" know exactly how automatic the speech process is. Often we have said things and we have no idea why we said them.

Phonetics is the study of the production and perception of speech sounds. During your study of phonetics, you will begin to think about the process of speech production. You will learn how speech is formulated by the speech organs. You also will learn how individual speech sounds are created and how they are combined during the speech process to form syllables and words. You will need to learn to *listen* to the speech patterns of words and sentences to become familiar with the sounds of speech that comprise spoken language. A large part of any course in phonetics also involves how speech sounds are transcribed, or written. Therefore, you also will be learning a new alphabet that will enable you to transcribe speech sounds. This alphabet, the **International Phonetic Alphabet (IPA)**, is different from most alphabets because it is designed to represent the *sounds* of words, not their spellings. Without such a systematic phonetic alphabet, it would be virtually impossible to capture on paper an accurate representation of the speech sound disorders of individuals seeking professional remediation. Using the IPA also permits consistency among professionals in their transcription of typical or atypical speech.

Another "sound" science related to phonetics is **phonology**. Phonology is the systematic organization of speech sounds in the production of language. The major distinction between the fields of phonetics and phonology is that *phonetics* focuses on the study of speech sounds, their acoustic and perceptual characteristics, and how they are produced by the speech organs. *Phonology* focuses on the linguistic (phonological) rules that are used to specify the manner in which speech sounds are organized and combined into meaningful units, which are then combined to form syllables, words, and sentences. Phonological rules, along with syntactic/morphological rules (for grammar), semantic rules (for utterance meaning), and pragmatic rules (for language use), are the major rule systems used in production of language.

The idea of studying speech sounds may be an odd idea to understand at first. We generally think about words in terms of how they appear in print or how they are spelled. We usually do not take the time to stop and think about how words are spoken and how spoken words sound to a listener. Look at the word "phone" for a moment. What comes to mind? You might consider the fact that it contains the five letters: p-h-o-n-e. Or you might think of its definition. You probably did not say to yourself that there are only three speech sounds in the word ("f"-"o"-"n"). The reason you do not consider the sound patterns of words when reading is simple—it is not something you do daily. Nor is it something you were taught to do. In fact, talking about the sound patterns of words and being able to transcribe them is an arduous task; it requires considerable practice. Let's try another example. How many speech sounds do you think there are there in the word "street"? If you answered five, you are correct.

As you soon will find out, the way you believe a word sounds may not be the way it sounds at all. First, it is difficult to forget our notions of how a word is spelled. Second, our conception of how a word sounds is usually wrong. Consider the greeting "How are you doing?" We rarely ask this question with such formality. Most likely, we would say "How ya doin'?" What happens to the word "are" in this informal version? It disappears! Now examine the pronunciation of the words "do" and "you" in "Whatcha want?" (the informal version of "What do you want?"). Neither of these words is spoken in any recognizable form. Actually, these words become the non-English word "cha" in "whatcha." With these examples, you can begin to understand the importance of thinking about the sounds of speech in order to be able to discuss and transcribe speech patterns.

Exercise 1.1

The expressions below are written two separate ways: (1) formally and (2) casually. Examine the differences between the two versions. What happens to the production of the *individual* words in the casual version?

Formal	Casual
1. Are you going to eat now?	Ya gonna eat now?
2. Can't you see her?	Cantcha see 'er?
3. Did you go?	Ja go?

Phonetics is a skill-based course much like taking a foreign language or sign language course. In many ways it *is* like learning a new language because as you learn the IPA, you will be learning new symbols and new rules to represent spoken language. However, the new symbols you will be learning will be representative of the *sounds* of English, *not their spelling*. As with the learning of any new language, phonetics requires considerable practice in order for you to become proficient in its use when transcribing speech patterns. This text is designed to promote practice of phonetic transcription principles.

At the beginning of each chapter, several *Learning Objectives* are listed. By reading through the Learning Objectives, you will have a clear idea of the material contained in each chapter and what you should expect to learn as you read

through the text and complete the exercises. *Chapter Summaries*, at the end of each chapter, provide a summary of the *Learning Objectives* in a bulleted format.

By now you may have noticed that exercises are embedded in the text. It is important that you complete the exercises as you go along instead of waiting until after you have completed the chapter. These exercises emphasize particular points by highlighting the material you just completed, thereby assisting in the learning process. If you are unsure of an answer, simply look in the back of the text for assistance in completing the embedded exercises.

At the end of each chapter, you will find a series of *Review Exercises* so that you may gain expertise with the material presented. The Review Exercises help drive home much of the material discussed in each chapter. All of the answers to the Review Exercises are located at the back of the book. Similar to the embedded exercises, providing the correct answers for the Review Exercises will provide you with immediate feedback, helping you learn from your mistakes. There is no better way to learn! To aid in the learning process, all new terms are in bold letters the first time they are used. In addition, all new terms are located in the *Glossary* at the back of the book.

Study Questions at the end of each chapter will help you explore the major concepts presented. *Online Resources* also are provided to supplement the material presented in the text. *Assignments* at the end of the chapters were designed to be collected by your instructor to test your comprehension of the material. Therefore, the answers for Assignments are not given in the text.

There are several conventions that are adopted throughout the text. When there is a reference to a particular Roman alphabet letter, it is enclosed with a set of quotation marks: for example, the letter "m." Likewise, references to a particular word are also enclosed with quotation marks: for example, "mail." Individual speech sounds are referenced with the traditional slash marks: for example, the /m/ sound. When a word and its transcription are given together, they appear in the following format: "mail" /meɪl/.

Audio Practice files provide a wide range of listening exercises to accompany the text. Clinical practice generally requires phonetic transcription of recorded speech samples. Reading words on paper and transcribing them is not the same as transcribing spoken words. The Audio Practice files are designed to increase your listening skills and your ability to transcribe spoken English. Exercises requiring the Audio Practice files are indicated with a speaker icon in the text. The speaker icon will alert you to the presence of an audio file in order to complete the exercise.

Variation in Phonetic Practice

Although the IPA was developed for consistency, not everyone transcribes speech in the same manner. The IPA does allow for some flexibility in actual practice. If you were to pick up another phonetics textbook, you would observe notice some definite differences in transcription symbols. Therefore, alternate transcription schemes are introduced throughout this text.

One reason transcription practice differs from individual to individual is due to personal habit or the method learned. For instance, the word "or" (or "oar") could be transcribed reliably in all of the following ways:

/ɔɹ/, /oɹ/, /ɔɚ/, /oɚ/, /ɔ͡ɚ/

All of these forms have appeared in other phonetics textbooks and have been adopted by professionals through the years.

Several years ago I was assigned to a jury trial that lasted two weeks. Due to the length of the trial, the judge allowed us to take notes. So that no one could read my notes, I decided to use the IPA! Because I had to write quickly, my transcription habits changed. At the beginning of the trial, I transcribed the word "or" as /ɔɚ/ due to personal preference. By the middle of the trial, I had switched to /ɔɹ/, simply because it was easier to write and more time efficient.

Another difference in ease of use of transcription symbols involves the symbol /r/, traditionally used to transcribe the initial sound in the word "red." According to the IPA, this sound actually should be transcribed with the symbol /ɹ/. The IPA symbol /r/ represents a *trill*, a sound found in Spanish and other languages but not part of the English speech sound system. Because /r/ and /ɹ/ both do not exist in English, /r/ often is substituted simply because it is easier to write. In previous editions of this text, /r/ was used to represent "r" sounds in English words. However, with the ever-increasing number of Spanish speakers in the United States, it has become increasingly important that these two symbols remain distinct; that is /r/ should be reserved for trills, and /ɹ/ should be reserved for "r" sounds, as in the words "<u>r</u>ed," "a<u>r</u>ound," and "st<u>r</u>eet." Therefore, in this edition, /ɹ/ will be used to represent English "r"' sounds.

As future speech and hearing professionals, you will be using the IPA to transcribe clients with speech sound disorders. Because the IPA was not originally designed for this purpose, clinicians have varied in their choice of symbols in transcription of speech sound disorders. In 1990, an extended set of phonetic symbols (known as the extIPA) was created as a supplement to the IPA to provide a more standard method for transcription of speech sound disorders (refer to Chapter 8). Similar to the original IPA, the extIPA has not been used consistently among phoneticians, linguists, and speech and hearing professionals.

Is one method of transcription "better" or more correct than another? Some linguists and phoneticians might argue that one form is superior to another based on linguistic, phonological, or acoustic theory. The form of transcription you adopt is not important as long as you understand the underlying rationale for your choice of symbols. In addition, you need to make sure that you are consistent and accurate in the use of the symbols you adopt. Throughout this text, variant transcriptions are introduced to increase your familiarity with the different symbols you may encounter in actual clinical practice in the future.

The IPA and Unicode Fonts

Historically, the typical typewriter or computer did not lend itself well to the IPA. Some keyboard symbols were routinely substituted for IPA symbols simply because typewriters and computer keyboards did not have keys for many of the IPA symbols. For example, the word "dot" was typically transcribed (i.e., typed) as /dat/ instead of the correct form /dɑt/ because it simply was not possible to type the vowel symbol /ɑ/.

You may not know it, but you already have the ability to type IPA symbols with one of the fonts located on your computer. In 1991 the Unicode Consortium was established to develop a universal character set that would represent all of the world's languages. The Consortium continues to publish the Unicode Standard, which in its most recent version—version 11.0.0—covers virtually all of the characters of all the languages of the world, including several character sets for the IPA. In addition, there are character sets for currency symbols, braille patterns, geometric shapes, musical symbols, mathematical symbols, and even emojis.

The current version of the Standard contains 137,374 characters, including 684 new characters and 66 new emojis. Each character is mapped to a unique alphanumeric sequence called a *code point*. A code point is a hexadecimal sequence of numbers (0 through 9) and/or letters ("a" through "f") that uniquely identify each of the characters in the set. Each character also has a unique name. For instance, the code point for the Roman letter "j" is *006A*, and its name is "Latin small letter j." Similarly, the code point for the Greek letter "θ" is *03B8*, and its name is "Greek small letter theta." Since each character in the universal set is linked to an alphanumeric sequence, the word processor and font you select will determine the "look" of each individual character, that is, what appears on your monitor and what is reproduced by your printer. Keep in mind that any one particular Unicode font does not contain all of the code points from the universal set.

The nice thing about Unicode fonts is that they can be used on multiple platforms (e.g., Macintosh, Windows, Linux) and with all word processing software packages. Unicode fonts also can be used when creating HTML documents for online use. In the past, cross-platform fonts did not exist. Also, there was a limit to the number of characters contained in any one font package; most fonts were limited to 256 characters. Fonts of different languages existed separately as well, making it difficult to switch between writing systems in the same document.

Another advantage of using a Unicode font with IPA symbols is that once the symbols have been typed into a particular document, you can switch to a different Unicode font and all of the symbols will remain intact. The only difference in appearance between fonts would be related to a particular font's size and shape and whether it is a serif or sans serif font. Prior to the utilization of Unicode, it was not possible to switch fonts without obliterating all of the IPA symbols in a document. Trust me, I know!

A number of Unicode phonetic fonts are available online. Many are available for free and are really quite easy to download and use. The phonetic symbols in this text were created with *Charis SIL,* a Unicode font available from SIL International (refer to the "Online Resources" at the end of this chapter). This font contains over 2000 characters. *Doulos SIL* and *Gentium* are two other Unicode phonetic fonts available for free from the SIL International website.

There are three ways to enter IPA symbols from a Unicode font into a document: (1) make use of software that creates an alternate keyboard layout; (2) enter the code point for each IPA symbol; or (3) insert each symbol individually by using character maps available as part of the Windows and Macintosh operating systems.

The easiest method is to use an alternate keyboard layout. I obtained a specialized keyboard for entering the IPA symbols in this text from the website of University College London (UCL) Psychology and Language Sciences (refer to the "Online Resources" at the end of the chapter). Once the keyboard was installed, all I had to do to enter the symbol /ʃ/ was to simply type SHIFT + "s." Without such a keyboard, it would be necessary to type the unique code point for each character (which is a tedious and time-consuming task). In Microsoft Word (Windows), you would have to type the four-character code point, followed by the sequence ALT + "x," for entry of a particular symbol. For instance, typing the sequence "0283" followed by ALT + "x" will yield the IPA symbol /ʃ/ (without the slash marks). With Mac OS, you would need to go to *System Preferences;* select *Keyboard, Input Sources*; and then *Unicode Hex Input.* Also, select *show input menu in menu bar.* Once *Unicode Hex Input* is selected, hold down the ALT key, and type the code point sequence for the particular phonetic symbol you want. Alternatively, you could use the "insert symbol" function (Windows) or use the "character viewer" (Macintosh) to enter the symbols individually from a character map that shows all of the symbols associated with a particular font. This process is much more tedious and time-consuming.

Exercise 1.2

Configure your computer so that you can enter code points into a text document (refer to the "Online Resources" at the end of the chapter for help). Then enter the following code points, and write the corresponding IPA symbols in the blanks provided.

Code Point	IPA Symbol
1. 0259	_____
2. 03B8	_____
3. 028A	_____
4. 0271	_____
5. 0279	_____

A Note on Pronunciation and Dialect

As you read this text, and as you attempt to answer the various exercises, please keep in mind that English pronunciation varies depending upon individual speaking style as well as on **dialect**. A dialect is a variation of speech or language based on geographical area, native language background, and social or ethnic group membership. Dialect involves not only pronunciation of words but also grammar (syntax) and vocabulary usage. As you will learn in Chapter 9, there is no one fixed standard of English in the United States as is the case in other countries. Instead, Americans speak several different varieties of English depending upon the region of the country in which they live. Additionally, dialects such as African American English and Mexican American English have particularly strong ties to ethnic group membership even though regional variations do exist among these dialects. The population of the United States contains many foreign-born residents who have learned English as a second language. The dialect of English spoken by a foreign-born individual is affected, at least in part, by his or her native language. This is because foreign languages have a different set of speech sounds than those we use in English. There are sounds that are present in English that are not present in the foreign language, and vice versa. For example, English has 14 vowels, whereas Spanish has only five vowels. Therefore, when a native Spanish speaker is learning English, it is not uncommon for the speaker to substitute one of the five Spanish vowels for an English vowel that does not exist in the Spanish vowel system, contributing to the person's "accent."

Knowledge of dialects is extremely important when establishing a treatment plan for individuals with a communication deficit and whose speech patterns reflect regional or ethnic dialectal variation. Because a dialect should not be considered a substandard form of English, a speech-language pathologist should be concerned only with remediation of clients' speech sound errors, not their dialects.

The pronunciations used in this text often reflect the author's Midwest (northern Ohio) pronunciation patterns. This does not mean that alternate pronunciations are wrong! The numerous text and recorded examples, as well as the answer key, may not be indicative of the way *you* pronounce a particular word or sentence. Always check with your instructor for alternate pronunciations of the materials found in this text and in the Audio Practice files.

Chapter Summary

- Phonetics involves the study of how speech sounds are produced, how individual speech sounds are combined to form syllables and words, and the instruction of phonetic transcription for manually recording spoken utterances. The International Phonetic Alphabet (IPA) is a unique alphabet designed to represent the *sounds* of words of a language, not the spelling of words. Use of the IPA permits consistency among professionals in their transcription of typical or atypical speech.

- Variation in phonetic transcription exists for several reasons, including differences in methods learned, personal habit, how strictly the IPA is followed, and which symbols are adopted for transcribing disordered speech.

- The use of a Unicode font is useful when transcribing speech by computer. Unicode fonts provide a universal character set of over 137,000 characters (mapped to a unique alphanumeric code point), including the IPA. Unicode fonts can be used on multiple platforms including Macintosh, Windows, and Linux.

Study Questions

1. What is a *phonetic alphabet*?
2. Why is it important to use a phonetic alphabet in transcription of individuals with speech sound disorders?

3. Why is there variation in phonetic transcription from professional to professional?
4. What is the difference between *phonetics* and *phonology*?
5. What is a Unicode font? What are the advantages of using such a font?
6. What are three ways you can enter phonetic symbols into a document using a Unicode font?

Online Resources

Search online for *Symbol Codes Home Penn State University*. This website provides several resources related to phonetic fonts and keyboards for both Windows and Macintosh.

Search online for *SIL International.* From the organization's website, select "resources" and "software and fonts" for a vast list of phonetic font resources, including downloads for the Unicode fonts Charis SIL and Doulos SIL.

Search online for *The Unicode Consortium* for information regarding the most current Unicode standard, access to character code charts for all the world's languages, the IPA, and many different symbol and character sets.

Search online for *University College London Psychology and Language Sciences*. From the home page of the website, search for "resources and tools" in the search bar at the top right of the page. This site has a wealth of information relating to Unicode fonts and keyboarding.

Chapter 2
Phonetic Transcription of English

⌄ Learning Objectives

After reading this chapter you will be able to:

2.1 Explain the differences between spelling and sound in English.

2.2 Describe the importance of *morphemes, phonemes,* and *allophones* in phonetics

2.3 Define and describe the components of a syllable.

2.4 Identify primary stress in words.

2.5 Describe the differences between broad and narrow transcription, and systematic and impressionistic transcription.

As you begin your study of phonetics, it is extremely important to think about words in terms of how they sound and *not* in terms of how they are spelled. As you begin your study of phonetics, it is extremely important to think about words in terms of how they sound and *not* in terms of how they are spelled. *The repetition of this first sentence is not a typographical error.* The importance of this concept cannot be stressed enough. You *must* ignore the spelling of words and concentrate only on speech sounds. If you have been troubled in the past with your inability to spell, do not fear—phonetics is the one course where spelling is highly discouraged.

For many, ignoring spelling and focusing only on the sounds of words will be a difficult task. Most of us started to spell in preschool or kindergarten as we learned to read. It was drilled into our heads that "cat" was spelled C-A-T and "dog" was spelled D-O-G. Consequently, we learned to connect the spoken (or printed) words with their respective spellings. Imagine the following fictitious scenario between a parent and child reading along together before bedtime:

> "OK, Mary. Now, let's think about the word 'cat.' It's spelled C-A-T, but the first speech sound is a /k/ as in 'king,' the second sound is an /æ/ as in 'apple,' and the third sound is a /t/ as in 'table.' Notice that the first sound is really a /k/ even though the word begins with the letter 'c.' When 'c' begins a word, it may sound like /k/ or it may sound like /s/, as in the word 'city.' Actually, Mary, there is no phonetic symbol in English that uses the printed letter 'c.'"

Obviously, this type of interchange would cause children to lose any desire to read!

The Differences Between Spelling and Sound

The English language, as we know it today, reflects significant historical changes that occurred during its three major developmental periods: Old English (300–1150 CE), Middle English (1150–1500 CE), and Modern English (since 1500 CE). The period between 300 and 500 CE marked both the end of the Roman Empire and the invasion of Britain by the Anglo-Saxons. In the 600s, the Roman alphabet was introduced to the Anglo-Saxons by Christian missionaries. Anglo-Saxon monks first adopted the Roman alphabet to transcribe Old English.

The Roman alphabet was originally used to transcribe Latin. It was particularly well-suited to represent Latin since there was a separate letter for each individual Latin speech sound. An alphabet that maintains a one-to-one relationship between a sound and a particular alphabet letter is known as a **phonetic alphabet**.

The Norman Conquest of England occurred during the late Old English period. English began to disappear as French became the official language. During the early Middle English period, English no longer appeared in a written form; all writing was in either French or Latin. French scribes attempted to transcribe Old English using their own French speaking patterns. As such, changes in spelling began to reflect the French influence. However, the alphabet contained both Old English and French letters.

Modern spelling began to be formalized by the end of the Middle English period and the beginning of the Modern period. Scribes copied forms used by their predecessors and adopted spelling conventions with little regard for pronunciation changes; the Roman alphabet was no longer alphabetic. Also, with the advent of printing, the spelling of words began to become more standard. Since many of the first printers were from other countries, they used their own spelling conventions. Words were often contracted or abbreviated in their spellings, and words were given extra letters instead of using spaces, in order to make sure the lines of print on the page were lined up properly, or justified.

Contemporary spelling conventions also reflect letters in words that were once pronounced but have become "silent" over time. For example, the final sound in the word "plumb" has no connection to its pronunciation. Consequently, "plumb" has only four speech sounds but five printed letters, or **graphemes**. *Silent letters* also can be found in the words "gnome," "psychosis," "rhombus," and "pneumonia."

Exercise 2.1

Compose a list of 10 words that contain *silent letters*.

Many oddly spelled English words, and those that contain silent letters, are often related to the origin of a word and usually reflect a spelling common to the language from which it was borrowed. For example, words such as "pneumonia," "rhombus," and "cyst" are derived from the Greek language, helping explain their particular spellings. In addition, we borrow entire words from other languages, keeping their spelling intact. This only adds to our spelling irregularities. Examples of some words borrowed from other languages include:

quiche (French)	karaoke (Japanese)
kielbasa (Polish)	chutzpah (Yiddish)
sauerkraut (German)	taekwondo (Korean)
tequila (Spanish)	lasagna (Italian)

Examine the word "through." The word has seven *graphemes* but only three speech sounds: "th," "r," and "oo." Now examine the word "phlegm." How many sounds (not letters) do you think are in this word? If you answered four, you are correct—"f," "l," "e," and "m." Letters only tell us about spelling; they give no clues as to the number of sounds in a word or the word's actual pronunciation. It is imprecise to talk about a sound that may be associated with a particular alphabet letter (or letters) because the letters may not be an accurate reflection of the sound they represent. For instance, the grapheme "s" represents a different sound in the word "size" than it does in the word "vision." What do you think is the sound associated with the letter "g" in the word "phlegm"?

Exercise 2.2

Say each of the following words out loud to determine the number of sounds that comprise each one. Write your answer in the blank.

Examples:

_3_	reed	_4_	frog	_4_	wince
____	lazy	____	smooth	____	cough
____	spilled	____	driven	____	oh
____	comb	____	why	____	raisin
____	thrill	____	judge	____	away

Because the Roman alphabet contains fewer letters than the number of speech sounds in English, one alphabet letter often represents more than one speech sound. For instance, the grapheme "c," in the words "cent" and "car," represents two different sounds. Likewise, the grapheme "o" represents *six* different sounds in the words "cod," "bone," "women," "bough," "through," and "above." Sometimes the same sequence of letters represents different sounds in English. For instance, the letter sequence "ough" represents four different vowel sounds in the words "through," "bough," "cough," and "rough." (Note that the spelling "ough" also represents the inclusion of the consonant /f/ in the last two words.) These examples provide further evidence of why it is inappropriate to discuss sounds in association with letters. After reading the previous information, how would you answer the following question: What is the sound of the letter "o" or the letters "ough"?

Exercise 2.3

For each grapheme given, provide two words that demonstrate the varied use of that grapheme.

Examples:

_c_	_car_	_city_
_s_	_vision_	_sit_
_a_	_____	_____

Exercise 2.3 (*Cont.*)

i	_____	_____
g	_____	_____
f	_____	_____
z	_____	_____

Another way sound and spelling differ is that the same sound can be represented by more than one letter or sequence of letters. **Allographs** are different letter sequences or patterns that represent the same sound. The following groups of words contain allographs of a particular sound, represented by the underlined letters. You will note that the sound associated with some allographs is predictable, while the sound associated with others is not. Keep in mind that for each example, although the spelling is different, *the sounds they represent are the same.*

> loop, through, threw, fruit, canoe
> mail, convey, hate, steak
> trite, try, tried, aisle, height
> for, laugh, photo, muffin
> shoe, Sean, caution, precious, tissue
> scene, miss, same, censure
> jam, exaggerate, gem, lodge, soldier

Note in some of the examples that *pairs* of letters often represent one sound because there are simply not enough single alphabet letters to represent all of the sounds of English. These pairs of letters are called **digraphs**. Digraphs may be the same two letters (as in "hoot," "heed," or "tissue") or two completely different letters (as in "shoe," "steak," or "tried").

Exercise 2.4

Examine the underlined sounds (letter combinations) in the words in each row. Place an "X" in front of the one word that does not share an allograph with the others.

Example:

	raid		cake		hey	X	back
1. ___	shoe	___	measure	___	ocean	___	sufficient
2. ___	chord	___	liquor	___	biscuit	___	rag
3. ___	moon	___	through	___	though	___	suit
4. ___	wood	___	done	___	flood	___	rub
5. ___	ice	___	was	___	press	___	scissors

Morphemes, Phonemes, and Allophones

In this section, we will focus our attention on *morphemes, phonemes,* and *allophones*. These three units of spoken language help form the foundation for the study of phonetics. You will soon understand how a thorough understanding of these three basic elements of language is essential in your mastery of phonetics and phonetic transcription.

Morphemes: Units of Meaning

One key to understanding the irregularity of English spelling can be found if we study the spelling patterns among words that share similar meaningful linguistic units, or morphemes. A **morpheme** is the smallest unit of language capable of carrying meaning. For instance, the word "book" is a morpheme. The word "book" carries meaning because it connotes an item that is composed of pages with print, binding, two covers, and so on. The word "chair" is also a morpheme; it conveys meaning.

Now consider the word "books." It contains two morphemes, the morpheme "book" and the morpheme represented by the word ending -s. The -s ending indicates the plural form of the word, that is, more than one book. Since -s carries meaning, it is a morpheme. Other examples of morphemes include regular verb endings (such as -ed and -ing as in the words "walk<u>ed</u>" and "call<u>ing</u>"), prefixes (such as pre- and re- as in "prepaid" and "reread"), and suffixes (such as -tion in "constitution" and -ive as in "talkative"). Notice that syllables and morphemes are *not* the same thing. It is possible for a one-syllable word, such as "books" or "walked," to have more than one morpheme. Conversely, it is possible for words with more than one syllable to be comprised of only one morpheme (e.g., "celery" and "asparagus").

Take a moment to examine the following three pairs of words. Notice that each word pair shares the same morpheme. Say each pair aloud. What do you notice?

*music music*ian   *phlegm phlegm*atic   *press press*ure

Hopefully you noted that although each pair shares the same morpheme, the pronunciation of the morphemes in each pair is different. English morphemes tend to be spelled the same even though the words that share them are pronounced in a different manner. English spelling may not appear to be so odd if one considers the spelling of the morphemes that form the roots of many irregularly spelled English words (MacKay, 1987).

Morphemes that can stand alone and still carry meaning, such as "book," "phlegm," "music," or "press," are called **free morphemes**. Morphemes (bold) such as **pre**(date), **re**(tread), (book)**s**, (music)**ian**, and (press)**ure** are called **bound morphemes** because they are bound to other words and carry no meaning when they stand alone.

Having a good understanding of morphemes is important in the study of phonetics. However, when performing phonetic transcription, we will not focus on morphemic analysis of words. Instead, our attention will be on individual speech sounds, or *phonemes*.

Exercise 2.5

A. For each item below, think of another word that shares the same morpheme.

Example:

create   _____creation_____

1. deduce   _____   3. potent   _____
2. protect   _____   4. scrutiny   _____

Exercise 2.5 (*Cont.*)

5. labor   _____   8. decent   _____

6. great   _____   9. late   _____

7. honest   _____   10. magnet   _____

B. Indicate the number of morphemes in each of the following words.

Examples:

__1__	cucumber	__2__	reading	__3__	reworked		
____	caution	____	running	____	lived	____	relistened
____	warmly	____	finger	____	talker	____	kangaroo
____	prorated	____	clarinetist	____	sharply	____	swarming

Phonemes and the International Phonetic Alphabet (IPA)

A **phoneme** is an individual speech sound that is capable of differentiating morphemes and therefore is capable of distinguishing meaning. Note that a morpheme (such as "look") is composed of a string of individual phonemes. A change in a single phoneme always will change the identity and meaning of the morpheme. For example, by changing the initial phoneme from /l/ to /b/, the morpheme "look" becomes "book." Using our definition of phoneme, we can say that the phoneme /l/ (or the phoneme /b/) differentiates the two morphemes "look" and "book." By changing the final phoneme from /t/ to /b/, the morpheme "cat" is distinguished from the morpheme "cab." In these two examples, a change of only one phoneme results in the creation of two morphemes (words, in this case) with completely different meaning. Words that vary by only one phoneme (in the same word position) are called **minimal pairs** or **minimal contrasts**. "Look"/"book" and "cat"/"cab" are examples of minimal pairs because they vary by only one phoneme. Other examples of minimal pairs include "hear"/"beer," "through"/"brew," "clip"/"click," and "brine"/"bright." Notice that these words differ by only *one speech sound* even though spelling shows more than one letter change.

Exercise 2.6

A. For each word below, create a minimal pair by writing a word in the blank. The first five minimal pairs should reflect a change in the initial phoneme; the second five should involve a change in the final phoneme.

Examples:

initial phoneme change   seal   <u>meal</u>

final phoneme change   card   <u>cart</u>

Exercise 2.6 (*Cont.*)

initial phoneme change   *final phoneme change*

1. tame _____	6. heart _____
2. late _____	7. tone _____
3. call _____	8. web _____
4. could _____	9. cheap _____
5. boil _____	10. rub _____

B. Place an "X" next to the word pairs that are examples of minimal pairs.

_____ 1. kale, mail	_____ 6. find, fanned
_____ 2. blog, blot	_____ 7. daughter, slaughter
_____ 3. smart, smarts	_____ 8. twitch, switch
_____ 4. rinse, sins	_____ 9. rings, brings
_____ 5. bird, burned	_____ 10. limes, rhymes

Because it is difficult to use the Roman alphabet to represent speech sounds, the International Phonetic Alphabet (IPA) has been adopted by linguists, phoneticians, and speech and hearing professionals for the purpose of speech transcription. The IPA is a *phonetic* alphabet; each symbol of the alphabet represents one specific speech sound. The IPA was created for adoption by languages worldwide by the International Phonetic Association, formed in 1886. The IPA symbols are consistent from language to language. For example, the English word "sit" and the German word "mit" (meaning "with") both have the same vowel. Therefore, we would use the same vowel symbol to transcribe these words (/sɪt/ and /mɪt/, respectively). A list of all the common IPA symbols used in English is located in Table 2.1.

The complete IPA chart (revised to 2015) is located in Figure 2.1. Take some time to examine the chart. There are several sections that need to be highlighted. The large area at the top, labeled CONSONANTS (PULMONIC), shows all the consonants of the world's languages that are produced with an airstream from the lungs. All English consonants are pulmonic consonants. Many of these symbols may appear foreign to you. Compare the IPA pulmonic consonants with the English consonant symbols given in Table 2.1. You will observe that many of the symbols in the IPA chart represent sounds not present in spoken English. However, some of the non-English symbols are used in transcription of disordered speech. This will be discussed in some detail in Chapter 8. Also, call your attention to the section of NON-PULMONIC CONSONANTS that are produced without the need for airflow from the lungs. Non-pulmonic consonants include the *clicks* often heard in some African languages.

An especially important part of the IPA chart is labeled VOWELS. You will note that the vowels are placed in various locations around a four-sided figure. This *quadrilateral* is a schematic drawing of a speaker's mouth, or oral cavity. The placement of the vowel symbols within the quadrilateral is *roughly* based on where the tongue is located during production of the various vowels. As with the consonants, many of the IPA vowel symbols are representative of speech sounds not found in English.

TABLE 2.1 The IPA Symbols for American English Phonemes.

	Symbol	Key Word	Symbol	Key Word
Vowels	/i/	key	/o/	okay
	/ɪ/	win	/ɔ/	law
	/e/	reb<u>a</u>te	/ɑ/	cod
	/ɛ/	red	/ə/	<u>a</u>bout
	/æ/	had	/ʌ/	bud
	/u/	moon	/ɚ/	butt<u>er</u>
	/ʊ/	wood	/ɝ/	bird
Diphthongs	/aʊ/	how	/eɪ/	bake
	/aɪ/	tie	/oʊ/	rose
	/ɔɪ/	boy		
Consonants	/p/	pork	/ð/	<u>th</u>em
	/b/	bug	/s/	say
	/t/	to	/z/	zoo
	/d/	dog	/ʃ/	<u>sh</u>ip
	/k/	king	/ʒ/	beige
	/g/	go	/h/	hen
	/m/	mad	/tʃ/	<u>ch</u>ew
	/n/	name	/dʒ/	<u>j</u>oin
	/ŋ/	ri<u>ng</u>	/w/	wise
	/f/	for	/j/	<u>y</u>et
	/v/	vote	/ɹ/	row
	/θ/	<u>th</u>ink	/l/	let

The area marked DIACRITICS presents another array of specialized symbols that are used in conjunction with the IPA consonant and vowel symbols. **Diacritics** are employed to indicate an alternate way of producing a certain sound. The use of diacritical markings is explained in more detail in Chapter 8.

The last section of the IPA chart, most important for our purposes, is labeled SUPRASEGMENTALS. The suprasegmental symbols are used to indicate the stress, intonation pattern, and tempo of any particular utterance in a language.

As you look over the entire chart, you will notice that many of the unfamiliar symbols appear similar to the letters of the Roman alphabet. This was one of the guiding principles of the International Phonetic Association when creating the symbols for the IPA. That is, all symbols of the IPA were designed to blend in with the letters of the Roman alphabet (*Handbook of the International Phonetic Association,* 1999).

Initially, the IPA chart will be confusing to you. As you progress through this text, the chart will become less confusing and more meaningful in your study of phonetics. Some good resources that will help you become better acquainted with the sounds and symbols of the IPA can be found at the end of the chapter.

Figure 2.1 The International Phonetic Alphabet (revised to 2015). Based on IPA Chart, http://www.internationalphoneticassociation.org/content/ipa-chart, available under a Creative Commons Attribution-Sharealike 3.0 Unported License. Copyright © 2015 International Phonetic Association.

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2015)

CONSONANTS (PULMONIC) © 2015 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	’ Examples:
ǀ Dental	ɗ Dental/alveolar	p’ Bilabial
ǃ (Post)alveolar	ʄ Palatal	t’ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	k’ Velar
ǁ Alveolar lateral	ʛ Uvular	s’ Alveolar fricative

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative
w Voiced labial-velar approximant
ɥ Voiced labial-palatal approximant
ʜ Voiceless epiglottal fricative
ʢ Voiced epiglottal fricative
ʡ Epiglottal plosive

ɕ ʑ Alveolo-palatal fricatives
ɺ Voiced alveolar lateral flap
ɧ Simultaneous ʃ and x

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. t͡s k͡p
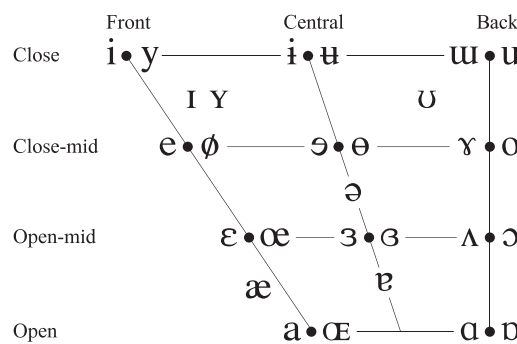
VOWELS

Where symbols appear in pairs, the one to the right represents a rounded vowel.

SUPRASEGMENTALS

ˈ Primary stress ˌfoʊnəˈtɪʃən
ˌ Secondary stress
ː Long eː
ˑ Half-long eˑ
˘ Extra-short ĕ
| Minor (foot) group
‖ Major (intonation) group
. Syllable break ɹi.ækt
‿ Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL		CONTOUR	
é or ˥	Extra high	ě or ˩˥	Rising
é ˦	High	ê ˥˩	Falling
ē ˧	Mid	é̄ ˦˥	High rising
è ˨	Low	è̌ ˩˨	Low rising
è̏ ˩	Extra low	ê̌ ˧˦˨	Rising-falling
↓ Downstep		↗ Global rise	
↑ Upstep		↘ Global fall	

DIACRITICS Some diacritics may be placed above a symbol with a descender, e.g. ŋ̊

̥ Voiceless	n̥ d̥	̤ Breathy voiced	b̤ a̤	̪ Dental	t̪ d̪
̬ Voiced	s̬ t̬	̰ Creaky voiced	b̰ a̰	̺ Apical	t̺ d̺
ʰ Aspirated	tʰ dʰ	̼ Linguolabial	t̼ d̼	̻ Laminal	t̻ d̻
̹ More rounded	ɔ̹	ʷ Labialized	tʷ dʷ	̃ Nasalized	ẽ
̜ Less rounded	ɔ̜	ʲ Palatalized	tʲ dʲ	ⁿ Nasal release	dⁿ
̟ Advanced	u̟	ˠ Velarized	tˠ dˠ	ˡ Lateral release	dˡ
̠ Retracted	e̠	ˤ Pharyngealized	tˤ dˤ	̚ No audible release	d̚
̈ Centralized	ë	̴ Velarized or pharyngealized	ɫ
̽ Mid-centralized	e̽	̝ Raised	e̝ (ɹ̝ = voiced alveolar fricative)
̩ Syllabic	n̩	̞ Lowered	e̞ (β̞ = voiced bilabial approximant)
̯ Non-syllabic	e̯	̘ Advanced Tongue Root	e̘
˞ Rhoticity	ɚ a˞	̙ Retracted Tongue Root	e̙

Exercise 2.7

Examine the vowel symbols in Table 2.1. Which vowel symbol would be used to transcribe each vowel in the following words?

Example:

    beast   __i__

1. lend   _____   4. should   _____

2. man   _____   5. rude   _____

3. flick   _____   6. week   _____

Exercise 2.8

Examine the consonant symbols in Table 2.1. Which consonant symbol would be used to transcribe the *last* consonant sound in each of the following words? Hint: Listen to the last sound in each word as you say it aloud. Remember: Forget about spelling!

Examples:

    dog   __g__

    rich   __tʃ__

1. ram   _____   4. sung   _____

2. laugh   _____   5. bath   _____

3. wish   _____   6. leave   _____

Exercise 2.9

Which vowel or consonant IPA symbol would you use when transcribing the sounds represented by the digraphs (underlined) in the following words? Write your answer in the blank. (Consult Figure 2.1 and Table 2.1 to assist in completing this exercise.)

1. shoe   _____   7. mocked   _____

2. them   _____   8. wing   _____

3. chew   _____   9. exaggerate   _____

4. guilt   _____   10. biscuit   _____

5. wood   _____   11. vision   _____

6. rough   _____   12. labor   _____

Complete Assignment 2-1.

Allophones: Members of a Phoneme Family

The term *phoneme* has been discussed as a speech sound that can distinguish one morpheme from another. However, there is another way to define *phoneme*. We could also say that a phoneme is a family of sounds. Speech sounds are not always produced the same way in every word. For example, the /l/ in the word "lip" is different from the /l/ in the word "bottle." You might say to yourself: How are they different? They are both /l/s. You need to consider how these /l/ sounds are produced in the mouth when saying these two words. In "lip," the /l/ is produced with the tongue toward the front of the mouth, and in the word "bottle" the /l/ is produced in the back of the mouth. Say them to yourself, and you will discover that this is indeed true. These are but two examples of the /l/ family of sounds.

Members of a phoneme family are actually variant pronunciations of a particular phoneme. These variant pronunciations are called **allophones**. The front (or light) /l/ and the back (or dark) /l/ are allophones or variant productions of the phoneme /l/. These two variants both can be found in the word "little" (the first /l/ is light; the second is dark). Try saying "little" by using the dark /l/ at the beginning of the word. Although the word may sound funny to you, it is still recognizable as the word "little." For this reason, the variants of /l/ are not individual phonemes. Saying the word "little" with either the front or back /l/ at the beginning of the word *does not change the identity or meaning of the original word*. That is, it does not result in the creation of a minimal pair.

Exercise 2.10

Try saying the /p/ sound in the word "keep" two different ways:

1. exploding (or releasing) the /p/
2. not exploding the /p/

(These are two allophones of the /p/ phoneme.)

Certain allophones must be produced a particular way due to the constraints of the other sounds in a word, that is, the *phonetic context*. For instance, the /k/ sound in the word "kid" is produced close to the front of the mouth because the vowel that follows it is a "front vowel," that is, a vowel produced toward the front of the mouth. On the other hand, the /k/ sound in "could" is produced farther back in the mouth because the vowel following /k/ is a "back vowel"— produced toward the back of the mouth. Say the two words, paying attention to the position of your lips and tongue as you pronounce them. Hopefully you will observe that there is a difference in the position of your speech organs. These two allophones of /k/ are *not* interchangeable due to the phonetic constraints of the vowel in each word. These allophones are said to be in **complementary distribution**. That is, these two allophones of /k/ are found in distinctly different phonetic environments and are not free to vary in terms of where in the mouth they may be produced.

Another example of complementary distribution involves production of /p/ in the words "pit" and "spit." In English, when /p/ is produced at the beginning of a word, a small puff of air occurs after its release. The puff of air is called *aspiration*. Say the word "pit" holding your hand in front of your mouth. You should be able to feel the puff of air escaping from your lips following the production of /p/. Whenever the phoneme /p/ follows the phoneme /s/, as in the word "spit,"

it will always be *unaspirated*. Say the word "spit" holding your hand in front of your mouth. You should feel less air than when you said the word "pit." Hold your hand in front of your mouth alternating the productions of these two words. You should be able to feel the variance in the airstream on your hand. These two allophones of /p/, aspirated and unaspirated, are in complementary distribution. In English, unaspirated phonemes never occur in the initial position of a word. However, unaspirated phonemes do occur at the beginning of words in many other languages, including Vietnamese, Spanish, Mandarin Chinese, and Tagalog.

In contrast to the examples just given, some allophones are not linked to phonetic context and therefore can be exchanged for one another; they are free to vary. In Exercise 2.10 you were asked to say the word "keep" two different ways, either releasing the /p/ or not; it is up to the speaker to decide. The phonetic environment has no bearing on whether the /p/ will be exploded. In this case, the allophones of /p/ are said to be in **free variation**. Likewise, the final /t/ in the word "hit" may be released or unreleased, depending on the speaker's individual production of the word. These two variant productions (released or unreleased) are allophones of /t/ that are in free variation.

Syllables and their Components

In conversational speech it is often difficult to determine where one phoneme ends and the next one begins. This is due to the fact that in conversational speech, phonemes are not produced in a serial order, one after the other. Instead, phonemes are produced in an overlaid fashion due to overlapping movements of the articulators (speech organs) during speech production. Because there is considerable overlap in phonemes during the production of speech, many phoneticians and linguists suggest that the smallest unit of speech production is not the allophone or phoneme but the **syllable**.

As you know, words are composed of one or more syllables. We all have a general idea of what a syllable is. If you were asked how many syllables are in the word "meatball," you would have little difficulty determining the correct answer—two. Even though you have a general idea of what a syllable is, in actuality it is quite difficult to answer the seemingly simple question: *What is a syllable?* The reason for this difficulty is that a syllable may be defined in more than one way. Also, phoneticians and linguists often do not agree on the actual definition of a syllable.

We will begin our definition by stating that a syllable is a basic building block of language that may be composed of either one vowel alone or a vowel in combination with one or more consonants. This is a typical dictionary definition. However, for our purposes this definition is not adequate because it is based on vowel and consonant *letters,* not vowel and consonant phonemes.

In most cases, it is easy to identify the number of syllables in a word. For instance, we would agree that the words "control," "intend," and "downtown" all have two syllables. Likewise, it is easy to determine that the words "contagious," "alphabet," and "tremendous" each have three syllables. However, it is not always so easy to determine the number of syllables in a word. Using our simple dictionary definition, the words "feel" and "pool" would be one-syllable words. That is, they each contain a vowel in combination with one or more consonant letters. Many individuals, however, pronounce these words as two syllables. On the other hand, some people pronounce these words as one syllable depending on their individual speaking style and dialect. The word "pool" is pronounced by many as "pull," as in "swimming pull." Likewise, some Southern speakers pronounce the word "feel" as "fill," as in "I fill fine."

Another example involves the words "prism" and "chasm." According to the basic definition, these words would be considered one syllable because they

contain only one vowel. However, most speakers would probably consider these words to consist of two syllables. One last example involves the pronunciation of words like "camera" or "chocolate." These words have three vowels but can be pronounced as either two or three syllables, depending on whether the speaker pronounces the middle vowel (i.e., "camra" or "choclate"). Both pronunciations are considered appropriate for either word.

Obviously a better definition of "syllable" is necessary to help overcome these difficulties. One way to refine our definition might be to more fully describe a syllable's internal structure, using terms other than consonant and vowel. It is possible to divide English syllables into two components: **onset** and **rhyme**. The onset of a syllable consists of all the consonants that precede a vowel, as in the words "**spl**it," "**tr**ied," and "**f**ast" (onset is in bold letters). Note that the onset may consist of either a single consonant or a **consonant cluster** (two or three contiguous consonants in the same syllable).

In syllables with no initial consonant, there is no onset. Examples of words with no onset are "eat," "I," and the first syllable in the word "afraid." Note that the second syllable of "afraid" has an onset consisting of the consonant cluster /fɹ/.

Exercise 2.11

Circle the syllables in the following one-syllable and two-syllable words containing an *onset*. (For the two-syllable words, circle *any* syllable with an onset.)

ouch	crab	hoe	oats	elm	your
react	cargo	beware	atone	courage	eating

The rhyme of a syllable is divided into two components, the **nucleus** and the **coda**. The nucleus is typically a vowel. The nuclei of the words "spl**i**t," "tr**ie**d," and "f**a**st" are indicated in bold letters. However, several *consonants* in English may be considered to be the nucleus of a syllable in certain instances. In the words "chasm" and "feel," the /m/ and /l/ phonemes would be considered to be the nucleus of the second syllable of each word (if "feel" is pronounced as a two-syllable word). In these words, the consonants /m/ and /l/ assume the role of the vowel in the second syllable. When consonants take on the role of vowels, they are called **syllabic consonants**.

The coda includes either single consonants or consonant clusters that follow the nucleus of a syllable, as in the words "spli**t**," "trie**d**," and "fa**st**." In some instances the coda may, in fact, have no elements at all, as in the words "me," "shoe," "oh," and "pry." In these examples, remember to forget spelling and focus on the *sounds* in the words.

Exercise 2.12

Circle the letters that make up the *nucleus* in the following words. Some of the words have more than one nucleus.

shrine	scold	plea	produce	schism	away
elope	selfish	auto	biceps	flight	truce

Exercise 2.13

Circle the word(s) (or syllables) that have a *coda*.

through	spa	rough	bough	row	spray
lawful	funny	create	inverse	candy	reply

To further illustrate the nomenclature associated with syllables, the structure of the one-syllable words "scrub," "each," and "three" are detailed in "tree diagrams" (Figure 2.2). The onset, rhyme, nucleus, and coda of each word are labeled appropriately. The Greek letter sigma (σ) is used to indicate a syllable division. Note the null symbol (ɸ), which indicates the absence of the onset and coda in two of the examples. Diagrams of the two-syllable words "behave" and "prism" follow the diagrams of the one-syllable words (refer to Figure 2.3). Notice in Figure 2.3 that the consonant /m/ in "prism" forms the nucleus of the second syllable.

Syllables that end with a vowel phoneme (no coda) are called **open syllables**. Examples include "the," "I," and both syllables of the word "maybe." Syllables with a coda—that is, those that end with a consonant phoneme—are called **closed syllables**. Examples of closed syllables are "had," "keg," and both syllables of the word "contain." When determining whether a syllable is open or closed,

---

Figure 2.2 Syllable structure of the one-syllable words "scrub," "each," and "three."