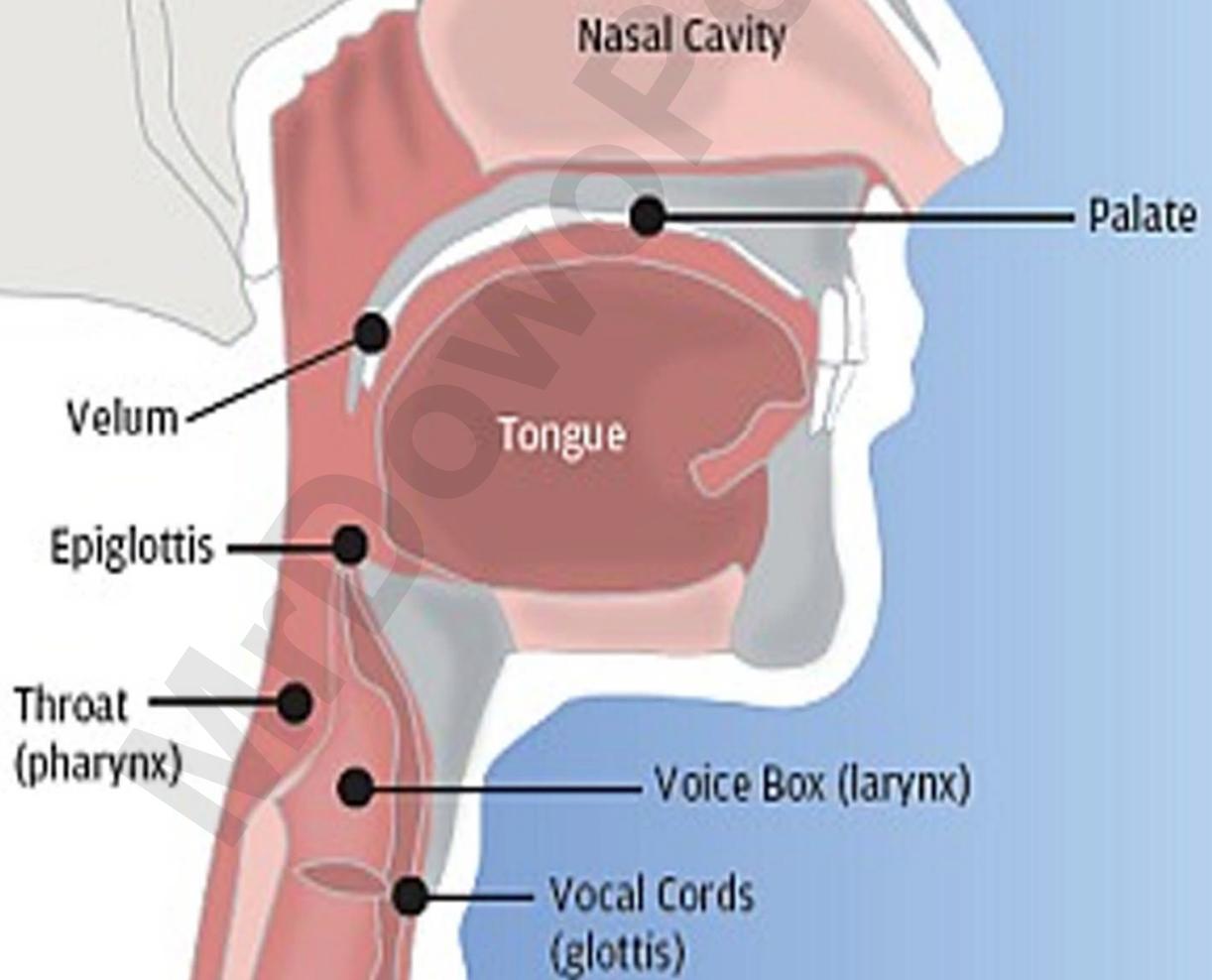


fə'netiks ænd fə'nalədʒi



Dedy Subandowo, M.A

A Course Book  
of  
Phonetics and Phonology

Guided by

Dedy Subandowo, M.A

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## **DAFTAR PUSTAKA**

## Preface

Finally, this course book was successfully made. The main reason why this course book is chosen to be a book guidance is to intend the students for the absolute beginner who has no previous knowledge of either linguistics in general or phonetics and phonology. The handout modul serves some insues in phonetics and phonology like the sounds of English and their manners.

This book consists of two main part discussion. The firts part is looking briefly at sound segments, articulatory phonetics, prosodic features, phonetic symbols and spelling correspondences. The second part is treating sound patterns of language, the pronunciation of morpheme, phonemes, distinctive feature of phonemes, the rules of phonology, and prosodic phonology.

The contains of the material are taken mainly from the book *Introduction to Language* by Fromkin, et.al.(2011).

Hopefully, this book may help the students to develop and strengthen their knowledge more about phonetics and phonology.

Best Regards

Dedy Subandowo, M.A

Metro

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# CHAPTER I

## PHONETICS (THE SOUNDS OF LANGUAGE)

### A. VOWELS AND CONSONANTS

**A Phonetic Alphabet for English Pronunciation**

Consonants				Vowels					
p	pill	t	till	k	kill	i	beet	ɪ	bit
b	bill	d	dill	g	gill	e	bait	ɛ	bet
m	mill	n	nil	ŋ	ring	u	boot	ʊ	foot
f	feel	s	seal	h	heal	o	boat	ɔ	bore
v	veal	z	zeal	l	leaf	æ	bat	a	pot/bar
θ	thigh	tʃ	chill	r	reef	ʌ	butt	ə	sofa
ð	thy	dʒ	gin	j	you	aɪ	bite	aʊ	bout
ʃ	shill	ɹ	which	w	witch	ɔɪ	boy		
ʒ	measure								

### Sound Charts

These are the symbols for the sounds of English.

**Sounds of English**

**VOWELS**

ɪ	ʊ	ʌ	ɒ	ə	e	æ	'short'	
i:	u:	a:	ɔ:	ɜ:			'long'	
ɪə	ʊə	aɪ	ɔɪ	əʊ	eə	aʊ	eɪ	diphthongs

**CONSONANTS**

p	t	tʃ	k	f	θ	s	ʃ	voiceless
b	d	dʒ	g	v	ð	z	ʒ	voiced
m	n	ŋ	h	l	r	w	j	

bbclearningenglish.com

There are 26 letters in the English alphabet and 44 sounds in the English language. This means that the number of sounds in a word is not always the same as the number of letters. The word 'CAT' has three letters and three sounds but the word 'CATCH' has five letters but still only three sounds. If we write these words using phonemic symbols, we can see exactly how many sounds they have.

*CAT is written /k ae t/*

*CATCH is written /k ae tʃ/*

In 'CATCH' the three letters *TCH* are one sound represented by one phonemic symbol /tʃ/. Try the exercise below to help develop your knowledge of English pronunciation.

### **Pronunciation Exercise Sounds and Spelling**

Look at the words below and put them into the correct column based on the number of sounds.

<i>HORSE</i>	<i>THROUGH</i>	<i>JUDGE</i>	<i>ENOUGH</i>
<i>SUGAR</i>	<i>CAUGHT</i>	<i>ISLAND</i>	<i>DAUGHTER</i>
<i>KNOWLEDGE</i>	<i>HEART</i>	<i>CUPBOARD</i>	<i>COW</i>
<i>KNOW</i>	<i>BUSINESS</i>	<i>DOOR</i>	<i>SINGING</i>
<i>MORE</i>	<i>CARROT</i>	<i>CHEMIST</i>	<i>CHECK</i>
<i>TREASURE</i>	<i>THINKING</i>	<i>LAUGH</i>	<i>THOROUGH</i>
<i>SINGER</i>			

### Exercise I

2 sounds	3 sounds	4 sounds	5 sounds	6 sounds
cow /k aʊ/				

### B. SOUND SEGMENTS

Phonetics deals with the sounds of language. If we know English, we know some sounds which are represented by the letters *b*, *s*, and *u*, and we are able to communicate them to form the words *bus* or *sub*. There are some discussions in this part such as, speech sounds, how the sounds produced, and how the sounds may be classified.

The study of speech sound is called as *phonetics*. To find and describe the speech sounds, we have to know what an individual sound is, and how the sounds are different from all others. If we hear the sound with our mind's ear, we hopefully are able to make sense of those sounds. We realize and recognize that the sound *b*, *s*, and *u* can occur in elsewhere such as *b* in *bet*, *rob*, *u* as in *up*, and *s* as in *sister*.



Speakers of English can separate the *keepout* into the two words *keep* and *out* because they know the language. We as an English learner do not generally pause between

words (expect to take a breath), even though we may think we do. Children learning a language reveal this fact. A two-year-old child going down stairs heard his mother say, “*Hold on*”. He replied, “*I’m holing don, I’m holing don,*” not knowing where the break between words occurred. In fact, word boundary misperceptions have changed the form of words historically.

Some phrases and sentences that are clearly distinct when printed may be ambiguous when spoken. Read the following pairs aloud and see why we might misinterpret what we hear:

*Grade A*

*Gray day*

*I scream*

*Ice cream*

*The sun’s rays meet*

*The sons raise meat*

### **Identity of Speech Sound**

When we try to identify the speech sound, we analyze suddenly by understanding the individual words of the speakers in an utterance. For example, if someone coughs in the middle of saying “How (cough) are you?” a listener will ignore the cough and interpret this simply as “*How are you?*”. People speak at different pitch levels, at different rates of speed. Here are some parts to identify speech sounds, *Acoustic phonetics* that describes the physical properties of sounds; *auditory phonetics* which focuses how listeners perceive these sounds; and *articulatory phonetics* which concerns how the vocal tract produces the sounds of language.

### **The Phonetic Alphabet**

Before we go far, let me tell you that orthography or alphabetic spelling is not consistent way of sounds of a language. Phonetics shows that there are various

sounds to be spelled with the same letter every time, and for any letter to stand for the same sound every time. See the sentence below:

*Did he believe that Caesar could see the people seize the seas?*

*The silly amoeba stole the key to the machine.*

The same sound is represented variously by **e**, **ie**, **ae**, **ee**, **eo**, **ei**, **ea**, **y**, **oe**, **ey**, and **i**. On the other hand, consider:

*My father wanted many a village dame badly.*

Here the letter **a** represents the various sounds in *father*, *wanted*, *many*, and so on. A combination of letters may represent a single sound:

<i>shoot</i>	<i>character</i>	<i>Thomas</i>	<i>physics</i>
<i>either</i>	<i>deal</i>	<i>rough</i>	<i>nation</i>
<i>coat</i>	<i>glacial</i>	<i>theater</i>	<i>plain</i>

Or, conversely, the single letter **x**, when not pronounced as **z**, usually stands for the two sounds **ks** as in *wax* (you may have to speak aloud to hear that *wax* is pronounced wæks). Some letters have no sound in certain words (so-called silent letters):

<i>mnemonic</i>	<i>autumn</i>	<i>resign</i>	<i>ghost</i>
<i>pterodactyl</i>	<i>write</i>	<i>hole</i>	<i>corps</i>
<i>psychology</i>	<i>sword</i>	<i>debt</i>	<i>gnaw</i>
<i>bough</i>	<i>lamb</i>	<i>island</i>	<i>knot</i>

Or, conversely, there may be no letter to represent sounds that occur. In many words, the letter **u** represents a **y** sound followed by a **u** sound:

- cute* (sounds like kyute; compare: *coot*)
- fume* (sounds like fyume; compare: *fool*)
- use* (sounds like yuse; compare: *Uzbekistan*)

In 1888 members of the International Phonetic Association developed a phonetic alphabet to symbolize the sounds of all languages. Someone who knew this alphabet would know how to pronounce a word written in it, and upon hearing a word pronounced, would know how to write it using the alphabetic symbols. The inventors of this **International Phonetic Alphabet**, or **IPA**, knew that a phonetic alphabet should include just enough symbols to represent the fundamental sounds of all languages.

### International Phonetic Alphabet

Consonants						Vowels			
p	pill	t	till	k	kill	i	beet	ɪ	bit
b	bill	d	dill	g	gill	e	bait	ɛ	bet
m	mill	n	nil	ŋ	ring	u	boot	ʊ	foot
f	feel	s	seal	h	heal	o	boat	ɔ	bore
v	veal	z	zeal	l	leaf	æ	bat	a	pot/bar
θ	thigh	tʃ	chill	r	reef	ʌ	butt	ə	sofa
ð	thy	dʒ	gin	j	you	aɪ	bite	aʊ	bout
ʃ	shill	ɹ	which	w	witch	ɔɪ	boy		
ʒ	measure								

The symbol [ə] is called as a **schwa**. *Schwa* is the most common sound in the English language. It occurs only in unstressed syllables and getting it correct helps spoken English to sound more natural and fluent, such as *general*, *about*, *reader*, etc.

## Exercise 2

Underline and/or write the schwa symbol over the correct part of the word. The first one has been done for you.

Hint: One word has two examples of schwa. All the others have only one.

- |                    |                      |
|--------------------|----------------------|
| 1. doct <u>o</u> r | 7. b a n a n a       |
| 2. t o m o r r o w | 8. d i f f i c u l t |
| 3. s u m m e r     | 9. l e v e l         |
| 4. p r o t e c t   | 10. s u r v i v e    |
| 5. p u p i l       | 11. t h e a t r e    |
| 6. m e a s u r e   | 12. w i z a r d      |

## Exercise 3

In this exercise, look at these sentences and decide where the *schwa* sound occurs. It may occur more than once in each sentence. The minimum number of schwas in a sentence is 1, the maximum 7.

1. It's **for** you
2. It takes a lot of time
3. How about a cup of tea?
4. What are you doing tonight?
5. What time will you arrive in Victoria?
6. I was going to tell you
7. The leisure center is closed for a private function.
8. The airport is not far from the capital city
9. The book is about pronunciation
10. We need more financial support
11. You need to pay attention all the time
12. It is a very thorough report

Speakers from different parts of the country may pronounce some words differently. For example, some of you may pronounce the words *which* and *witch* identically. If you do, the initial sound of both words is symbolized by [w] in the chart. If you don't, the breathy *wh* of *which* is represented by [ʍ].

The symbols in Table are IPA symbols with one small exception. The IPA uses an upside-down “r” (ɹ) for the English sound *r*. We, and many writers, prefer the right side up symbol *r* for clarity when writing for an English-reading audience. Apart from “r,” some writers use different symbols for other sounds that once were traditional for transcribing American English. You may encounter these in other books. Here are some equivalents:

IPA	Alternative
ʃ	š
ʒ	ž
tʃ	č
dʒ	ǰ
ʊ	u

Using the IPA symbols, we can now unambiguously represent the pronunciation of words. For example, in the six words below, *ou* represents six distinct vowel sounds; the *gh* is silent in all but *rough*, where it is pronounced [f]; the *th* represents a single sound, either [θ] or [ð], and the *l* in *would* is also silent. However, the phonetic transcription gives us the actual pronunciation.

**Spelling    Pronunciation**

though	[ðo]
thought	[θɔt]
rough	[rʌf]
bough	[baʊ]
through	[θru]
would	[wʊd]

**Exercise 4**

Write the phonetic symbol for the first sound in each of the following words according to the way you pronounce it.

*Examples:*    ooze    [u]                    psycho            [s]

a. judge                    [ ]                    f. thought            [ ]

b. Thomas                [ ]                    g. contact            [ ]

c. though                 [ ]                    h. phone              [ ]

d. easy                     [ ]                    i. civic                [ ]

e. pneumonia            [ ]                    j. usual                [ ]

Write the phonetic symbol for the last sound in each of the following words.

Example:    boy    [ɔɪ]    (Diphthongs should be treated as one sound.)

a. fleece                    [ ]                    f. cow                 [ ]

b. neigh                    [ ]                    g. rough              [ ]

c. long                      [ ]                    h. cheese             [ ]

d. health [ ]                      i. bleached [ ]  
e. watch [ ]                        j. rags [ ]

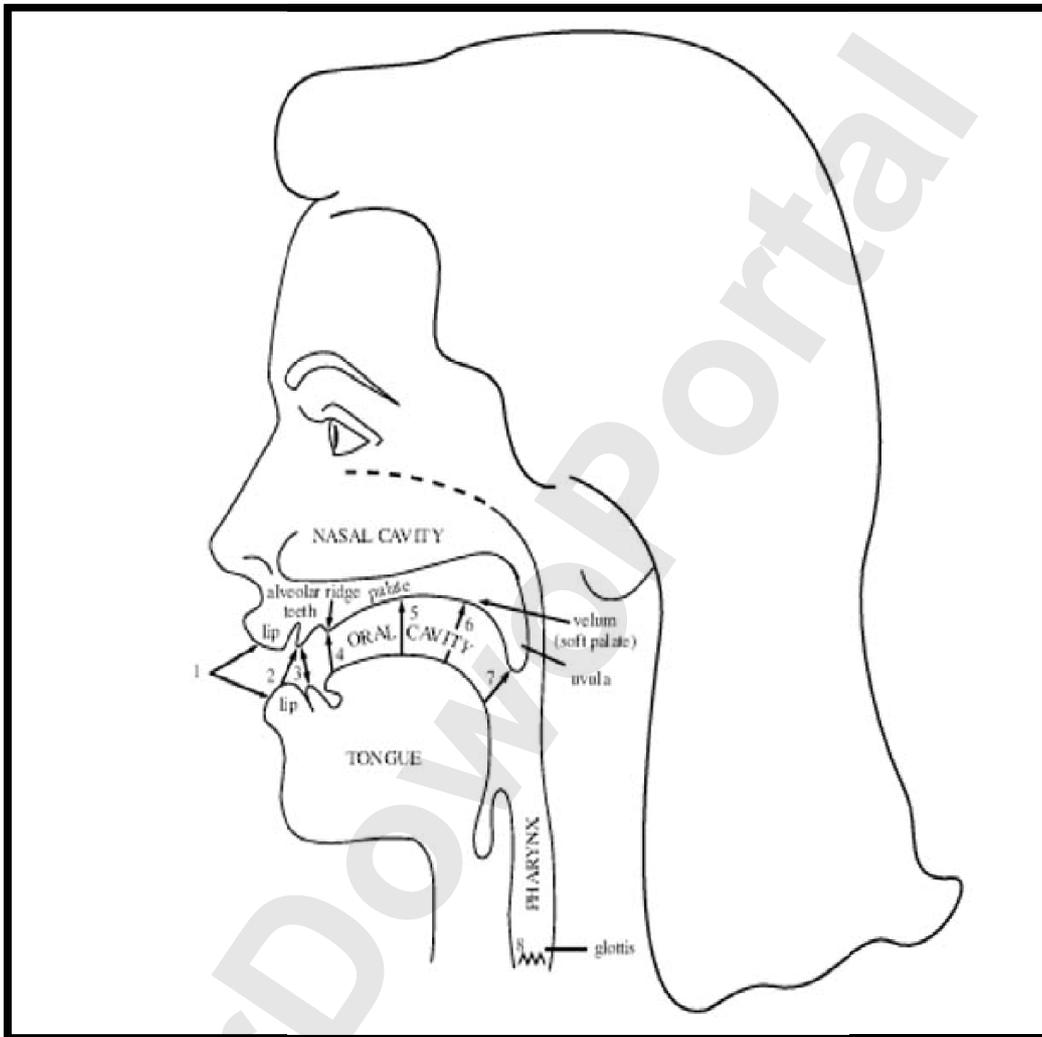
## C. ARTICULATORY PHONETICS

### Consonants

The sounds fall into two classes: *consonants* and *vowels*. Consonants are produced with some restriction or closure in the vocal tract that impedes the flow of air from the lungs. In phonetics, the terms *consonant* and *vowel* refer to types of *sounds*, not to the letters that represent them. In speaking of the alphabet, we may call “a” a vowel and “c” a consonant, but that means only that we use the letter “a” to represent vowel sounds and the letter “c” to represent consonant sounds.

The classification of the consonants is based on the vocal tract the air flow restriction occurs, called the *place of articulation*. Movement of the tongue and lips creates the constriction, reshaping the oral cavity in various ways to produce the various sounds.

## Place of Articulation



**The Vocal Tract. Place of Articulation: 1). Bilabial; 2). Labiodentals; 3). Interdental; 4). Alveolar; 5). (Alveo) palatal; 6). Velar; 7). Uvular; 8). Glottal.**

1. **Bilabials** [p] [b] [m] When we produce a [p], [b], or [m] the sounds articulate by bringing both lips together.
2. **Labiodentals** [f] [v] We also use our lips to form [f] and [v]. We articulate these sounds by touching the bottom lip to the upper teeth.

3. **Interdentals** [θ] [ð] These sounds, both spelled *th*, are pronounced by inserting the tip of the tongue between the teeth. However, for some speakers the tongue merely touches behind the teeth, making a sound more correctly called dental. Watch yourself in a mirror and say *think* [θɪŋk] or *these* [ðiz] and see where your tongue tip goes.
4. **Alveolars** [t] [d] [n] [s] [z] [l] [r] All seven of these sounds are pronounced with the tongue raised in various ways to the **alveolar ridge**.
  - For [t,d,n] the tongue tip is raised and touches the ridge, or slightly in front of it.
  - For [s,z] the sides of the front of the tongue are raised, but the tip is lowered so that air escapes over it.
  - For [l] the tongue tip is raised while the rest of the tongue remains down, permitting air to escape over its sides. Hence, [l] is called a **lateral** sound. You can feel this in the “l’s” of *Lolita*.
  - For [r] [IPA ɹ] most English speakers either curl the tip of the tongue back behind the alveolar ridge, or bunch up the top of the tongue behind the ridge. As opposed to [l], air escapes through the central part of the mouth when [r] is articulated. It is a **central** liquid.
5. **Palatals** [ʃ] [ʒ] [tʃ] [dʒ] [j] For these sounds, which occur in *mission* [mɪʃən], *measure* [mɛʒər], *cheap* [tʃi:p], *judge* [dʒʌdʒ], and *yoyo* [jojo], the constriction occurs by raising the front part of the tongue to the palate.
6. **Velars** [k] [g] [ŋ] Another class of sounds is produced by raising the back of the tongue to the soft palate or velum. The initial and final sounds of the words *kick* [kɪk] and *gig* [gɪg] and the final sounds of the words *back* [bæk], *bag* [bæg], and *bang* [bæŋ] are all velar sounds.
7. **Uvulars** [ʀ] [q] [ɣ] **Uvular** sounds are produced by raising the back of the tongue to the uvula, the fleshy protuberance that hangs down in the back of our throats. The *r* in French is often a uvular *trill* symbolized by [ʀ]. The uvular

sounds [q] and [ɟ] occur in Arabic. These sounds do not ordinarily occur in English.

8. **Glottals [h] [ʔ]** The sound of [h] is from the flow of air through the open glottis, and past the tongue and lips as they prepare to pronounce a vowel sound, which always follows [h]. If the air is stopped completely at the glottis by tightly closed vocal cords, the sound upon release of the cords is a glottal stop [ʔ]. The interjection uh-oh, that you hope never to hear your dentist utter, has two glottal stops and is spelled phonetically [ʔʌʔo].

The result of the classification of these English consonants by their place of articulation can be seen from the picture below.

#### Place of Articulation of English Consonants

<b>Bilabial</b>	p	b	m				
<b>Labiodental</b>	f	v					
<b>Interdental</b>	θ	ð					
<b>Alveolar</b>	t	d	n	s	z	l	r
<b>Palatal</b>	ʃ	ʒ	tʃ	dʒ			
<b>Velar</b>	k	g	ŋ				
<b>Glottal</b>	h	ʔ					

#### Manner of Articulation

##### Voice and voiceless

Sounds are voiceless when the vocal cords are apart, so that air flows freely through the glottis into the oral cavity. [p] and [s] in *super* [supər] are two of the several voiceless sounds of English.

If the vocal cords are together, the airstream forces its way through and causes them to vibrate. Such sounds are voiced. [b] and [z] in *buzz* [bʌz] are two of the many voiced sounds of English. To get a sense of voicing, try putting a finger in each ear and say the voiced “z-z-z-z-z.” You can feel the vibrations of the vocal cords. If you now say the voiceless “s-s-s-s-s,” you will not sense these vibrations (although you might hear a hissing sound). When you whisper, you are making all the speech sounds voiceless. Try it! Whisper “Sue” and “zoo.”

fine/vine	seal/zeal	choke/joke
[faɪn]/[vaɪn]	[sil/zil]	[tʃok]/[dʒok]
peat/beat	tote/dote	kale/gale
[pit]/[bit]	[tot]/[dot]	[kel]/[gel]

Voiceless sounds fall into two classes depending on the timing of the vocal cord closure. When we say *pit*, the vocal cords remain open for a very short time after the lips come apart to release the *p*. We call this *p aspirated* because a brief puff of air escapes before the glottis closes.

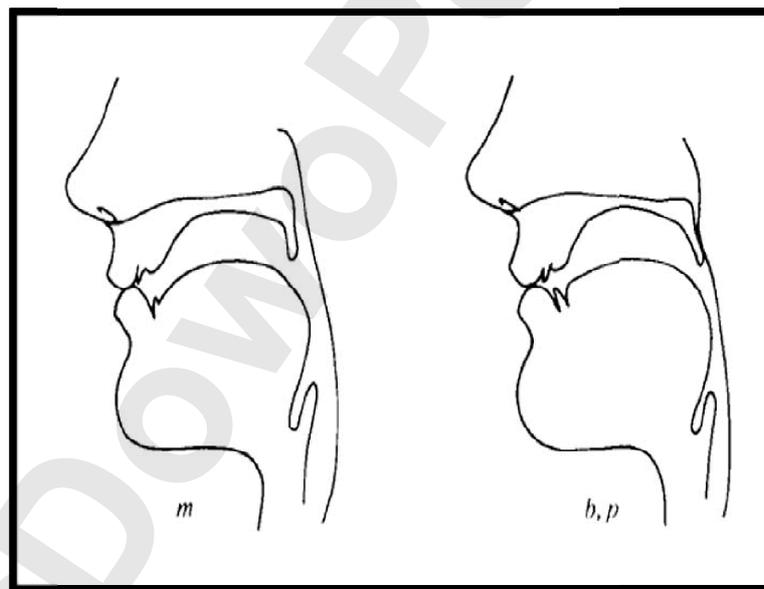
When we pronounce the *p* in *spit*, however, the vocal cords start vibrating as soon as the lips open. That *p* is *unaspirated*. Hold your palm about two inches in front of your lips and say *pit*. You will feel a puff of air, which you will not feel when you say *spit*. The *t* in *tick* and the *k* in *kin* are also aspirated voiceless stops, while the *t* in *stick* and the *k* in *skin* are unaspirated.

### Oral and Nasal Sounds

**Oral sounds** occur when the sounds produced with the velum up, blocking the air from escaping through the nose. It happens because the air

can escape only through the oral cavity. Most sounds in all languages are oral sounds. When the velum is not in its raised position, air escapes through both the nose and the mouth. Sounds produced this way are **nasal sounds**. The sound [m] is a nasal consonant. Thus [m] is distinguished from [b] because it is a nasal sound, whereas [b] is an oral sound.

The pictures below show the position of the lips and the velum when [m], [b], and [p] are articulated. The sounds [p], [b], and [m] are produced by stopping the airflow at the lips; [m] and [b] differ from [p] by being voiced; [m] differs from [b] by being nasal.



Position of lips and velum for *m* (lips together, velum down) and *b,p* (lips together, velum up).

We now have three ways of classifying consonants: by **voicing**, by **place of articulation**, and by **nasalization**. For example, [p] is a voiceless, bilabial, oral sound; [n] is a voiced, alveolar, nasal sound, and so on.

**Stops** [p] [b] [m] [t] [d] [n] [k] [g] [ŋ] [tʃ] [dʒ] [ʔ] We are seeing finer and finer distinctions of speech sounds. However, both [t] and [s] are voiceless, alveolar, oral sounds. What distinguishes them? After all, tack and sack are different words.

Stops are consonants in which the airstream is completely blocked in the oral cavity for a short period (tens of milliseconds). All other sounds are continuants. The sound [t] is a stop, but the sound [s] is not, and that is what makes them different speech sounds.

- [p], [b], and [m] are bilabial stops, with the airstream stopped at the mouth by the complete closure of the lips.
- [t], [d], and [n] are alveolar stops; the airstream is stopped by the tongue, making a complete closure at the alveolar ridge.
- [k], [g], and [ŋ] are velar stops, with the complete closure at the velum.
- [tʃ] and [dʒ] are palatal affricates with complete stop closures. They will be further classified later.
- [ʔ] is a glottal stop; the air is completely stopped at the glottis.

**Fricatives** [f] [v] [θ] [ð] [s] [z] [ʃ] [ʒ] [x] [χ] [h] In the production of some continuants, the airflow is so severely obstructed that it causes friction, and the sounds are therefore called fricatives. The first of the following pairs of fricatives are voiceless; the second voiced.

**Affricates** [tʃ] [dʒ] These sounds are produced by a stop closure followed immediately by a gradual release of the closure that produces an effect characteristic of a fricative. The palatal sounds that begin and end the words *church* and *judge* are voiceless and voiced affricates, respectively. Affricates are not continuants because of the initial stop closure.

**Liquids [l] [r]** In the production of the sounds [l] and [r], there is some obstruction of the airstream in the mouth, but not enough to cause any real constriction or friction. These sounds are liquids.

**Trills and flaps** The “r”-sound of many languages may be different from the English [r]. A trilled “r” is produced by rapid vibrations of an articulator. An alveolar trill, as in the Spanish word for dog, perro, is produced by vibrating the tongue tip against the alveolar ridge. Its IPA symbol is [r], strictly speaking, though we have co-opted [r] for the English “r.” Many French speakers articulate the initial sound of rouge as a uvular trill, produced by vibrating the uvula. Its IPA symbol is [ʀ].

Another “r”-sound is called a **flap** and is produced by a flick of the tongue against the alveolar ridge. It sounds like a very fast d. It occurs in Spanish in words like pero meaning “but.” It may also occur in British English in words such as very. Its IPA symbol is [ɾ]. Most American speakers produce a flap instead of a [t] or [d] in words like writer and rider, which then sound identical and are spelled phonetically as [raɪrər].

### **Phonetic Symbols for American English Consonants**

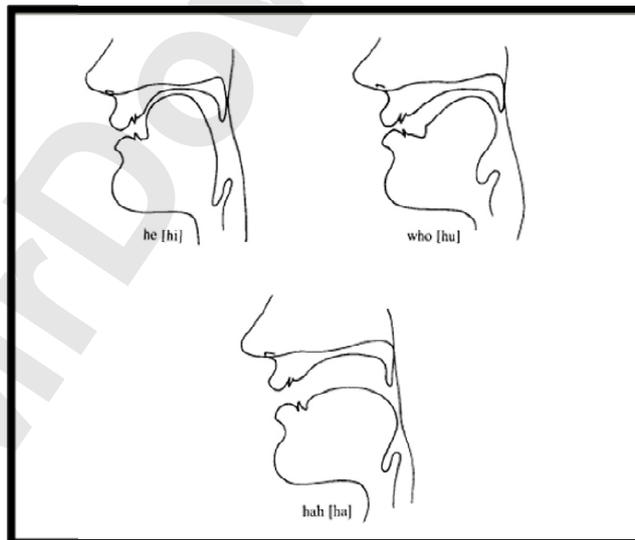
## Vowels

Vowels are produced with little restriction of the airflow from the lungs out the mouth and/or the nose. The quality of a vowel depends on the shape of the vocal tract as the air passes through. Different parts of the tongue may be high or low in the mouth; the lips may be spread or pursed; the velum may be raised or lowered.

Vowels can stand alone—they can be produced without consonants before or after them. You can say the vowels of *beat* [bit], *bit* [bɪt], or *boot* [but], for example, without the initial [b] or the final [t], but you cannot say a [b] or a [t] alone without at least a little bit of vowel sound.

## Tongue Position

Look at the picture below that shows the tongue is high in the mouth in the production of the vowels [i] and [u] in the words *he* [hi] and *who* [hu]. In *he* the front part (but not the tip) of the tongue is raised; in *who* it is the back of the tongue. (Prolong the vowels of these words and try to feel the raised part of your tongue.) These are both *high* vowels, and the [i] is a *high front* vowel while the [u] is a *high back* vowel.



**Position of the tongue in producing the vowels in *he*, *who*, and *hah***

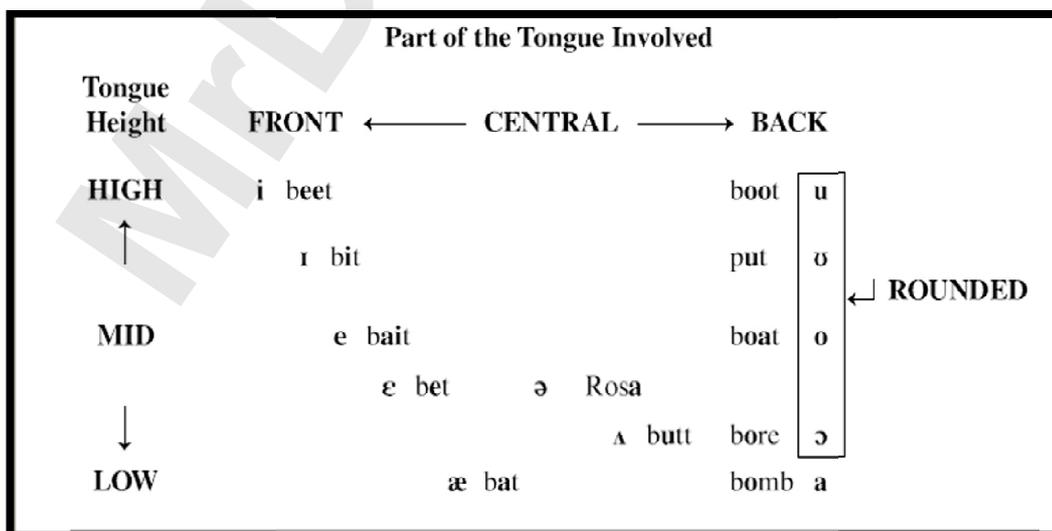
### Lip Rounding

Vowels also differ as to whether the lips are rounded or spread. The back vowels [u], [ʊ], [o], and [ɔ] in *boot*, *put*, *boat*, and *bore* are the only **rounded vowels** in English. They are produced with pursed or rounded lips. You can get a feel for the rounding by prolonging the word *who*, as if you were an owl: *whoooooooooooo*. Now pose for the camera and say *cheese*, only say it with a prolonged vowel: *cheeeeeeeeeese*. The high front [i] in *cheese* is unrounded, with the lips in the shape of a smile, and you can feel it or see it in a mirror. The low vowel [a] in the words *bar*, *bah*, and *aha* is the only (American) English back vowel that occurs without lip rounding.

### Diphthong

A **diphthong** is a sequence of two vowel sounds. Diphthongs are present in the phonetic inventory of many languages, including English. The vowels we have studied so far are simple vowels, called **monophthongs**. The vowel sound in the word *bite* [baɪt], however, is the [a] vowel sound of *father* followed rapidly by the [ɪ] sound of *fit*, resulting in the diphthong [aɪ].

### The classification of American English Vowels



### Nasalization of Vowels

Vowels, like consonants, can be produced with a raised velum that prevents the air from escaping through the nose, or with a lowered velum that permits air to pass through the nasal passage. When the nasal passage is blocked, *oral vowels* result; when the nasal passage is open, *nasal* (or *nasalized*) vowels result. In English, nasal vowels occur for the most part before nasal consonants in the same syllable, and oral vowels occur in all other places. result. The words *bean*, *bone*, *bingo*, *boom*, *bam*, and *bang* are examples of words that contain nasalized vowels. To show the nasalization of a vowel in a narrow phonetic transcription, an extra mark called a *diacritic*—the symbol ~ (tilde) in this case—is placed over the vowel, as in *bean* [bĩn] and *bone* [bõn].

### Tense and Lax Vowels

In the picture of the classification of American English Vowels shows that the vowel [i] has a slightly higher tongue position than [ɪ]. This is also true for [e] and [ɛ], [u] and [ʊ], and [o] and [ɔ]. The first vowel in each pair is generally produced with greater tension of the tongue muscles than its counterpart, and they are often a little longer in duration. These vowels can be distinguished by the features tense and lax, as shown in the first four rows of the following:

Tense		Lax			
i	beat	ɪ	bit	ə	about
e	bait	ɛ	bet		
u	boot	ʊ	put		
o	boat	ɔ	bore		
a	hah	ɔɪ	boy		
aɪ	high	æ	hat		
aʊ	how	ʌ	hut		

Additionally, [a] is a tense vowel as are the diphthongs [aɪ] and [aʊ], but the diphthong [ɔɪ] is lax as are [æ], [ʌ], and of course [ə]. Tense vowels may occur at the ends of words: [si], [se], [su], [so], [pa], [saɪ], and [haʊ] represent the English words *see, say, sue, sew, pa, sigh, and how*. Lax vowels mostly do not occur at the ends of words; [sɪ], [sɛ], [sʊ], [sæ], [sʌ], and [sə] are not possible words in English. (The one exception to this generalization is lax [ɔ] and its diphthong [ɔɪ], which occur in words such as [sɔ] (*saw*) and [sɔɪ] (*soy*).

### Exercise 5

Which of the following vowels are lax and which are tense?

- a. [i] b. [ɪ] c. [u] d. [ʌ] e. [ʊ] f. [e] g. [ɛ] h. [o] i. [ɔ] j. [æ] k. [a]  
l. [ə] m. [aɪ] n. [aʊ] o. [ɔɪ]

### Major Phonetic Classes

#### Noncontinuants and Continuants

Stops and affricates belong to the class of *noncontinuants*. There is a total obstruction of the airstream in the *oral cavity*. Nasal stops are included although air does flow continuously out the nose. All other consonants, and all vowels, are *continuants*, in which the stream of air flows continuously out of the mouth.

#### Obstruents and Sonorants

The non-nasal stops, the fricatives, and the affricates form a major class of sounds called *obstruents*. The airstream may be fully obstructed, as in nonnasal stops and affricates, or nearly fully obstructed, as in the production of fricatives.

Sounds that are not obstruents are *sonorants*. Vowels, nasal stops [m,n,ŋ], liquids [l,r], and glides [j,w] are all sonorants. They are produced with much less obstruction to the flow of air than the obstruents, which permits the air to

resonate. Nasal stops are sonorants because, although the air is blocked in the mouth, it continues to resonate in the nasal cavity.

### **Consonantal**

Obstruents, nasal stops, liquids, and glides are all consonants. There is some degree of restriction to the airflow in articulating these sounds. With glides ([j,w]), however, the restriction is minimal, and they are the most vowel-like, and the least consonant-like, of the consonants. Glides are even referred to as “semivowels” or “semi-consonants” in some books. In recognition of this fact linguists place the obstruents, nasal stops, and liquids in a subclass of consonants called consonantal, from which the glides are excluded.

Here are some other terms used to form subclasses of consonantal sounds. These are not exhaustive, nor are they mutually exclusive (e.g., the interdental belong to two subclasses). A full course in phonetics would note further classes that we omit.

**Labials** [p] [b] [m] [f] [v] [w] [ɸ] Labial sounds are those articulated with the involvement of the lips. They include the class of bilabial sounds [p] [b] and [m], the labiodentals [f] and [v], and the labiovelars [w] and [ɸ].

**Coronals** [θ] [ð] [t] [d] [n] [s] [z] [ʃ] [ʒ] [tʃ] [dʒ] [l] [r] Coronal sounds are articulated by raising the tongue blade. Coronals include the interdental [θ] [ð], the alveolars [t] [d] [n] [s] [z], the palatals [ʃ] [ʒ], the affricates [tʃ] [dʒ], and the liquids [l] [r].

**Anteriors** [p] [b] [m] [f] [v] [θ] [ð] [t] [d] [n] [s] [z] Anterior sounds are consonants produced in the front part of the mouth, that is, from the alveolar area forward. They include the labials, the interdentals, and the alveolars.

**Sibilants** [s] [z] [ʃ] [ʒ] [tʃ] [dʒ] Another class of consonantal sounds is characterized by an acoustic rather than an articulatory property of its members.

The friction created by sibilants produces a hissing sound, which is a mixture of high-frequency sounds.

#### D. PROSODIC FEATURES

*Length, pitch, and stress* (or “accent”) are **prosodic**, or **suprasegmental**, features. They are features *over and above* the segmental values such as place or manner of articulation, thus the “supra” in *suprasegmental*. The term *prosodic* comes from poetry, where it refers to the metrical structure of verse. One of the essential characteristics of poetry is the placement of stress on particular syllables, which defines the versification of the poem.

In some languages when a vowel is prolonged to around twice its normal length, it can make a difference between words. In Japanese the word *biru* [biru] with a regular *i* means “building,” but with the *i* doubled in length as in *biiru*, spelled phonetically as [bi:ru], the meaning is “beer.” (The colon-like : is the IPA symbol for segment length or doubling.) In Japanese vowel length can make the difference between two words.

English is not a language in which vowel or consonant length can change a word. You might say “*puleeeeeeze*” to emphasize your request, but the word is still *please*. You may also say in English “*Whattttttt a dump!*” to express your dismay at a hotel room, prolonging the t-closure, but the word *what* is not changed.

When we speak, we also change the **pitch** of our voice. The pitch depends on how fast the vocal cords vibrate; the faster they vibrate, the higher the pitch. If the larynx is small, as in women and children, the shorter vocal cords vibrate faster and the pitch is higher, all other things being equal. That is why women and children have higher-pitched voices than men, in general. When we discuss tone languages in the next section, we will see that pitch may affect the meaning of a word.

In many languages, certain syllables in a word are louder, slightly higher in pitch, and somewhat longer in duration than other syllables in the word. They are

*stressed syllables*. For example, the first syllable of *digest*, the noun meaning “summation of articles,” is stressed, whereas in *digest*, the verb meaning “to absorb food,” the second syllable receives greater stress. Stress can be marked in several ways: for example, by putting an accent mark over the stressed vowel in the syllable, as in *dígest* versus *digést*.

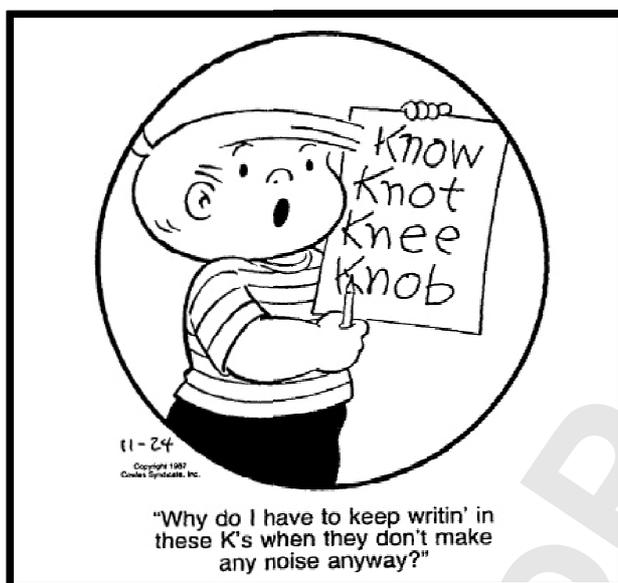
### **Tone and Intonation**

We have already seen how length and stress can make sounds with the same segmental properties different. In some languages, these differences make different words, such as the two *digests*. Pitch, too, can make a difference in certain languages.

Speakers of all languages vary the pitch of their voices when they talk. The effect of pitch on a syllable differs from language to language. In English, it doesn't matter whether you say *cat* with a high pitch or a low pitch. It will still mean “cat.” But if you say [ba] with a high pitch in Nupe (a language spoken in Nigeria), it will mean “to be sour,” whereas if you say [ba] with a low pitch, it will mean “to count.” Languages that use the pitch of individual vowels or syllables to contrast meanings of words are called *tone languages*.

Languages that are not tone languages, such as English, are called *intonation languages*. The *pitch contour* of the utterance varies, but in an intonation language as opposed to a tone language, pitch is not used to distinguish words from each other. Intonation may affect the meaning of whole sentences, so that *John is here* spoken with falling pitch at the end is interpreted as a statement, but with rising pitch at the end, a question.

## E. PHONETICS SYMBOLS AND SPELLING CORRESPONDENCES



The picture shows the sound/spelling correspondences for American English consonants and vowels. (We have not given all possible spellings for every sound; however, these examples should help you relate English orthography to the English sound system.) We have included the symbols for the voiceless aspirated stops to illustrate that what speakers usually consider

one sound—for example *p*—may occur phonetically as two sounds, [p], [p<sup>h</sup>].

Some of these pronunciations may differ from your own. For example, you may (or may not) pronounce the words *cot* and *caught* identically. In the form of English described here, *cot* and *caught* are pronounced differently, so *cot* is one of the examples of the vowel sound [a] as in *car*. *Caught* illustrates the vowel [ɔ] as in *core*.

There will be some symbols that may be used to describe the phonetics of any of the world's language. The picture below is about phonetics symbol/English spelling correspondences.

Phonetic Symbol/English Spelling Correspondence

**Consonant**

<b>Symbol</b>	<b>Examples</b>
p	spit tip Lapp
p <sup>h</sup>	pit prick plaque appear
b	bit tab brat bubble
m	mitt tam smack Emmy camp comb
t	stick pit kissed write
t <sup>h</sup>	tick intend pterodactyl attack
d	dick cad drip loved ride
n	nick kin snow mnemonic Gnostic pneumatic know
k	skin stick scat critique elk
k <sup>h</sup>	curl kin charisma critic mechanic close
g	girl burg longer Pittsburgh
ŋ	sing think finger
f	fat philosophy flat phlogiston coffee reef cough
v	vat dove gravel
s	sip skip psychology pass pats democracy scissors fasten deceive descent
z	zip jazz razor pads kisses Xerox design lazy scissors maize
θ	thigh through wrath ether Matthew
ð	thy their weather lathe either
ʃ	shoe mush mission nation fish glacial sure
ʒ	measure vision azure casual decision rouge
tʃ	match rich righteous
tʃ <sup>h</sup>	choke Tchaikovsky discharge
dʒ	judge midget George magistrate residual
l	leaf feel call single
r	reef fear Paris singer

j	you yes feud use
w	witch swim queen
ɹ	<b>which where whale</b> (for speakers who pronounce <i>which</i> differently than <i>witch</i> )
h	<b>hat who whole rehash</b>
ʔ	bottle button glottal (for some speakers), (ʔ)uh-(ʔ)oh
r	writer, rider, latter, ladder

### Phonetic Symbol/English Spelling Correspondences

#### Vowels

Symbols	Examples
i	beet beat be receive key believe amoeba people Caesar Vaseline serene
ɪ	bit consist injury bin women
e	gate bait ray great eight gauge greyhound
ɛ	bet serenity says guest dead said
æ	pan act laugh comrade
u	boot lute who sewer through to too two move Lou true suit
ʊ	put foot butcher could
ʌ	cut tough among oven does cover flood
o	coat go beau grow though toe own sew
ɔ	caught stalk core saw ball awe auto
a	cot father palm sergeant honor hospital melodic
ə	sofa alone symphony suppose melody bird verb the
aɪ	bite sight by buy die dye aisle choir liar island height sign
aʊ	about brown doubt coward sauerkraut
ɔɪ	boy oil

**Exercise 6: Write the phonetic symbol of the italicized words in the following sentences.**

1. I take it you already *know*
2. Of *tough* and *bough* and *cough* and *dough*?
3. Some may *stumble*, but not *you*,
4. On *hiccough*, *thorough*, *slough* and *through*?
5. So now you are *ready*, *perhaps*,
6. To *learn* of less *familiar* traps?
7. Beware of *heard*, a dreadful word
8. That looks like *beard* and sounds like *bird*.
9. And *dead*, it's said like *bed*, not *bead*;
10. For goodness' sake, don't call it *deed*!
11. Watch *out* for *meat* and *great* and *threat*.
12. They *rhyme* with *suite* and *straight* and debt
13. A *moth* is not a moth in mother,
14. Nor *both* in *bother*, *broth* in brother.

## CHAPTER II

### PHONOLOGY

There are thousands of languages but only hundreds of speech sounds, some of which will be examined in the previous discussion. You may ask, do languages sound different? One reason is that the sounds form different patterns in different languages. English has nasalized vowels, but only in syllables with nasal consonants. French puts nasal vowels anywhere it pleases, with or without nasal consonants. The speech sound that ends the word *song*—the velar nasal [ŋ]—cannot begin a word in English, but it can in Vietnamese. The common Vietnamese name spelled *Nguyen* begins with this sound, and the reason few of us can pronounce this name correctly is that it doesn't follow the English pattern.

The fact that a sound such as [ŋ] is difficult for an English speaker to pronounce at the beginning of a word, but easy for a Vietnamese speaker, means that there is no general notion of “difficulty of articulation” that can explain all of the sound patterns of particular languages.

The study of how speech sounds form patterns is *phonology*. These patterns may be as simple as the fact that the velar nasal cannot begin a syllable in English, or as complex as why *g* is silent in *sign* but is pronounced in the related word *signature*. To see that this is a pattern and not a one-time exception, just consider the slippery *n* in *autumn* and *autumnal*, or the *b* in *bomb* and *bombard*.

Phonology tells you what sounds are in your language and which ones are foreign; it tells you what combinations of sounds could be an actual word, whether it is (*black*) or isn't (*blick*), and what combination of sounds could not be an actual word (*\*lbick*). It also explains why certain phonetic features are important to identifying a word, for example voicing in English as in *pat* versus *bat*, while other features, such as aspiration in English, are not crucial to identifying a word. And it also allows us to

adjust our pronunciation of a morpheme, for example the past or plural morpheme, to suit the different phonological contexts that it occurs in, as we will discuss shortly.

## A. The Pronunciation of Morpheme

### The pronunciation of Plurals

Noun English has plural forms, such as *cat/cats*, *dog/dogs*, *fox/foxes*. But have you ever paid attention to how plural forms are pronounced? Try to pronounce the plurals of the following forms.

A	B	C	D
<i>cab</i>	<i>cap</i>	<i>bus</i>	<i>child</i>
<i>cad</i>	<i>cat</i>	<i>bush</i>	<i>ox</i>
<i>bag</i>	<i>back</i>	<i>buzz</i>	<i>mouse</i>
<i>love</i>	<i>cuff</i>	<i>garage</i>	<i>criterion</i>
<i>boy</i>	<i>faith</i>	<i>match</i>	<i>sheep</i>
<i>cam</i>		<i>badge</i>	
<i>can</i>			
<i>call</i>			

The final sound of the plural nouns from Column A is a [z]—a *voiced* alveolar fricative. For column B the plural ending is an [s]—a *voiceless* alveolar fricative. And for Column C it's [əz]. Here is our first example of a morpheme with different pronunciations. Note also that there is a regularity in columns A, B, and C that does not exist in D. The plural forms in D—*children*, *oxen*, *mice*, *criteria*, and *sheep*—are a hodge-podge of special cases that are memorized individually when you acquire English, whether natively or as a second language. This is because there is no way to predict the plural forms of these words.

The variant of morpheme which has difference pronunciation is called as *allomorph*. Writing the words from the first three columns in broad phonetic transcription, we have our first chart for the plural morpheme.

Allomorph	Environment
[z]	After [kæb], [kæd], [bæg], [lʌv], [leð], [kæm], [kæn], [bæŋ], [kɔl], [bar], [spa], [bɔɪ], e.g., [kæbz], [kædz] . . . [bɔɪz]
[s]	After [kæp], [kæt], [bæk], [kʌf], [feθ], e.g., [kæps], [kæts] . . . [feθs]
[əz]	After [bʌs], [bʊʃ], [bʌz], [gərəʒ], [mætʃ], [bædʒ], e.g., [bʌsəz], [bʊʃəz] . . . [bædʒəz]

To guide our search in finding whether the plural forms are in [z] rather than [s] or [əz], we look for *minimal pairs* in our list of words. A *minimal pair* is two words with different meanings that are identical except for one sound segment that occurs in the same place in each word. For example, *cab* [kæb] and *cad* [kæd] are a minimal pair that differ only in their final segments, whereas *cat* [kæt] and *mat* [mæt] are a minimal pair that differ only in their initial segments. Other minimal pairs in our list include *cap/cab*, *bag/back*, and *bag/badge*.

Minimal pairs whose members take different allomorphs are particularly useful for our search. For example, consider *cab* [kæb] and *cap* [kæp], which respectively take the allomorphs [z] and [s] to form the plural. Clearly, the final segment is responsible, because that is where the two words differ. Similarly for *bag* [bæg] and *badge* [bædʒ]. Their final segments determine the different plural allomorphs [z] and [əz].

Apparently, the distribution of plural allomorphs in English is conditioned by the final segment of the singular form. We can make our chart more concise by considering just the final segment. (The diphthongs such as [ɔɪ] treat as single segments.)

<b>Allomorph</b>	<b>Environment</b>
[z]	After [b], [d], [g], [v], [ð], [m], [n], [ŋ], [l], [r], [a], [ɔɪ]
[s]	After [p], [t], [k], [f], [θ]
[əz]	After [s], [ʃ], [z], [ʒ], [tʃ], [dʒ]

We can make another rule;

<b>Allomorph</b>	<b>Environment</b>
[z]	After voiced nonsibilant segments
[s]	After voiceless nonsibilant segments
[əz]	After sibilant segments

An even more concise way to express these rules is to assume that the basic or underlying form of the plural morpheme is /z/, with the meaning “plural.” This is the “default” pronunciation. The rules tell us when the default does not apply:

1. Insert a [ə] before the plural morpheme /z/ when a regular noun ends in a sibilant, giving [əz].
2. Change the plural morpheme /z/ to a voiceless [s] when preceded by a voiceless sound.

The following picture shows that how the plurals of *bus*, *butt*, and *bug* are formed. At the top are the basic forms. The two rules apply or not as appropriate as one moves downward. The output of rule 1 becomes the input of rule 2. At the bottom are the phonetic realizations—the way the words are pronounced.

Phonology: The Sound Patterns of Language			
	<i>bus</i> + pl.	<i>butt</i> + pl.	<i>bug</i> + pl.
<i>Basic representation</i>	/bʌs + z/	/bʌt + z/	/bʌg + z/
Apply rule (1)	ə	NA*	NA
Apply rule (2)	NA	s	NA
<i>Phonetic representation</i>	[bʌsəz]	[bʌts]	[bʌgz]

\*NA means "not applicable."

### Additional Examples of Allomorphs

English has irregular verbs which must be learned individually, such as *go/went*, *sing/sang*, and *hit/hit*. For plurals, there are *three phonetic* past-tense morphemes for regular verbs: [d], [t], and [əd]. Here are several examples in broad phonetic transcription. Study sets A, B, and C and try to see the regularity before reading further.

Set A:     gloat [glot], gloated [glotəd]; raid [red], raided [redəd]

Set B:     grab [græb], grabbed [græbd]; hug [hʌg], hugged [hʌgd]; faze [fez],  
fazed [fezd]; roam [rom], roamed [romd].

Set C:     reap [rip], reaped [ript]; poke [pok], poked [pokt]; kiss [kɪs], kissed  
[kɪst]; patch [pætʃ], patched [pætʃt]

Set A suggests that if the verb ends in a [t] or a [d] (i.e., non-nasal alveolar stops), [əd] is added to form the past tense, similar to the insertion of [əz] to form the plural of nouns that end in sibilants. Set B suggests that if the verb ends in a voiced segment other than [d], you add a voiced [d]. Set C shows us that if the verb ends in voiceless segment other than [t], you add a voiceless [t].

Just as /z/ was the basic form of the plural morpheme, /d/ is the basic form of the past-tense morpheme, and the rules for past-tense formation of regular verbs are much like the rules for the plural formation of regular nouns. These are also morphophonemic rules as they apply specifically to the past-tense morpheme /d/. As with the plural rules, the output of Rule 1, if any, provides the input to Rule 2, and the rules must be applied in order.

1. Insert a [ə] before the past-tense morpheme when a regular verb ends in a non-nasal alveolar stop, giving [əd].
2. Change the past-tense morpheme to a voiceless [t] when a voiceless sound precedes it.

Two further allomorphs in English are the possessive morpheme and the third-person singular morpheme, spelled s or es. These morphemes take on the same phonetic form as the plural morpheme according to the same rules! Add [s] to ship to get ship's; add [z] to woman to get woman's; and add [əz] to judge to get judge's. Similarly for the verbs eat, need, and rush, whose third-person singular forms are eats with a final [s], needs with a final [z], and rushes with a final [əz].

## **B. PHONEMES: THE PHONOLOGICAL UNITS OF LANGUAGE**

This section introduces the notions of *phoneme* and *allophone*. Phonemes are what we have been calling the basic form of a sound and are sensed in your mind rather than spoken or heard. Each phoneme has associated with it one or more sounds, called *allophones*, which represent the actual sound corresponding to the phoneme in various environments. For example, the phoneme /p/ is pronounced with the aspiration allophone [p<sup>h</sup>] in *pit* but without aspiration [p] in *spit*.

### **Allophone of /t/**

Consonants, too, have allophones whose distribution is rule-governed. For /t/ the following examples illustrate the point.

*tick* [t<sup>h</sup>ɪk] *stick* [stɪk] *hits* [hɪts] *bitter* [bɪɾər]

In *tick* we normally find an aspirated [t<sup>h</sup>], whereas in *stick* and *hits* we find an unaspirated [t], and in *bitter* we find the flap [ɾ]. As with vowel nasalization, swapping these sounds around will not change word meaning. If we pronounce *bitter* with a [t<sup>h</sup>], it will not change the word; it will simply sound unnatural (to most Americans).

The knowledge of how *t* is pronounced by positing a phoneme /t/ with three allophones [t<sup>h</sup>], [t], and [ɾ]. Whether we pronounce *tick* as [t<sup>h</sup>ɪk], [tɪk], or [ɾɪk], we are speaking the same word, however strangely pronounced. The allophones of a phoneme do not *contrast*. If we change the voicing and say *Dick*, or the manner of articulation and say *sick*, or the nasalization and say *nick*, we get different words. Those sounds do *contrast*. *Tick*, *Dick*, *sick*, and *nick* thus form a minimal set that shows us that there are phonemes /t/, /d/, /s/, and /n/ in English. We may proceed in this manner to discover other phonemes by considering *pick*, *kick*, *Mick* (as in Jagger), *Vic*, *thick*, *chick*, *lick*, and *Rick* to infer the phonemes /p/, /k/, /m/, /v/, /θ/, /tʃ/, /l/, and /r/. By finding other minimal pairs and sets, we would discover yet more consonant phonemes such as /ð/, which, together with /θ/, contrasts the words *thy* and *thigh*, or *either* and *ether*.

### **C. DISTINCTIVE FEATURES OF PHONEMES**

Phonetics provides the means to describe the phones (sounds) of language, showing how they are produced and how they vary. Phonology tells us how various sounds form patterns to create phonemes and their allophones.

For two phones to contrast meaning, there must be some phonetic difference between them. The minimal pairs seal [sil] and zeal [zil] show that [s] and [z] represent two contrasting phonemes in English. They cannot be allophones of one phoneme because one cannot replace the [s] with the [z] without changing the meaning of the word. Furthermore, they are not in complementary distribution; both occur word initially before the vowel [i]. They are therefore allophones of the two different phonemes /s/ and /z/. From the discussion, we know that [s] and [z] differ in voicing: [s] is voiceless and [z] is voiced. The phonetic feature of voicing therefore distinguishes the two words. Voicing also distinguishes feel and veal [f]/[v] and cap and cab [p]/[b]. When a feature distinguishes one phoneme from another, hence one word from another, it is a distinctive feature or, equivalently, a phonemic feature.

### Feature Values

One can think of voicing and voicelessness as the presence or absence of a single feature, voiced. This single feature may have two values: plus (+), which signifies its presence, and minus (-), which signifies its absence. For example, [b] is [+voiced] and [p] is [-voiced].

The presence or absence of nasality can similarly be designated as [+nasal] or [-nasal], with [m] being [+nasal] and [b] and [p] being [-nasal]. A [-nasal] sound is an oral sound. See the details below.

	<b>p</b>	<b>b</b>	<b>m</b>
<b>Stop</b>	+	+	+
<b>Labial</b>	+	+	+
<b>Voiced</b>	-	+	+
<b>Nasal</b>	-	-	+

### Nondistinctive Features

We have seen that nasality is a distinctive feature of English consonants, but it is a nondistinctive feature for English vowels. Given the arbitrary relationship

between form and meaning, there is no way to predict that the word *meat* begins with a nasal bilabial stop [m] and that the word *beat* begins with an oral bilabial stop [b]. You learn this when you learn the words. On the other hand, the nasality feature value of the vowels in *bean*, *mean*, *comb*, and *sing* is predictable because they occur before nasal consonants. When a feature value is predictable by rule for a certain class of sounds, the feature is a nondistinctive or redundant or predictable feature for that class. (The three terms are equivalent.) Thus nasality is a redundant feature in English vowels, but a nonredundant (distinctive or phonemic) feature for English consonants.

Another nondistinctive feature in English is aspiration. English both aspirated and unaspirated voiceless stops occur. The voiceless aspirated stops [p<sup>h</sup>], [t<sup>h</sup>], and [k<sup>h</sup>] and the voiceless unaspirated stops [p], [t], and [k] are in complementary distribution in English, as shown in the following:

Syllable Initial before a Stressed Vowel			After a Syllable Initial /s/			Nonword*	
[p <sup>h</sup> ]	[t <sup>h</sup> ]	[k <sup>h</sup> ]	[p]	[t]	[k]	[pɪl]*	[tɪl]*
<i>pill</i>	<i>till</i>	<i>kill</i>	<i>spill</i>	<i>still</i>	<i>skill</i>		
[p <sup>h</sup> ɪl]	[t <sup>h</sup> ɪl]	[k <sup>h</sup> ɪl]	[spɪl]	[stɪl]	[skɪl]	[sp <sup>h</sup> ɪl]*	[st <sup>h</sup> ɪl]*
<i>par</i>	<i>tar</i>	<i>car</i>	<i>spar</i>	<i>star</i>	<i>scar</i>	[pɑr]*	[tɑr]*
[p <sup>h</sup> ɑr]	[t <sup>h</sup> ɑr]	[k <sup>h</sup> ɑr]	[spɑr]	[stɑr]	[skɑr]	[sp <sup>h</sup> ɑr]*	[st <sup>h</sup> ɑr]*

Where the unaspirated stops occur, the aspirated ones do not, and vice versa. If you wanted to, you could say *spit* with an aspirated [p<sup>h</sup>], as [sp<sup>h</sup>ɪt], and it would be understood as *spit*, but listeners would probably think you were *spitting* out your words. Given this distribution, we see that aspiration is a redundant, nondistinctive

feature in English; aspiration is predictable, occurring as a feature of voiceless stops when they occur initially in a stressed syllable.

This is the reason speakers of English usually perceive the [p<sup>h</sup>] in *pill* and the [p] in *spill* to be the same sound, just as they consider the [i] and [ɪ] that represent the phoneme /i/ in *bead* and *bean* to be the same. They do so because the difference between them is predictable, redundant, nondistinctive, and nonphonemic (all equivalent terms). This example illustrates why we refer to the phoneme as an abstract unit or as a mental unit. We do not utter phonemes; we produce phones, the allophones of the phonemes of the language. In English /p/ is a phoneme that is realized phonetically (pronounced) as both [p] and [p<sup>h</sup>], depending on context. The phones or sounds [p] and [p<sup>h</sup>] are allophones of the phoneme /p/.

#### **D. The Rules of Phonology**

##### **Assimilation**

Articulatory adaptation of one sound to a nearby sound with regard to one or more **features (articulation)**. Assimilation has numerous aspects. (a) Assimilation can be a matter of (i) the *place of articulation*, e.g. the n in *incomplete* pronounced as [ŋ]; (ii) *the manner of articulation*. e.g. /in/ > [ɪr] in *irregular*; or (iii) the glottal state, e.g. the pronunciation of the plural **morpheme** {-s} in *dogs* [dogz] and *cats* [kaets]. (This is also called ‘*voicing assimilation*.’) (b) Depending on the direction of influence in a sound sequence, a distinction is drawn between progressive (or perseverative) assimilation, in which a following sound adapts itself to a preceding one (as in *vowel harmony*), and regressive (or anticipatory) assimilation, in which a preceding sound takes on a feature or features of a following sound (as in **umlaut**). (c) A distinction is also made between complete and partial assimilation. Complete assimilation describes the leveling of two sounds (as in *irregular*, above), which is always the case if the sounds are differentiated by only one feature. Partial assimilation refers to the change of only one of several features (as in *incomplete*,

above). (d) *Assimilation* can also be reciprocal (also called ‘bidirectional’ or ‘fusional’), when a mutual adaptation occurs, and a third sound replaces the two original sounds: [ti] > [ʃ] in *nation* [ˈneɪʃən]. (e) If the process involves adjacent sounds, it is a case of contact assimilation. Otherwise it is called distant assimilation.

### **Dissimilation**

Process and result of differentiation of two similar sounds with a view to greater clarity, Eng. *pilgrim* < Lat. *peregrīnus*, where the first *r* has dissimilated into *l*. The difficulty of tongue twisters like “*the sixth sheik’s sixth sheep is sick*” is based on the repeated similarity of sounds.

An example of easing pronunciation through dissimilation is found in some varieties of English, where there is a fricative dissimilation rule. This rule applies to sequences /fθ/ and /sθ/, changing them to [ft] and [st]. Here the fricative /θ/ becomes dissimilar to the preceding fricative by becoming a stop. For example, the words *fifth* and *sixth* come to be pronounced as if they were spelled *fift* and *sikst*.

### **Segment Insertion and Deletion Rules**

Phonological rules may add or delete entire segments. These are different from the feature-changing and feature-adding rules we have seen so far, which affect only parts of segments. The process of inserting a consonant or vowel is called *epenthesis*.

The rules for forming regular plurals, possessive forms, and third-person singular verb agreement in English all require an epenthesis rule. Here is the first part of that rule that we gave earlier for plural formation:

- (1) Insert a [ə] before the plural morpheme /z/ when a regular noun ends in a sibilant, giving [əz].
- (2) Insert a [ə] before the past-tense morpheme when a regular verb ends in a non-nasal alveolar stop, giving [əd].

There is a plausible explanation for insertion of a [ə]. If we merely added a [z] to *squeeze* to form its plural, we would get [skwiz], which would be hard for English speakers to distinguish from [skwiz]. Similarly, if we added just [d] to *load* to form its past tense, it would be [lod:], which would also be difficult to distinguish from [lod], because in English we do not contrast long and short consonants. These and other examples suggest that the morphological patterns in a language are closely related to other generalizations about the phonology of that language.

Just as vowel length can be used for emphasis without changing the meaning of a word, as in “*Stooooop* [sta:p] hitting me,” an epenthetic schwa can have a similar effect, as in “P-uh-lease [p<sup>h</sup>əliz] let me go.”

Segment deletion rules are commonly found in many languages and are far more prevalent than segment insertion rules. One such rule occurs in casual or rapid speech. We often delete the unstressed vowels that are shown in bold type in words like the following:

*mystery general memory funeral vigorous Barbara*

These words in casual speech sound as if they were written:

*mystry genral memry funral vigrousb Barbra*

The silent g that torments spellers in such words as sign and design is actually an indication of a deeper phonological process, in this case, one of segment deletion.

Consider the following examples:

A		B	
sign	[sãɪn]	signature	[sɪgnətʃər]
design	[dɛzãɪn]	designation	[dɛzɪgneʃɔ̃n]
paradigm	[p <sup>h</sup> ærədãɪm]	paradigmatic	[p <sup>h</sup> ærədɪgmætək]

In none of the words in column A is there a phonetic [g], but in each corresponding word in column B a [g] occurs. Our knowledge of English phonology

accounts for these phonetic differences. The “[g]—no [g]” alternation is regular, and we apply it to words that we never have heard. Suppose someone says:

“He was a *salignant* [səlɪgn nt] man.”

Not knowing what the word means (which you couldn’t, since we made it up), you might ask:

“Why, did he *salign* [səlāɪn] somebody?”

It is highly doubtful that a speaker of English would pronounce the verb form without the *-ant* as [səlɪgn], because the phonological rules of English would delete the /g/ when it occurred in this context. This rule might be stated as:

Delete a /g/ when it occurs before a syllable-final nasal consonant.

The rule is even more general, as evidenced by the pair *gnostic* [nastɪk] and *agnostic* [ægnastɪk], and by the silent g’s in the cartoon:



This more general rule may be stated as:

- (3) Delete a /g/ word initially before a nasal consonant or before a syllable-final nasal consonant.

Given this rule, the phonemic representation of the stems in *sign/signature*, *design/ designation*, *malign/malignant*, *phlegm/phlegmatic*, *paradigm/paradigmatic*, *gnostic/agnostic*, and so on will include a /g/ that will be deleted by the regular rule if a prefix or suffix is not added. By stating the class of sounds that follow the /g/ (nasal

consonants) rather than any specific nasal consonant, the rule deletes the /g/ before both /m/ and /n/.

### Movement (Metathesis) Rules



Phonological rules may also reorder sequences of phonemes, in which case they are called *metathesis* rules. For some speakers of English, the word *ask* is pronounced [æks], but the word *asking* is pronounced [æskɪŋ]. In this case a metathesis rule reorders the /s/ and /k/ in certain contexts. Children's speech shows many cases of metathesis (which are corrected as the child approaches the adult grammar): *aminal* [æm nəl] for *animal* and *pusketti* [p<sup>h</sup>æskɛti] for *spaghetti* are common children's pronunciations, and at least two presidents of the United States have applied a metathesis rule to the word *nuclear*, which many Americans pronounce [njukliər], but is pronounced [nukjələr] by those leading statesmen.

### From One to Many and from Many to One

Phonological rules that relate phonemic to phonetic representations have several functions, among which are the following:

No	Function	Example
1	Change feature values	Nasal consonant assimilation rules in English
2	Add new features	Aspiration in English
3	Delete segments	<i>g</i> -deletion before nasals in English
4	Add segments	Schwa insertion in English plural and past Tense
5	Reorder segments	Metathesis rule relating [æsk] and [æks]

The relationship between the phonemes and phones of a language is complex and varied. Rarely is a single phoneme realized as one and only one phone. We often find one phoneme realized as several phones, as in the case with English voiceless stops that may be realized as aspirated or unaspirated, among other possibilities. And we find the same phone may be the realization of several different phonemes. Here is a dramatic example of that many-to-one relationship. See the vowels in the following pairs of words:

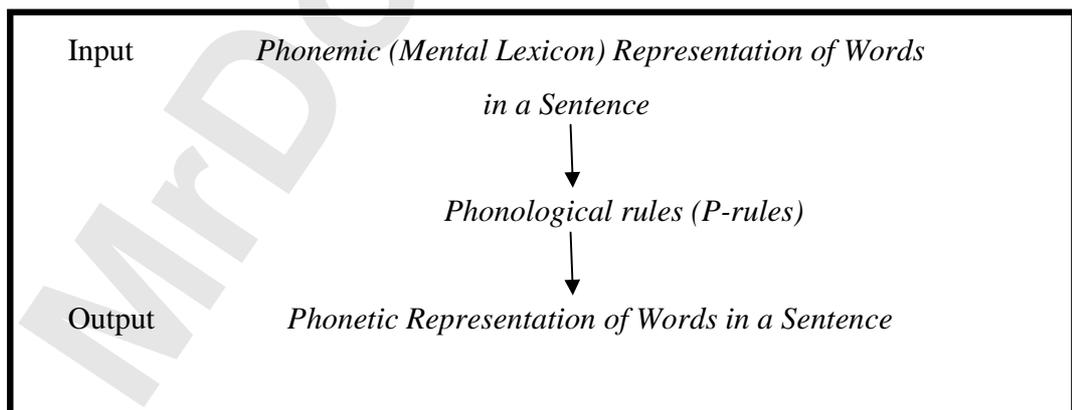
	A		B	
/i/	compete	[i]	competition	[ə]
/ɪ/	medicinal	[ɪ]	medicine	[ə]
/e/	maintain	[e]	maintenance	[ə]
/ɛ/	telegraph	[ɛ]	telegraphy	[ə]
/æ/	analysis	[æ]	analytic	[ə]
/a/	solid	[a]	solidity	[ə]

/o/	<b>ph</b> one	[o]	ph <b>o</b> netic	[ə]
/ʊ/	Tal <b>u</b> dic	[ʊ]	Tal <b>u</b> d	[ə]

In column A all the boldfaced vowels are stressed vowels with a variety of vowel phones; in column B the boldfaced vowels are without stress or reduced and are pronounced as schwa [ə]. In these cases the stress pattern of the word varies because of the different suffixes. The vowel that is stressed in one form becomes reduced in a different form and is therefore pronounced as [ə]. The phonemic representations of all of the root morphemes contain an unreduced vowel such as /i/ or /e/ that is phonetically [ə] when it is reduced. We can conclude, then, that [ə] is an allophone of all English vowel phonemes. The rule to derive the schwa is simple to state: Change a vowel to a [ə] when the vowel is reduced.

### The Function of Phonological Rules

The function of phonological rules in grammar is to provide the phonetic information necessary for the pronunciation of utterances. It can be illustrated in the following way:



The input to the P-rules is the phonemic representation. The P-rules apply to the phonemic strings and produce as output the phonetic representation. The

application of rules in this way is called a *derivation*. We have given examples of derivations that show how plurals are derived, how phonemically oral vowels become nasalized, and how /t/ and /d/ become flaps in certain environments. A derivation is thus an explicit way of showing both the effects and the function of phonological rules in a grammar.

### Slips of the Tongue: Evidence for Phonological Rules

Slips of the tongue, or *speech errors*, in which we deviate in some way from the intended utterance, show phonological rules in action. We all make speech errors, and they tell us interesting things about language and its use. Consider the following speech errors:

<b>Intended Utterance</b>	<b>Actual Utterance</b>
gone to seed	god to seen
[gɔ̃n tə sid]	[gɔd tə sɪ̃n]
stick in the mud	smuck in the tid
[stɪk ɪn ðə mʌd]	[smʌk ɪn ðə tʰɪd]
speech production	preach seduction
[spi:tʃ pʰrədʌkʃən]	[pʰri:tʃ sədʌkʃən]

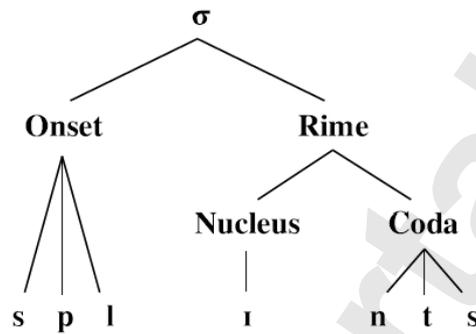
## E. PROSODIC PHONOLOGY

### Syllable Structure



Words are composed of one or more syllables. A *syllable* is a phonological unit composed of one or more phonemes. Every syllable has a *nucleus*, which is usually a vowel (but which may be a syllabic liquid or nasal). The nucleus may be preceded and/or followed by one or more phonemes called the syllable *onset* and *coda*. From a very early age, children learn that certain words rhyme. In rhyming words, the nucleus and the coda of the final syllable of both words are identical, as in the following jingle:

Jack and *Jill*  
Went up the *hill*  
To fetch a pail of water.  
Jack fell *down*  
And broke his *crown*  
And Jill came tumbling after.



For this reason, the nucleus + coda constitute the subsyllabic unit called a rime (note the spelling).

A syllable thus has a hierarchical structure. Using the IPA symbol  $\sigma$  for the phonological syllable, the hierarchical structure of the monosyllabic word splits can be shown:

### Word Stress

In many languages, including English, one or more of the syllables in every content word (i.e., every word except for function words like *to*, *the*, *a*, *of*) are stressed. A stressed syllable, which can be marked by an acute accent (´), is perceived as more prominent than an unstressed syllable, as shown in the following examples:

pérvert	(noun)	as in	“My neighbor is a pervert.”
pervért	(verb)	as in	“Don’t pervert the idea.”
sú bject	(noun)	as in	“Let’s change the subject.”
subjéct	(verb)	as in	“He’ll subject us to criticism.”

These pairs show that stress can be contrastive in English. In these cases it distinguishes between nouns and verbs.

Some words may contain more than one stressed vowel, but exactly one of the stressed vowels is more prominent than the others. The vowel that receives primary stress is marked by an acute accent. The other stressed vowels are indicated by a grave accent ( ` ) over the vowels (these vowels receive secondary stress).

rèsignátion	linguístics	systemátic
fùndaméntal	ìntrodúctory	rèvolútion

It's usually easy to distinguish between stressed and reduced syllables, because the vowel in reduced syllables is pronounced as a schwa [ə], except at the ends of certain words such as *confetti* or *laboratory*. It may be harder to distinguish between primary and secondary stress. If you are unsure of where the primary stress is in a word (and you are a native or near-native speaker of English), try shouting the word as if talking to a person across a busy street. Often, the difference in stress becomes more apparent.

The stress pattern of a word may differ among English-speaking people. For example, in most varieties of American English the word *laboratory* [ləˈbɒrət̩əri] has two stressed syllables, but in most varieties of British English it receives only one stress [ləˈbɒrət̩ri]. Because English vowels generally reduce to schwa or delete when they are not stressed, the British and American vowels differ in this word. In fact, in the British version the fourth vowel is deleted because it is not stressed.

### **Sentence and Phrase Stress**

When words are combined into phrases and sentences, one syllable receives greater stress than all others. That is, just as there is only one primary stress in a word spoken in isolation, only one of the vowels in a phrase (or sentence) receives primary stress or accent. All of the other stressed vowels are reduced to secondary stress. In English we place primary stress on the adjectival part of a compound noun (which

may be written as one word, two words separated by a hyphen, or two separate words), but we place the stress on the noun when the words are a noun phrase consisting of an adjective followed by a noun. The differences between the following pairs are therefore predictable:

### **Compound Noun**

tíghtrope (“a rope for acrobatics”)

Rédcoat (“a British soldier”)

hótdog (“a frankfurter”)

Whíte House (“the President’s house”)

### **Adjective + Noun**

tight rópe (“a rope drawn taut”)

red cóat (“a coat that is red”)

hot dóg (“an overheated dog”)

white hóuse (“a house painted white”)

### **Intonation**

In English, intonation may reflect syntactic or semantic differences. If we say *John is going* with a falling pitch at the end, it is a statement, but if the pitch rises at the end, it may be interpreted as a question. Similarly, *what’s in the tea, honey?* may, depending on intonation, be a query to someone called “honey” regarding the contents of the tea (falling intonation on *honey*), or may be a query regarding whether the tea contains honey (rising intonation on *honey*).

A sentence that is ambiguous in writing may be unambiguous when spoken because of differences in the pitch contour, as we saw in the previous paragraph. Here is a somewhat more subtle example. Written, sentence 1 is unclear as to whether Tristram intended for Isolde to read and follow directions, or merely to follow him:

1. Tristram left directions for Isolde to follow.

Spoken, if Tristram wanted Isolde to follow him, the sentence would be pronounced with a rise in pitch on the first syllable of follow, followed by a fall in pitch, as indicated (oversimplistically) in sentence 2.

Tristram left directions for Isolde to follow.

In this pronunciation of the sentence, the primary stress is on the word follow. If the meaning is to read and follow a set of directions, the highest pitch comes on the second syllable of directions, as illustrated, again oversimplistically, in sentence 3.

Tristram left directions for Isolde to follow.

The primary stress in this pronunciation is on the word directions. Pitch plays an important role in both tone languages and intonation languages, but in different ways, depending on the phonological system of the respective languages.

<http://linguistics.berkeley.edu/~kjohnson/ling110/>