

# Phonetics Fundamental

# Sound Segments

- Knowing a language includes knowing the sounds of that language
- **Phonetics** is the study of speech sounds
- We are able to **segment** a continuous stream of speech into distinct parts and recognize the parts in other words
- Everyone who knows a language knows how to segment sentences into words and words into sounds

# Identity of Speech Sounds

- Our linguistic knowledge allows us to ignore nonlinguistic differences in speech (such as individual pitch levels, rates of speed, coughs)
- We are capable of making sounds that are not speech sounds in English but are in other languages

# Identity of Speech Sounds

- The science of phonetics aims to describe all the sounds of all the world's languages
  - **Acoustic phonetics:** focuses on the physical properties of the sounds of language
  - **Auditory phonetics:** focuses on how listeners perceive the sounds of language
  - **Articulatory phonetics:** focuses on how the vocal tract produces the sounds of language

# The Phonetic Alphabet

- Spelling, or **orthography**, does not consistently represent the sounds of language
- Some problems with ordinary spelling:

- 1. The same sound may be represented by many letters or combination of letters:

*he      people      key  
believe      seize      machine  
Caesar      seas  
see      amoeoba*

- 2. The same letter may represent a variety of sounds:

*father      village  
badly      made  
many*

# The Phonetic Alphabet

- 3. A combination of letters may represent a single sound

shoot      character Thomas  
either      physics      rough  
coat      deal

- 4. A single letter may represent a combination of sounds

xerox

# The Phonetic Alphabet

- 4. Some letters in a word may not be pronounced at all

*autumnn      sword      resignn  
pterodactyl      lambb      corps  
psychology      write      knot*

- 5. There may be no letter to represent a sound that occurs in a word

*cute  
use*

# The Phonetic Alphabet

- In 1888 the **International Phonetic Alphabet (IPA)** was invented in order to have a system in which there was a one-to-one correspondence between each sound in language and each phonetic symbol
- Someone who knows the IPA knows how to pronounce any word in any language



# The Phonetic Alphabet

- Dialectal and individual differences affect pronunciation, but the sounds of English

| 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								

# The Phonetic Alphabet

- Using IPA symbols, we can now represent the pronunciation of words

unambi

## Spelling

though  
thought  
rough  
bough  
through  
would

## Pronunciation

[ðo]  
[θɔt]  
[rʌf]  
[baʊ]  
[θru]  
[wʊd]

# Articulatory Phonetics

- Most speech sounds are produced by pushing air through the vocal cords
  - **Glottis** = the opening between the vocal cords
  - **Larynx** = ‘voice box’
  - **Pharynx** = tubular part of the throat above the larynx
  - **Oral cavity** = mouth
  - **Nasal cavity** = nose and the passages connecting it to the throat and sinuses

# Consonants: Place of Articulation

- Consonants are sounds produced with some restriction or closure in the vocal tract
- Consonants are classified based in part on where in the vocal tract the airflow is being restricted (the **place of articulation**)
- The major places of articulation are:
  - bilabial, labiodental, interdental, alveolar, palatal, velar, uvular, and glottal

# Consonants: Place of Articulation

- **Bilabials:**
  - Produced by bringing both lips together
- **Labiodentals:**
  - Produced by touching the bottom lip to the upper teeth
- **Interdentals**
  - Produced by putting the tip of the tongue between the teeth

# Consonants: Place of Articulation

- **Alveolars:** [t] [d] [n] [s] [z] [l] [r]
  - All of these are produced by raising the tongue to the **alveolar ridge** in some way
    - [t, d, n]: produced by the tip of the tongue touching the alveolar ridge (or just in front of it)
    - [s, z]: produced with the sides of the front of the tongue raised but the tip lowered to allow air to escape
    - [l]: the tongue tip is raised while the rest of the tongue remains down so air can escape over the sides of the tongue (thus [l] is a **lateral** sound)
    - [r]: air escapes through the **central** part of the mouth; either the tip of the tongue is curled back behind the alveolar ridge or the top of the tongue is bunched up behind the alveolar ridge

# Consonants: Place of Articulation

- **Palatals:** [j]
  - Produced by raising the front part of the tongue to the palate
- **Velars:** [k] [g] [ŋ]
  - Produced by raising the back of the tongue to the soft palate or velum
- **Uvulars:** [ʀ] [q] [ɢ]
  - Produced by raising the back of the tongue to the uvula
- **Glottals:** [h]
  - Produced by restricting the airflow through the open glottis ([h]) or by stopping the air completely at the glottis (a **glottal stop**: [ʔ])

# Consonants: Manner of Articulation

- The **manner of articulation** is the way the airstream is affected as it flows from the lungs and out of the mouth and nose
- **Voiceless** sounds are those produced with the vocal cords apart so the air flows freely through the glottis
- **Voiced** sounds are those produced when the vocal cords are together and vibrate as air passes through



# Consonants: Manner of Articulation

- The voiced/voiceless distinction is important in English because it helps us distinguish words like:

<i>rope/robe</i>	<i>fine/vine</i>	<i>seal/zeal</i>
[rop]/[rob]	[fain]/[vain]	[sil]/[zil]

- But some voiceless sounds can be further distinguished as **aspirated** or **unaspirated**

aspirated

unaspirated

*pool* [pul]

*spool* [spul]

*tale* [tel]

*stale* [stel]

*kale* [kel]

*scale* [skel]

# Consonants: Manner of Articulation

- **Oral sounds** are those produced with the velum raised to prevent air from escaping out the nose
- **Nasal sounds** are those produced with the velum lowered to allow air to escape out the nose
- So far we have three ways of classifying sounds based on **phonetic features**: by voicing, by place of articulation, and by nasalization
  - [p] is a voiceless, bilabial, oral sound
  - [n] is a voiced, alveolar, nasal sound

# Consonants: Manner of Articulation

- **Stops:** [p] [b] [m] [t] [d] [n] [k] [g] [ŋ]
  - Produced by completely stopping the air flow in the oral cavity for a fraction of a second
    - All other sounds are **continuants**, meaning that the airflow is continuous through the oral cavity
- **Fricatives:** [f] [v] [s] [z] [h]
  - Produced by severely obstructing the airflow so as to cause friction

# Consonants: Manner of Articulation

- **Affricates:** [tʃ] [dʒ]
  - Produced by a stop closure that is released with a lot of friction
- **Liquids:** [l] [r]
  - Produced by causing some obstruction of the airstream in the mouth, but not enough to cause any real friction
- **Glides:** [j] [w]
  - Produced with very little obstruction of the airstream and are always followed by a vowel

# Consonants: Manner of Articulation

- **Approximants:** [w] [j] [r] [l]
  - Sometimes liquids and glides are put together into one category because the articulators approximate a frictional closeness but do not actually cause friction
- **Trills and flaps:** [r]\* [ɾ]
  - Trills are produced by rapidly vibrating an articulator
  - Flaps are produced by a flick of the tongue against the alveolar ridge
- **Clicks:**
  - Produced by moving air in the mouth between various articulators
  - The disapproving sound *tsk* in English is a consonant in Zulu and some other southern African languages
  - The lateral click used to encourage a horse in English is a consonant in Xhosa

\*The textbook uses [r] to represent the central liquid as in the word *ready* rather than as a trill

# Examples of Consonants in English Words

	Bilabial	Labiodental	Interdental	Alveolar	Palatal	Velar	Glottal
<b>Stop</b> (oral)							
voiceless	<i>p</i> ie			<i>t</i> ie		<i>k</i> ite	(ʔ)uh-(ʔ)oh
voiced	<i>b</i> uy			<i>d</i> ie		<i>g</i> uy	
<b>Nasal</b> (voiced)	<i>m</i> y			<i>n</i> ight		<i>ŋ</i> g	
<b>Fricative</b>							
voiceless		<i>f</i> ine	<i>θ</i> igh	<i>s</i> ue	<i>ʃ</i> oe		<i>h</i> igh
voiced		<i>v</i> ine	<i>ð</i> y	<i>z</i> oo	measure		
<b>Affricate</b>							
voiceless					<i>tʃ</i> ease		
voiced					<i>dʒ</i> ump		
<b>Glide</b>							
voiceless	<i>w</i> hich					<i>w</i> hich	
voiced	<i>w</i> ipe				<i>j</i> ou	<i>w</i> ipe	
<b>Liquid</b> (voiced)							
(central)				<i>r</i> ye			
(lateral)				<i>l</i> ye			

# Vowels

- Vowels are classified by how high or low the tongue is, if the tongue is in the front or back of the mouth, and whether or not the lips are rounded
- **High** vowels: [i] [u]
- **Mid** vowels: [e] [o]
- **Low** vowels: [a]

# Vowels

- **Round vowels:** Produced by rounding the lips
  - English has only back round vowels, but other languages such as French and Swedish have front round vowels
- **Diphthongs:** [ai] [au]
  - A sequence of two vowel sounds (as opposed to the **monophthongs** we have looked at so far)
- **Nasalization:**
  - Vowels can also be pronounced with a lowered velum, allowing air to pass through the nose
  - In English, speakers nasalize vowels before a nasal sound, such as in the words *beam*, *bean*, and *bingo*
  - The nasalization is represented by a diacritic, an extra mark placed with the symbol:

*bean* [bĩn]



# Vowels

- **Tense** vowels:
  - Are produced with greater tension in the tongue
  - May occur at the end of words
- **Lax** vowels:
  - Are produced with less tongue tension
  - May not occur at the end of words

## Tense

i	beat
e	bait
u	boot
o	boat
a	hah
aɪ	high
aʊ	how

## Lax

ɪ	bit
ɛ	bet
ʊ	put
ɔ	bore
ɔɪ	boy
æ	hat
ʌ	hut
ə	about

# Vowels

## Part of the Tongue Involved

Tongue  
Height

FRONT ← CENTRAL → BACK

HIGH



MID



LOW

i beet

ɪ bit

e bait

ɛ bet

ə Rosa

ʌ butt

æ bat

boot

put

boat

bore

bomb

u

ʊ

o

ɔ

a

← ROUNDED

# Major Phonetic Classes

- **Noncontinuants:** the airstream is totally obstructed in the oral cavity
  - Stops and affricates
- **Continuants:** the airstream flows continuously out of the mouth
  - All other consonants and vowels
- **Obstruents:** the airstream has partial or full obstruction
  - Non-nasal stops, fricatives, and affricates
- **Sonorants:** air resonates in the nasal or oral cavities
  - Vowels, nasal stops, liquids, and glides

# Major Phonetic Classes: Consonantal

- **Consonantal:** there is some restriction of the airflow during articulation
  - All consonants except glides
- Consonantal sounds can be further subdivided:
  - **Labials:** [p] [b] [m] [f] [v] [w] [ʍ]
    - Articulated with the lips
  - **Coronals:** [t] [d] [n] [s] [z] [l] [r]
    - Articulated by raising the tongue blade

# Major Phonetic Classes

- Consonantal categories cont.:
  - Anteriors: [p] [b] [m] [f] [v] [t] [d] [n] [s] [z]
    - Produced in the front part of the mouth (from the alveolar area forward)
  - Sibilants: [s] [z] ]
    - Produced with a lot of friction that causes a hissing sound, which is a mixture of high--frequency sounds
- **Syllabic Sounds:** sounds that can function as the core of a syllable
  - Vowels, liquids, and nasals

*dazzle* [dæzɫ]

*rhythm* [rɪðm]

# Prosodic Features

- **Prosodic**, or **suprasegmental** features of sounds, such as length, stress and pitch, are features above the segmental values such as place and manner of articulation
- **Length**: in some languages, such as Japanese, the length of a consonant or a vowel can change the meaning of a word:
  - *biru* [biru] “building”      *biiru* [bi:ru] “beer”
  - *saki* [saki] “ahead”      *sakki* [sak:i] “before”

# Prosodic Features

- **Stress:** stressed syllables are louder, slightly higher in **pitch**, and somewhat longer than unstressed syllables
  - The noun *digest* has the stress on the first syllable
  - The verb *digest* has the stress on the second syllable
  - English is a stress-timed language, meaning that at least one syllable is stressed in an English word
    - French functions differently, so when English speakers learn French they put stress on certain syllables which contributes to their foreign accent

# Tone and Intonation

- **Tone languages** are languages that use pitch to contrast the meaning of words
- For example, in Thai, the string of sounds [na:] can be said with 5 different pitches and can thus have 5 different meanings:

[ː]	L	low tone	[nà:]	“a nickname”
[ː]	M	mid tone	[nā:]	“rice paddy”
[ː]	H	high tone	[ná:]	“young maternal uncle or aunt”
[ː]	HL	falling tone	[nâ:]	“face”
[ː]	LH	rising tone	[nǎ:]	“thick”



# Tone and Intonation

- **Intonation** languages (like English) have varied **pitch contour** across an utterance, but pitch is not used to distinguish words
  - However, intonation may affect the meaning of a whole sentence:
    - *John is here* said with falling intonation is a statement
    - *John is here* said with rising intonation is a question