

# **Review for Final**

SPAU 3343

# Before we start...

- The final review session gives you great assistance.

BUT

- The session may not cover 100% of your exam. You are **RESPONSIBLE** for all the issues introduced in your textbook, lectures, and lab sessions!!!

# 1. IPA

- International Phonetic Alphabet.
- Each symbol represents a single sound.
- We can transcribe any sound of any language with IPA.

## 2. Linguistics

- The scientific study of language  
(Note: not one particular language,  
but language in the universal  
sense...)

# 3. Phonetics

- Phonetics is a branch of linguistics. It is the scientific study of speech sounds.
  - **Articulatory phonetics**
  - **Acoustic phonetics**
  - **Auditory phonetics**
  - **Linguistic phonetics**

# 4. Phonology

- How speech sounds are used in language.
- The study of systems of speech sounds and the rules which govern them.

## 5. (Elements of) sound

- Sound consists of **variations in air pressure creating longitudinal waves.** The waves occur very rapidly one after another.

## 6. Phone

- An individual sound of speech; an elementary sound unit.



# 7. Phoneme

- Refers to the smallest sound unit in a language that distinguishes word meanings.
- **-eme** = “systematic unit”

## 8. Allophone – [ ]

- Allophones refers to a variant of a phoneme. The allophones of a phoneme form a set of sounds that do not change the meaning of a word.
- **The differences among allophones can be stated in terms of phonological rules.**

# 9-1. Vowel

## Monophthongs vs. Diphthongs

### Monophthongs

- A vowel in which there is no appreciable change in quality during a syllable, as in “father.”

### Diphthongs

- A vowel in which there is a change in quality during a single syllable, as in “high.”

## 9-2. Vowel

Tense vowels with partial offglide

But these are not full diphthongs.

$/e/ = /eɪ/$

$/i/ = /ij/$

$/o/ = /oʊ/$

$/u/ = /uʍ/$

# 10. Vowel Diphthongs

**/aɪ/**

**/aʊ/**

**/ɔɪ/**

# 11. Consonants of GAE

Manner	Voicing		Place of articulation							
	Voiced (+)	Voiceless (-)	Bilabial	Labio-Dental	Dental	Alveolar	Palato-Alveolar	Palatal	Velar	Glottal
<b>Stop (nasal)</b>	+		m			n			ŋ	
<b>Stop (oral)</b>		-	p			t			k	
<b>Stop (oral)</b>	+		b			d			g	
<b>Fricative</b>		-		f	θ	s	ʃ			h
<b>Fricative</b>	+			v	ð	z	ʒ			
<b>Affricate</b>		-					tʃ			
<b>Affricate</b>	+						dʒ			
<b>Approximant</b>		-							hw	
<b>Approximant</b>	+					ɹ		j	w	
<b>(lateral)</b>	+					l			ɫ	

Also: /ʔ/, /r/

## 12. Connected speech

- The way we talk daily. Our talk is “connected” because we do not separate each word as we talk.
- Connected speech is not like citation form.

## 13. Citation form

- Single words pronounced by themselves.
- We rarely talk in citation form. Our conversation is usually carried out in “connected speech.”



# 14-1. Feature theory

## Markedness – mark only unusual cases

(Item 52. on the review sheet...)

- Voicing, place and manner →  
Consonants are assumed to be:
  - **Central instead of lateral** →  
Therefore, “lateral” is a marked feature.  
You don’t have to mark “central.”
  - **Oral instead of nasal** → Therefore,  
“nasal” is marked. You don’t have to  
mark “oral.”

# 14-2. Feature theory

## Binary vs. Graded Features

- **Binary features:**
  - In a binary system, a state is either “on” or “off.” For example, “voiced” or “voiceless”.
- **Graded features:**
  - Like prosody (the melody of language), it cannot be explained by clear-cut binary features.

# 15-1. Coarticulation

- Coarticulation is:
  - Overlapping of speech sounds.
  - language dependent.

## 2 types:

- Anticipatory coarticulation → “look-ahead”  
→ future sounds influence the present sound.
- Perseverative coarticulation → “carryover” →  
previous sounds still influence your present sound.

## 15-2. Coarticulation

Example: “**screws**” /       /

- The lip-rounding needed for /u/ and /ɪ/ seems to take place as early as the /s/.  
(anticipatory coarticulation).
- This command remains in effect after the end of the /u/, even into the final /z/  
(perseverative coarticulation)

# 25-1. Assimilation

- Coarticulation is one form of **assimilation**.
- **Assimilation** refers to the change of one sound into another sound because of the influence of neighboring sounds, as in the change of underlying [n] to [m] in “input” [ˈɪmpʊt] or of underlying [z] to [ʒ] in “does she” [ˈdʌʒʃi].

## 25-2. Dissimilation

- A phonological process whereby segments become less similar to one another.
- One good example is the process which changed one of two *r* segments within a word into an *l* in the development of Latin into modern-day Romance languages. Thus, Latin *arbor* (*tree*) became Spanish *arbol*.

# 16. Electropalatography (EPG)



- Subjects wear the unit on the upper surface of the mouths.
- Platinum electrodes record points of tongue contact.

# 17. Syllable

- A unit of speech consisting of either a single vowel (or a syllabic consonant) or a vowel and one or more consonants associated with it.
- The syllable is often used to describe patterns of stress and timing in speech.



# 18. Tonic syllable

- Within an intonational phrase, the stressed syllables of multisyllabic words must still be marked for their local “primary” stress -- but we must also mark the one syllable that carries the major stress of the whole phrase
- The syllable within a tone group that stands out because it carries the major stress is called the **tonic syllable**.

# 19. Sentence-level intonation

- English also uses sentence-level intonation, which is the use of pitch variations to convey syntactic information.
- Examples:
  - Yes/No question
  - “**Wh**” Question
  - Simple declarative sentence

## 20. Tone group

- A group of words which constitutes one complete intonational pattern.
- Also known as an “intonational phrase.”

# 21-1. Stress

- The use of extra respiratory energy during a syllable.
- Usually **LOUDER, LONGER, HIGHER** (in pitch).

## 21-2. Stress placement

- The symbol // is a stress mark that has been placed **before** the syllable carrying the main stress.
- Stress should **always** be marked in words of more than one syllable.

# 22. Language Family

- “Stress-timed” language  
**English, German**
- Syllable-timed language  
**Spanish, Japanese**
- Tone Language  
**Chinese**

## 23. Diacritics

- A small mark that can be used to distinguish different values of an IPA symbol.

## 24. 12 Phonological Rules

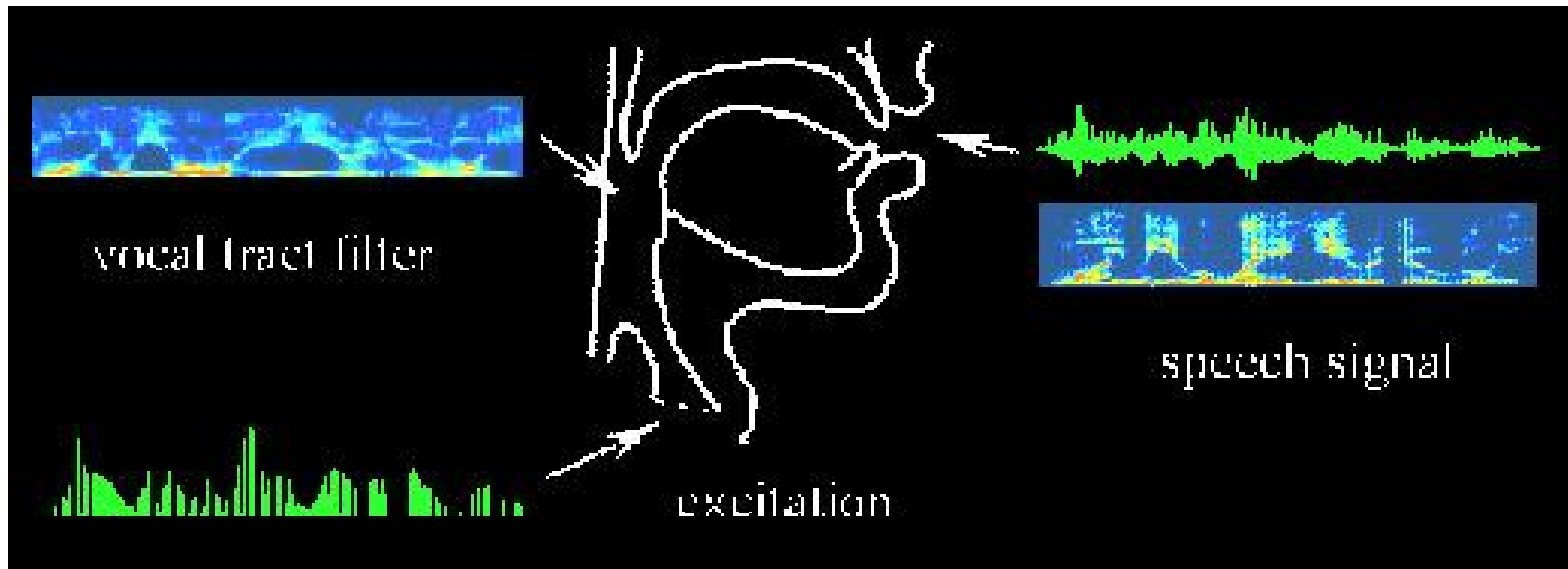
Know all 12 of them.

- When to apply each of them.
- Which one is applicable in XX situation.

[<sup>h</sup>], [◦], none, [°], [ʔ], [ʔ],  
[ , ], [ , ], [ɹ], [ɹ̄], [̃], [̃]



# 26. Source-filter theory



Vocal source 

vocal tract filter 

speech 

## 27. Fundamental Frequency ( $F_0$ )

- In speech, the fundamental frequency refers to the first harmonic of the voice.
- The perceptual correlate is pitch.

## 28. Harmonics

- Energy at integer multiples of the fundamental frequency in voiced sounds.

Ideally, the voice source can be conceptualized as a line spectrum in which energy appears as a series of harmonics.

# 29. Formants

- Formants are a product of vocal tract resonances.
- Vowels are characterized chiefly by the frequencies of the first three formants (F1, F2, and F3).
- The formants that characterize different vowels are the result of different shapes of the vocal tract.

## 30. Resonance – three basic rules

- **F1 rule** – inversely related to tongue height. As the jaw goes down, F1 goes up.
- **F2 rule** – directly related to tongue fronting. As the tongue moves forward, F2 increases.
- **Lip rounding rule** – All formants are lowered by lip rounding (because lip protrusion lengthens the vocal tract ‘tube’)

# 31. Physical vs. perceptual

## PHYSICAL

- Fundamental frequency (F0) →
- Amplitude/ Intensity →
- Duration →

## PERCEPTUAL

“Pitch”

“Loudness”

“Length”

## 32. Vowel Reduction

- The replacement of a vowel by [ə] or by a vowel closer to [ə], usually triggered by the unstressed nature of the syllable concerned.
- More likely to occur in spontaneous speech than in citation form.

## 33. Tense/lax Vowels

- Tense /i, e, u, o/
- Lax /ɪ, ɛ, æ, ʌ, ʊ/



## 34. Geminate consonant

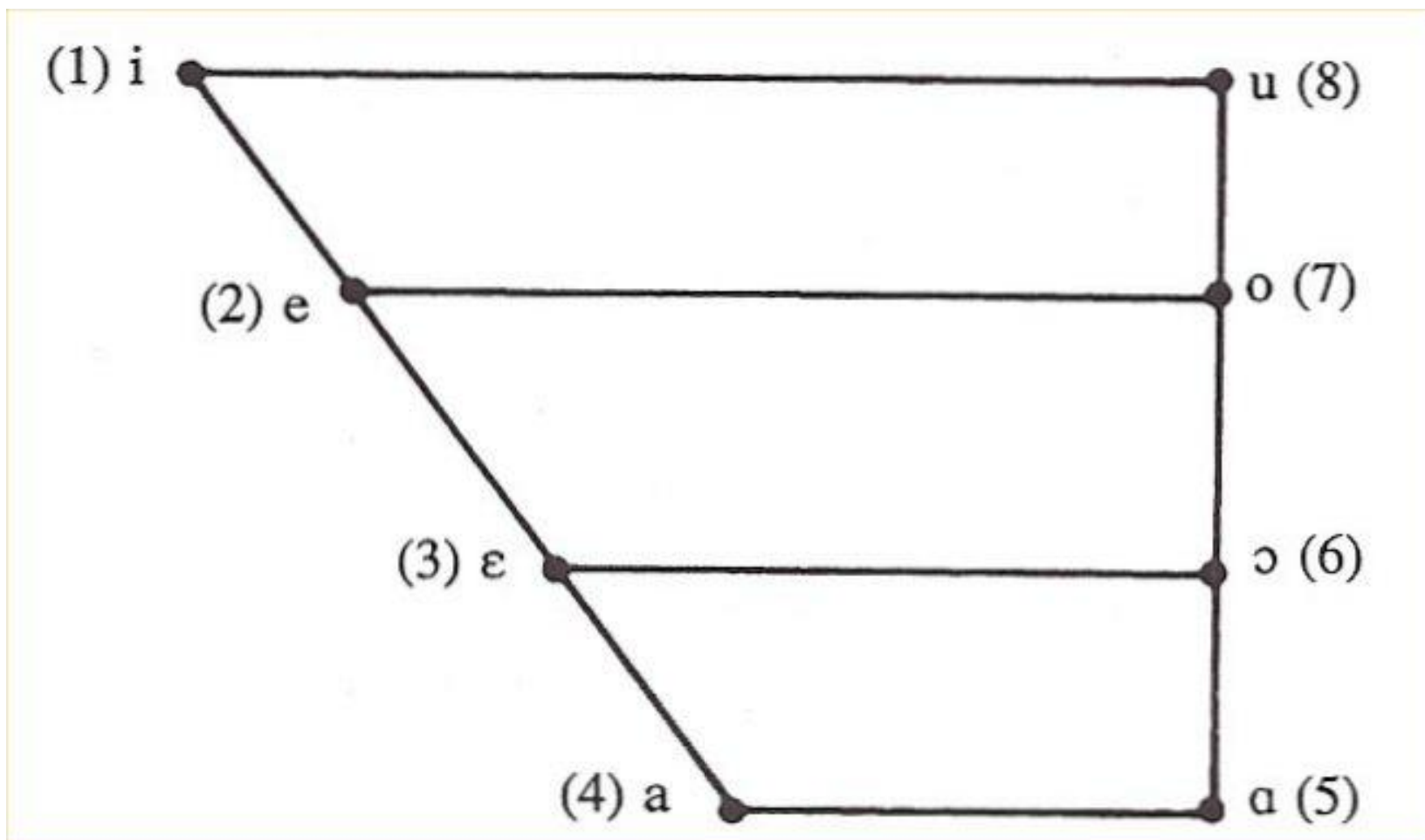
- Long consonants that can be analyzed as “double” are called *gemimates*.
- Example: the long consonant in the middle of Italian “folla”.
- Careful: many English words are spelled with two consonants, but these are NOT usually gemimates (e.g., “running”).

# 35-1. Cardinal Vowels

- A set of reference vowels first defined by Daniel Jones.
- The vowels of any language can be described by stating their relations to the cardinal vowels.
- A series of eight cardinal vowels, evenly spaced around the outside of the possible vowel area and designed to act as fixed reference points for phoneticians.

# 35-2. The Cardinal Vowels

(p. 215 Fig. 9.2)



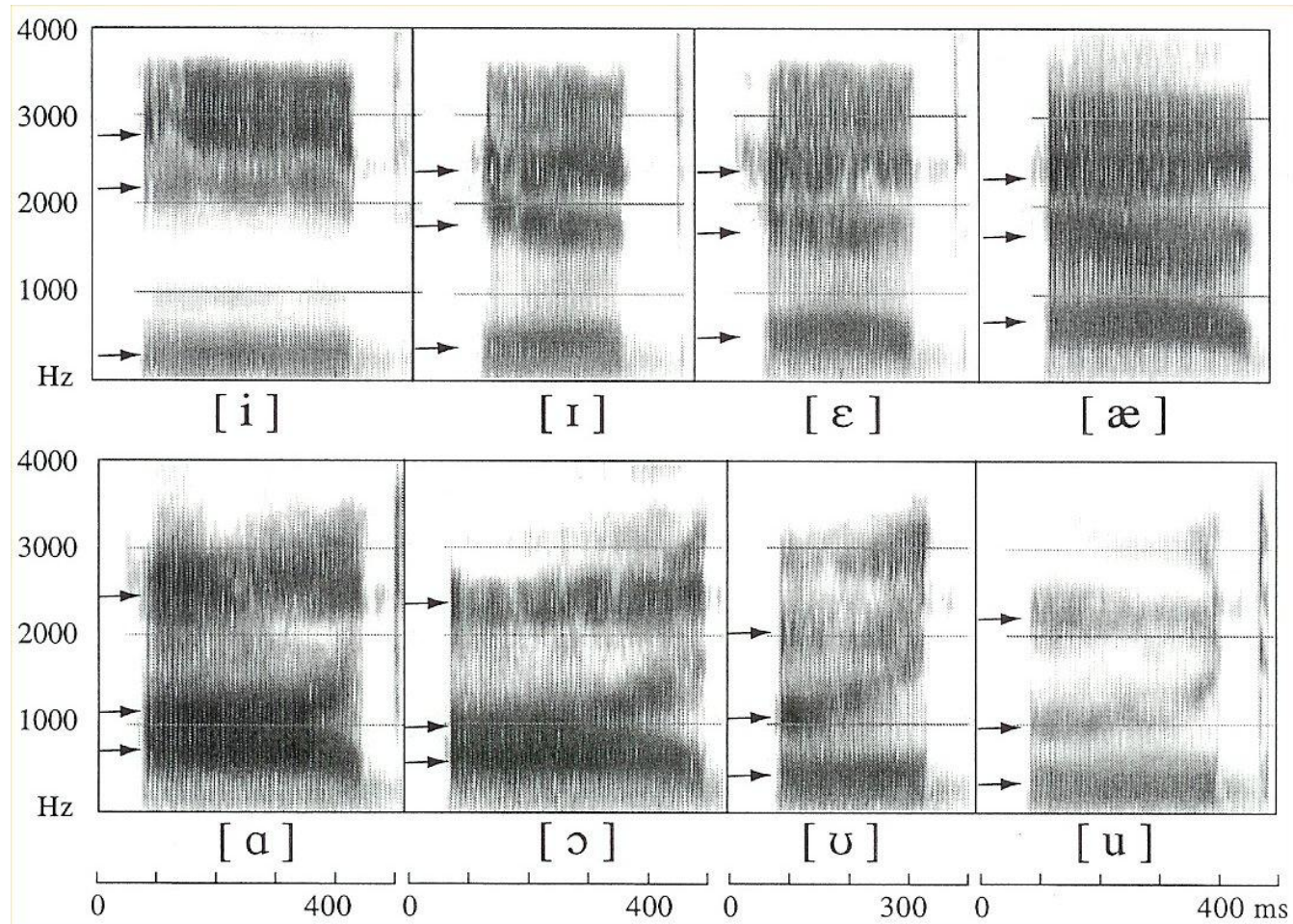
# 36. Transcription methods

- **Broad** → captures the phonemes of a language, by using a simple set of symbols.
- **Narrow** → captures allophones and shows more phonetic detail, either by just using more specific symbols or by using a variety of diacritics.

# 37-1. Spectrogram

- A graphic representation of sounds in terms of their component frequencies, in which time is shown on the horizontal axis, frequency on the vertical axis, and the intensity of each frequency at each moment in time by the darkness of the mark.

# 37-2. A spectrogram of the words in GAE “heed, hid, head, had, hod, hawed, hood, who’d” (p. 204 Fig. 8.17)



# 38-1. Bandwidth

- A measure of the frequency band of a sound.
- Bandwidth is determined at the half-power (“3 db down”) points of the frequency response curve. → Both the lower and higher frequencies that define the bandwidth are 3 db less intense than the peak energy in the band.

## 38.2 Phase

- The relative timing of two or more components of a complex periodic waveform.
- Phase is measured in degrees.  
Suppose that two components are at zero amplitude at the same time. If one is positive-going and the other negative-going, then they have a relative phase of 180 degrees.



## 38-3. Amplitude

- The magnitude of displacement for a sound wave.
- The waveform of a sound is represented on a two-dimensional graph in which amplitude is plotted as a function of time.
- Generally speaking, amplitude of sound determines the perceived loudness of the sound.

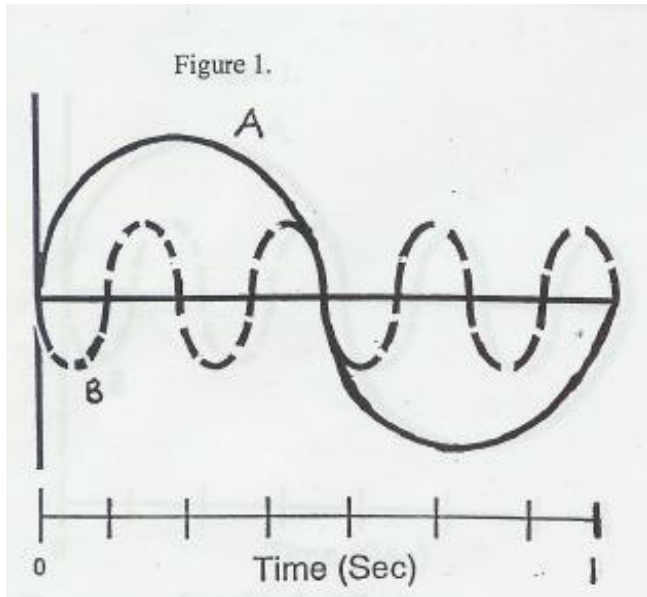
## 38-4. Frequency

- The rate of vibration of a periodic event. For example, a periodic sound has a frequency measured as the number of cycles of vibration per second (Hz).
- Frequency = Cycles Per Second (CPS) = Hz

## 38-5. Wavelength

- The distance that a periodic signal travels in one complete cycle of vibration.
- $\text{wavelength} = \text{speed of sound} / \text{frequency}$
- NOT REALLY USED MUCH IN THE SOUND WORLD...

# Know this one...



- The frequency of B is higher than that of A.

A

- One cycle in a second.
- $1/1=1$

**1 Hz**

B

- Four cycles in a second.
- $4/1=4$

**4 Hz**

- The amplitude of Wave A is much **greater/larger** than that of Wave B.

# Know this one...

## Periodic waves

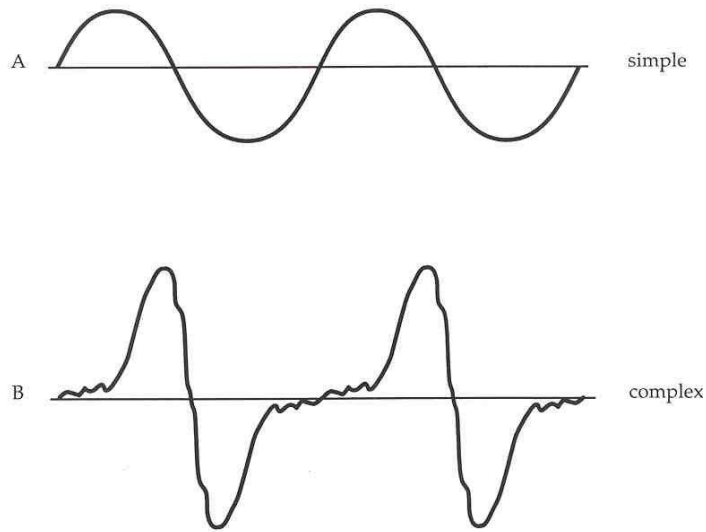


FIGURE 5.6 Schematic diagram of (A) a simple periodic waveform, and (B) a complex periodic waveform.

- Simple (sine; sinusoid)
- Complex (actually a composite of many overlapping simple waves)

# 39. Suprasegmental features

- Phonetic features which are not properties of single consonants or vowels.
  - Stress
  - Length
  - Tone
  - Intonation

# 40. Sonority

- The loudness of a sound relative to that of other sounds with the same length, stress, and pitch.
- Low vowel /a/ is louder (has greater sonority) than /i, u/.

# 41. Prominence

- The extent to which a sound stands out from others because of its sonority, length, stress, and pitch.



# 42. Strong form & Weak form

## **Strong form**

- The form in which a word is pronounced when it is stressed. This term is usually applied only to words that normally occur unstressed and with a weak form, such as “to” and “a.”

## **Weak form**

- The unstressed form of any word, such as “but” or “as,” that does not maintain its full form when it occurs in conversational speech.

# 43. Tone

- A pitch that conveys part of the meaning a word. In Mandarin (Chinese), for example, /ma/ pronounced with a high-level tone means “mother” and with a high falling tone means “scold.”
- There are two types of tone: **Register** (e.g., in African Languages) and **Contour** (e.g., Chinese).
  - **Register tone** = set levels
  - **Contour tone** = may include e.g. rise/fall (tone shapes)

## 44. Voice – type of phonation

- **Breathy voice (murmur)** → the vocal folds are only slightly apart so that they vibrate while allowing a high rate of airflow through the glottis, as in **Hindi** /b<sup>h</sup>/.
- **Creaky voice (laryngealization)** → the arytenoid cartilages hold the posterior end of the vocal folds together so that they can vibrate only at the other end, as in **Hausa** /b̰/.

# 45-1. Airstream mechanism

- **Airstream mechanism:** The manner in which an airstream is set in motion for the purposes of speech.
- Airstream mechanisms may produce **egressive** (outward) or **ingressive** (inward) airflow.
- Speech sounds are produced with one of three airstream mechanisms, or occasionally by a combination of two of these.

# 45-2 & 57. Airstream Mechanism

	Pulmonic	Glottalic	Velaric
Egressive	Plosives /p, t, k, b, d, g/ <b>English</b>	Ejectives /p', t', k'/ <b>Lakhota, Hausa</b>	NONE
Ingressive	NONE	Implosives /ɓ, ɗ, ɠ/ <b>Sindhi</b>	Clicks /ʘ,  , !, †,   / <b>!Xhosa, Zulu</b>

## 46. Ejective vs. Implosive sounds

- **Ejective** → A stop made with an egressive glottalic airstream, such as Hausa /k'/.  
Ejectives are produced by a burst of air from the glottis, pushing the vocal folds apart. This results in a sharp, popping sound that is often used to emphasize a word or to indicate a specific grammatical function, such as emphasis or surprise. In Hausa, the ejective /k'/ is used to emphasize the word 'k' (to eat), as in 'k' (eat) vs. 'k' (eat).
- **Implosive** → A stop made with an ingressive glottalic airstream, such as Sindhi /ɓ/.  
Implosives are produced by a burst of air from the glottis, pulling the vocal folds together. This results in a sharp, popping sound that is often used to emphasize a word or to indicate a specific grammatical function, such as emphasis or surprise. In Sindhi, the implosive /ɓ/ is used to emphasize the word 'ɓ' (to eat), as in 'ɓ' (eat) vs. 'ɓ' (eat).

# 47. Voice Onset Time (VOT)

- The interval between the release of a stop consonant and the beginning of vocal cord vibration (voicing).
- In English, consonants with a VOT greater than 25 milliseconds are perceived as voiceless (such as /p/), and VOTs less than 25 milliseconds are perceived as voiced (such as /b/).

# 48-1. Closure

Steps for the production of a stop consonant in initial position

1. closure
2. build up intra-oral pressure
3. release (burst)
4. (VOT)
5. *if voiceless in syllable-initial position → aspiration*
6. voicing



## 48-2. Aspiration

- A period of voicelessness after the release of an articulation, as in English “*pie*.”
- In a narrow transcription, aspiration may be indicated by a small raised *h*, /<sup>h</sup>/.

*pie* /p<sup>h</sup>aɪ/

*tie* /t<sup>h</sup>aɪ/

*kye* /k<sup>h</sup>aɪ/

## 48-3. Fricative voicing

-- Effect on preceding vowel length

- The same rule as that of stops.
- When a vowel occurs before one of the voiceless fricatives /f, θ, s, ʃ/, it is shorter than it would be before one of the voiced fricatives /v, ð, z, ʒ/.
  - **strife** /straɪf/ vs. **strive** /straɪv/
  - **teeth** /ti:θ/ vs. **teethe** /ti:ð/
  - **rice** /raɪs/ vs. **rise** /raɪz/

# 49. Prevoicing

- The onset of voicing before the appearance of a supraglottal articulatory event; for example, for stops, prevoicing means that voicing precedes the stop release.
- Also called “voicing lead.”
- Optionally produced by some English talkers; mandatory for many sounds of Russian.

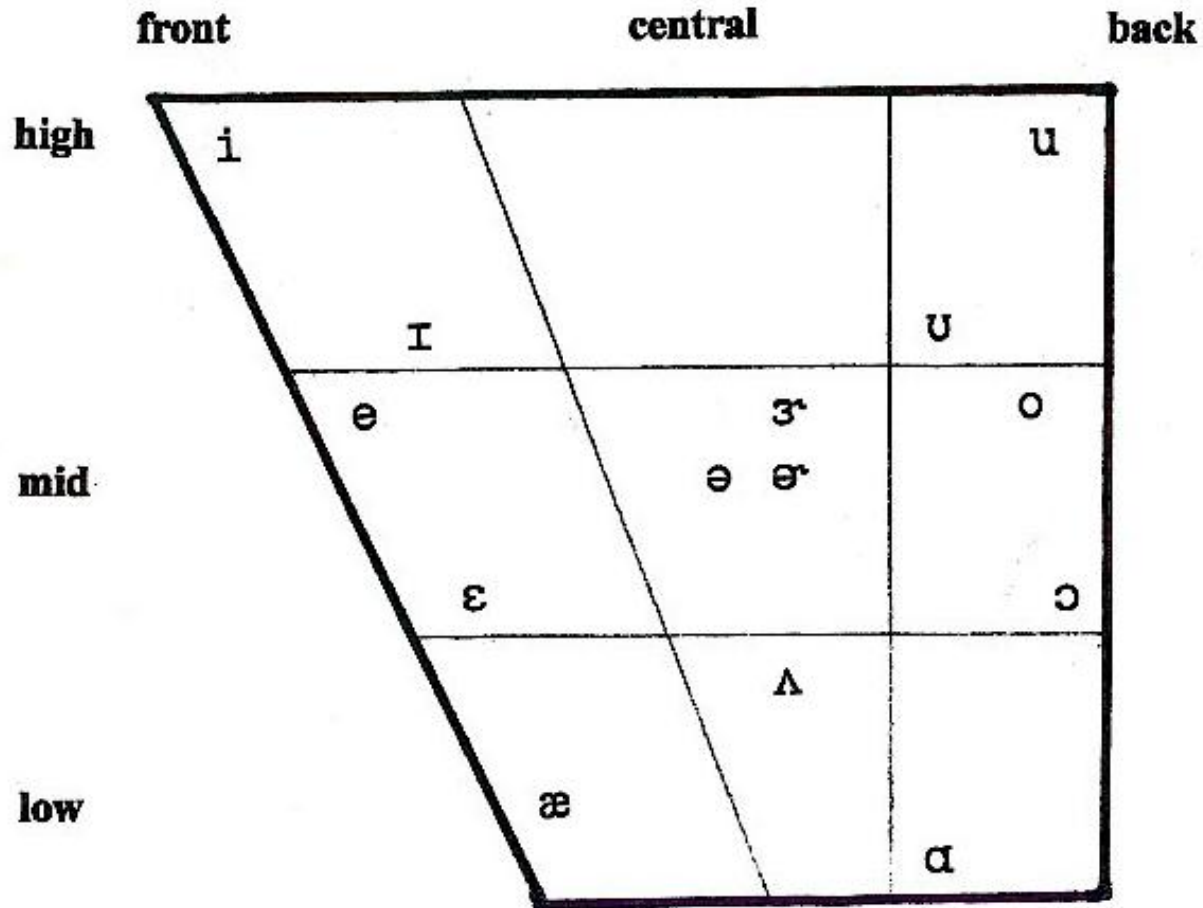
# 50. Natural classes

- A group of segments which are phonetically similar and which occur frequently as the input, output or environment of phonological rules.
- Example: stops and affricates are grouped together as a natural class.

# 51. Sibilants

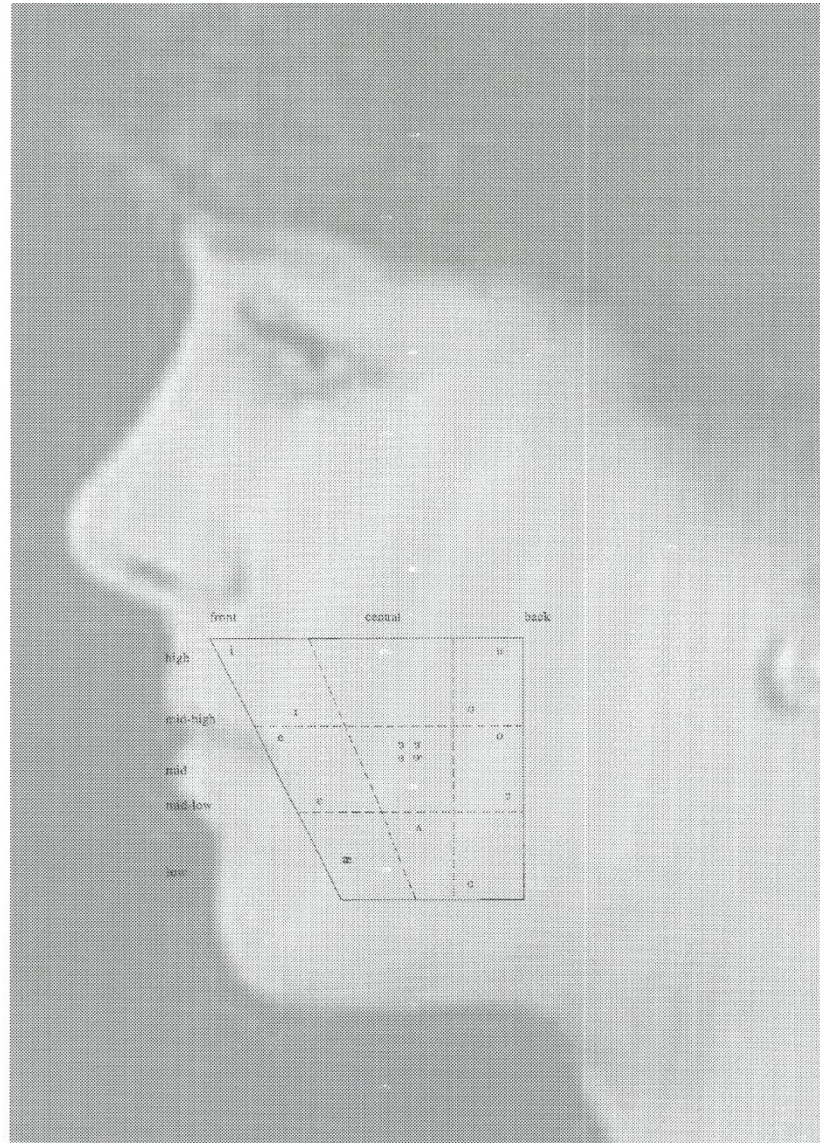
- A speech sound in which there is high-pitched, turbulent noise, as in English [s] and [ʃ] in “sip” and “ship.”

# 53-1. GAE Vowel Quadrilateral



Diphthongs: /aɪ, aʊ, ɔɪ/

# 53-2. Vowels of General American English



# 53-3. How to describe vowels

## Main classification

- Tongue height → high, mid, or low.
- Tongue advancement → front, central, or back.

## Also, we talk about...

- Tenseness → tense or lax
- Lip rounding



## 53-4. But remember..

- As Ladefoged tells us, vowels are more precisely described by their acoustic characteristics (i.e., formant frequency relations, duration) than by their articulatory features (e.g., mid/high, etc.).

Fr: American Accent

## 54-1. Accent

- The phonetic and phonological distinctions between language varieties.
  - Some of the NE accents sound more like British English.
    - For example, “r” reduction...

## 54-2. Dialect

- A dialect is any variety of a language spoken by a group of people that is characterized by both the aspect of word selection and phonological characters.

(word choice)

Texans:

“I’m fixing to go lunch.”

Some of NE region:

“May I aid you?”

## 54-3. Social vs. Geographic constraints

### Social

- Teenagers:
  - “Dude...”
- College professors:
  - “Henceforth...”

### Geographical

- Texans:
  - “I’m fixing to go lunch.”
- Some of NE region:
  - “May I aid you?”

Fr: American Accent

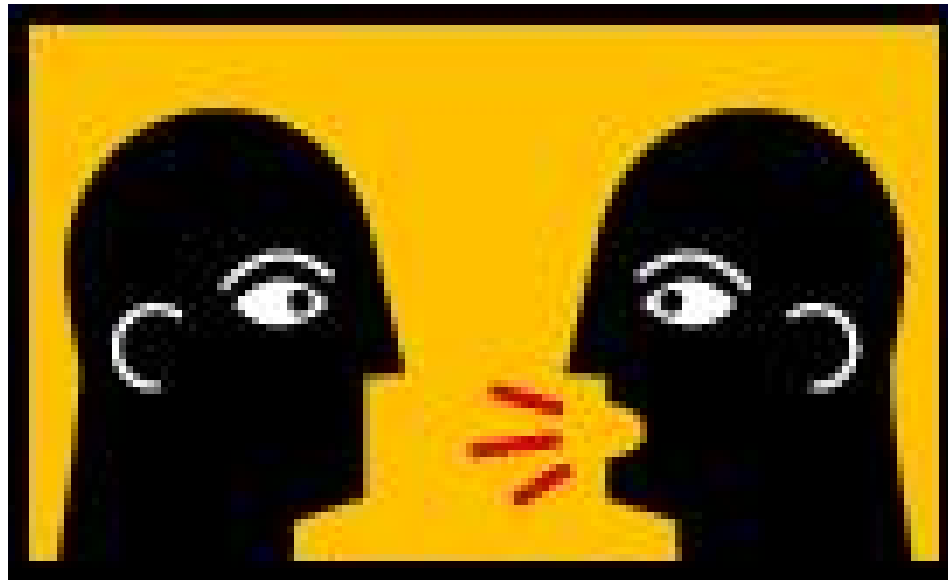
## 54-4. Language Variation

- Regional
- Socioeconomic
- Political
- Age
- Gender
- Ethnicity

Fr: American Accent

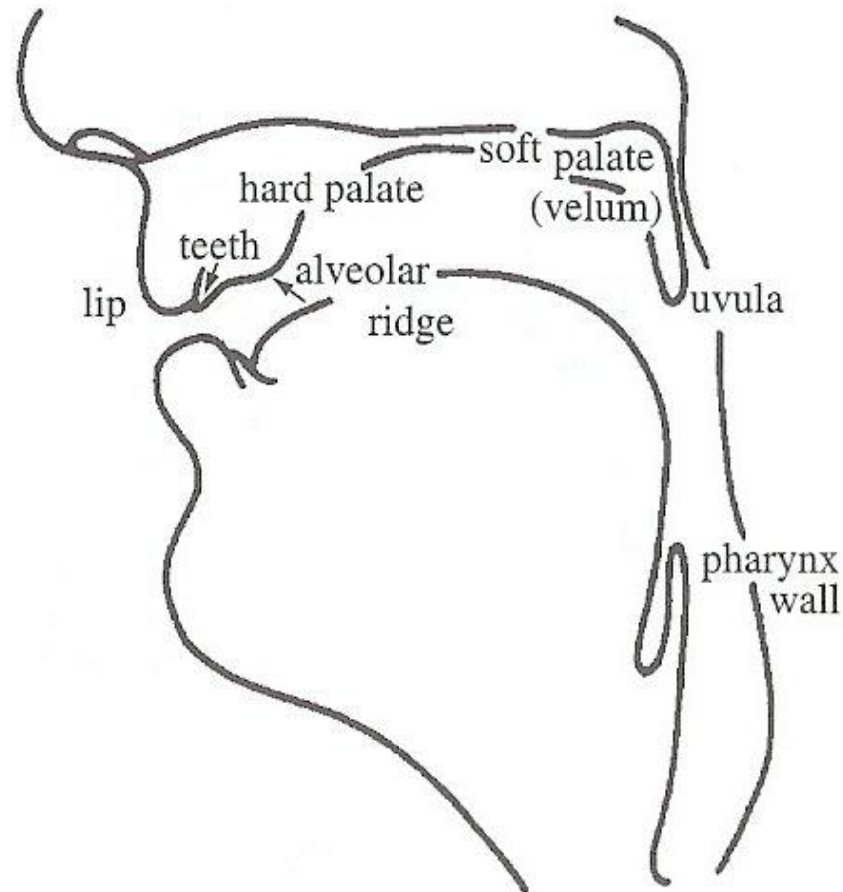
## 54-5. Important Note

- Linguistically speaking, no one dialect or language is better, more correct, or more logical than any other.



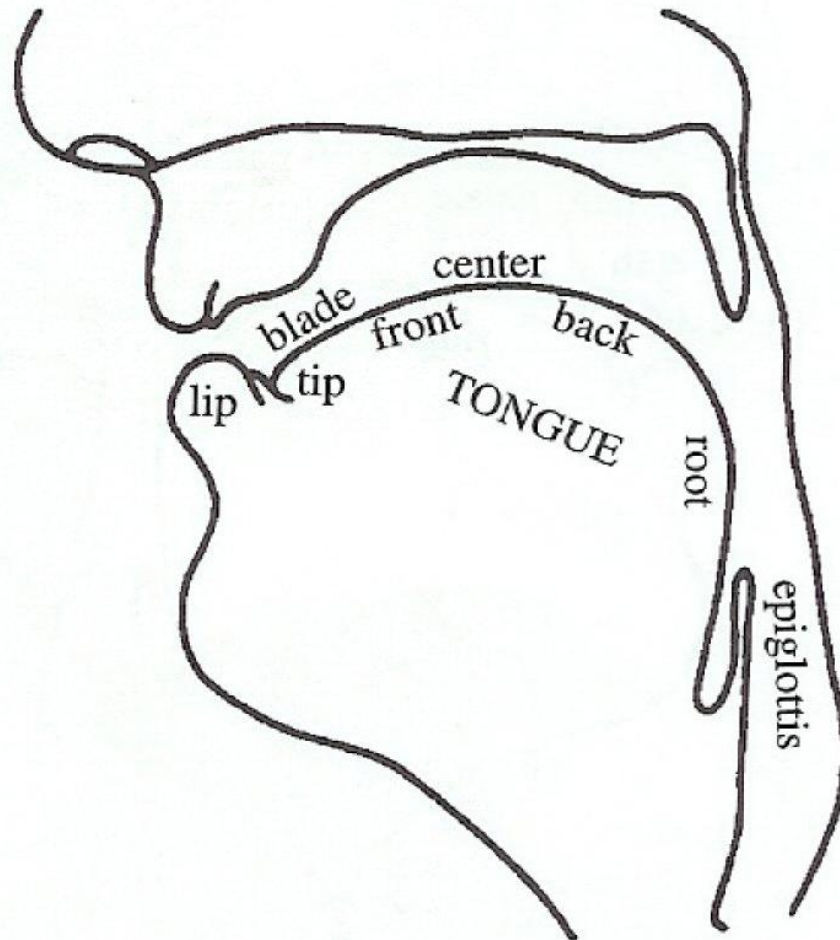
# 55-1. Basic Speech Anatomy – upper details

(p. 8, Fig. 1.5)



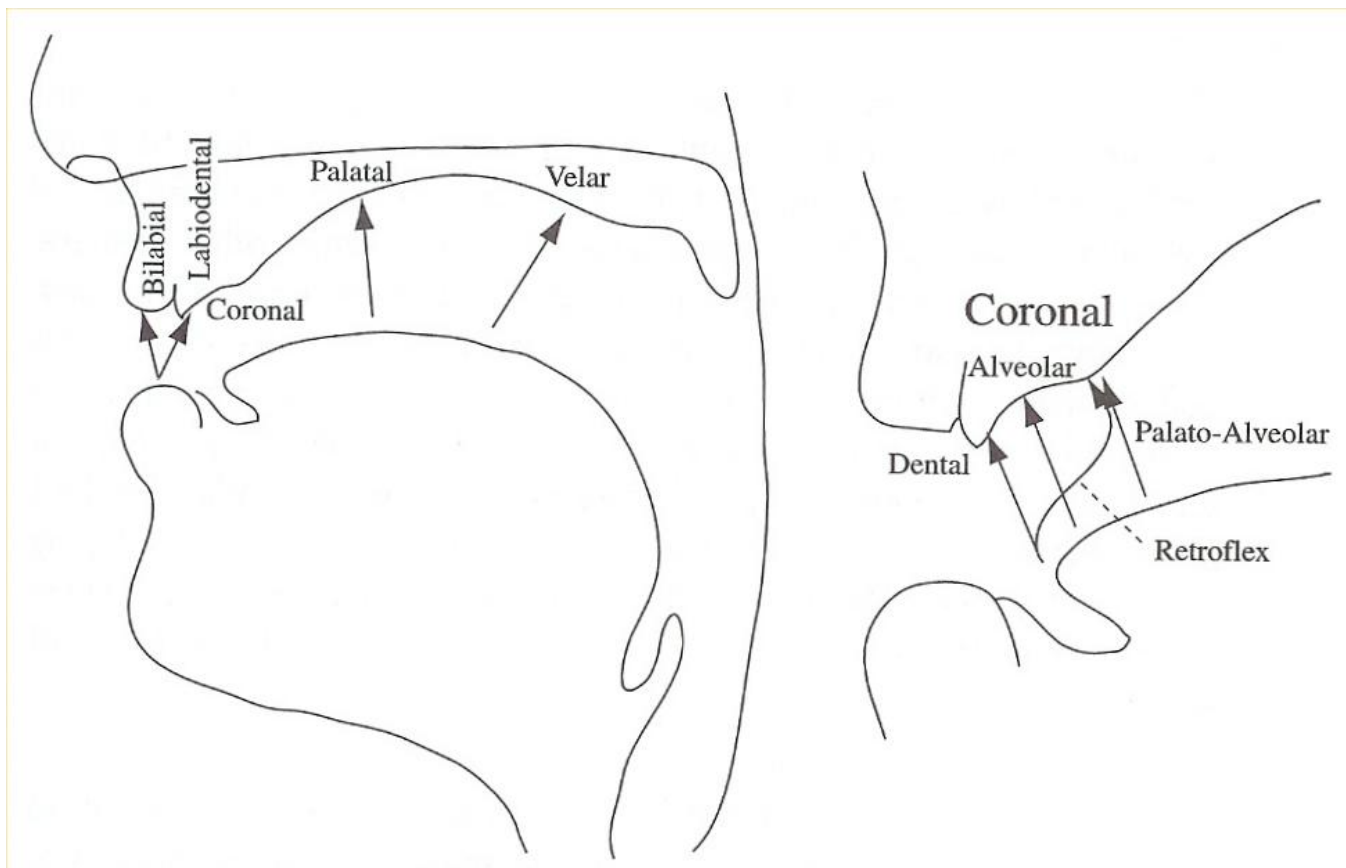
# 55-2. Basic Speech Anatomy – lower details

(p. 9, Fig. 1.6)





# 55-3. A sagittal section of the vocal tract (p. 11, Fig. 1.7)



# Remember this one...

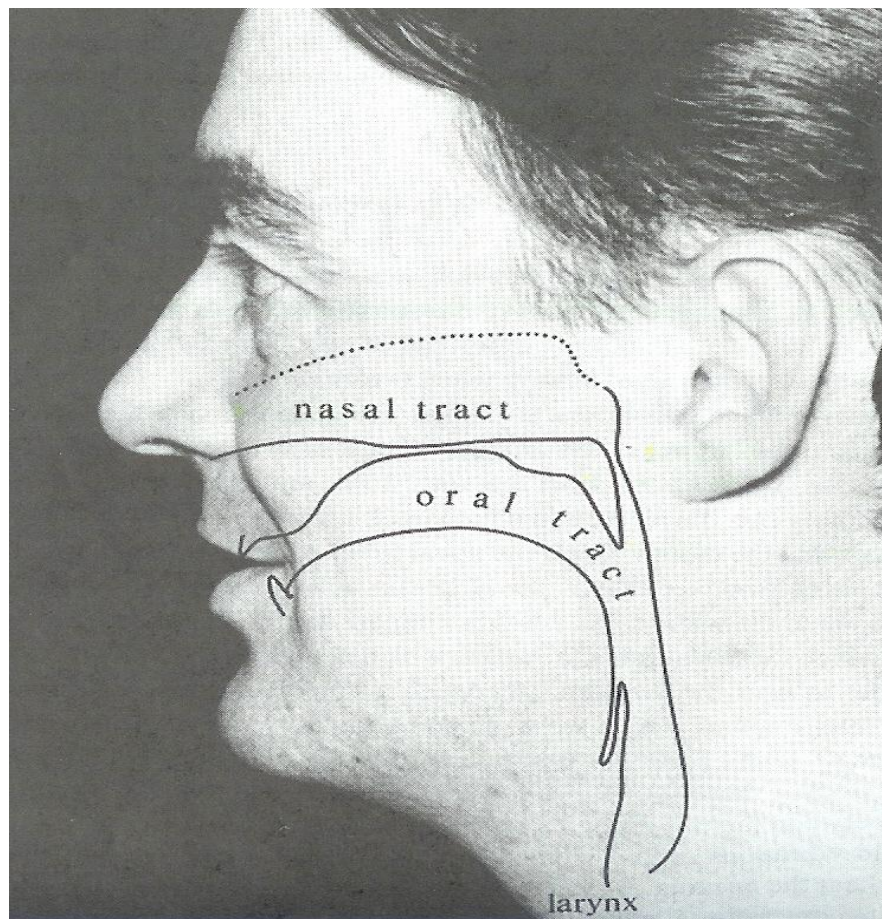
## Vocal Cord



- **Glottis** is the space between the vocal folds.
- **Vocal folds** are the two moving parts.

# Remember this one...

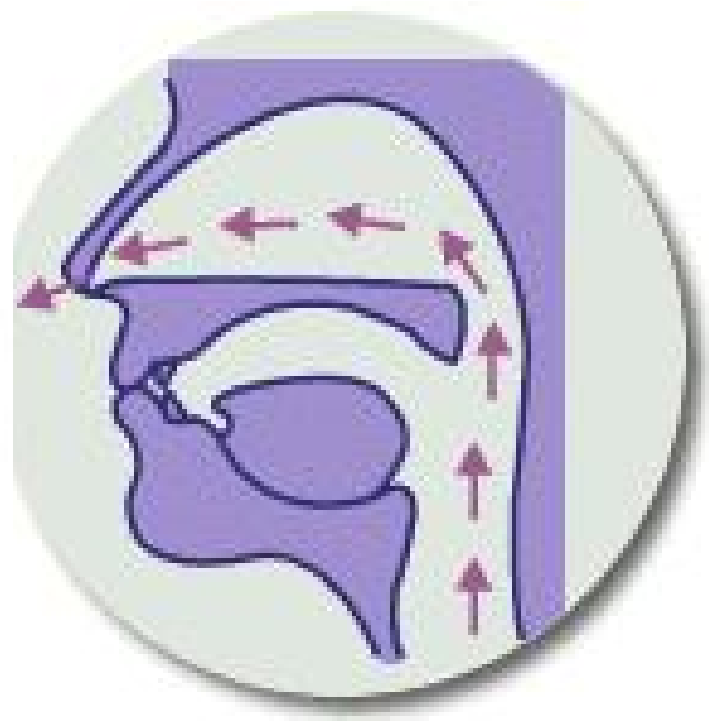
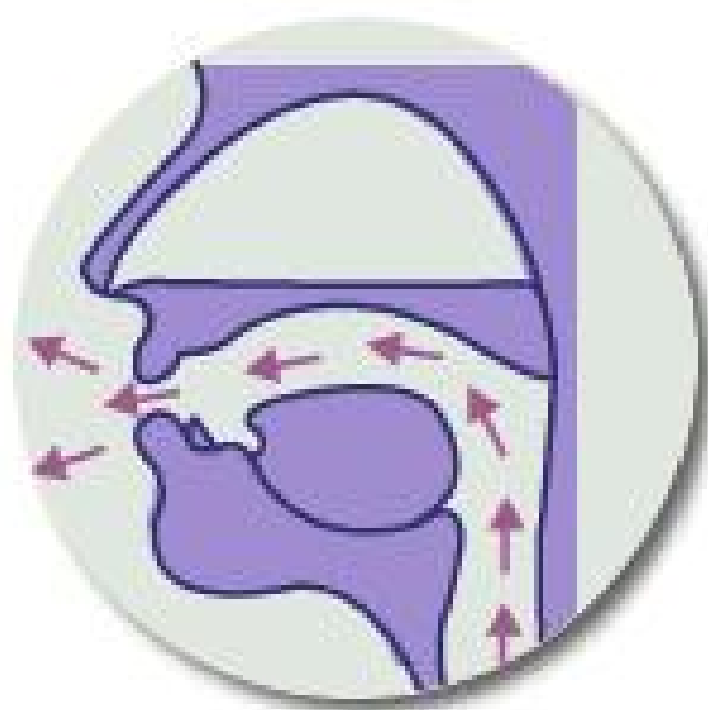
## Nasal sounds



- The velum goes down to close the oral tract.
- The air comes out through the nasal tract.

Remember this one...

# Oral vs. Nasal Sounds



# 56. Famous phoneticians

- Sir William Jones → Set a trend in the linguistic study of Sanskrit.
- Henry Sweet → Pioneer in modern scientific phonetics.
- Daniel Jones → Cardinal vowels
- Raymond H. Stetson → Speech movements and phonetics.
- Peter Ladefoged → Major contributions in articulatory, acoustic, and linguistic phonetics.

**GOOD LUCK!!**

