

reading: Johnson Ch.1 (Thurs)

### The Speech Chain

1. (planning) → articulation → acoustics → audition → perception

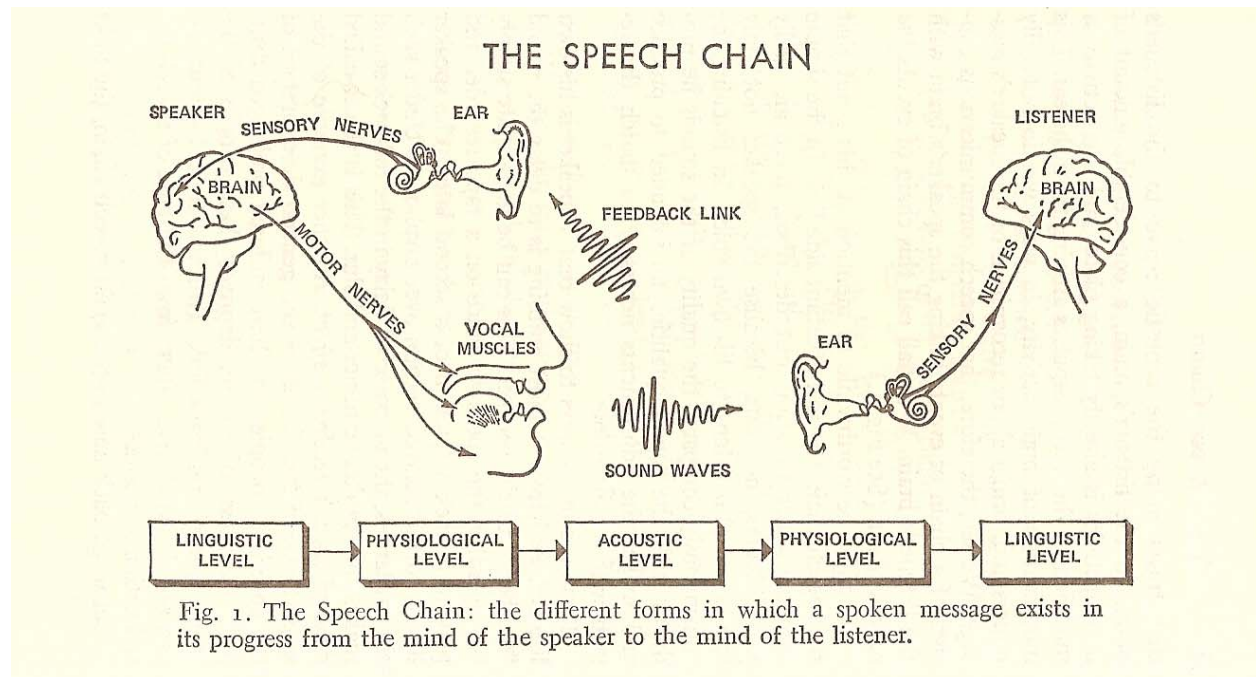


Fig. 1. The Speech Chain: the different forms in which a spoken message exists in its progress from the mind of the speaker to the mind of the listener.

(from Denes & Pinson, 1993)

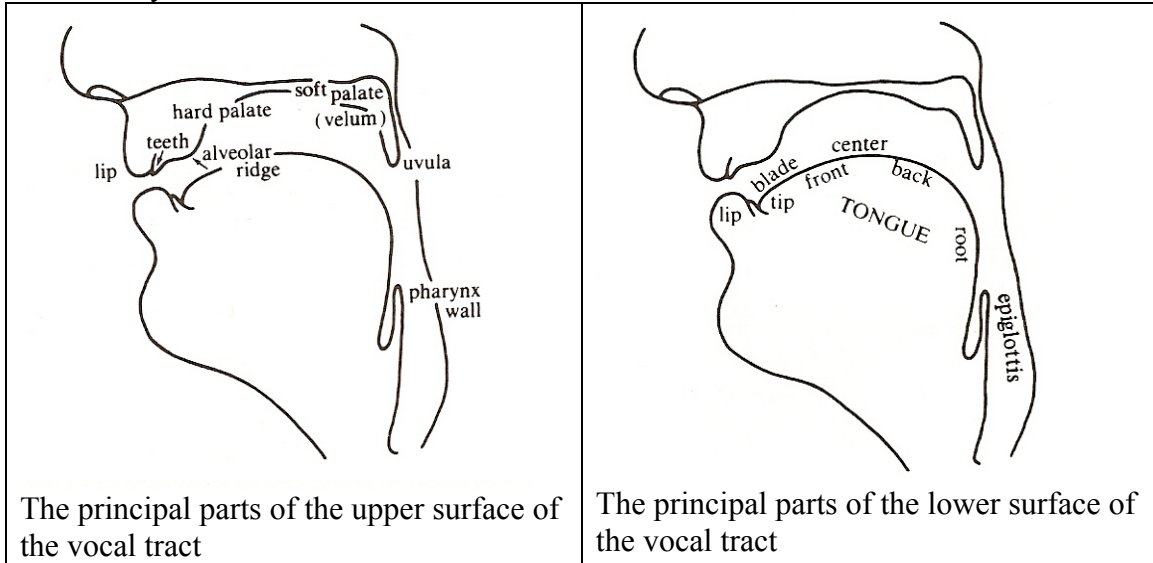
- traditional areas of phonetic study
  - speech production – how people plan and execute speech movements
  - speech perception – auditory perception
  - speech acoustics – general theory of acoustics (particularly in a tube)

2. What is linguistic phonetics?

- approaches to linguistic phonetics
  - practical (impressionistic) – skills of production & transcription, introspection about articulation
  - theoretical – accounts of speech production, perception, and acoustics; explanations for patterns in languages
  - experimental – obtaining data using specialized equipment with the goals of developing theories of speech or language and describing sounds or sound structures of individual languages

## Articulatory phonetics

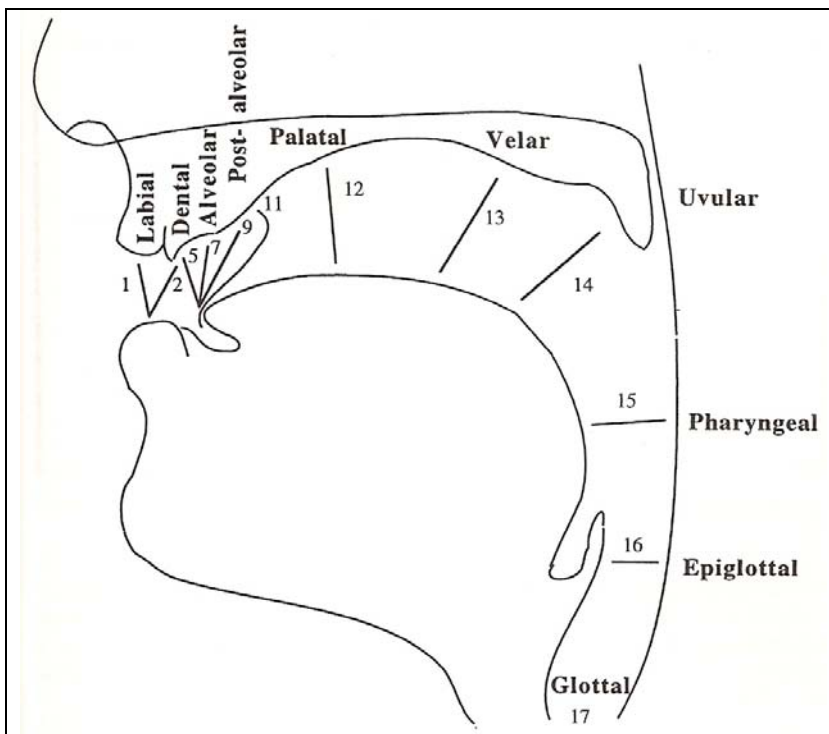
### 3. Vocal anatomy



(from Ladefoged, 1993)

### 4. Place of articulation – consonants

- There are two aspects to a ‘place of articulation’: what moves and what it moves towards.
  - active articulators move (the tongue is the ‘default’ active articulator)
  - passive articulators do not



(from Ladefoged & Maddieson, 1995)

5. Manners of articulation (degree of constriction)

stop “Complete closure of the articulators involved so that the airstream cannot escape through the mouth”

- can be oral (produced with raised velum) or nasal (produced with lowered velum)

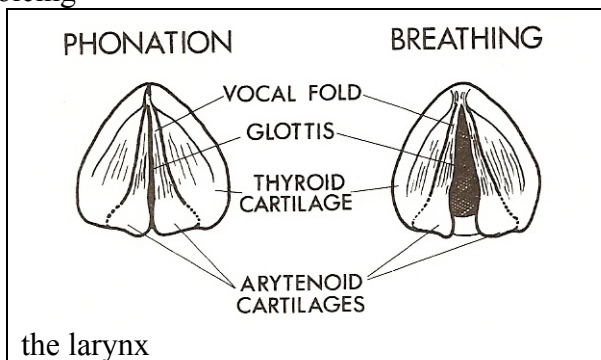
fricative “Close approximation of two articulators so that the airstream is partially obstructed and turbulent airflow is produced”

affricate A combination of a stop immediately followed by a fricative at the same place of articulation

approximant “An articulation in which one articulator is close to another, but without the vocal tract being narrowed to such an extent that a turbulent airstream is produced.”

- can be central (this is default) or lateral (“Obstruction of the airstream at a point along the center of the oral tract, with incomplete closure between one or oth sides of the tongue and the roof of the mouth”)

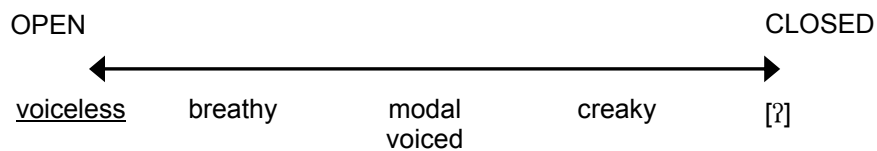
6. Voicing



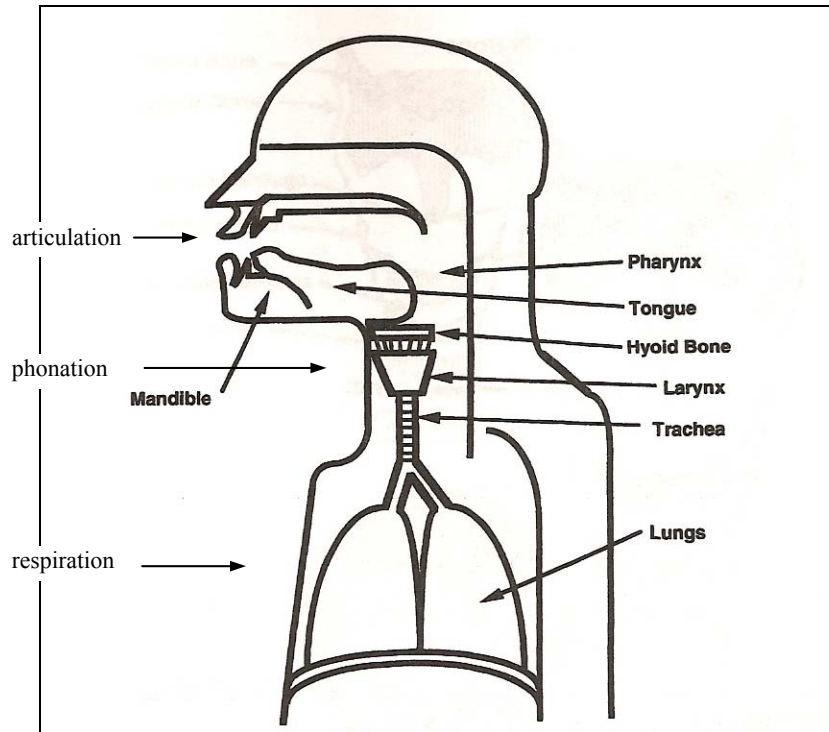
(from Pickett, 1999)

Laryngeal settings

- The opening between the vocal folds can vary from wide (completely open) to completely closed.
- Given sufficient airflow, the vocal folds vibrate if they are close together but not closed. → voicing



## 7. Airstream mechanisms



(from Fucci & Lass, 1999)

- Most sounds are produced with air expelled from the lungs: pulmonic egressive airstream.
- Ejectives are produced with a glottal closure and a supra-laryngeal constriction (usually a closure). The glottis is raised, compressing air between the two constrictions. Then the supra-laryngeal constriction is released, resulting in a very rapid increase in airflow. (glottalic egressive)  
(e.g., Lakhota, Quechua, Navajo)
- Implosives are stops produced with larynx lowering during the closure. This lowers pressure in the oral cavity and can result in ingressive airflow when the stop closure is released. (glottalic ingressive)  
(e.g., Sindhi)
- Clicks are produced by trapping a small pocket of air within the mouth (generally between the tongue and the palate, with two points of constriction). A vacuum is created (generally by lowering the tongue), and when one of the closures is released, air rushes into the oral cavity. (velaric ingressive)  
(e.g., Khoisan languages)

## 8. Vowel articulation

- Vowels are produced with the tongue as the active articulator, but the degree of constriction is less than for consonants.
- They are described articulatorily in terms of the height (from low to high) and backness (back to front) of the tongue during the vowel.
- Some vowels are produced with lip rounding while others are not.
- Additionally, vowels can be oral or nasal (or nasalized) and produced with different voice qualities (modal, breathy, creaky, etc.)

## 9. International Phonetic Alphabet (IPA)

- The IPA chart is a summary of a theory of linguistic phonetics. Its scope is limited to sounds that have linguistic significance.
- It also predicts which articulatory combinations are impossible.

# THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

## CONSONANTS (PULMONIC)

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

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

## CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
◌ ɸ	ɓ Bilabial	ʼ as in:
◌ ɗ	ɗ Dental/alveolar	ɸ Bilabial
◌ ɠ	ɠ Palatal	ɬ Dental/alveolar
◌ ɡ	ɡ Velar	ɰ Velar
◌ ʘ	ʘ Uvular	ɮ Alveolar fricative

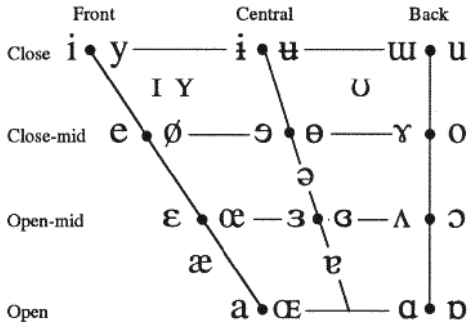
## SUPRASEGMENTALS

- ˈ Primary stress
- ˌ Secondary stress
- ː Long
- ˑ Half-long
- ˚ Extra-short
- Syllable break
- ◌ Minor (foot) group
- ◌ Major (intonation) group
- ◌ Linking (absence of a break)

## TONES & WORD ACCENTS

- | LEVEL             | CONTOUR               |
|-------------------|-----------------------|
| ◌ or ˥ Extra high | ˩ or ˨ Rising         |
| ˥ High            | ˨ Falling             |
| ˧ Mid             | ˩ High rising         |
| ˨ Low             | ˩ Low rising          |
| ◌ Extra low       | ˩ Rising-falling etc. |
| ˩ Downstep        | ˩ Global rise         |
| ˩ Upstep          | ˩ Global fall         |

## VOWELS



## DIACRITICS

Diacritics may be placed above a symbol with a descender, e.g. ɲ̣

◌ Voiceless	◌ Breathy voiced	◌ Dental
◌ Voiced	◌ Creaky voiced	◌ Apical
◌ Aspirated	◌ Linguolabial	◌ Laminal
◌ More rounded	◌ Labialized	◌ Nasalized
◌ Less rounded	◌ Palatalized	◌ Nasal release
◌ Advanced	◌ Velarized	◌ Lateral release
◌ Retracted	◌ Pharyngealized	◌ No audible release
◌ Centralized	◌ Velarized or pharyngealized	
◌ Mid-centralized	◌ Raised	
◌ Syllabic	◌ Lowered	
◌ Non-syllabic	◌ Advanced Tongue Root	
◌ Rhoticity	◌ Retracted Tongue Root	

## OTHER SYMBOLS

- ◌ Voiceless labial-velar fricative
- ◌ Voiced labial-velar approximant
- ◌ Voiced labial-palatal approximant
- ◌ Voiceless epiglottal fricative
- ◌ Voiced epiglottal fricative
- ◌ Epiglottal plosive
- ◌ Alveolo-palatal fricatives
- ◌ Alveolar lateral flap
- ◌ Simultaneous ʃ and ʒ
- Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.

k͡p t͡s