Where am I?

- HUL242: **Fundamentals of Language Sciences**
- **Phonetics (Lecture-1)**
- Monday, January 6

Language competence and Linguistics

5 areas of human language competence	5 core branches of linguistics
(Speech) sounds	Phonetics
How to put (speech) sounds together	Phonology
Words	Morphology
How to put words together to make phrases and sentences	Syntax
Meaning	Semantics

Phonetics

Phonetics: the study of sounds

- Human languages have a wide variety of sounds used in communication, called **phones/segments/(speech) sounds.**

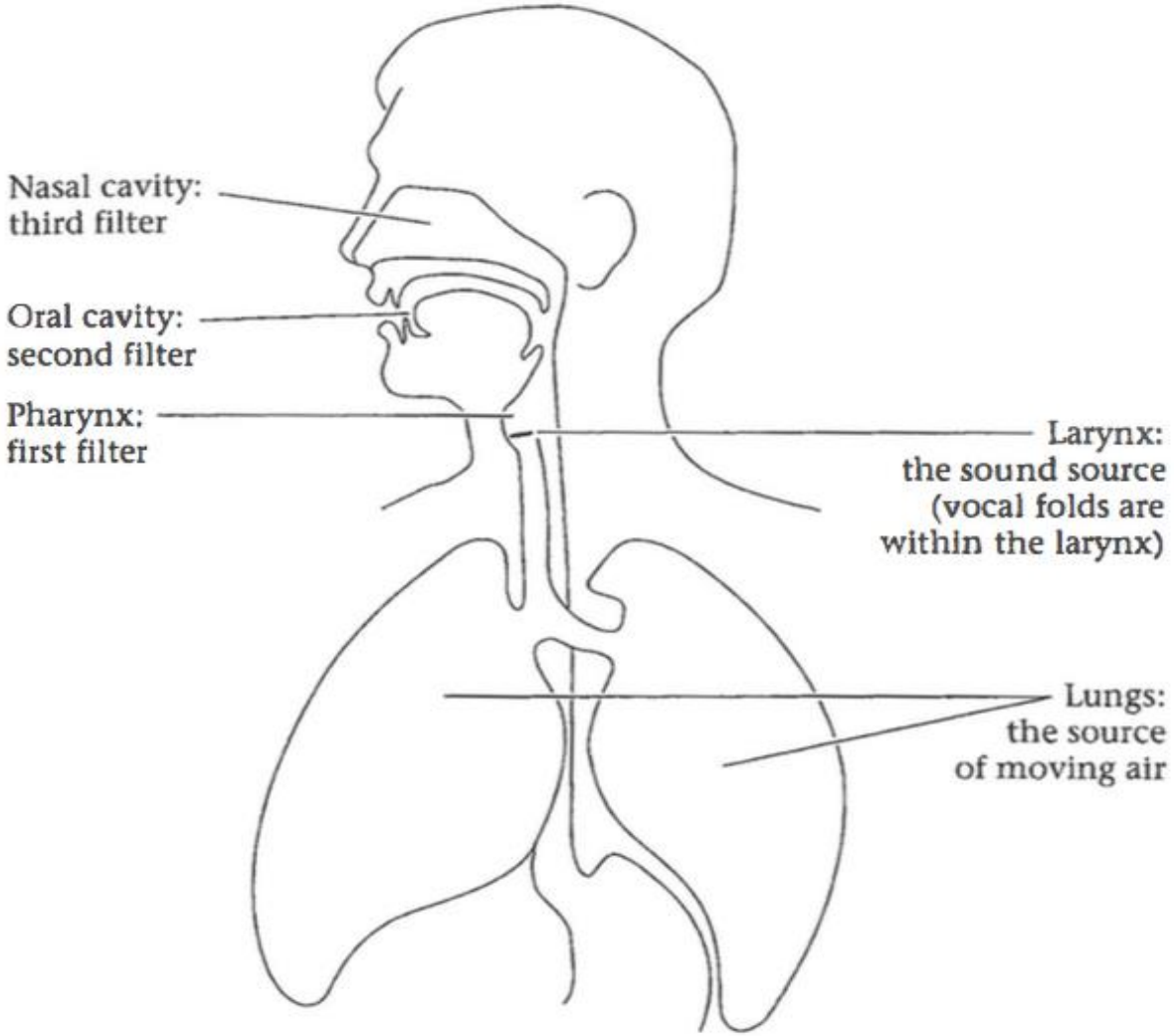
- In Phonetics, we study a language by examining the **inventory** and **structure** of the speech sounds.

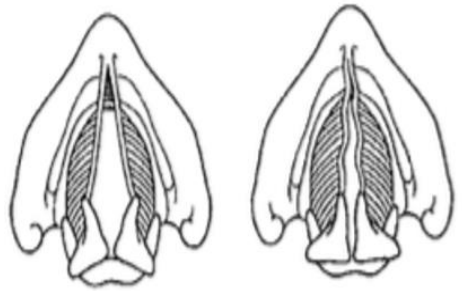
The Module Learning Goal

- How do sounds differ from each other in a language? What makes them distinctive?
- How to identify these differences.
- How do we represent and describe these sounds?
- What different sounds have in common with each other.

- We will achieve these goals by describing modern English. Hindi sounds will also be discussed for the comparison.

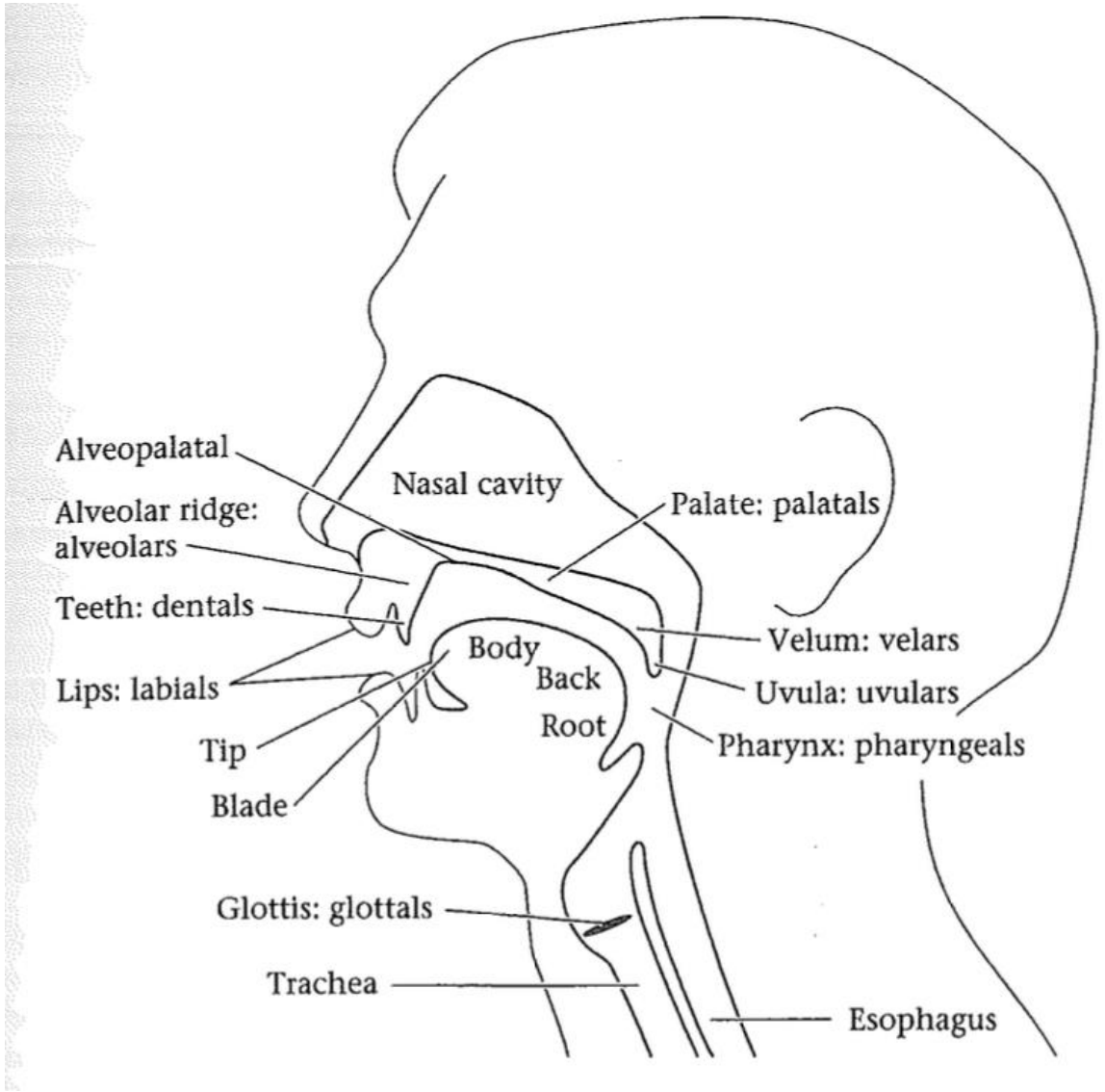
The Anatomy of Human Speech Sounds (The sound-producing system)





Vocal folds/cords

The Vocal tract



- In the next few classes, we'll learn more about how this system works and how sounds are produced by the human vocal tract.

Sounds: Three different major classes

Consonants

- Involve some obstruction of the airflow in the vocal tract
- short in duration

Vowels

- No obstruction of the airflow
- Pronounced with an open vocal tract
- longer in duration

Glides

- Have properties of both consonants and vowels.
- Open vocal tract, but shorter in duration, and distributed like consonants in syllables.

The consonants

Role of *place* in articulation

- How do **the first sounds** in each of these words differ from each other?
  - *pulmonary* [p]
  - *team* [t]
  - *cultivate* [k]

- You form the sounds using different parts of your mouth!
  - The first sound [p] in *pulmonary* is formed with your **lips**.
  - The first sound [t] in *team* is formed with your tongue pressing against your **alveolar ridge**.
  - The first sound [k] in *cultivate* is formed with the **back of your tongue** meeting your **soft palate/velum**.

A note: sounds are represented in bracket [ ]

- What is the difference between 'p' and [p]?
  - 'p' represents a **letter** while [p] represents a **sound**
- What is the first sound of the words *pin, or picture*?
  - [p] (correct representation)
  - p (wrong representation)

Parameter 1: Place of articulation

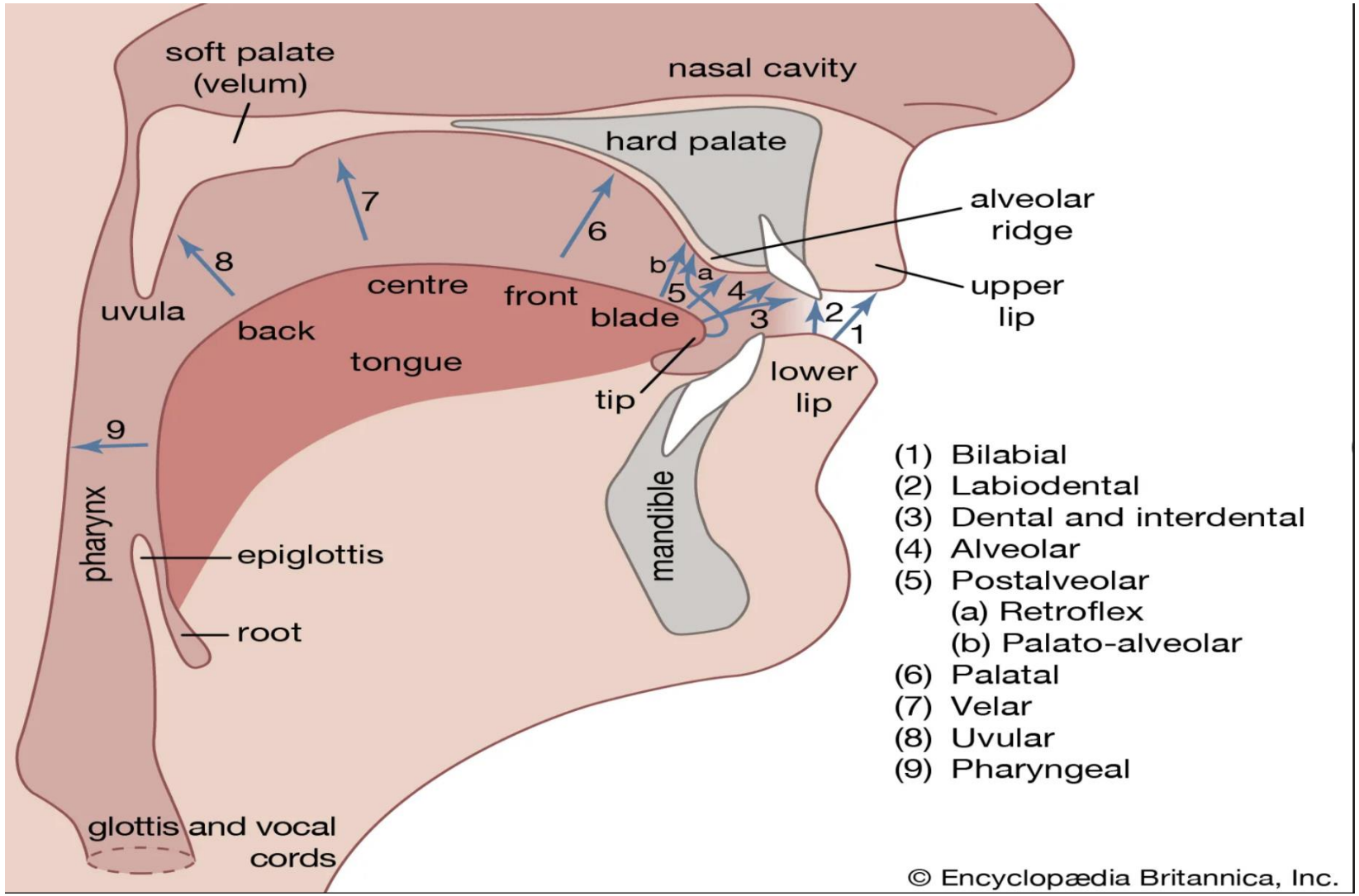
- **Bilabial**: Sounds involving both libs
  - the first sounds of *man, picture, bird*

- **Labiodental**: Sounds involving the lower lip and the upper teeth
  - the first sounds of *fan, van*

- **Dental**: These sounds are produced with the tip of the tongue placed against or near the teeth
  - the first sounds of *three, there*

- **Alveolar**: The tip of the tongue may touch or be brought near the alveolar ridge (a part just behind the upper front teeth.)
  - the first sounds of *team, seem, near, lean*

The Vocal tract



Parameter 1: Place of articulation

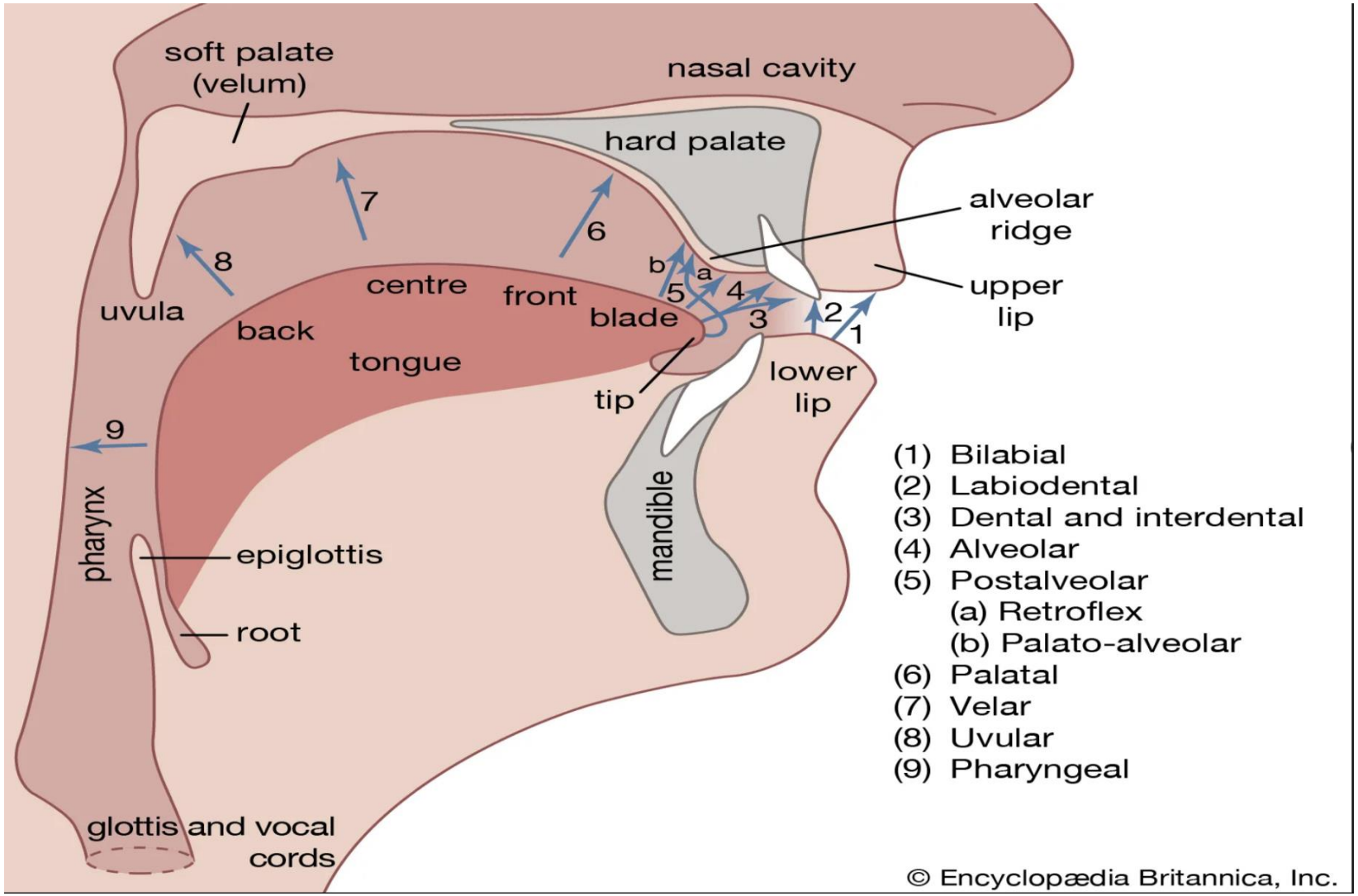
- **Postalveolar/alveopalatal**: When the blade of the tongue touches the hard palate (a part just behind the alveolar ridge)
  - the first sounds of *shoo*, *Zoo*

- **Palatal**: When the front part of the tongue is placed on or near the palate (a part after the alveolar ridge)
  - the first sound of yes

- **Velar**: When the centre part of the tongue is placed on or near the soft palate/velum
  - the first sounds of *camel*, *game*

- **Glottal**: Sounds produced using the vocal folds as primary articulators
  - the first sound of *home*, *hog*

The Vocal tract



Parameter 1: Place of articulation

- English does not have ***Uvular*** and ***Pharyngeal*** sounds.

- **Uvulars** are found in some European languages such as French
  - Sounds made with the back part of tongue near or teaching the uvula
  - https://www.youtube.com/watch?v=cfqUNtnzO3k

- **Pharyngeals** are found in many dialects of Arabic.
  - Sounds are made by modifying airflow in the pharynx by retracting the tongue or constructing the pharynx (the throat area between the uvula and larynx).
  - https://www.youtube.com/shorts/kA9B7rynDNo

Role of *manner* in articulation

- How do the **bolded** sounds in each of these words differ from each other?

***b**eam* vs. ***m**ine*	[b] vs [m]
***t**eam* vs. ***s**eem*	[t] vs [s]

- The sounds do different things with the *flow of air*:
  - The first sound [b] in *beam* involves a complete stoppage of air in the oral cavity, but the first sound [m] in *mine* lets air flow through your nose!
  - The first sound [t] in *team* also involves a complete stoppage of air in the oral cavity, while the first sound [s] in *seem* lets air flow through oral cavity!

Parameter 2: Manner of articulation

- **Plosives/Stops**: the first sounds of *bit, can*
  - Complete closure of articulators in the oral cavity or at the glottis.

- **Nasals**: the first sounds of *man, near*
  - Complete closure of articulators in the oral cavity, but airflow continues through the nasal cavity.

- **Fricatives**: the first sounds of *fee, see, she*
  - Produced by bringing one articulator in the vocal tract close to another, no complete closure, airflow continues through the oral cavity with friction

- **Affricates:** the first and the last sounds of *church, judge*
  - Affricates begin as a stop (complete closure) and release as a fricative (slow release of the closure).

Parameter 2: Manner of articulation

- **Approximants/Liquids**: the first sounds of *ride, lock*
  - Produced by bringing one articulator in the vocal tract close to another but with no audible friction (like fricatives).

Lateral approximants: the first sound of *lock*

- Air escapes through the mouth along the lowered sides of the tongue

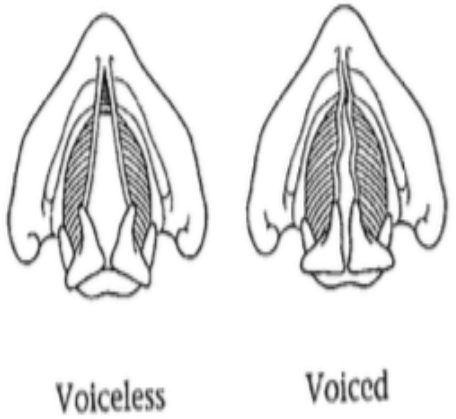
Retroflex approximants: the first sounds of *ride*

- Produced either by curling the tongue tip back into the mouth or by bunching the tongue upward and back in the mouth.

- **Flap/Tap**: the middle consonant in *butter*, *rider*, *writer*
  - Produced by a single quick flip of the tongue against the upper part of the mouth/hard palate

Parameter 3: Phonation

- How do the first sounds in the following words differ?
  - *peep* vs. *beep* [p] vs. [b]
  - *sack* vs. *zoo* [s] vs. [z]
  - *fee* vs. *very* [f] vs. [v]
  - *show* vs. *just* [ʃ] vs. [ʒ]



Vocal folds/cords

- Your vocal folds are doing different things!
  - When you produce the first sounds in *peep*, *sack*, *fee*, and *show*, your larynx does not vibrate (the vocal folds are apart enough to not vibrate): **Voiceless** sounds
  - When you produce the first sounds in *beep*, *Zach*, *very*, and *just*, your larynx vibrates (the vocal folds are close enough to vibrate): **Voiced** sounds

What is it to Whisper?

- Say the following sentence normally, then whisper it:

1. It was John who shredded the documents.

- How do the two pronunciations differ?
  - The whispered version has only **voiceless** sounds.

One more phonation distinction: Aspiration

- How do the **bolded** sounds in the following words differ? (Try placing your hand in front of your mouth and paying attention to how it feels.)
  - ***p****en* vs. *s****p****ine*
  - ***c****at* vs. *s****k****ate*

- They differ in whether their production is associated with a burst of air!
  - The first sounds of *pen* and *cat* are made with a burst of air
  - The corresponding sounds in *spine* and *skate* aren't.

- This burst of air is called **aspiration**. In English, aspiration is just a variant of its corresponding sound. (We will learn about such variants, called *allophones*, in Phonology)
- In many Indian languages, the *aspirated* and *unaspirated* stops are two different sounds. (Different sounds are called phonemes. We will learn about *phonemes* in Phonology))

Hindi consonants: Aspiration

	Bilabial		Labio-dental		Denti-alveolar		Retro-flex		Palatal		Velar		Glottal	
Plosive	प	ब			त	द	ट	ड			क	ग		
Aspirated plosive	फ	भ			थ	ध	ठ	ढ			ख	घ		
Affricate									च	ज				
Aspirated affricate									छ	झ				
Fricative	(फ)		फ़	(व)	स	ज़	ष		श		ख़	ग़	(ह)	ह
Nasal		म				न		(ण)		(ञ)		(ङ)		
Tap						र		(ड़)						
Aspirated tap						(र)		(ढ़)						
Approximant		(व)		व		ल				य				

c.f., ‘The Ohio State University’

Interim Summary: 3 parameters

1. Place of articulation

- Which pieces of your vocal tract you use to make the sound
  (Bilabial, Labiodental, Dental, Postalveolar, Palatal, Velar, Glottal etc.)

2. Manner of articulation

- How the airflow is modulated by your vocal tract
  (Plosives/stops, Nasals, Taps or flaps, Fricatives, Approximants etc.)

3. Phonation:

- Whether the vocal folds are vibrating or not
  (voiced, voiceless, or aspirated)

The IPA chart: English consonants

Place of Articulation															
		Bilabial		Labio-dental		Inter-dental		Alveolar		Alveo-palatal		Palatal		Velar		Glottal
Manner of Articulation	Stop	p	b					t	d					k	g	?
	Fricative			f	v	θ	ð	s	z	ʃ	ʒ					h
	Affricative									tʃ	dʒ					
	Nasal		m						n						ŋ	
	Flap								ɾ							
	Lateral Approximant								l							
	Retroflex Approximant								ɹ							
	Glide		w										j			

State of the Glottis	
Voiceless	Voiced

- The International Phonetic Alphabet, or **IPA** is a standardized orthography for speech sounds.
- Same alphabet for all the languages across the board.

The need for IPA: spelling is unreliable

- English orthography sometimes spells the same sounds differently:
  - *doff* and *tough*
  - *bandage* and *juice*

- Sometimes the same letter obscures differences in sounds:
  - *team* and *demonstration*

- Sometimes, the number of letters doesn't correspond to the number of sounds:
    - *tax*: the final letter is pronounced with *two* consonants [k], [s]
    - *bing*: the final two letters are pronounced with *one* consonant [ŋ]

IPA symbols and corresponding English sounds

- [p] *Voiceless bilabial stop*. second sound of *upper, spell*
- [d] *Voiced alveolar stop*. first sound of *dip, dust, draft*
- [k] *Voiceless velar stop*. second sound of *cultivate*
- [tʃ] *Voiceless alveo-palatal affricate*. first and last sound of *church*
- [z] *Voiced alveolar fricative*. first sound of *Xerox, zipper*
- [ð] *Voiced dental fricative*. first sound of *this, there*
- [v] *Voiced labio-dental fricative*. first sound of *vote, van*
- [n] *Voiced alveolar nasal*. first sound of *now, never*
- [ɹ] *Voiced alveolar retroflex approximant*. first sound of *read, road*

IPA symbols and corresponding English sounds

- [b] *Voiced bilabial stop*. The first sound of *bin, boat*
- [t] *Voiceless alveolar stop*. The second sound of *stem, stuck*
- [g] *Voiced velar stop*. The first sound of *game, gun*
- [dʒ] *Voiced alveo-palatal stop*. The first sound of *judge*
- [f] *Voiceless labio-dental fricative*. The first sound of *fruit, feel*
- [θ] *Voiceless lnter-dental fricative*. The first sound of *thought, three*
- [s] *Voiceless alveolar fricative*. The first sound of *science, sir*
- [ʃ] *Voiceless alveo-palatal fricative*. The first sound of *ship, shock*
- [ʒ] *Voiced alveo-palatal fricative*. The third sound of *measure, visual*
- [h] *Voiceless glottal fricative*. The first sound of *home, hope*

IPA symbols and corresponding English sounds

- [m] *Voiced bilabial nasal*. The first sound of *man, mail*
- [ŋ] *Voiced velar nasal*. The last sound of *sang, speaking*
- [l] *Voiced alveolar lateral approximant*. The first sound of *lock, loose*

Sounds cross-linguistically

- The IPA chart here is incomplete: it only charts **English** sounds!
- Other languages may make fewer, more, or different distinctions.
  - Hindi/Magahi has the following plosive/stop sounds

    Bilabial: p, p^h, b, $b^ɦ$

    Dental: t̪, $t̪^h$, d̪, $d̪^ɦ$

    Retroflex: ʈ, $ʈ^h$, ɖ, $ɖ^ɦ$

    Palatal: tʃ, $tʃ^ɦ$, dʒ, $dʒ^ɦ$

    Velar: k, k^h, g, $g^ɦ$

  - Magahi has the following fricatives: [s] and [h]

- 7 stop sounds in English vs. 20 stop sounds in Hindi/Magahi.
  - Indian languages have more stops
- 9 fricative sounds in English vs. 2 in Magahi

Sounds in world languages

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2020)

CONSONANTS (PULMONIC)

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

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

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	ʼ Examples:
ǀ Dental	ɗ Dental/alveolar	pʼ Bilabial
ǃ (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

OTHER SYMBOLS

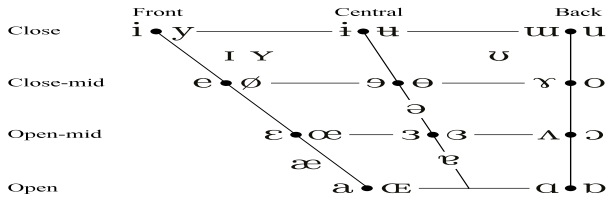
ʍ Voiceless labial-velar fricative
w Voiced labial-velar approximant
ɥ Voiced labial-palatal approximant
ʜ Voiceless epiglottal fricative
ʢ Voiced epiglottal fricative
ʡ Epiglottal plosive

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

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

t͡s k͡p

VOWELS



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

SUPRASEGMENTALS

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

TONES AND WORD ACCENTS

LEVEL		CONTOUR	
e̋ or ˥	Extra high	ě or ˧˥	Rising
é ˦	High	ê ˥˩	Falling
ē ˧	Mid	e᷄ ˦˥	High rising
è ˨	Low	e᷅ ˩˧	Low rising
ȅ ˩	Extra low	e᷈ ˩˥	Rising-falling
↓	Downstep	↗	Global rise
↑	Upstep	↘	Global fall

DIACRITICS

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰
◌ʰ	Aspirated	tʰ dʰ	◌̼	Linguolabial	t̼ d̼
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ
◌̠	Retracted	e̠	◌ˤ	Pharyngealized	tˤ dˤ
◌̈	Centralized	ë	◌̴	Velarized or pharyngealized	ɫ
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝ (ɪ̝ = voiced alveolar fricative)
◌̩	Syllabic	n̩	◌̞	Lowered	e̞ (β̞ = voiced bilabial approximant)
◌̯	Non-syllabic	e̯	◌̘	Advanced Tongue Root	e̘
◌˞	Rhoticity	ə˞ a˞	◌̙	Retracted Tongue Root	e̙

◌̪	Dental
◌̺	Apical
◌̻	Laminal
◌̃	Nasalized
◌ⁿ	Nasal release
◌ˡ	Lateral release
◌̚	No audible release

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

Typefaces: Doulos SIL (metatext); unitipa (symbols)

Next class

- Vowels and Glides in English (Read - section 6)
- Suprasegmental Phonetics (Read - section 8)
- Speech production (Read -section 9)
- Other consonants and vowels (Read - section 10)