1. **Introduction:**
   - **Phonetics** is the study of sound.
   - **Facts**:
     1. Humans can communicate by using a wide range of modalities, such as writing, gestures, sign language, etc, but speech has a particular importance in natural languages. It is the most common way humans communicate. Speech is made of sounds, so humans use sounds to communicate.
     2. Humans spoke long before they started to write, and this is reflected in their anatomical specialization.
     3. Moreover, humans also appear to have specialized neural mechanisms for the perception of speech sounds.
   - There is no one-to-one correspondence between sounds and spelling in English.
   - E.g. Face has 4 letters, but 3 sounds.
2. **Basic Ways of Analyzing Speech Sounds:**

   1. Articulatory Phonetics:
   - Looks at the physiological mechanisms of speech production (What organs are involved, where specifically sounds are produced). We will focus mainly on this approach.

   2. Acoustic Phonetics:
   - Measuring and analyzing the physical properties of the sound waves produced in speech.
3. **Different Sounds:**
   - The alphabets created for writing systems of various languages are ambiguous.
   - E.g. Consider “ough”
     In the “ough” of rough, there are 2 sounds.
     In the “ough” of through, there is 1 sound.
     In the “ough” of though, there is 1 sound.
     All 3 pronunciations are different, despite them all having “ough.”
4. **Phonetic Transcription:**
   - Because there is not a 1-1 correspondence between sounds and spelling, linguistics created the IPA (International Phonetic Alphabet).
   - The IPA is a system of phonetic notation giving a standardized representation of speech sounds.
   - The purpose of the IPA is to create a 1-1 correspondence between sounds and spelling.
   - Therefore, one symbol represents one sound.
   - The IPA does not represent the spelling system of a particular language.
   - We need the IPA because:
     1. Same spelling for different sounds.
     2. Combinations of letters representing 1 sound.
     3. Silent Letters
     4. Lack of a 1-1 correspondence between letters and sounds.
   - **Phones/Speech Sounds** are the building blocks of human language.

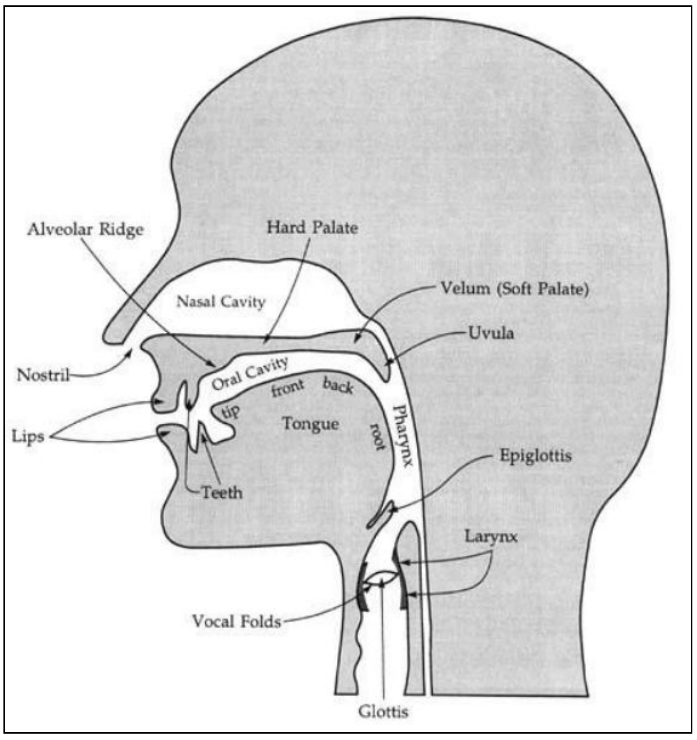
- **Segments** are individual speech sounds. We know that words can be segmented because of:
    1. Slips of the tongue.
    2. Sounds across languages are similar enough to transcribe them in the same way.
    3. Sounds like *s* and *d* are consistently distinct and are assigned different IPA symbols.

5. **<u>Basic Classification of the IPA Chart:</u>**
    - All sounds (phones) are classified under these 3 major types/classes:
      1. **Vowel**
      2. **Consonants**
      3. **Glides**
    - **Class of sounds:** The grouping of sounds based on shared phonetic characteristics.
    - The phones found in each of the three major classes can be further distinguished based on their **articulation properties**.
6. **<u>Consonants:</u>**
    - Square brackets [] indicate sounds.
    - Consonants can be described in 3 ways:
      1. **Place of Articulation**
      2. **Manner of Articulation**
      3. **Voicing (state of the glottis)**
    - Consonants Chart

	Bilabial	Labio-dental	Inter-dental	Alveolar	Alveo-palatal	Palatal	Velar	Glottal
Stop	p ‘pan’ b ‘ban’			t ‘tan’ d ‘Dan’			k ‘can’ g ‘gone’	ʔ ‘uh-oh’
Nasal	m ‘beam’			n ‘bean’			ŋ ‘being’	
Fricative		f ‘fan’ v ‘van’	θ ‘three’ ð ‘this’	s ‘sap’ z ‘zap’	ʃ ‘shone’ ʒ ‘vision’			h ‘heap’
Affricate					tʃ ‘cheap’ dʒ ‘Jeep’			
Lateral Liquid				l ‘lap’				
Retroflex Liquid				r (ɹ) ‘rap’				
Glide	w ‘weep’					j ‘yes’	w ‘weep’	

- The placement of the tongue and the positioning of the lips are the crucial factors.
- **The tongue**:
    - The primary (active) articulating organ.
    - Extremely mobile: can be raised, lowered, thrusted forward, retracted, rolled back. Its sides can also be raised or lowered.

7. **Places of Articulation:**



- Looks at the parts of your body you use to articulate words.
- Places of articulation are found at the lips, within the oral cavity, in the pharynx and at the glottis.
- Sounds, based on their place of articulation, are in different groups, shown in the chart above.
- Note: Speech sounds can be differentiated from each other by how the air stream is affected as it goes from the lungs up and out of the mouth.
- The places of articulation are
  1. Labial
  2. Interdental
  3. Alveolars
  4. Alveopalatal
  5. Palatal
  6. Velar
  7. Glottals

8. **Labial (Lips):**
   - Main articulator is your lips to produce these sounds.
   - There are 2 types of labial sounds, bilabial and labiodental.
   - **Bilabial Sounds (Use two lips):**
     - [m], [p], [b], [w], [M] (Sounds produced with your two lips.)
   - **Labiodental Sounds (Use lips and teeth):**
     - [f] and [v] (Sounds produced with your upper teeth and your lips.)
   - [m], [p], [b], [f], [w], [M] and [v] are labial sounds.
9. **Interdental (Between teeth):**
   - You put your tongue between your teeth to produce these sounds.
   - [ð] and [θ] are interdental sounds.

10. **Alveolars (Alveolar ridge):**
    - Your tongue moves to the alveolar ridge (the ridge which protrudes from just behind the upper teeth).
    - [n], [t], [d], [s], [z] and [l] are alveolar sounds.
11. **Alveopalatal/Palatoalveolar :**
    - These sounds are articulated behind the alveolar ridge, where the roof of the mouth rises; this area is known as the alveopalatal (or palatoalveolar) area.
    - Between the alveolar ridge and the hard palate.
    -  ,  ,  ,  are alveopalatal sounds.
12. **Palatal (Roof of the mouth):**
    - This is the highest part of the roof of the mouth; it is called the hard palate, and the sounds produced here are the palatals.
    - [j] is the only palatal sound.
13. **Velar (The Soft Area on the Roof of the Mouth):**
    - Now we're further back in the mouth, using a part of the tongue further in the back.
    - [ŋ], [k], [g] are velar sounds.
    - **Labio - Velar:**
      - With the tip of your tongue at the alveolar ridge, slowly move it back. The hard part right behind the alveolar ridge is the hard palate. When it gets soft after the hard palate, you've reached the velum.
      - [w] and [M] are **labio-velar** sounds, because tongue is raised near the velum (primary place of articulation) and the lips are rounded (secondary place of articulation) the at the same time.
      - [w] is a voiced, bilabial and velar sound.
      - [M] is a voiceless, bilabial and velar sound. [M] is a voiceless counterpart of [w]. It is rarely used in English.
14. **Glottal (Vocal Folds):**
    - Sounds produced with the vocal folds as primary articulators.
    - [h] is a glottal sound.
    -  is another glottal sound.
15. **Voicing:**
    - Consonants are either voiced or voiceless.
    - If there is a vibration of the vocal folds inside the larynx, then those sounds are **voiced sounds**.
      I.e. If the vocal cords are close together, then the air passing through will force the vocal cords to vibrate, causing a voiced sound.
    - If there is no vibration of the vocal folds inside the larynx, then those sounds are **voiceless sounds**.
      I.e. If the air passed freely through the glottis, voiceless sounds result.

- **Voicing Tests:**
  1. Touching the fingers to the larynx as the sound is produced. Voiceless sounds do not produce vibration, while voiced sounds do.
  2. Touching the fingers in the ears as the sound is produced. Voiced sounds produce greater resonance.
  3. Covering one of the ears while producing the sounds. Voiced sounds resonate stronger than voiceless ones.
- **Voiced Consonants:**

  [b], [d], [g], [m], [n], [ŋ], [z], [ð], [v]
  [ʒ], [dʒ], [l], [r], [j], [w]

  Voiceless Consonants:

  [p], [t], [k], [f], [h], [s], [θ], [ʃ],
  [tʃ], [ʔ]

16. <u>Manner of Articulation:</u>

- Refers to the way air passes through the oral cavity.
- Types of manner of articulation:
  1. Oral & Nasal
  2. Stops
  3. Continuants
  4. Fricatives
  5. Affricates
  6. Strides and Sibilants
  7. Liquids
  8. Glides

1. Consonants are either **oral** or **nasal**.
   - When the velum is raised, which cuts off the airflow through the nasal passages, **oral sounds** are produced.
     I.e. Air flows through the oral cavities (mouth).
   - **Nasal sounds** are articulated when the velum is lowered and allows air to pass through the nasal passages (nose).
   - Nasal sounds are voiced by nature.
   - List of nasal consonants:

     [m], [n], [ŋ]
   - Everything else is an oral consonant.

2. **Stops:**
   - If during the articulation of these consonants, the airflow is completely blocked, then the consonants are called **stop consonants** or **stops**.
   - Chart of Stop Consonants:

	Bilabial	Alveolar	Velar	Glottal
Voiceless	[p]	[t]	[k]	[ʔ]
Voiced	[b]	[d]	[g]	
Nasal	[m]	[n]	[ŋ]	

3. **Continuants:**
   - Opposite of stops.
   - The airflow out of the mouth is continuous (not stopped).
   - All language sounds can be classified as either stops or continuants.
   - Continuants include:
     1. Vowels
     2. Fricatives
     3. Liquids
     4. Glides
4. **Fricatives:**
   - The airflow passes through a narrow opening in the vocal tract, creating a continuous, loud noise.
   - A type of continuant.
   - Chart of Fricative Consonants:

	Labiodental	Interdental	Alveolar	Alveopalatal	Glottal
Voiceless	[f]	[θ]	[s]	[ʃ]	[h]
Voiced	[v]	[ð]	[z]	[ʒ]	

5. **Affricates:**
   - Made by producing a stop which is immediately followed by a slow release of the closure. So the second part is like a fricative.
   - Chart of Affricate Consonants:

	Alveopalatal
Voiceless	[tʃ]
Voiced	[dʒ]

6. **Strides and Sibilants:**
    - Fricatives and affricates can be further subdivided into two types based on their relative loudness.
    - The noisier or louder fricatives are called stridents or sibilants.
    - Their quieter counterparts (such as [θ] or [ð]) are called non-stridents.

Place of Articulation	Stridents	
	Voiceless	Voiced
Alveolar	[s]	[z]
Alveopalatal	[ʃ]	[ʒ]
	[tʃ]	[dʒ]

7. **Liquids:**
    - A subgroup of continuants, but your tongue gets close to an articulator. The air flows through the sides of the tongue.
    - When producing an [l] the air passes more freely.
    - In the case of [l], the tip of the tongue is at the alveolar ridge. The sides of the tongue are let down, allowing the air to pass freely over the sides. This makes it a **lateral liquid**.
    - [r] is the only other liquid sound found in English. It is a **retroflex alveolar liquid** in many dialects.
    - Another type of [r] is the **flap/tap**.
    - In North American English, when [t] and [d] occur between vowels, they usually sound like a flap [ɾ].
    - The flap/tap is produced when the tongue tip strikes the alveolar ridge, as it passes across it.
    - It is a variant of the retroflex alveolar liquid, [r].
    - E.g. bu**tt**er, bi**tt**er.
    - a) The tip of the tongue is curled back behind the alveolar ridge.
      b) The air passes freely so it is a continuant.
      c) There is no real friction so it is a liquid.
      d) The vocal cords are vibrating so it is voiced.
8. **Glides:**
    - A type of continuant.
    - Made with little or no obstruction of airflow in the mouth.
    - In a word, they must either immediately precede or follow a vowel.
    - They are transitional sounds (transitions to or from vowels) and are sometimes called semi-vowels/semi-consonants.
    - The 3 glides are:
      [j], [w], [M]

17. **How to describe consonants:**
    - E.g. Describe [g].
      Solution:
      1. Voiced (Voiced/Voiceless)
      2. Velar (Place of articulation)
      3. Oral Stop (Manner of articulation)
    - E.g. Describe [n].
      Solution:
      1. Voiced
      2. Alveolar
      3. Nasal Stop
18. **Vowels:**
    - All vowels are voiced sounds, a type of continuant and involve a continuous flow of air through the oral cavity. Compared to consonants, vowels are also much higher in resonance and are produced with little obstruction of the vocal tract. Due to this lack of major constriction in the vocal tract, it may be difficult to distinguish the differences in height, backness, tenseness, and so on.
    - Can be described in terms of 4 properties:
      1. Height
      2. Backness
      3. Roundness
      4. Tenseness
    - **English Vowel Charts:**

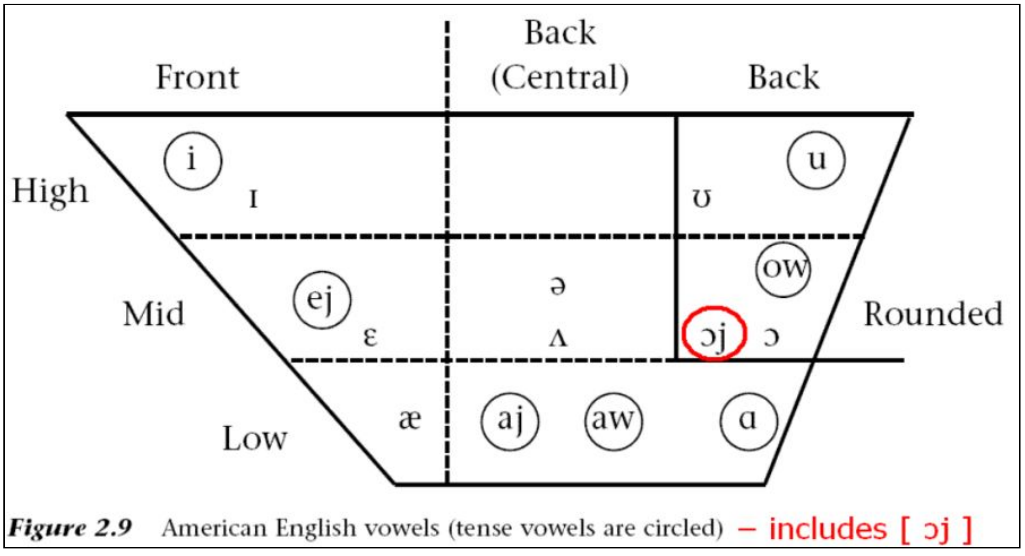


Figure 2.9 American English vowels (tense vowels are circled) – includes [ɔj]

[i] = sheep	[ɪ] = ship	[ɛ] = end
[u] = boot	[ʊ] = put	[ʌ] = cut
[æ] = hat	[ə] = famous	[o] = boat *[ow]
[ɑ] = spa		

- Note:  is called a schwa and it only occurs as an unstressed vowel.
- Note:  is called a caret and it only appears as a stressed vowel.
- Note: Some English speakers (for example, speakers from New York or from various British dialects) pronounce the first vowel in a word like coffee with a sound which is transcribed as [ɔ].
  [ɔ] only occurs before [r] and [oj] in Canadian Eng.

19. **Height:**
    - Describes the height of the tongue.
      I.e. The vertical position of the tongue in the mouth - how high or low the tongue is.
    - There are 3 categories to describe the height of the tongue:
      1. High
      2. Mid
      3. Low
20. **Frontness:**
    - Describes if the tongue is in the front or back of the mouth.
      I.e. The horizontal position of the tongue in the mouth – how far forward or backward the tongue is.
    - There are 3 categories to describe the frontness of the tongue:
      1. Front
      2. Central
      3. Back
21. **Tenseness:**
    - Describes if the tongue is tense or lax during the pronunciation of the vowel.
    - Usually, tense vowels are longer in duration.
    - Usually, lax vowels are shorter in duration.
22. **Rounded:**
    - Describes if the lips are rounded or not during the pronunciation of the vowel.
23. **Diphthongs (Complex Vowels):**
    - Simple vowels remain stable in quality for the duration of their production.
    - Diphthongs, on the other hand, change quality within the same syllable.
    - In English diphthongs, the tongue begins in the vowel position, but changes to a glide position within the same act of articulation.
      I.e. Diphthongs are two-part vowels but count as a single sound because two vowels are articulated together. They start with a vowel and end with a glide.
    - Note: Even though diphthongs change in quality, they still act as single vowels.
    - All diphthongs are tense.
    - There are 2 types of diphthongs:
    - **Major Diphthongs:**
      - Have a large, noticeable change in quality
    - **Minor Diphthongs:**

- Have a less noticeable change, which is why we often omit the glide portion of the diphthong in transcription.

Simple Vowels		Minor Diphthongs		Major Diphthongs	
Pit	[ɪ]				
Set	[ɛ]				
Put	[ʊ]				
Cut	[ʌ]	Say	[e] [ej]	My	[aj]
Cat	[æ]	Grow	[o] [ow]	Now	[aw]
Dog	[ɑ]			Boy	[oj]
Heat	[i]				
Lose	[u]				

- Note: for aj and aw, there has to be a hook at the top.
- I.e. a

24. <u>How to describe vowels:</u>

- E.g. Describe the vowel [ɔ].
  Solution: Mid Back Rounded Lax
- E.g. Describe the vowel [ə].
  Solution: Mid Central Unrounded Lax
- E.g. Describe the vowel [ɑ].
  Solution: Low Back Unrounded Tense

25. <u>Describe the differences between the 2 sets of vowels:</u>

- Note: This question always appears on the final exam.
- E.g. Describe the differences between:

  [I i] : [ʊ, u]
  Solution: Front vs Back and Unrounded vs Rounded
- E.g. Describe the differences between:

  [ə, ʌ] : [aj, aw]
  Solution: Mid vs Low and Lax vs Tense

26. <u>Write these words in their phonetic form:</u>

- Planting:[pl[æ]ntl[ŋ]]
- Roamed:[rowmd]
- Fried:[fr[aj]d]

27. <u>The Sounds Producing System:</u>

- When we speak, we use three main mechanisms to produce and modify sounds:

1. An air supply: our **lungs**.
2. A sound source: air is set into motion in the **larynx** which houses our **vocal folds** (also known as vocal cords).
3. A set of 3 filters: the **vocal tract** lies above the larynx and consists of the pharynx, oral cavity, and nasal cavity.

28. **The Lungs:**
    - There are 2 main parts of the lung used to maintain the level of air pressure needed for the speech system to function:
        1. The **intercostals**: Muscles between the ribs that raise the rib cage to allow the lungs to expand during inhalation.
        2. The **diaphragm**: A sheet of muscle below the lungs that helps control air release during exhalation so that we can speak in between breaths.
29. **The Larynx:**
    - Air leaves the lungs, travels up the **trachea** (windpipe) and goes through the **larynx** (also known as the voice box).
    - The vocal folds in the larynx can be pulled apart or together. Their position produces different glottal states as air moves through the **glottis** (space between the vocal folds).
30. **Glottal States:**
    - Listed below are four possible glottal states of sound production.
        1. **Voiceless** sounds are produced with the vocal folds pulled apart, allowing air to pass through the glottis without interference.
        2. **Voiced** sounds are produced when the vocal folds are pulled close together (but not tightly) so that the air passing through causes them to vibrate against each other.
        3. A **whisper** is voiceless, but different in that the front (anterior) of the vocal folds are pulled together while they are pulled apart at the back (posterior).
        4. **Murmur** (also known as **breathy voice**) is used to describe voiced sounds that have a “breathy” quality, due to the vocal folds being slightly more relaxed which allows more air to escape.
31. **Bracketing:**
    - [m]: the actual sound we produce (phonetic)
    - /m/: the abstract representation of that sound (phonemic)
    - <m>: the letter m