

# HUL242:: Phonetics- I

Ashwini Vaidya

## 1 Phonetics

Phonetics, i.e. the study of sounds can be divided into three major areas:

1. Articulatory Phonetics: study of the vocal tract and its role in the production of speech sounds
2. Auditory Phonetics: How listeners perceive speech sounds
3. Acoustic Phonetics: study of the physical properties of sounds

In this lecture, we focus on **articulatory phonetics**, i.e. the study of the way sounds are produced in the vocal tract. The analysis of sounds is carried out via a **proprioceptive** method, i.e. by becoming aware of the position and the movement of the articulators in the vocal tract.

## 2 Distinction between writing and sound

Writing systems are orthographies and they are not the preferred system for studying language. When we want to represent language, we do so by reference to how it is spoken, not written. Moreover, not all languages necessarily have writing systems. Therefore, there is a need to have an encoding that can have a one-to-one correspondence between the grapheme and phoneme.

The English writing system is highly irregular, and often has very little correspondence between sound and spelling. (alphabet). E.g. words that rhyme with *I* are *try*, *buy*, *cry*. The sound is the same, but it correspond to many letters. In the same way, one letter can correspond to many sounds. E.g 'c' in *face*, *much*, *chrome*, *city*.

In Devanagari, this correspondence is not as irregular but there are some forms that have lost their original sound, others that correspond to a consonant cluster and not a single sound. The process of writing sounds as they are spoken is 'transcription'. This is an important step to analyze language because we want to distinguish between sounds across languages, as well as within a particular language. In this handout, sounds will be represented in IPA.

Also take a look at the Wikipedia page which includes the entire IPA

[https://en.wikipedia.org/wiki/International\\_Phonetic\\_Alphabet](https://en.wikipedia.org/wiki/International_Phonetic_Alphabet)

क k	ख k <sup>h</sup>	ग g	घ g <sup>h</sup>	ङ ŋ
च tʃ	छ tʃ <sup>h</sup>	ज ɟ	झ ɟ <sup>h</sup>	ञ ɲ
ट t̪	ठ t̪ <sup>h</sup>	ड d̪	ढ d̪ <sup>h</sup>	ण ɳ
त t̪	थ t̪ <sup>h</sup>	द d̪	ध d̪ <sup>h</sup>	न n
प p	फ p <sup>h</sup>	ब b	भ b <sup>h</sup>	म m
य j	र r	ल l	व v	श ʃ
ष ʃ̌	स s	ह h		
क्ष kʃ	त्र t̪r	ज्ञ ɟɳ		
अ ə	आ a	इ ɪ	ई iː	उ u
ऊ uː	ए e	ऐ ɛ	ओ o	औ ɔː

Figure 1: The mapping between Devanagari akshar to IPA. Note that the central vowel ə is technically a part of the akshar. For example, b = bə. However, this has been omitted here for ease of reading.

### 3 Consonants and Vowels

The distinction between consonants and vowels is the most basic one that is made between sounds. In general, consonants are produced with a greater degree of constriction as compared to vowels. Vowels and consonants are also classified using different sets of features. In the following sections, we focus on consonants, using a familiar set of Hindi consonants as examples.

#### 3.1 Place of articulation

Consonants can be classified based on the position of the articulators. Examples of such articulators include the lips, tongue, back of the teeth, alveolar ridge, velum, hard palate etc. Figure 2 shows the position of these articulators.

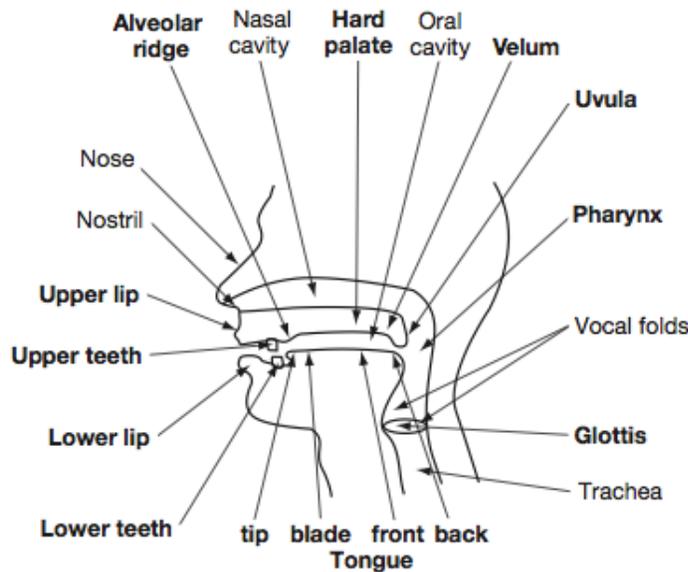


Figure 3.1 The vocal tract

Figure 2: Phonetic articulators. Source: Knight (2012), pg 26

When a sound is produced, two articulators e.g. tongue and alveolar ridge come together and form a constriction. If we examine Hindi consonants on the basis of place of articulation, we get the following classification.

- Velar: Back of the tongue + velum. Examples /k/, /k<sup>h</sup>/, /g/, /g<sup>h</sup> /, /ŋ/
- Palatal: Front of the tongue + hard palate /tʃ/, /tʃ<sup>h</sup> /, /ɕ/, /ɕ<sup>h</sup>/, /ɲ/

- Retroflex: Tongue tip (curled back) + place between hard palate and alveolar ridge /ʈ/, /ʈʰ/, /ɖ/, /ɖʰ/, /ɳ/
  - Dental: Tongue tip + upper front teeth. Examples /t̪/, /t̪ʰ/, /d̪/, /d̪ʰ/, /n̪/
  - Bilabial: Bottom lip + top lip: Examples: /p/, /pʰ/, /b/, /bʰ/, /m/
- Other places of articulation:
- Alveolar: Tongue tip + alveolar ridge /s/
  - Post-alveolar: Tongue tip + Region behind alveolar ridge. /ʃ/
  - Glottal: Vocal folds /ɦ/

The places of articulation for non-Hindi consonants are given below. Try to locate these positions on the diagram given above.

- Labiodental: Bottom lip + top teeth. Sounds such as the /v/ in the English word ‘violin’. Try to compare this with the Hindi /v/ in words like *vaayu* ‘air’.
- Uvular: Back of the tongue + Uvula. Some words with a Persio-Arabic origin in Hindi have this property e.g. *qatil* begins with the uvular /q/
- Pharyngeal: Back of the tongue + Back wall of the pharynx. The French sound /ʀ/ in words like ‘roue’; wheel.

### 3.2 Distinction between voiced and voiceless sounds

Vocal chords vibrate in voiced sounds like /b/, /d/, /g/ and do not in voiceless sounds /p/, /t/, /k/. Voicing can be experienced by placing the fingers on the larynx and alternating between producing a voiced/voiceless sound. This is an important distinction among consonants—in almost all languages, vowels are voiced.

### 3.3 Manner of articulation

Manner of articulation describes the airflow in the vocal tract, and how it is shaped by the movement of the different articulators, which we have described earlier. As we are concerned with airflow, the classification here is dependent upon how close or far the articulators are from each other. Note: Manner diagrams extracted from Knight (2012), Unit 4.

- Plosive or Stop: Air trapped between the articulators is suddenly released, creating a burst of sound. E.g. /p/. When air is released with an accompanying puff of air, it is an aspirated plosive. Aspirated plosives are sounds that are common in Indian languages. E.g. /pʰ/



Figure 4.2 Manner diagram for a plosive

- Fricative: Air escapes through a narrow constriction, making a continuous hissing sound. Unlike plosives, it is possible to ‘hold’ a fricative for a long time. Try saying ssssss. Examples /s/, /ʃ/



Figure 4.3 Manner diagram for a fricative

- Affricate: is a case of compound articulation, where a sound begins as a stop but is released as a fricative. Instead of a burst of sound (like a fricative, air is released slowly). Examples /tʃ/, /dʒ/



Figure 4.5 Manner diagram for an affricate

- Nasal: Articulated in the same manner as a plosive but with the velum or soft palate lowered. E.g. try alternating between a /d/ and /n/ to feel the movement of the velum.



Figure 4.7 Manner diagram for a nasal

- Approximant: Articulators are positioned in wide approximation, such that airflow is not restricted to such an extent as to cause friction. Place the tongue in position to produce a /l/, /r/, /j/ and take in the air. In the case of /l/, the cold air will be felt along the sides of the mouth, hence this sound is known as a ‘lateral approximant’. In the case of /r/ and /j/, the air is felt around the centre of the mouth. The sound /r/ is slightly different from /l/ and /j/ as the tongue repeatedly taps against the roof of the mouth, hence it is known as a **trill**.



Figure 4.4 Manner diagram for an approximant

### 3.4 Describing a consonant

When we describe a consonant, we mention whether it is voiced or voiceless, followed by place and manner of articulation. For example, /p/ is a voiceless bilabial plosive and /s/ is a voiceless alveolar fricative. If a sound has additional distinguishing properties, then these may also be mentioned. E.g. /p<sup>h</sup>/ is a voiceless aspirated bilabial plosive.

#### References

1. Rachael-Anne Knight. *Phonetics: A coursebook*. Cambridge University Press (2012)
2. Pramod Pandey. Phonology-Orthography Interface in Devanagari for Hindi. *Written Language & Literacy* 10:2 (2007), 139--156.