CHAPTER-2
THE PRODUCTION OF SPEECH

2.1 SPEECH MECHANISM

The lungs, the vocal cords, the tongue, the teeth and the lips are some of the important organs of speech. These organs have the following functions besides producing speech sounds: The lungs are necessary for breathing, the tightly shut prevent the food from entering the wind pipe, the tongue is used for differentiating tastes, the teeth are used for chewing food and so on.

The organs of speech can be grouped under three systems:

i. The Respiratory System, comprising the lungs, the muscles of the chest and the windpipe,

ii. The Phonatory System, formed by the larynx, and

iii. The Articulatory System, consisting of the nose, the lips and the mouth, including the tongue and the teeth.

Fig. 1
i. **The Pharynx:** Extending from the top of the larynx to the hindermost part of the tongue is the pharynx. By the movement of the back of the tongue, by the position of the soft palate, and by raising and lowering of the larynx, the quality of the sound produced.

ii. **The Lips:** The lips play an important part in the production of certain sounds. The lips can assume various positions for the different vowel and consonant sounds. They are closed, spread, neutral, open rounded, and close rounded.

![Types of lip-rounding](image)

<table>
<thead>
<tr>
<th>(a)</th>
<th>Close lip-spreading</th>
<th>(b)</th>
<th>Neutral lip position</th>
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<tr>
<td>(c)</td>
<td>Open lip-rounding</td>
<td>(d)</td>
<td>Close lip-rounding</td>
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**Fig. 2 Types of lip-rounding**
iii. **The Teeth:** Certain consonants are produced with the help of the teeth, the upper jaw, is a whole area called the roof of the mouth, comprising the teeth ridge, the hard palate, the soft palate and the uvula.

iv. **The Teeth-Ridge:** The teeth ridge is the convex part of the roof of the mouth lying immediately behind the upper teeth.

v. **The Hard Palate:** This is the name given to the hard bony, concave surface lying immediately behind the teeth-ridge.

vi. **The Soft Palate:** After passing through the glottis, the air stream enters the pharynx, the cavity at the back of the mouth. The entrance of the air-stream to the nose is controlled by the soft palate. It can be raised to shut off the nasal passage, the air can come out through the mouth only and the resulting sound is oral. The soft palate can be lowered to let the air pass through the nose. Sounds produced with complete oral closure at some point in the oral cavity and velic opening are called nasal sounds.

![Diagram of the mouth cavity with labels for nasal and oral passage of air]

Fig. 3 Soft palate in the raised position
**vii.** The vocal cords are situated in the larynx; they resemble two lips. The space between them is called the glottis. Sounds produced with a wide-open glottis are called voiceless sounds or breathed sounds. The initial sounds in these words _peel, ten, keen, chin, fine thin, seen, shine_ and _hat_ are voiceless sounds.
During the production of certain speech sounds, the vocal cords are loosely held together and the pressure of the air from the lungs makes them open and close rapidly. This is called the vibration of the vocal cords and the sounds produced when the vocal cords vibrate are called voiced sounds. The sounds _bead, deed, girl, judge, vine, then, zoo, measure, need, being, red, yard and well_ are voiced sounds.

![Diagram of vocal cords and glottis](image)

**Fig. 6**

![Diagram of vocal cords](image)

**Fig. 7** Vocal cords wide apart and the glottis fully open-position for breath and during the production of voiceless sounds.

![Diagram of vocal cords](image)

**Fig. 8** Vocal cords are kept loosely together-position for vibrating during the production of voiced sounds.
The Tongue: The tongue is very important organ of speech. It can be divided into three sections; the blade which includes the tip, the front and the back. The extreme edge of the tongue is called the tip.

2.2 AIR-STREAM MECHANISM

For the production of speech an air-stream is needed. An air-stream can be compared to a fruit-spray, a flit gun, a syringe, or a child's pop gun. In the human speech producing apparatus the equivalent of the plunger is called the initiator. The initiator sets an air-stream in motion, and it is the most important part of an air-stream mechanism.

There are three types of air-stream mechanisms.

i. Pulmonic
ii. Glottalic
iii. Velaric

i. The Pulmonic Air-Stream Mechanism:

Consists of the lungs and the respiratory muscles. The walls of the lungs act as the initiator so that air is either drawn into the lungs or pushed out of them. When the air-stream mechanism is used to push the air out, it is called egressive and when it is used to draw the air in, it is called ingressive. All the sounds of English and most Indian languages except Sindhi
are produced with egressive air stream mechanism. Ingressive air stream is used only for yawning and snoring, not for speaking.

ii. The Glottalic Air-Stream Mechanism:

The closed glottis acts as the initiator and air in the pharynx is used. Sounds produced by an ingressive or egressive glottalic air-stream are found in many languages; they are interspersed, so to speak, in the stream of pulmonic - egressively produced speech. They occur particularly commonly in languages of the Caucasus, of Africa, and of central and North America. Moreover, they occur sporadically in many other parts of the world.

iii. The Velaric Air-Stream Mechanism:

The back part of the tongue is the initiator and the air in the mouth is set in motion during this airstream mechanism. Sounds produced with a velaric ingressive mechanism exist in several African languages. No evidence is yet available of any language using velaric egressive air-stream mechanism.

2.3 ARTICULATORY DESCRIPTION

After passing through the larynx, the air stream is further modified by the various shapes assumed by the organs of speech lying above the pharynx, and every such modification affects the quality of the sound produced. The organs of speech involved in this process constitute the articulatory system.
### 2.3.1 The Active and Passive Articulators:

The articulators are those vocal organs which are situated along the vocal tract above the glottis. The articulators are responsible for the accessory movements of the syllable. They either, for its arrest and release, act so as to restrict the vocal tract to varying degrees; or they shape the vocal tract for the production of the vowel. The movable articulator is called the active one, and it is moved towards a passive articulator, which remains motionless. Most of the passive articulators are attached to the immovable upper jaw most of the active articulators lie on the lower side, or floor, of the vocal tract.

The active articulators are principally the lower lip, and the tongue. It is the upper surface of the tongue which is mostly concerned with articulation, and since it also is relatively large. It can be divided into: the tip or point, the blade, the front, the back and the root. The uvula also is usually included among the active articulators.

The passive articulators are the upper lip, the upper teeth, the roof of the mouth, and the back wall of the throat or pharynx. The roof of the mouth is a large area. It can be divided into: the teeth ridge or alveolar ridge which lies immediately behind the teeth; the hard palate which is the bony part of the roof of the mouth; and the soft palate or velum, which is the fleshy part of
the roof of the mouth further back than the hard palate.

The following points of articulations are involved in the articulation of the sounds given below:

i. **Bilabial**: The two lips are the articulators. The lower lip is the active and the upper lip is the passive articulator. Examples: /p, b, m, w/ as in pile, bite, mile, wine.

ii. **Labiodental**: The upper teeth are the passive articulators, and the lower lip is the active articulator. Examples: /f, v/ as in five and vine.

iii. **Dental**: The upper teeth are the passive articulators, and the tip of the tongue is the active articulator. Examples: /θ, ð/ as thin and then.

iv. **Alveolar**: The teeth ridge is the passive articulator and the tip and blade of the tongue are the active articulators. Examples: /t, d, n, l, s, z/ as tin, din, near, love, sin, zip.

v. **Post-alveolar**: The back of the teeth ridge is the passive articulator and the tip of the tongue is the active articulator. Examples: /r/ as in try, dry, cry.

vi. **Palato-alveolar**: That is palatal + alveolar. The teeth ridge and the hard palate are the passive articulators and the tip, the blade, and the front of the tongue are the active articulators. Examples: /ʃ, ʒ, ʃ, dʒ/ as in sheet, measure, treasure, cheat, jeep.
vii. Retroflex: The curled back tip of the tongue is the active articulator and the hinder part of the teeth ridge or the hard palate is the passive articulator. Examples: /t,d,ɳ,ɭ/.

viii. Palatal: The hard palate is the passive articulator and the front of the tongue is the active articulator. Example: /j/ as the initial sound in the English word yes, yet, are palatal sounds.

ix. Velar: The soft palate is the passive articulator and the back of the tongue is the active articulator. Example /k,g,ɳ/ as in track, bag, fog, song.

x. Uvular: The rear part of the back of the tongue is the active articulator and the uvula is the passive articulator. The initial sound in the urdu word meaning ‘pen’ is an example of a uvular sound.

xi. Glottal: Glottal sounds are produced at the glottis and the two vocal cords are the articulators. The initial sound in the English word hen, huge are an example of a glottal sound.

2.4 THE STRUCTURE INVOLVED

The stricture is the technical term for the position taken up by the active articulator in relation to the passive one; it reveals the nature and extent of the restriction of the passage of the air stream at a particular point in the vocal tract.
Following are various types of strictures normally involved in the articulation of speech sounds:

i. **Complete closure and sudden release:**

The stricture may be one of complete closure, i.e. the active and passive articulators come into firm contact with each other, thus preventing the lung air from escaping through the mouth. Sounds produced with a stricture of complete closure and sudden release are called plosives. /p, b, t, d, k, g/ are plosive sounds. The initial sounds in words as *pin, bin, tin, din, kin* and *gun.*

![Fig. 9 Articulation of the plosive sounds /t, d/. The tip and blade of the tongue in firm contact with the teeth ridge and soft palate in its raised position.](image)

![Fig. 10 Articulation of the plosive sounds /p, b/. The two lips are in firm contact and the soft palate is raised.](image)

![Fig. 11 Articulation of the plosive sounds /k, g/. The back of the tongue and the soft palate are in firm contact with each other. The soft palate is raised.](image)
ii. Complete Closure and Slow Release:

If after blocking the oral and the nasal passage of air, the oral closure is removed slowly, (i.e. if the active articulator is removed slowly from the passive articulator) slight friction is heard. Sounds that are articulated or produced with a stricture of complete closure and slow release are called affricates. The initial sounds in these words chin and jam are affricates.

iii. Complete Oral Closure:

The active and passive articulators are in firm contact with each other, thereby blocking off the oral passage of air completely. But the soft palate is lowered so that there is a velic opening, i.e. the nasal passage of air is opened. The lung air escapes through the nostrils freely. Sounds that are articulated with a stricture of complete oral closure are called Nasals. The final sounds in these words sum, sun and sung are some examples of nasal sounds.

Fig. 12 Articulation of the nasal consonant /m/. The closure of the lips (oral closure). The soft palate is lowered and the nasal passage is open.

Fig. 13 Articulation of the nasal consonant /n/. The blade of the tongue and the teeth-ridge in firm contact, effecting the oral closure. The soft palate is lowered and the nasal passage is open.
iv. Intermittent Closure:

The soft palate is raised, thereby shutting off the nasal passage of air. The active articulator strikes against the passive articulator several times with the result that the air escapes between the active and passive articulators intermittently. Such a stricture is termed intermittent closure. Sounds that are articulated with a stricture of intermittent closure are called trills or rolled consonants. The letter 'r' in these words like red and ran pronounced as a trill.

For some consonants the active articulator strikes against the passive articulator just once and then quickly flaps forward. Such consonants are called taps or flaps. The letter 'r' in very is pronounced as a tap consonant.
v. Close Approximation:

The active articulator is brought so close to the passive articulator that there is a very narrow gap between them. The soft palate is raised so as to shut off the nasal passage of air. The lung-air escapes through the narrow space between the active and passive articulators, producing audible friction. Sounds that are articulated with a stricture of close approximation are called fricatives. The initial sounds in these words five, vine, thin, then, sip, zip, sheep and hat are fricatives.

![Fig. 15 Articulation of the fricative sounds that begin the words /s/ and /z/. The velic closure effected by the raised soft palate. The narrow gap between the blade of the tongue and the teeth-ridge.]

![Fig. 16 Articulation of the fricative consonants /f/ and /w/. The soft palate is raised. The narrow gap between the lower lip and the upper front teeth (the passive articulators).]

vi. Partial Closure:

The active and passive articulators are in firm contact with each other. The soft palate is raised, thereby shutting off the
nasal passage of air. If the sides of the tongue are lowered so that there is plenty of gap between the sides of the tongue and the upper teeth, the air escapes along the sides of the tongue without any friction. Sounds that are articulated with a stricture of complete closure in the centre of the vocal tract but with the air escaping along the sides of the tongue without any friction are called laterals. The initial sound in the English word 'love' is a lateral sound.

![Diagram of the lateral sound](image)

Fig. 17 Articulation of the lateral sound /l/. The tip and blade of the tongue are in firm contact with the teeth-ridge. Soft palate in its raised position.

vii. **Open Approximation:**

The soft palate is raised, thereby shutting off the nasal passage of air. The active articulator and the passive articulator have sufficient space between them, the air escapes through
this space freely without any friction. Sounds that are articulated with a stricture of open approximation are called frictionless continuants, semi vowels and vowels in English. The initial sounds in yes, red and wet are examples of approximants.

Fig. 18 Articulation of the approximant represented by the Devnagari letter /w/ as in wet. The gap between the lower lip and the upper front teeth.