

- **CLASSIFICATION OF SPEECH SOUNDS**

# Consonants

- — sounds articulated with **some** degree of constriction in the vocal tract.
- —described in relation to their position in syllables, and also to a large extent, their phonetic nature (articulations involving the obstructions or narrowing, which produce **acoustic** noise components).
- There are 24 consonants in English, classified according to (1) place, (2) manner (stricture) and voicing.
- **Voicing**
- A classification according to the **state** of the **glottis** during sound production, e.g. as voiced or voiceless.
- Voiced sounds are made with the vocal folds slightly touching each other so that the air passing through them causes the vocal folds to vibrate.

- E.g. in English: [b, m, v, ð, d, n, ɹ, l, z, ʒ, dʒ, j, g, ŋ]

and in other languages:

- [β, m̥, z̥, r̥, ʒ̥, ʒ̥, ʃ̥, d̥, ŋ̥, j̥, ɲ̥, ɣ̥, L̥, ʉ̥, G̥, N̥, R̥, ʁ̥]

- **Voiceless Sounds:** are made with an open glottis (vocal folds are wide apart) so that the air passes through without causing the vocal folds to **vibrate**.

- e.g. in English [p, f, θ, t, s, ʃ, tʃ, k, h, ʔ]

- and in some other languages.

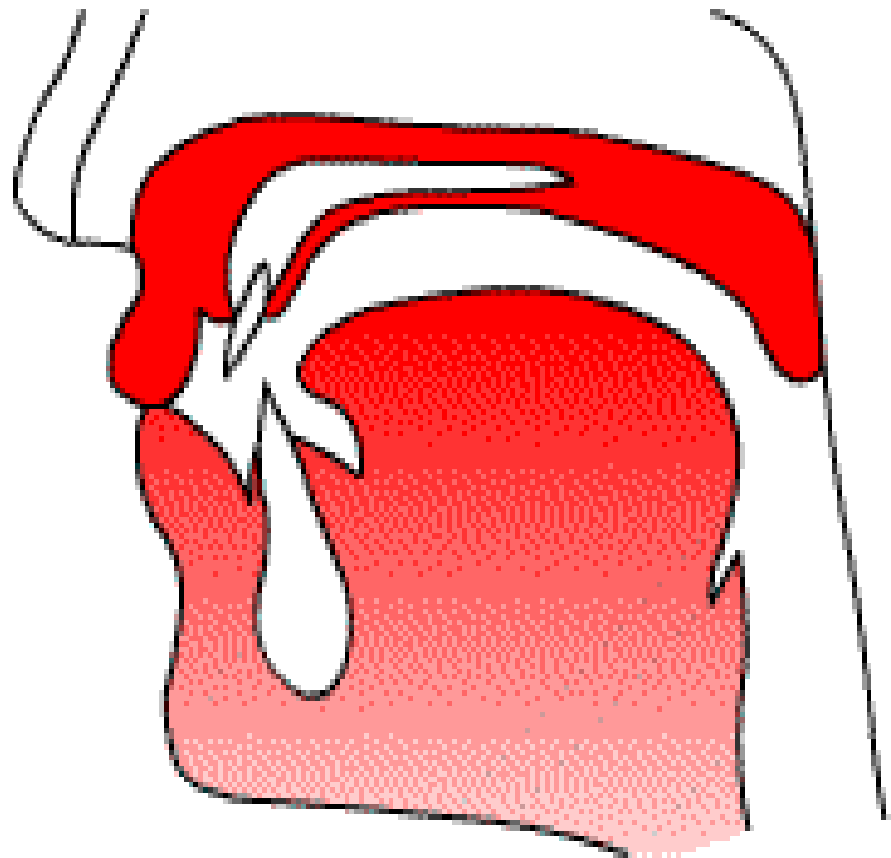
- [ɸ, ɸ̥, ɬ, ɬ̥, ɕ, ɕ̥, x, q, χ, ħ, ʕ, ʔ]

# Place of Articulation

- **Place of Articulation:** the **location** in the **vocal tract** where an articulation or a constriction occurs.
- For most articulation the term used to describe the place of articulation is based on the name of the **passive** articulator concerned.

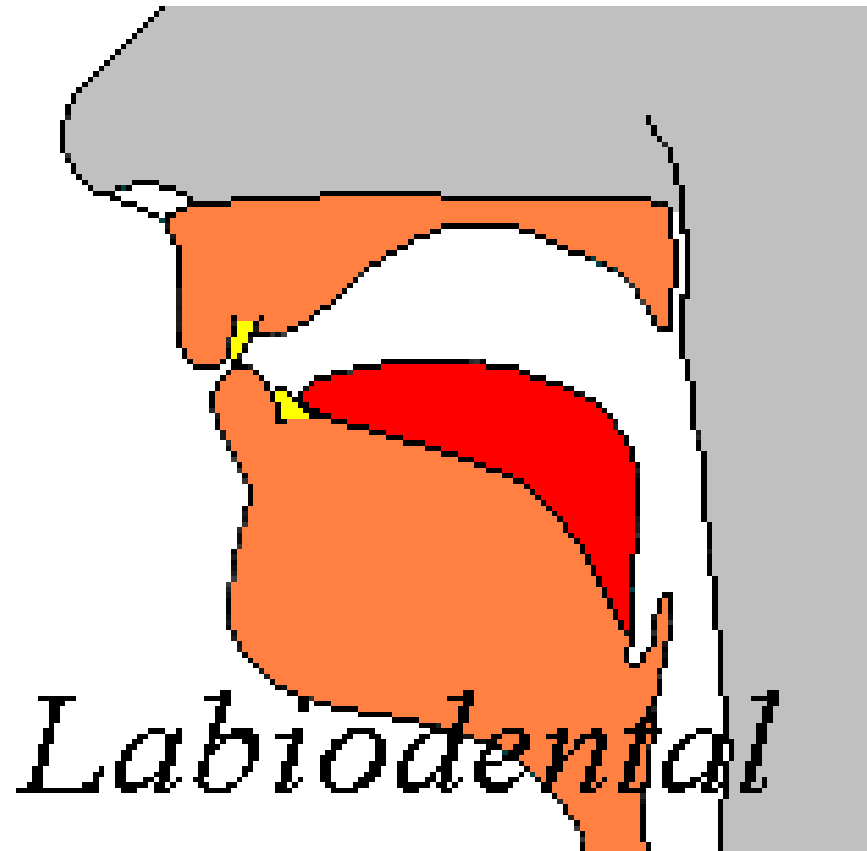
Examples: uvula

- **Bilabial:**-both the upper and the lower lips are active articulators for this place. In their articulation, the two lips come together causing some degree of constriction to the flow of air in the vocal tract.
- E.g. in English [p, b, m]
- [β, φ, ɸ] in some other languages.



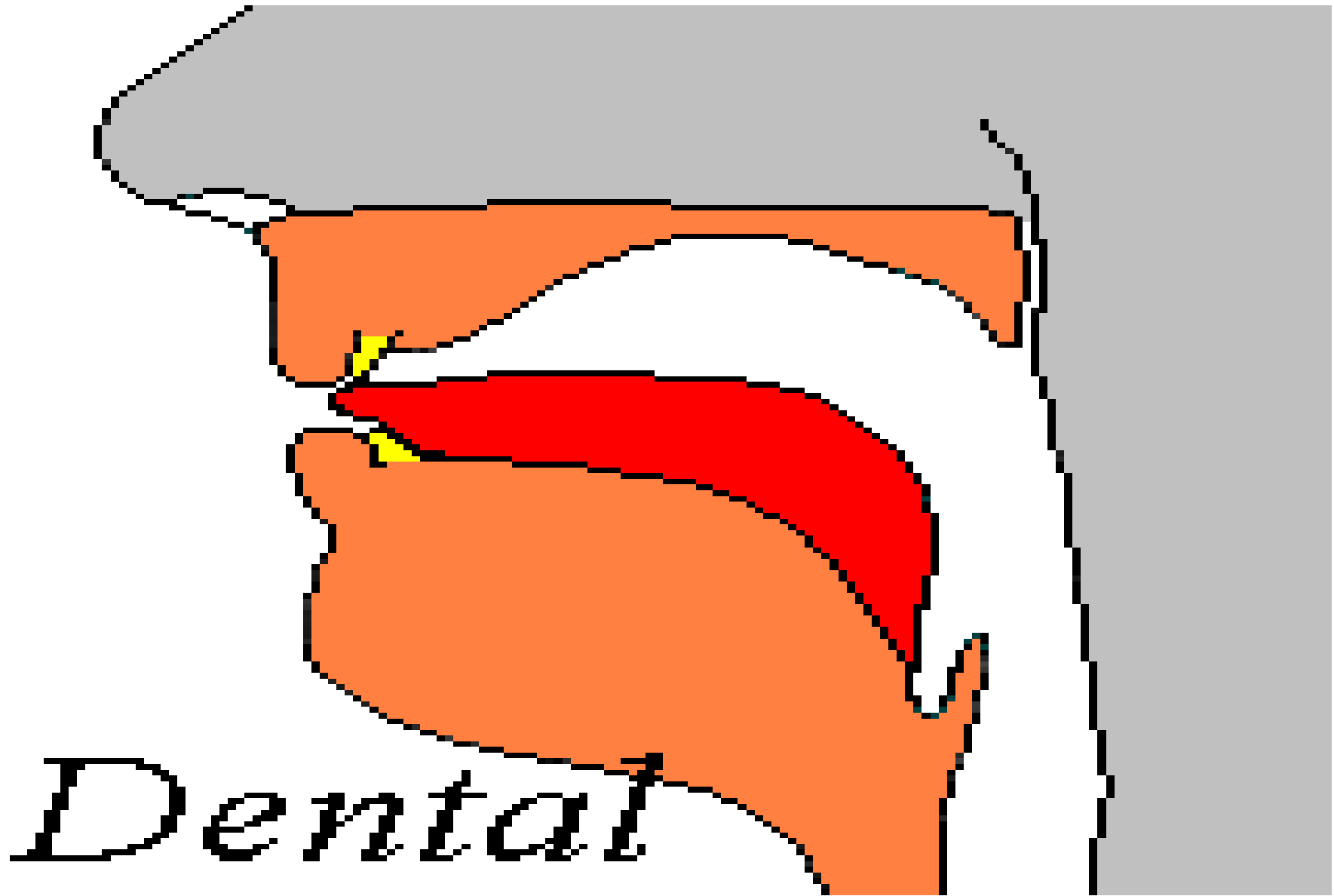
- **Labiodental**:-the **active** articulator is the **lower lip** and the **passive** articulator is the edge of the **upper front teeth**.
- The lip moves up towards the upper front teeth, they could make a **firm** contact or **not** depending on the kind of articulation, (whether is a stop or a fricative).
  - e.g. in English [f, v] and [m, u]

# The labiodental

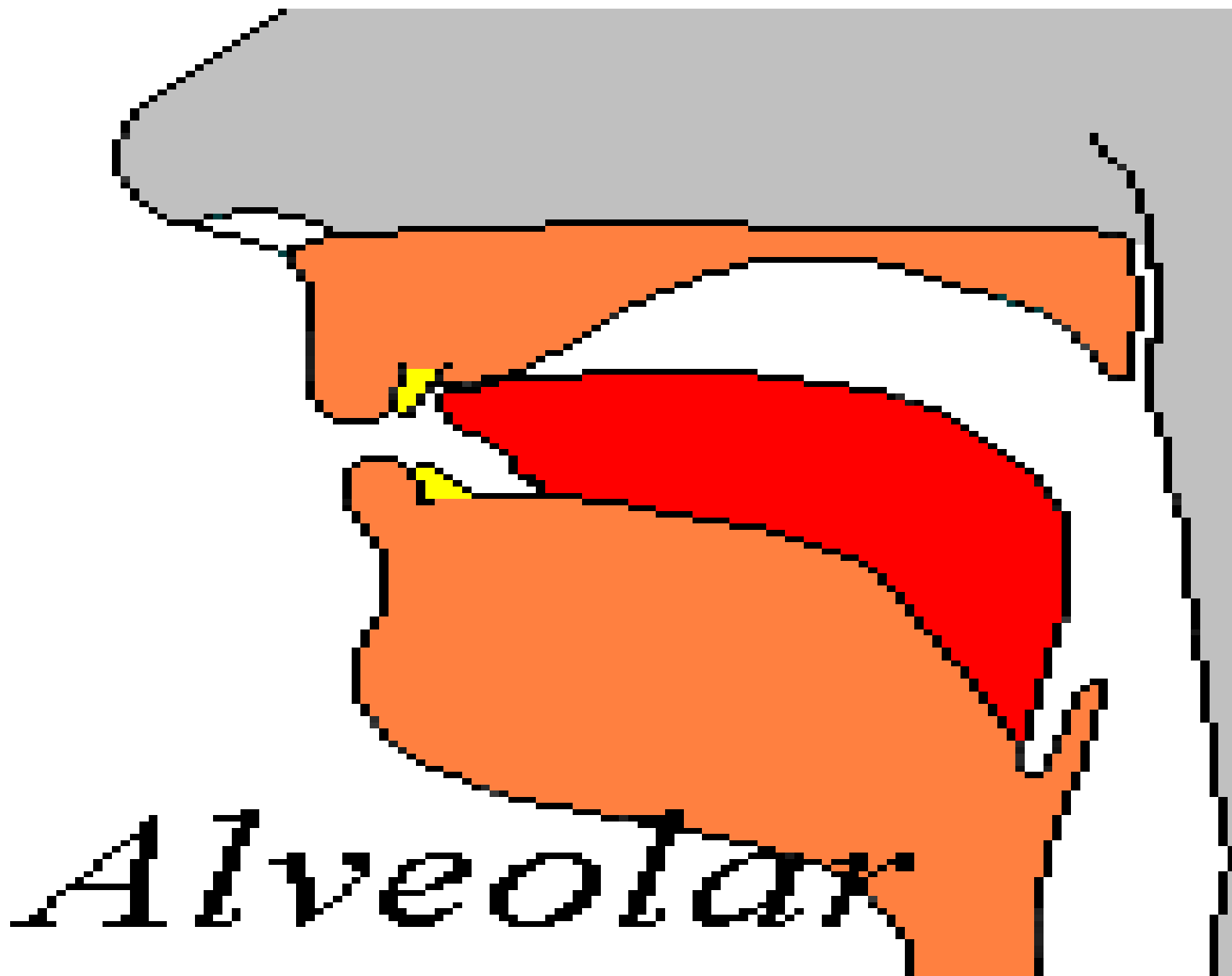


- **Dental**:-the active articulator is the **tongue tip** or the **blade** and the passive articulator is the **edge** of the **upper front teeth**.
- The tip of the tongue moves up against the upper teeth but does not make a firm contact with the teeth. E.g. /θ, ð/, in English





- **Alveolar**:- the active articulator is the **tip** or the **blade** of the tongue and the passive articulator is the **alveolar ridge**,
- The tip of the tongue moves against the alveolar ridge.
- E.g. in English [t, d, n, ɹ, l, s, z] and other languages [r, ɾ, ʎ, ʒ]



- **Retroflex**:- the active articulator is the **tongue tip** and the passive articulator is the **hard palate** . The tongue is curled back so that it approaches the roof of the mouth behind the alveolar ridge.
- Non-existence in English, but exist in languages such as India, Ewe etc. e.g. [ʂ ʐ ɽ ɻ ɳ].
- **Palatal**:-the active articulator is the **front** of the tongue and the passive articulator is the **hard palate**. The front of the tongue moves against the hard palate, e.g. in English [j] and
- [ɰ, ɲ, ɕ, ʝ, ɟ] in other languages.

- **Post-alveolar**:-active articulator is the **blade** and the passive articulator is the **place immediately behind the alveolar ridge**,
- E.g. [ʃ, ʒ, tʃ, dʒ]
- **Velar**:- the active articulator is the **back** of the tongue and the passive articulator is the **soft palate**.
- E.g. in English [k, g, ŋ]
- and [x, ɣ, ɮ, ʍ] some other languages.

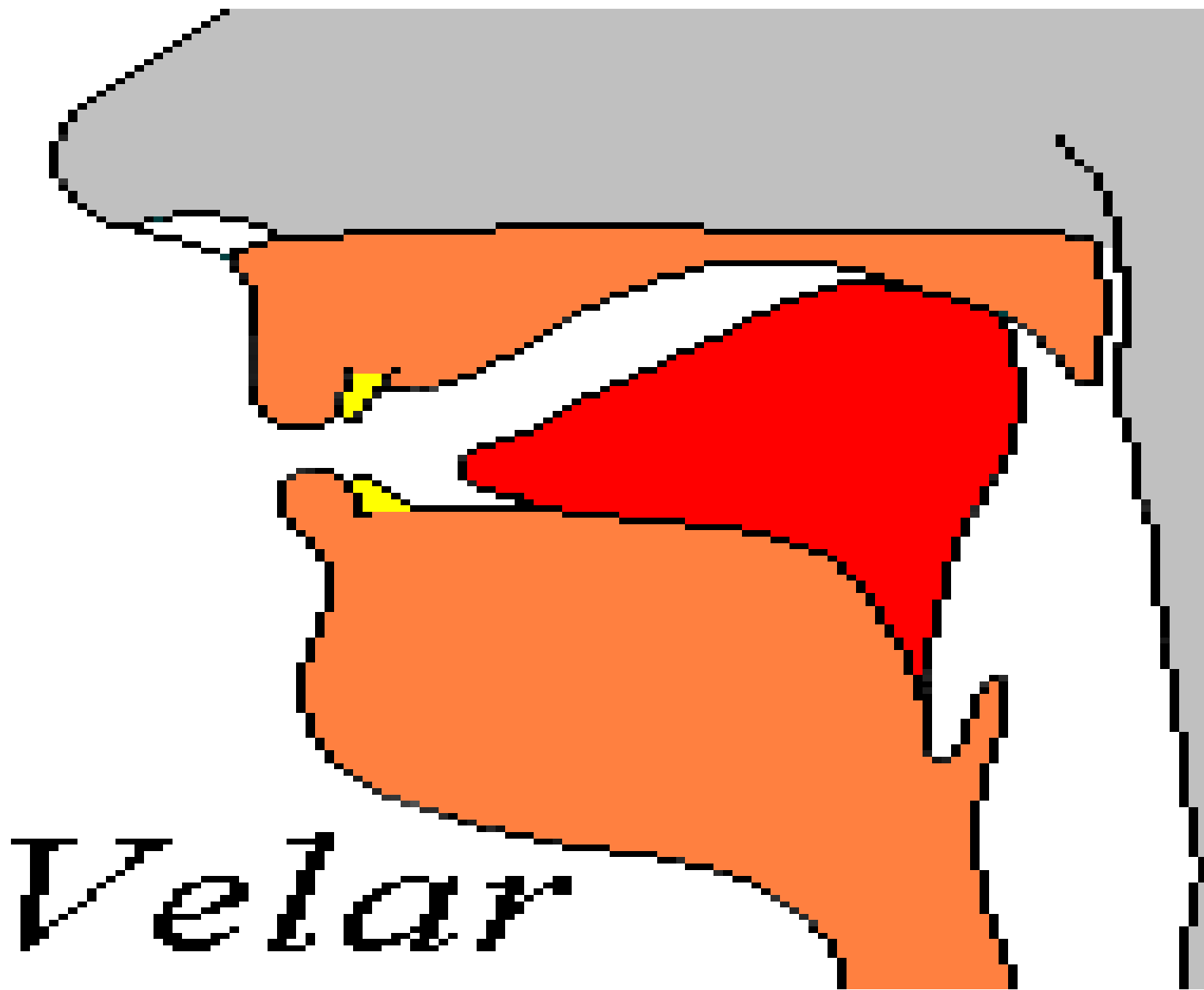
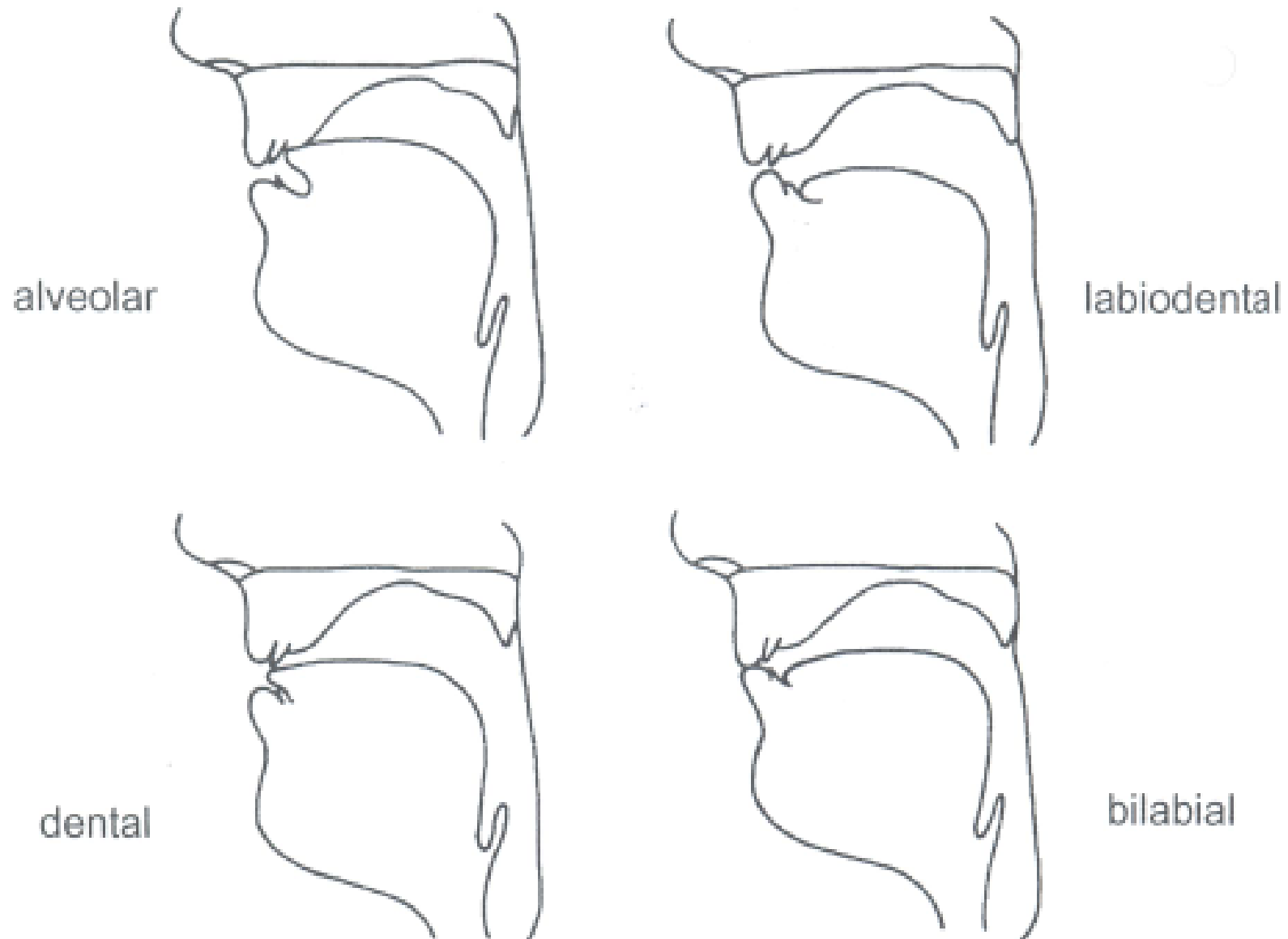
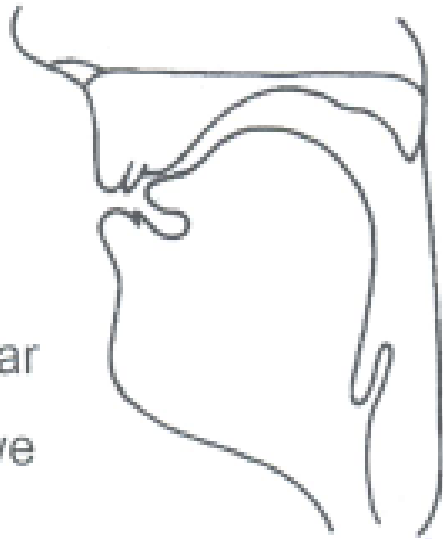


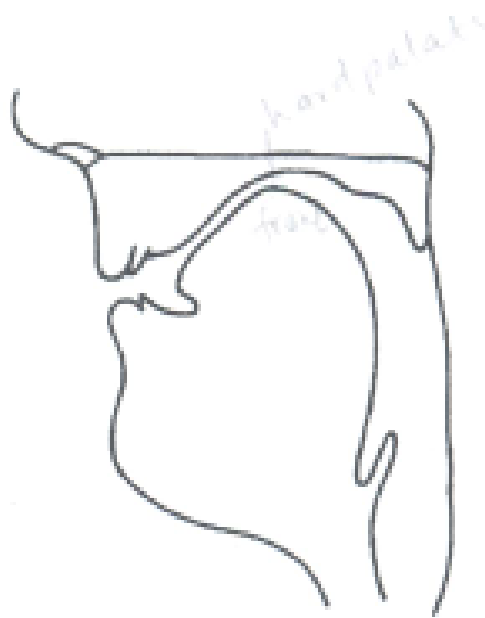
Figure 3. Vocal tract outlines (after Ladefoged (2001) *A course in phonetics*, page 18)



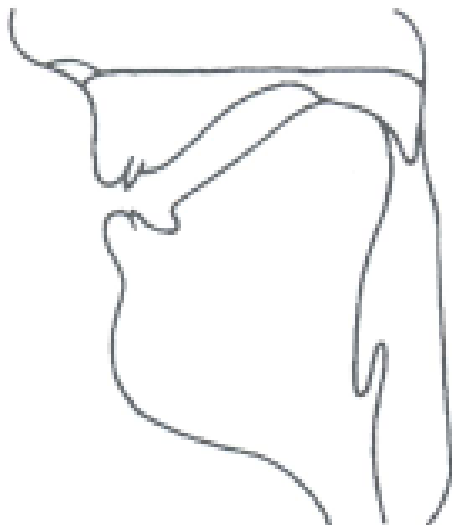
alveolar  
fricative



postalveolar  
fricative



velar





- **Uvula**:- the active articulator is the *back of the tongue* and the passive articulator is the **rear wall of the pharynx**.
- English does not have uvula sounds, but they exist in some other languages of the world,
- e.g. [q, ɢ, ŋ, ʀ, χ, ʁ].
- **Pharyngeal**- the active articulator is the *root* of the *tongue* and the passive articulator is the **rear wall** of the **pharynx**. No English sound is made at the pharynx. It is however used by some other languages,
- e.g. [ħ, ʕ].
- **Glottal**:- the articulators are the vocal folds, both of which are active. E. g. [ʔ, h, ɦ].

# Summary of place of articulation

## Active Articulator Passive Articulator

### Place of Articulation

- Bilabial      upper and lower lip      none
- Labiodental      lower lip      upper front teeth
- Dental      tongue tip      upper front teeth
- Alveolar      tongue tip or blade      alveolar ridge
- Post-alveolar      tongue tip or blade      rear of alveolar ridge

- Retroflex tongue tip      hard palate
- Palatal tongue front      hard palate
- Velar tongue back      soft palate
- Pharyngeal tongue root      rear wall of pharynx
- Glottal      vocal folds      none

# Manner of Articulation (Stricture)

- Consonants are also described according to the **degree** of **constriction** in the vocal tract; the **degree** of obstruction to the flow of air.
- The obstruction to the flow of air differs depending on the type of consonant that is being made.

# Narrowing with Friction

- This is a stricture formed with a **narrowing** in the vocal tract, which causes **friction**. Two organs come together to obstruct the air, but the obstruction does not cause a total blockage to the flow of the airstream.
- The small passage is created thereby allowing air to pass through with an **audible friction**,
- e.g. [f, v, θ, ð, s, z, ʃ, ʒ, h] and [ʍ] in English and [ɸ, β, ç, x] in some other languages.

# Partial Closure/Narrowing without Friction

- This is a type of articulation that involves a partial or a narrowing in the vocal tract **without friction** or noise.
- Sounds made with this stricture are called **Approximants**, e.g. /l, j, w, ɹ/.
- **Lateral approximant** -articulators form partial **closure** at the alveolar ridge; the airstream is allowed to escape centrally in between the closure .g. /ɹ/
- The production can differ depending on the environment.
- e.g. It is partially devoiced if it is preceded by a voiceless stop such as /p/ or /t/ as in
- pray [preɪ]
- try [traɪ]

- Sounds made with this structure are called **Approximants**, e.g. /l, j, w, ɹ/.
- **Central approximant** -articulators form partial, but firm **closure** at some point in the oral cavity; the airstream is allowed to escape through one or both sides of the contact, e.g. /l/
- The production can differ depending on the environment.
- It could be **dark** [ɫ] if it occurs just before another consonant e.g. /help/ or just after a consonant as in little [lɪtɫ].
- **clear** /l/ if it occurs at the initial accented position before a vowel, e.g. learn, lick, etc.
- It is partially devoiced if it is preceded by a voiceless stop such as /p/ as in please,

# Intermittent Closure

- **Trill or Roll**- is made with series of rapid intermittent closures by the tongue tip against the roof of the mouth.
- e.g. [r]
- the tongue tip **trills** against the alveolar ridge as in Spanish perro, or [R] where the uvula trills against the back of the tongue, as in the French word 'rouge'.
- \*English does not have a trill.
- **Tap**-is made with a **single** tap made by the tongue tip against the roof of the mouth as in many Scottish pronunciations of the English /r/.
- e.g. [r].
- also in American English



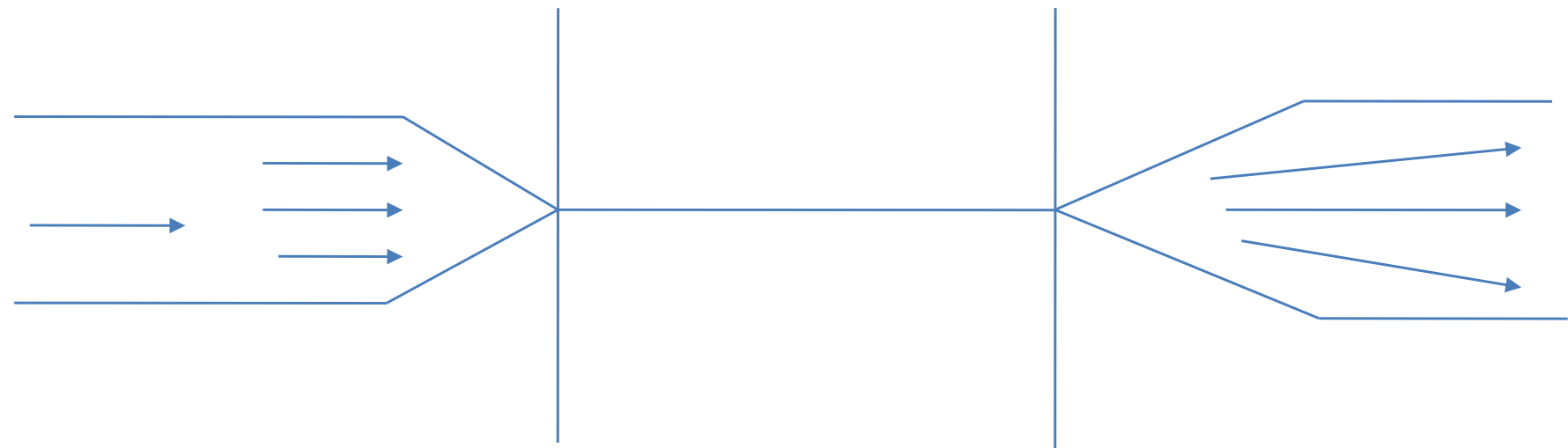
# Closure/complete closure

- This type of stricture involves a **complete** closure; there is a complete blockage of the airstream; the two articulators are in firm contact for an appreciable amount of time.
- Sounds articulated with a **complete** blockage in the vocal tract are called stops.
- The air is stopped **completely**, hence the term **stop**. The blockage can occur between the two lips, (producing bilabial stops), between the lower lip and the alveolar ridge (producing alveolar stops), between the back of the tongue and the velum (producing velar stops).



# Stages of Plosives Articulation

- 1. Approach** phase:-when the articulators come together to form a closure at some point in the VT.
- 2. Hold/compression** phase:-when the air is completely stopped and the pressure rises in the VT (stop gap)
- 3. Release** phase:-when the articulators part and the compressed air is released (burst).



1. approach phase

2. Hold phase

3. Release phase

- **Nasals:** - also stops; they are made with a stricture with a complete closure in the oral cavity, but in their case the soft palate is **lowered** allowing the airstream to escape through the nasal cavity.
- e.g. [m, n, ŋ] in English. They are continuants and are **almost** always voiced and have **no noise** component.
- There are voiceless nasals in e.g. Burmese, Welsh and Icelandic.
- Voiceless nasals are represented with the nasals [m n ŋ] with the diacritics [̥ ̜ ] either at their top or at their bottom.

# Voiceless Nasals contrasting Voiced Nasals in Burmese

NASALS	BILABIAL	DENTAL	PALATAL	VELAR
VOICELESS	m̥ã 'from'	n̥ã: 'nasal'	ɲ̥ã: 'considerate'	ŋ̥ã 'borrow'
VOICED	mã 'lift up'	nã: 'pain'	ɲã: 'right'	ŋã 'fish'

# Some Characteristics of Plosives

- There will be **no voicing** at the compression phase if the plosive is voiceless, e.g. /p, t, k/.
- \*There will be **voicing** at the compression/hold phase if the plosive is voiced, e.g. /b, d, g/. but **mostly** when it is between voiced sounds,
- e.g. ladder [læ**d**ə],                    **sudden**    **larger**    **about**
- but not at syllable initial position or final position.
- e.g. bed    [b**e**d]
- lag [læ**g**]
- **At the release phase** (after the articulators part and the compressed air is released) there will be voicing; **if the plosive is followed by a voiced consonant or a vowel**, e.g. cutting    going    or    burden,

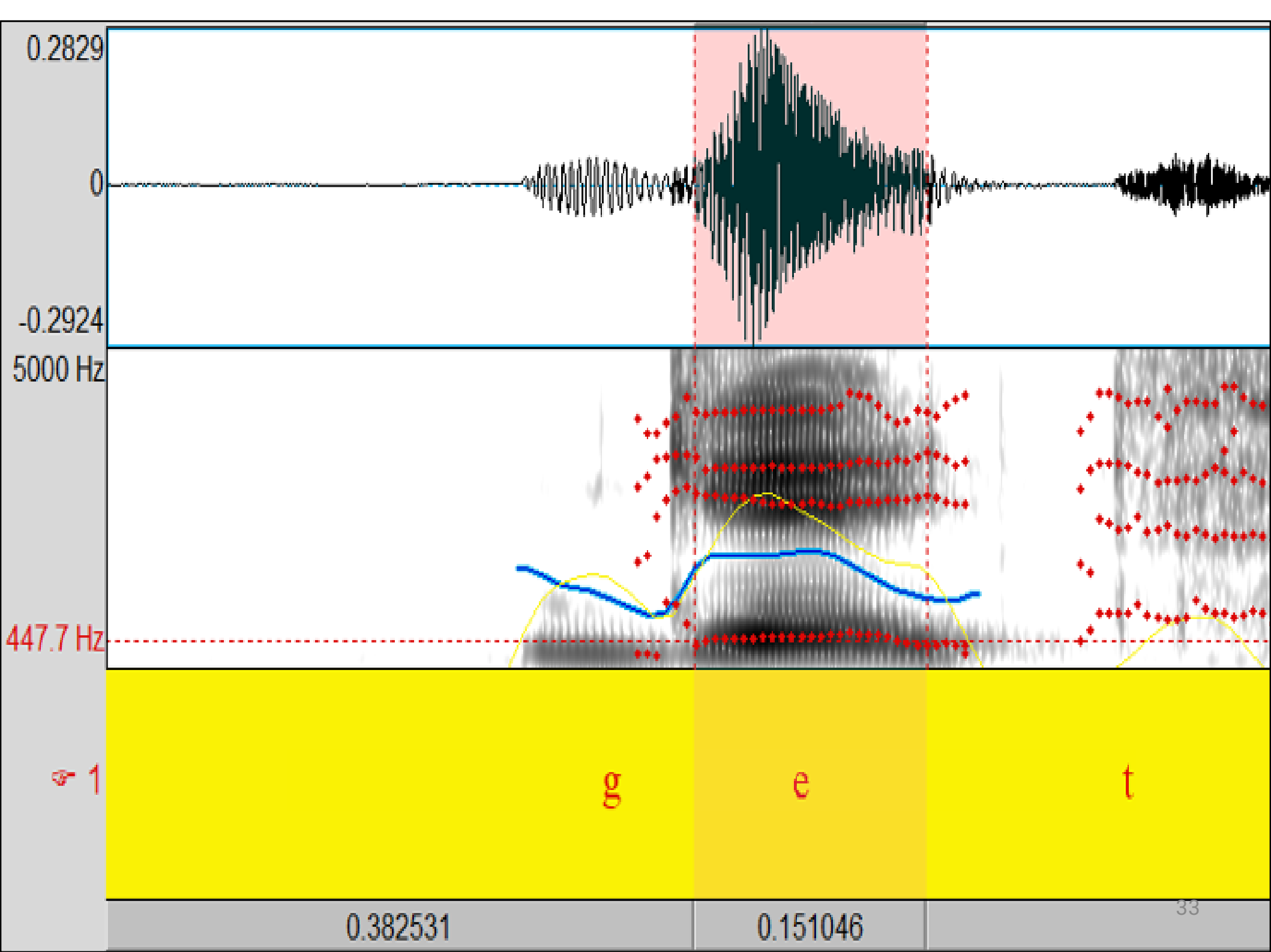
- If the plosive is voiceless, voicing for the following sound will delay.
- The delay in voicing for the following voiced sound is called **Voice Onset Time (VOT)**.
- This delay in voicing creates a short turbulent sound or noise called **aspiration** [h].
- **Aspiration** is a short turbulence sound or a short fricative noise produced after the release of a plosive. Delay in voicing will cause the following voiced sound to be devoiced (partially voiced).

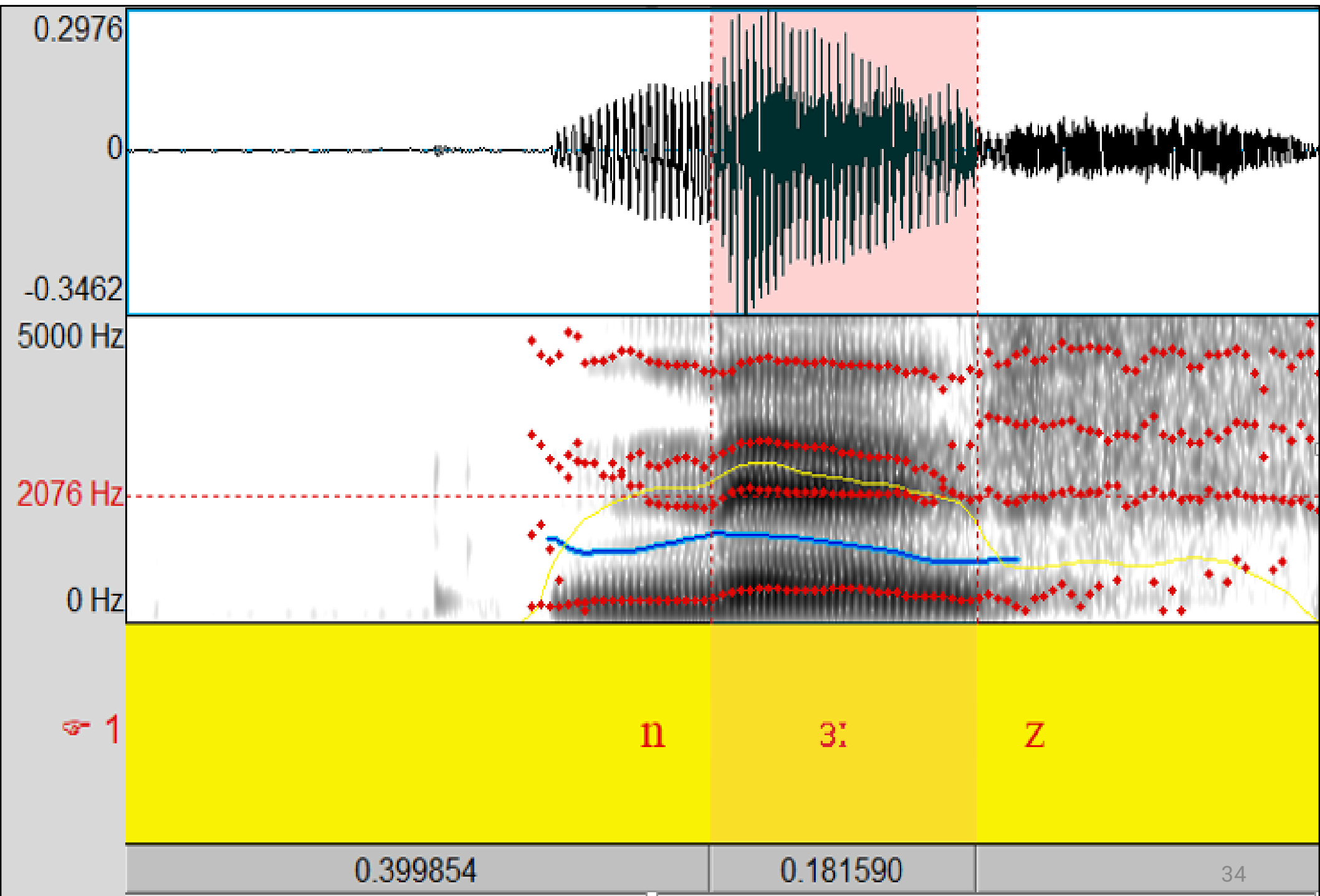
- put            [p<sup>h</sup>ʊt]

- top            [t<sup>h</sup>ɒp]

- court          [k<sup>h</sup>ɔ:t]







showing their accurate perception of the neutralisation.

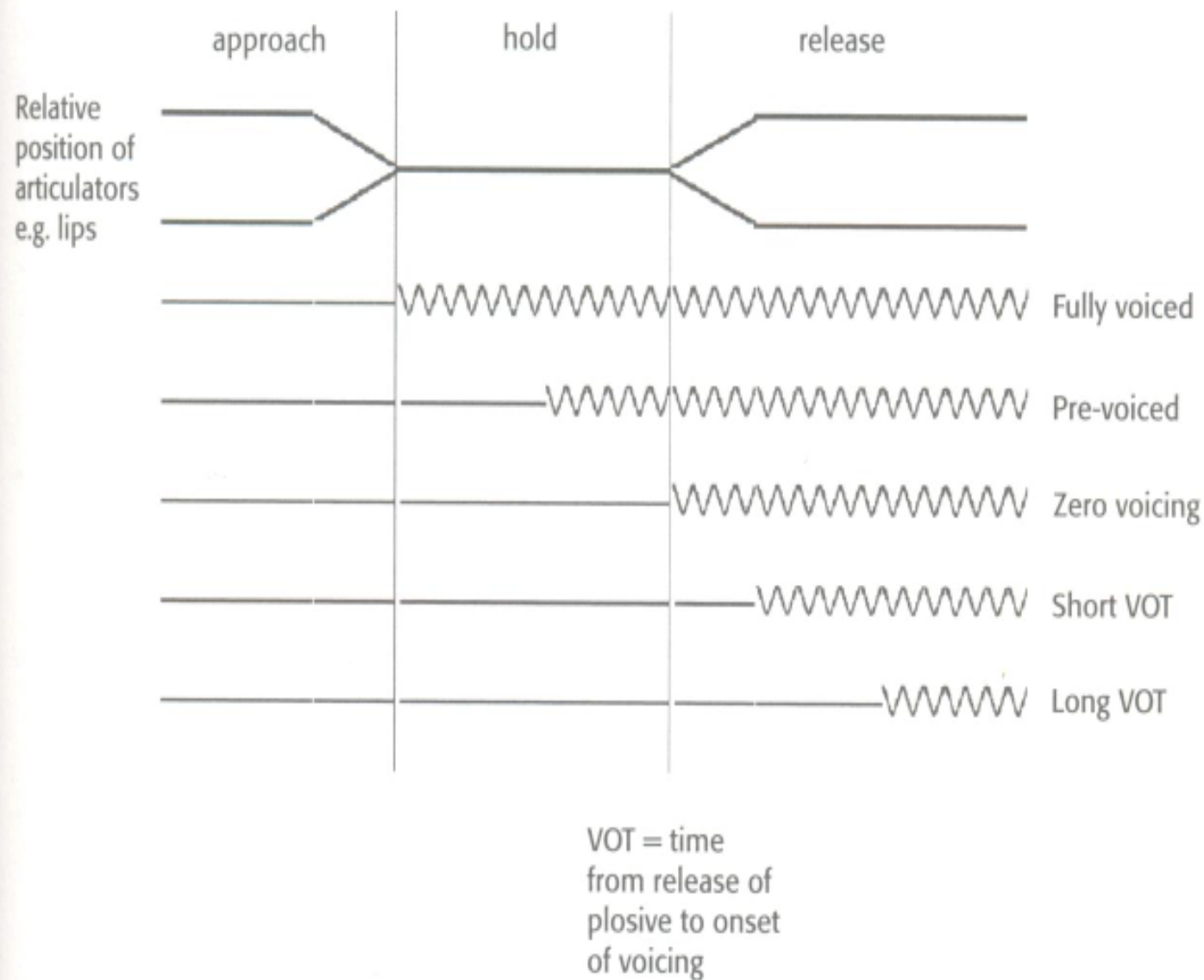
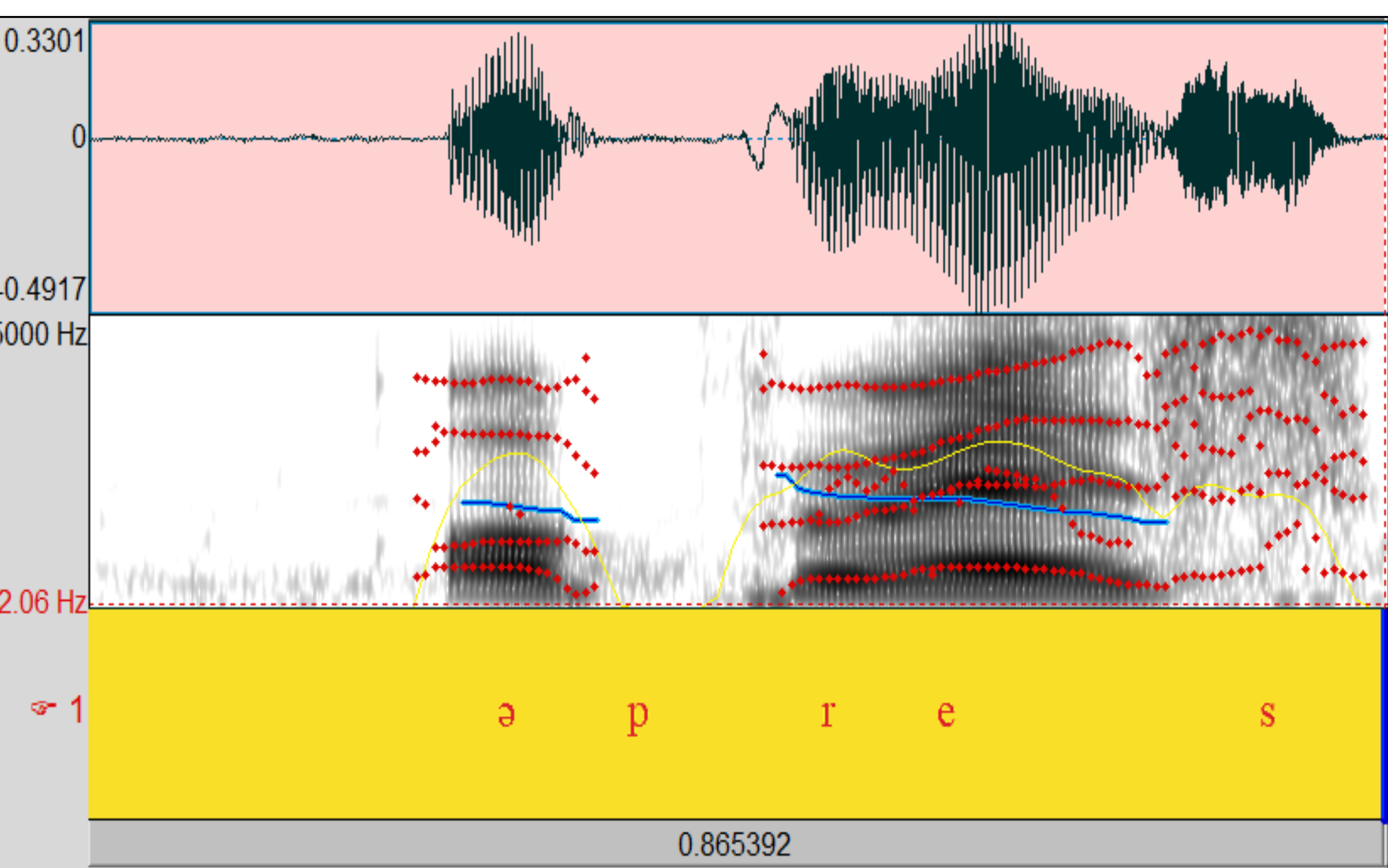
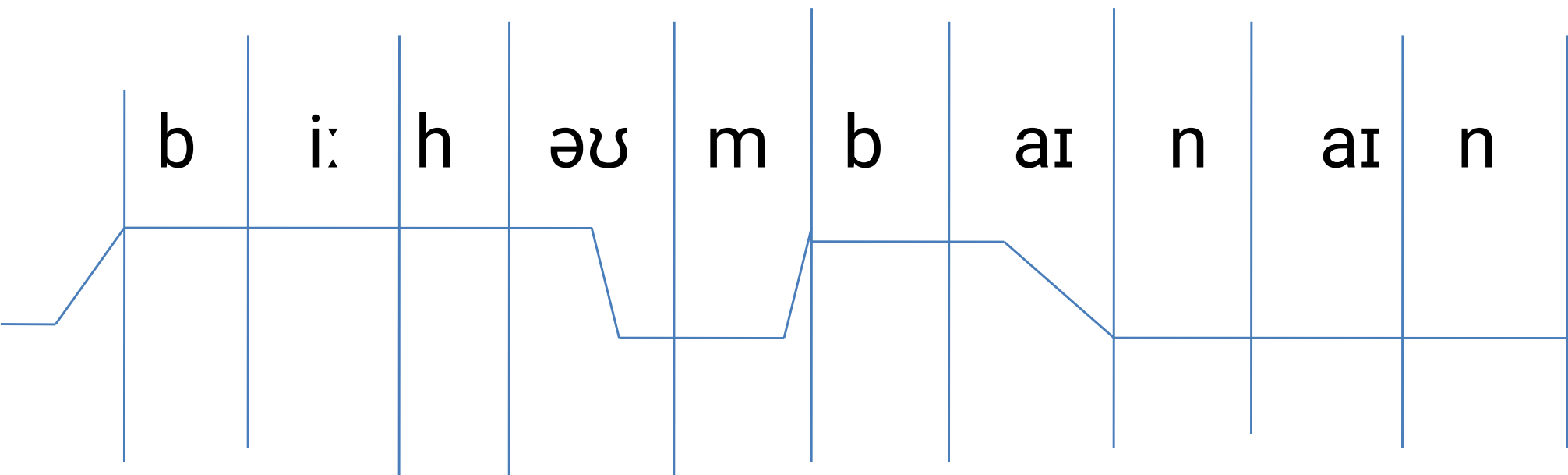


FIGURE 6.3  
Schematic parametric representation of the three phases of plosive production, with five different VOT possibilities.





# Affricates

- Also stops; their articulation involves the same approach as that of plosives.
- They also involve a complete closure at some point in the oral cavity, behind which a complete closure is made.
- They have the same kind of hold phase in the oral cavity, air pressure builds up behind the closures; but the release is slower compared to that of plosives, the air rushing between the two articulators makes hissing noise so that more extended friction is a characteristic of the second element of the sound,
- e.g. [dʒ, tʃ].

## Obstruents and Sonorants

- Consonants can also be classified according to their noise component.
- Sounds whose articulation involves some kind of noise in the vocal tract are known as **Obstruents** . E.g. plosives, fricatives and affricates.
- Those whose production involves no noise are called **Sonorants**, e.g. voiced sounds such as ***voiced nasals approximants and vowels.***

## Fortis and Lenis

- English voiced and voiceless sounds e.g. /s, z/ are distinguished not only by the presence or absence of the voice but also by the degree of breath and muscular effort involved in their articulation.
- **Voiced** stops and fricatives tend to be articulated with relatively **weak** energy, whereas those which are always **voiceless** are relatively **strong**.



- Give **two** examples each of rounded and unrounded vowels in English.
- What is Voice Onset Time (**VOT**) in the articulation of plosives?
- Briefly describe how a glottal stop is produced.
- Mention two roles played by the velum in the production of speech.
- What role is played by the basal cavity in the production of speech sound.

- Distinguish between the two l-sounds in 'hospital' and 'literature' as they are normally produced in English.
- State the difference between the two instances of /p/ in 'pull' and 'pin'.



- Clamber      disconnect      career
- Festoon      entering      personality
- Detest      injury      person
- Paper      event      pinker
- sunrise      suitcase      teacup
- Bad-tempered      heavy-handed      ice-cream