

LING 001

Introduction to Linguistics

Lecture 7

Articulatory Phonetics: Consonants

02/12/2019

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Announcements

- Exams will be returned in recitation **next** week
 - You can't take it with you, but you can take a picture.
- Your grade may be posted on canvas earlier
- Remember that your lowest exam will be dropped

Language as a DCS

- Language as an unbounded discrete combinatorial system
 - Discrete units (parts)
 - Rules for combining these parts

Sounds in language

- Two fields of linguistics devoted studying sound systems in language
 - Phonetics: the parts of the DCS
 - Phonology: the rules for combining these parts

Phonetics

- The study of the minimal units that make up language:
 - **Articulatory phonetics:** what are the sounds and how do we produce them?
 - **Acoustic phonetics:** what are the characteristics of the sounds produced?
 - **Auditory phonetics:** how do humans process and perceive these speech sounds?

Phonetic Transcription

- English spelling not designed to have a one-to-one mapping between sounds and symbols.
 - sea, see, scene
 - yet, type, happy
 - box, socks
- So we use the **International Phonetic Alphabet**

The International Phonetic Alphabet

- one symbol = one sound
- sea, see, scene
 - /si/, /sin/
- yet, type, happy
 - /jɛt/, /taɪp/, /'hapi/
- box, socks
 - /baks/, /saks/
- sign, got
 - /sain/, /gat/
- enough, thorough, ghost
 - /ɪ'nʌf/, /'θʌrə/, /gəʊst/

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

© 2005 IPA

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d			ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Tail				ɾ					ʀ		
Tap or Flap		ɸ		ɾ							
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		ɸ		ɹ			j	ɰ			
Lateral approximant				l			ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged as impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	ʼ Ejectives
ǀ Dental	ɗ Dental/alveolar	ʔ Glottal
ǃ Alveolar	ɟ Velar	ʈ Postalveolar
ǂ Postalveolar	ɠ Velar	ʡ Velar
ǁ Alveolar/retroflex	ʄ Alveolar	ʕ Pharyngeal/uvular

OTHER SYMBOLS

ʌ	Voiceless labial-velar fricative	ɕ ʑ	voiceless/voiced retroflexes
ʋ	Voiceless labial-velar fricative	ɻ	Voiceless labial-velar fricative
ɹ	Voiceless alveolar fricative	ɻ	voiceless alveolar fricative
ʎ	Voiceless palato-velar fricative	ɻ	voiceless palato-velar fricative
ɰ	Voiceless velar fricative	ɻ	voiceless velar fricative
ʀ	Voiceless uvular fricative	ɻ	voiceless uvular fricative
ʁ	Voiceless uvular fricative	ɻ	voiceless uvular fricative
ʕ	Pharyngeal fricative	ɻ	voiceless pharyngeal fricative

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. [t̪]

ˀ	Voiceless	ˁ	Voiced	˂	Aspirated	˃	Unaspirated	˄	Long	˅	Short
ˆ	Vowel lengthening	ˈ	Primary stress	ˉ	Tone	ˊ	Acute	ˋ	Grave	ˌ	Secondary stress
ː	Long	ˑ	Short	˒	Double short	˓	Very short	˔	Extra-short	˕	Micro-short
˗	Micro-short	˘	Short	˙	Very short	˚	Extra-short	˛	Micro-short	˜	Micro-short
˚	Extra-short	˛	Micro-short	˜	Micro-short	˝	Micro-short	˞	Micro-short	˟	Micro-short
˞	Micro-short	˟	Micro-short	ˠ	Micro-short	ˡ	Micro-short	ˢ	Micro-short	ˣ	Micro-short
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˾	Micro-short	˿	Micro-short	˽	Micro-short	˽	Micro-short	˽	Micro-short	˽	Micro-short
˿	Micro-short	˽	Micro-short	˽	Micro-short	˽	Micro-short	˽	Micro-short	˽	Micro-short

VOWELS

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

SUPRASEGMENTALS

- ˈ Primary stress
- ˌ Secondary stress
- ː Long
- ˑ Short
- ˒ Extra-short
- ˕ Micro-short
- ˞ Micro-short
- ˟ Micro-short
- ˠ Micro-short
- ˡ Micro-short
- ˢ Micro-short
- ˣ Micro-short
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- ˰ Micro-short
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- ˳ Micro-short
- ˴ Micro-short
- ˵ Micro-short
- ˶ Micro-short
- ˷ Micro-short
- ˸ Micro-short
- ˹ Micro-short
- ˺ Micro-short
- ˻ Micro-short
- ˼ Micro-short
- ˽ Micro-short
- ˾ Micro-short
- ˿ Micro-short

TONES AND WORD ACCENTS

LEVEL	CONTINUOUS	DISCRETE
˥	High	˥
˦	High	˦
˧	High	˧
˨	High	˨
˩	High	˩
˪	High	˪
˫	High	˫
ˬ	High	ˬ
˭	High	˭
ˮ	High	ˮ
˯	High	˯
˰	High	˰
˱	High	˱
˲	High	˲
˳	High	˳
˴	High	˴
˵	High	˵
˶	High	˶
˷	High	˷
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˹	High	˹
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˻	High	˻
˼	High	˼
˽	High	˽
˾	High	˾
˿	High	˿

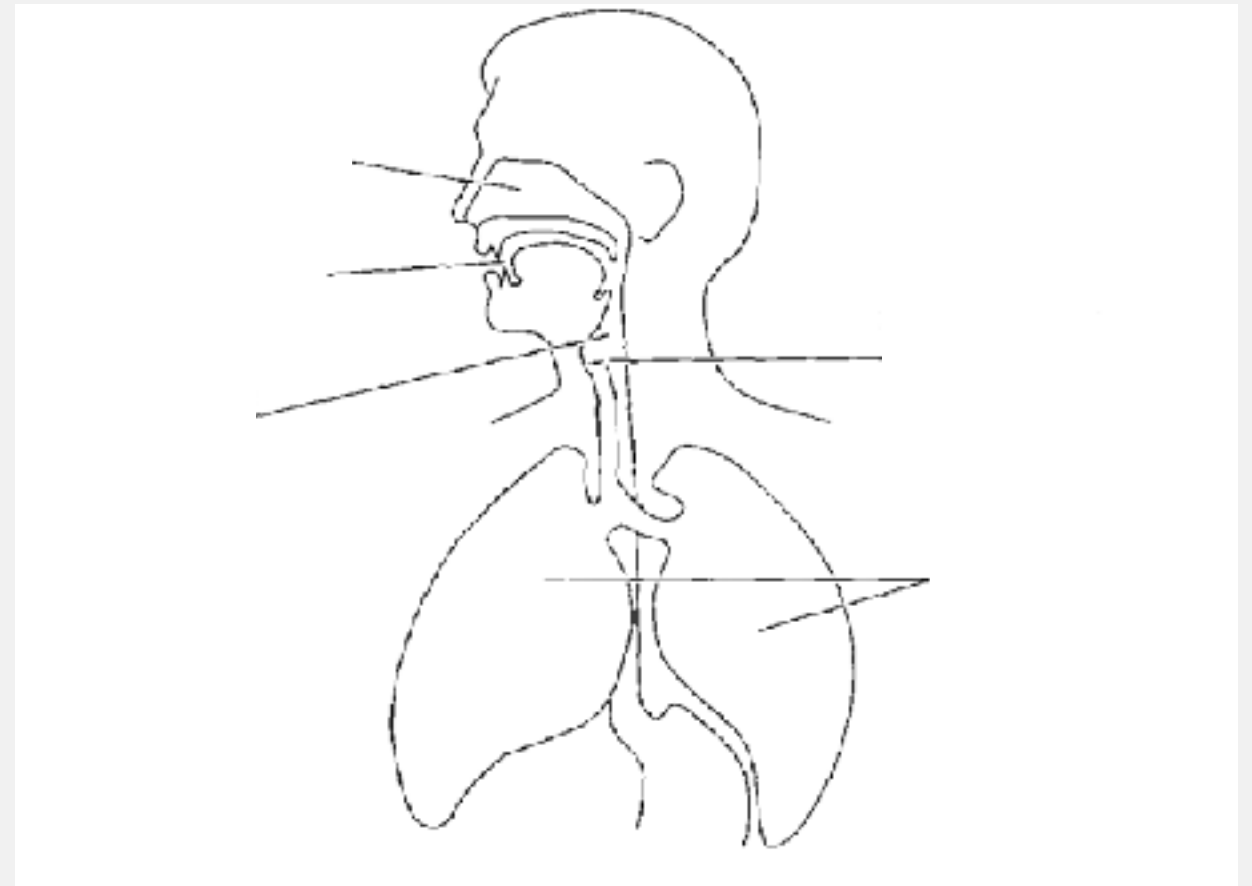
Articulatory Phonetics

- What are the sounds of language and how do we produce them with our anatomy?

Articulatory phonetics

- **Speech sounds** are shaped by various parts of the vocal tract:
 - **Lungs** supply airstream
 - **Vocal folds** (in the larynx) produce vibration
 - **Pharynx**: area above larynx and behind mouth
 - **Oral** and **nasal** passages for air to exit
 - **Tongue & Lips** **move** to articulate sounds
 - **Teeth** provide a **passive** articulator

- We can group sounds **based on similarities in how they're formed.**

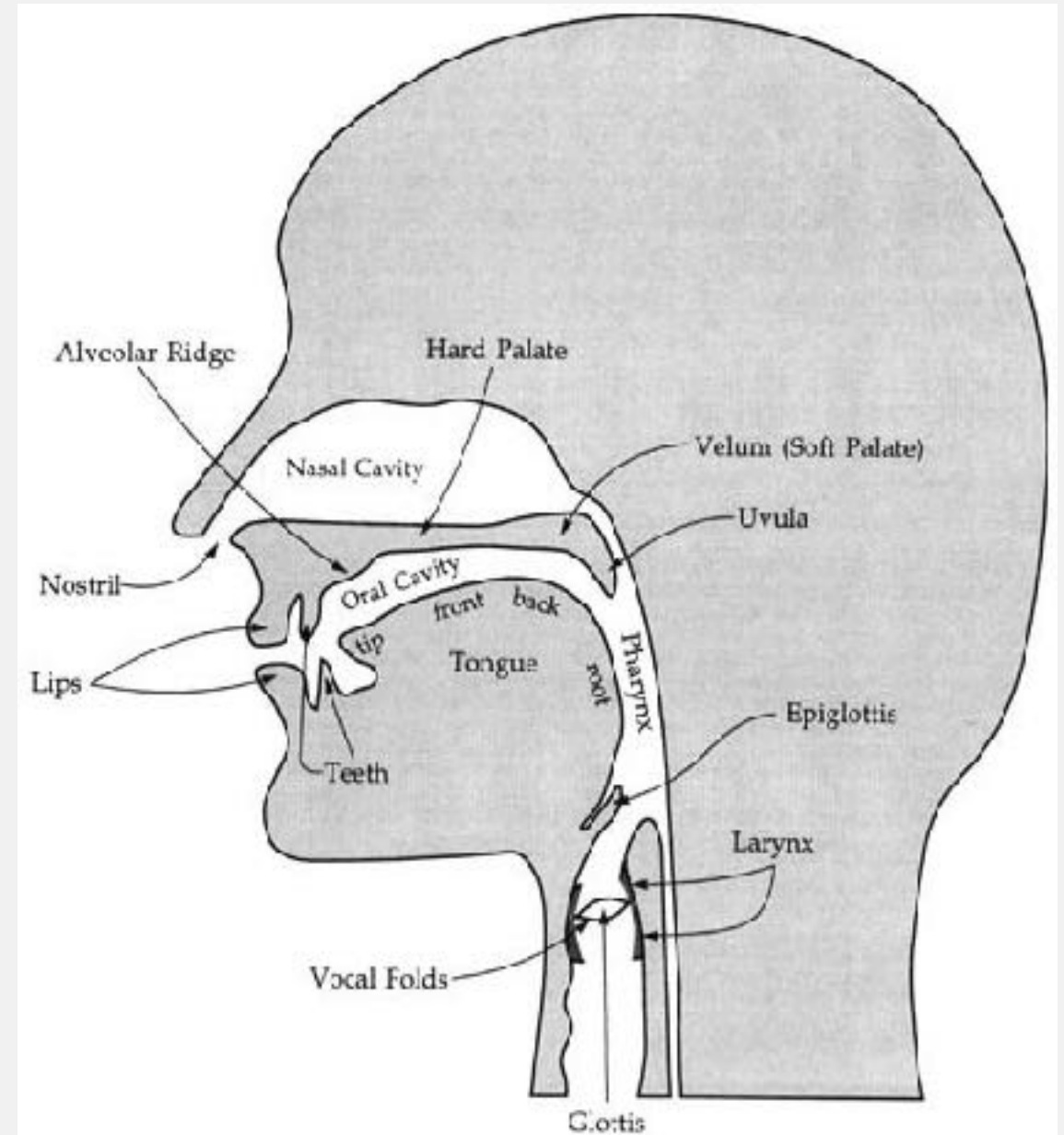


Segments

- **Consonants** involve **obstructing** the air-flow in one way or another (and to different degrees)
- **Vowels** result when the air-stream passes through the vocal tract with little obstruction
- The tongue and lips move to change the shape of the vocal tract, but not to obstruct airflow

Classifying consonants

1. **Vocal Folds (“glottal state”)**: voiced or voiceless?
2. **Place (which articulators involved?)**: bilabial, labiodental, interdental, alveolar, postalveolar, palatal, velar, glottal...?
3. **Manner (what kind of constriction?)**: stop, fricative, affricate, approximant...?

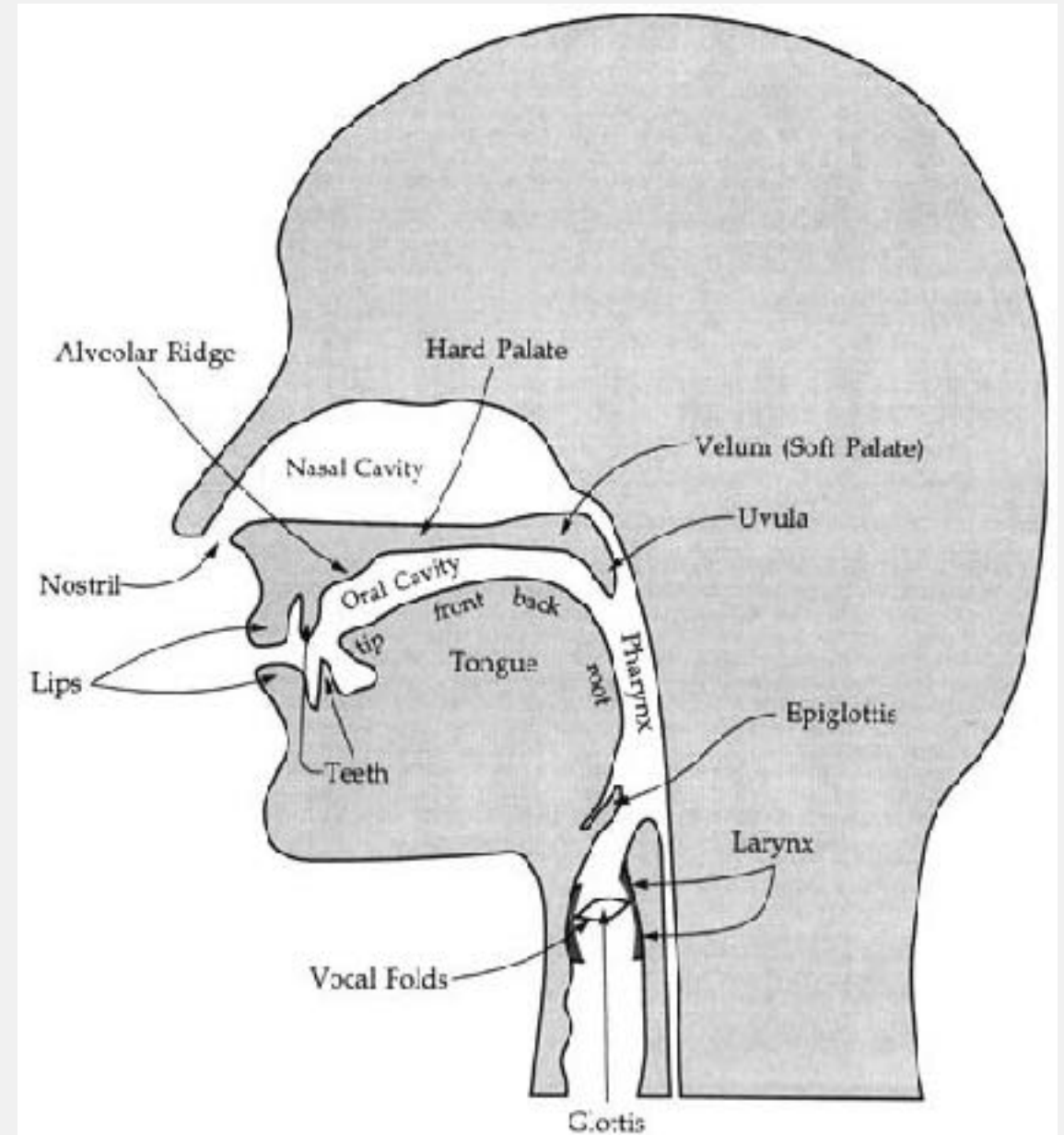


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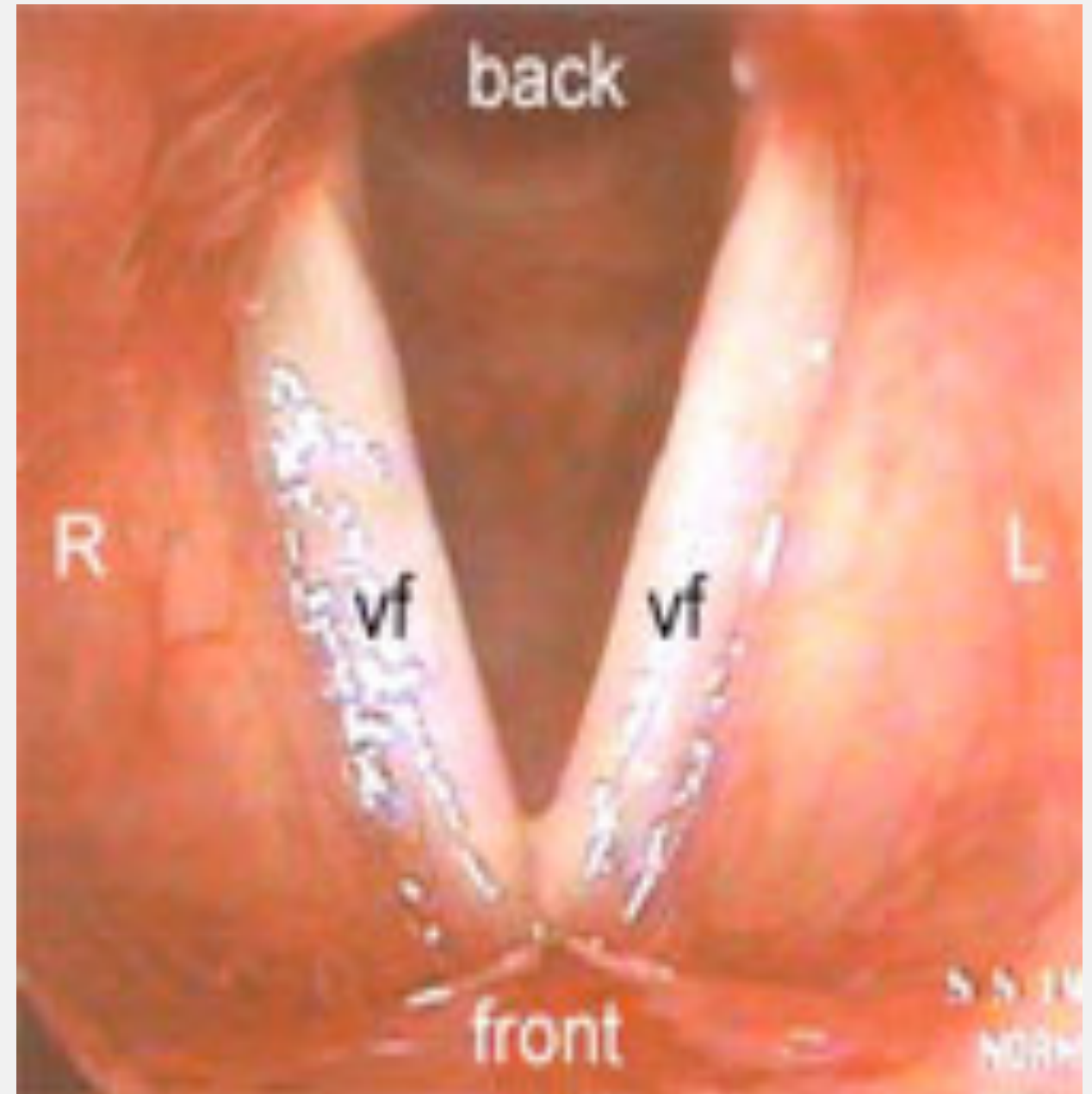


Vocal Folds in Action

Voiced



Voiceless



Voiceless vs. Voiced Sounds

Voiceless

[p] **pat**

[f] **fan**

[θ] **bath**

[t] **tip**

[s] **sip**

[ʃ] **lush**

[tʃ] **chin**

[k] **back**

Voiced

[b] **bat**

[v] **van**

[ð] **bathe**

[d] **dip**

[z] **zip**

[ʒ] **luge, pleasure**

[dʒ] **badge**

[g] **bag**

Place

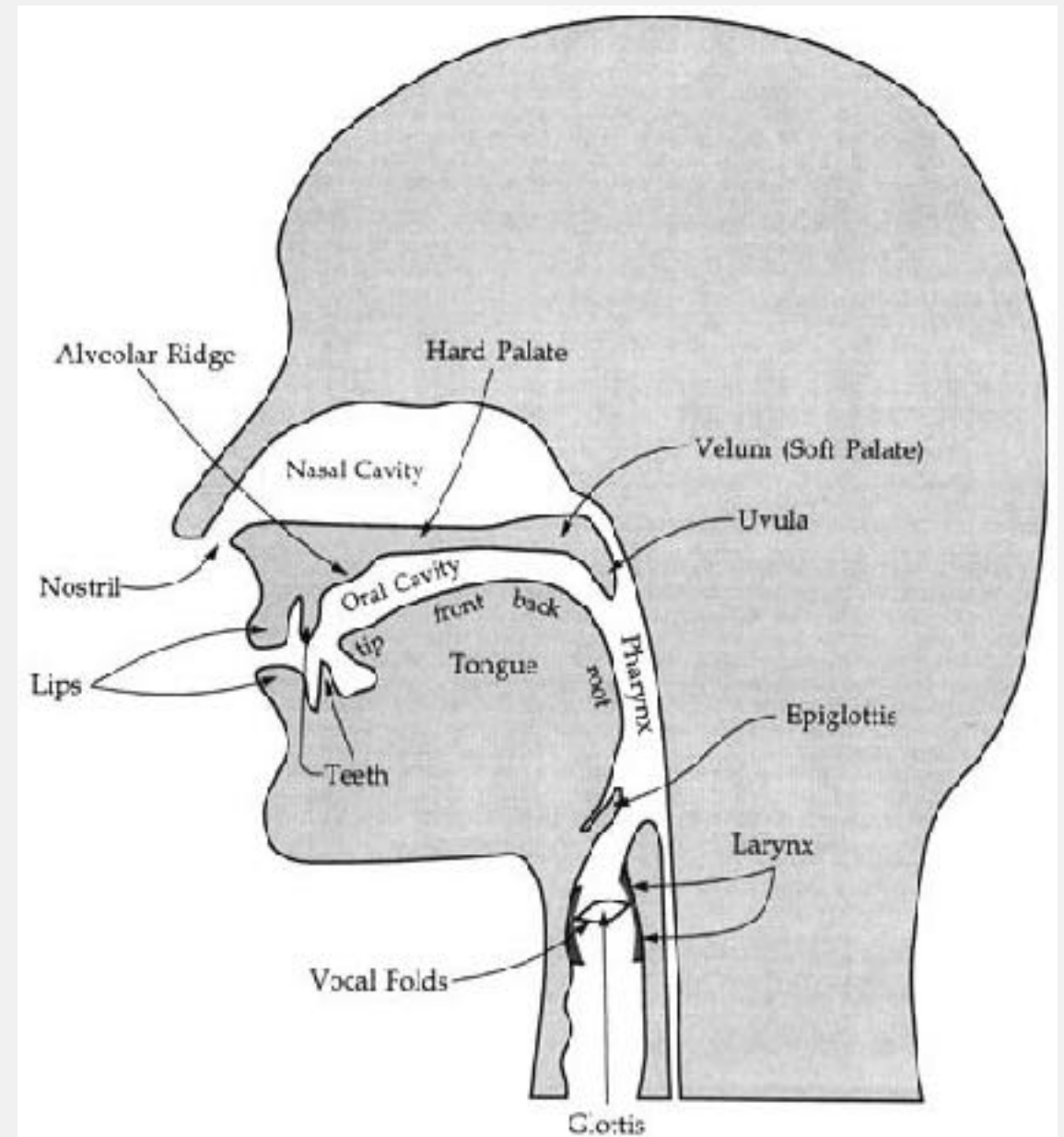
- **Place:** **Where** does the obstruction in the vocal tract occur?
- The **mouth** can be **narrowed in many ways** by the **lips** and the **tongue**.

Four Questions for Consonants

1. **Vocal Folds (“glottal state”)**: voiced or voiceless?

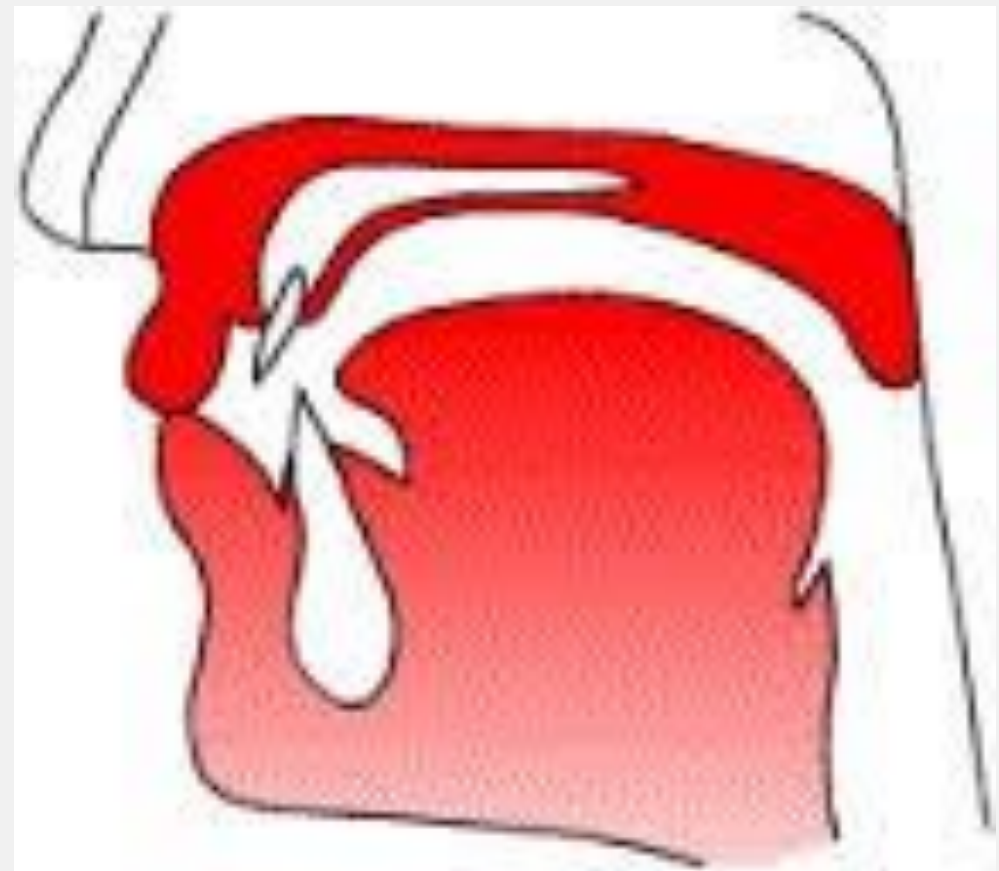
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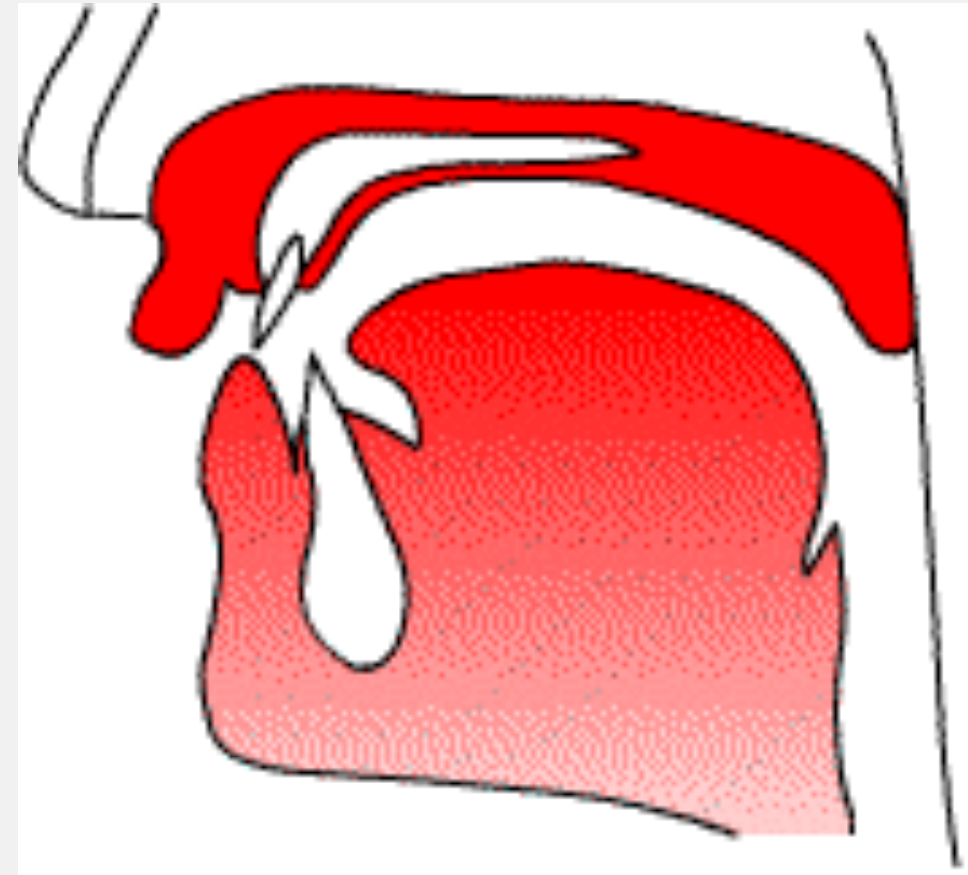
Place: Lips

- **Bilabial:** lips together
- [p] **p**at [b] **b**at
- [m] **m**at



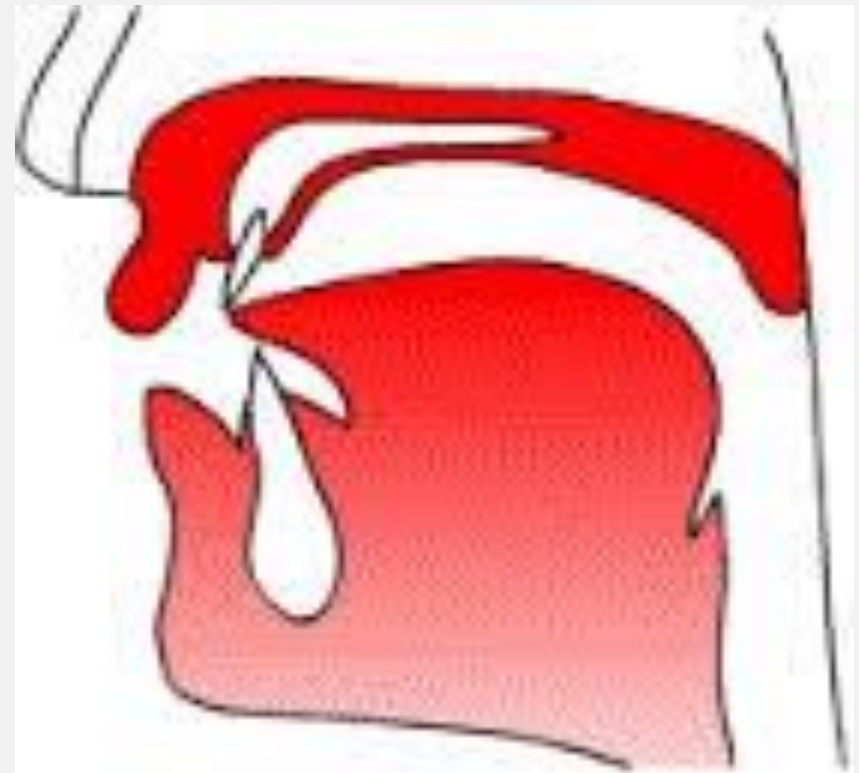
Place: Lips and teeth

- **Labiodental:**
Bottom lip and upper teeth
- [f] **f**an [v] **v**an



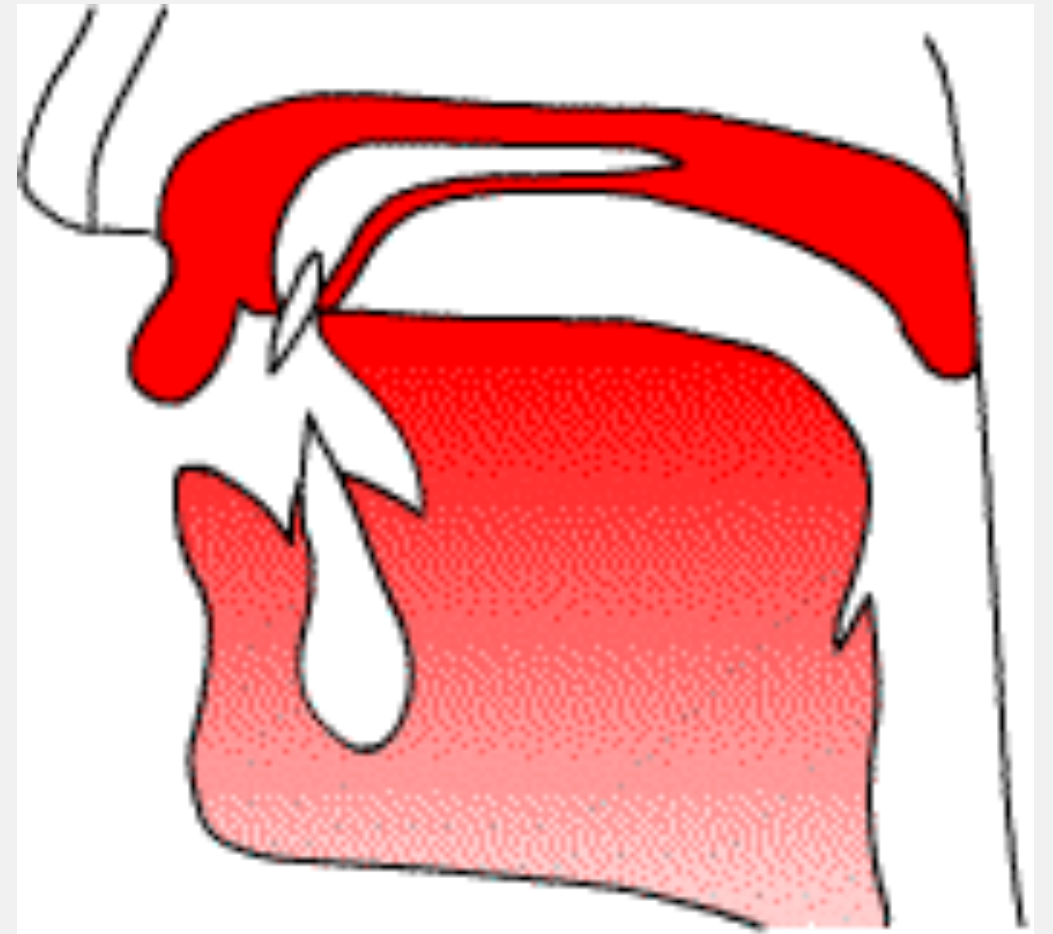
Place: Tongue tip between teeth

- **Interdental:**
tongue between teeth
- [θ] bath [ð] bathe



Place: Tongue tip and gum ridge

- **Alveolar:**
Tip of the tongue
and alveolar ridge
- [t] **t**in [d] **d**in
- [n] **n**ine
- [s] **s**ap [z] **z**ap
- [l] **l**ap [r] **r**ap



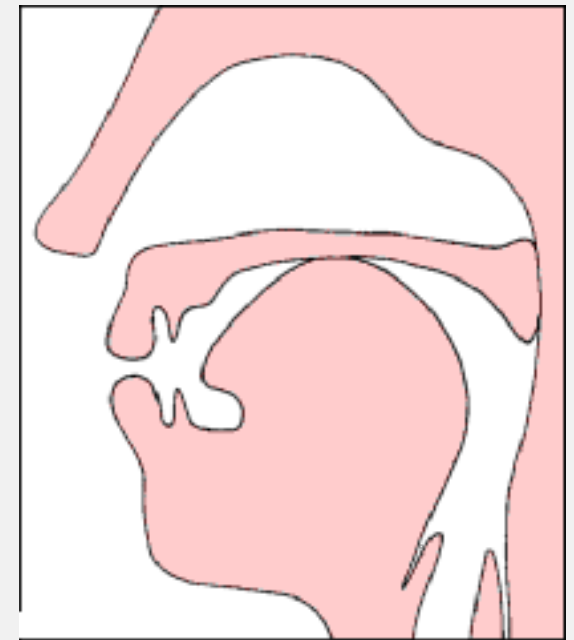
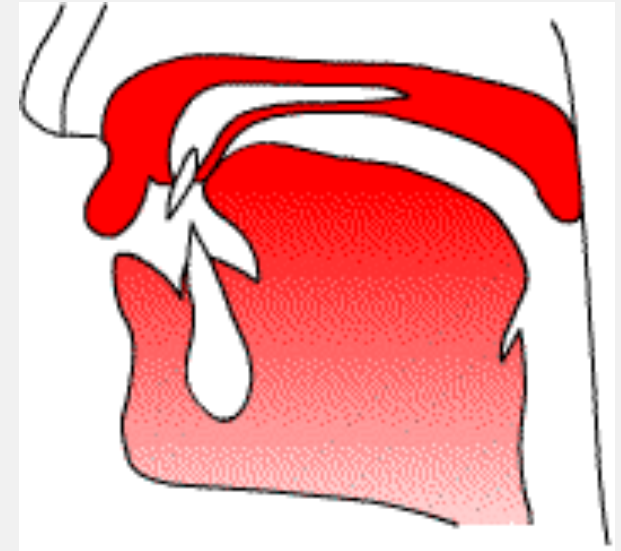
Place: Tongue tip behind the gum

- **Retroflex:** tip of tongue curled back
 - Occur in 20% of world's languages
 - Particularly common in South Asian and Australian/Western Pacific languages
 - /r/ in (e.g.) *rip* for some English speakers

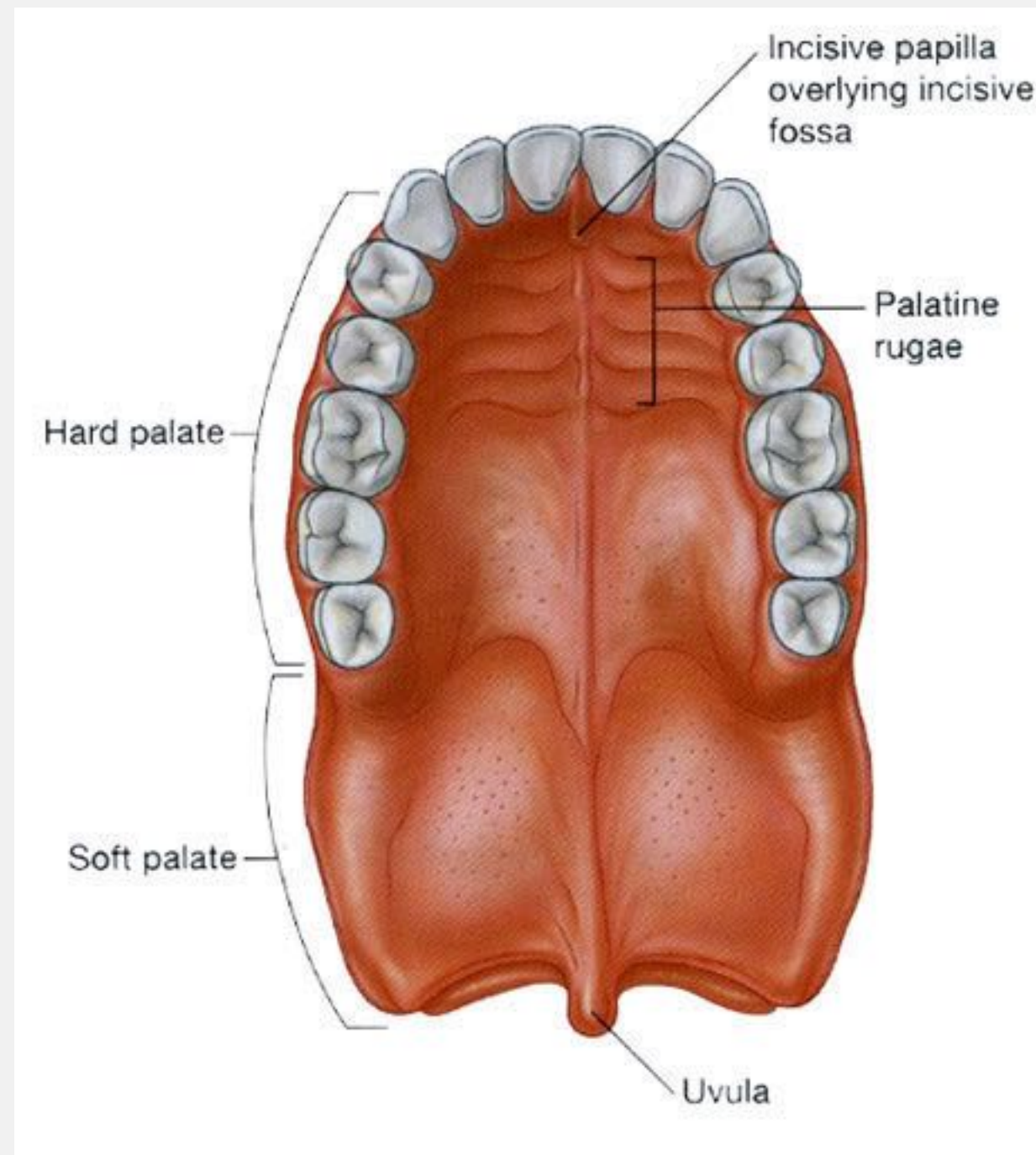


Place: Tongue Body behind the gum

- **Postalveolar:** tongue body and **back** of alveolar ridge
 - [ʃ] **shine** [ʒ] **treasure**
 - [tʃ] **chimes** [dʒ] **judge**
- **Palatal:** tongue body and hard palate
 - [j] **yes**

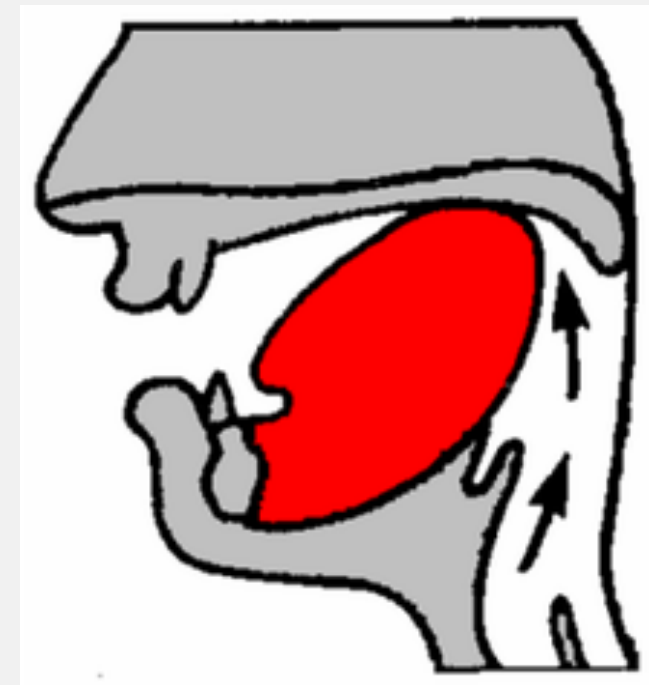


The palate(s)



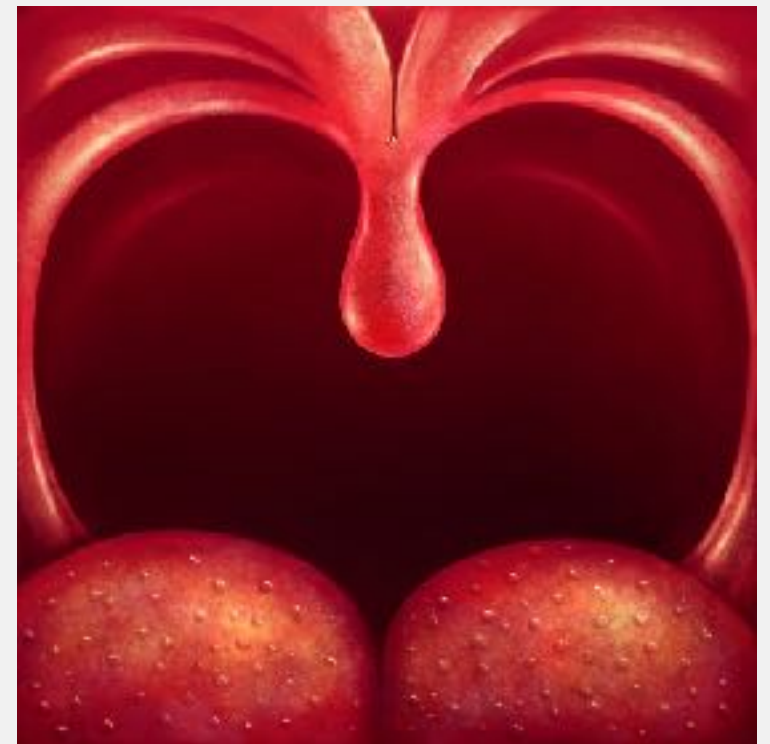
Place: Tongue Back and soft palate

- **Velar:** Back of the tongue and soft palate (the **velum**)
- [k] **back** [g] **bag**
- [ŋ] **bang**



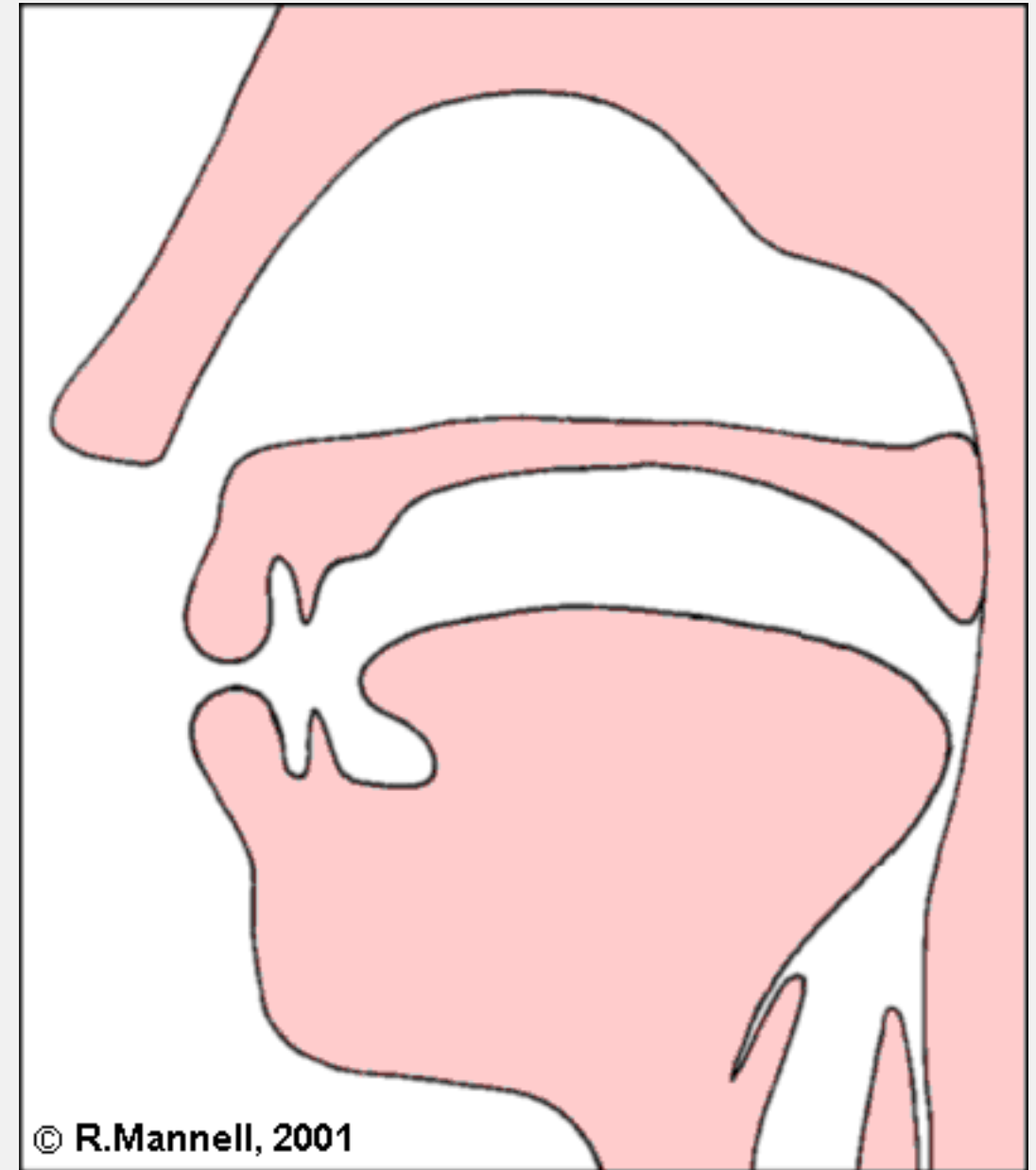
Place: Tongue back and uvula

- **Uvular:** Tongue back raised towards uvula
- uvular stops [q] and [G] occur in (e.g.) Arabic
- uvular trills and fricatives occur in (e.g.) German and French
- “je ne **regrette rien**...”



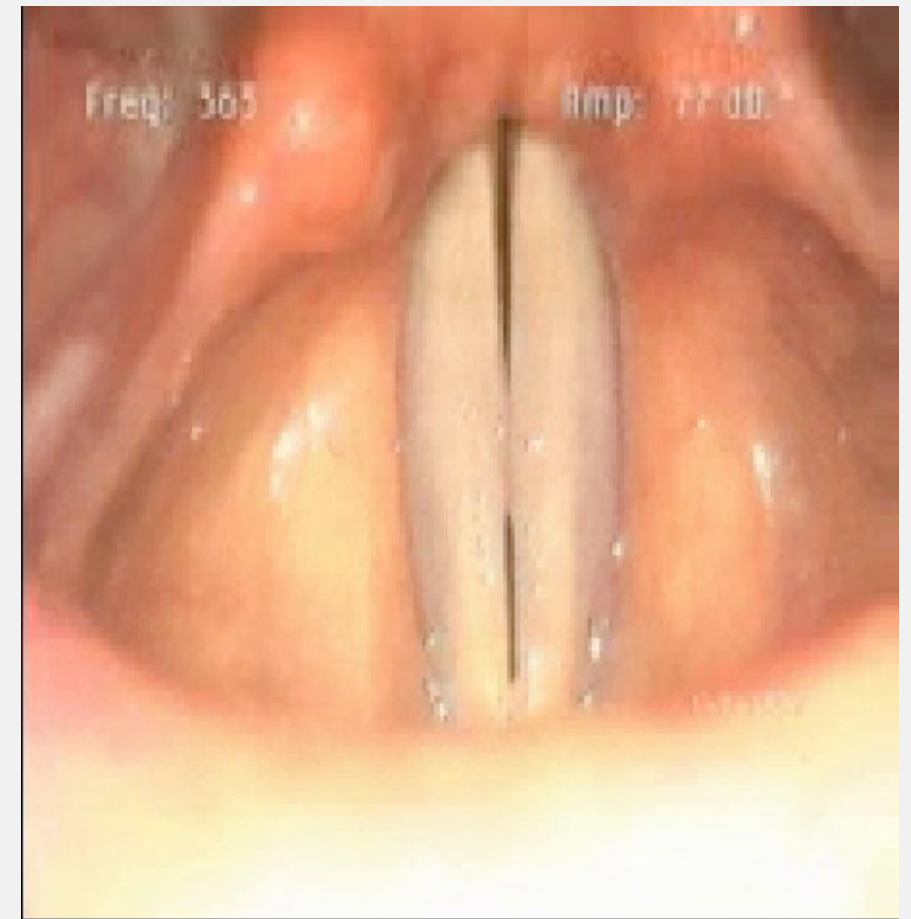
Place: Tongue back and pharynx

- **Pharyngeal:** back of tongue interacts with pharynx
- Pharyngeal sounds occur in (e.g.) Arabic and Danish
- (**Epiglottal** sounds pronounced in the lower pharynx, but the tongue isn't the important articulator.)



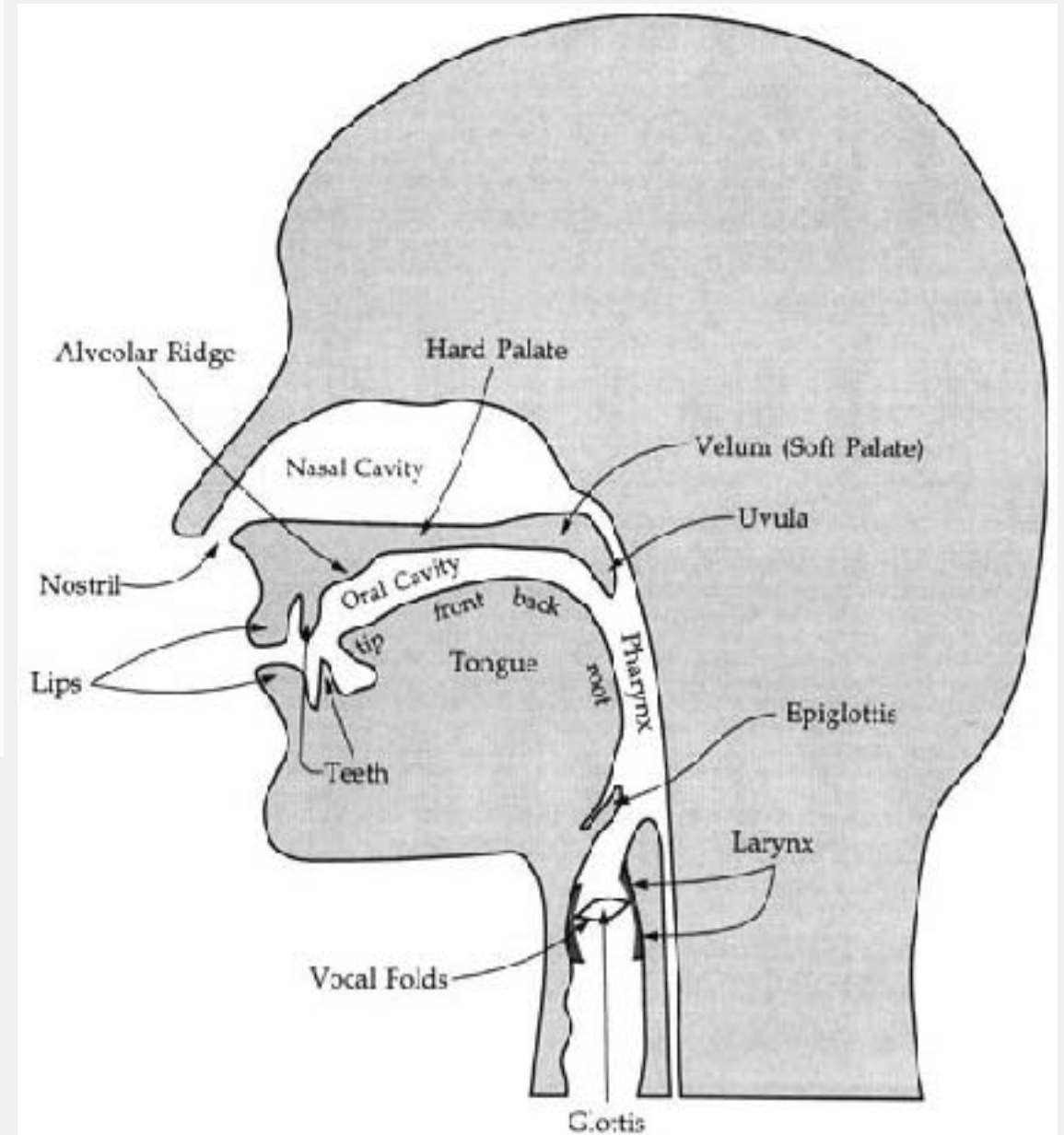
Place: Glottis

- **Glottal:** vocal folds together
 - [h] **hip**
 - [ʔ] **uh-oh!**
 - (Don't confuse ʔ, [ʔ] and [ʕ]!)



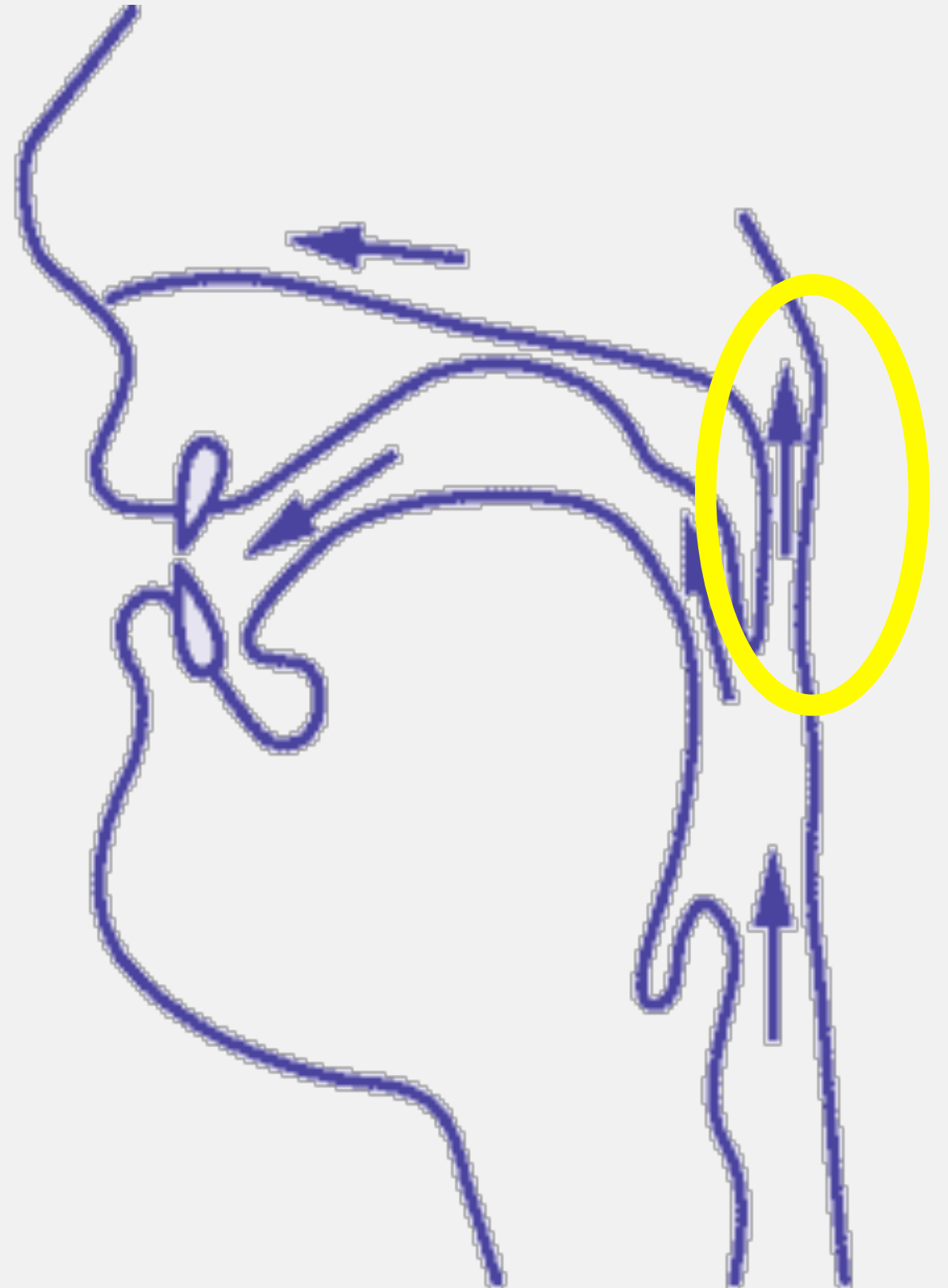
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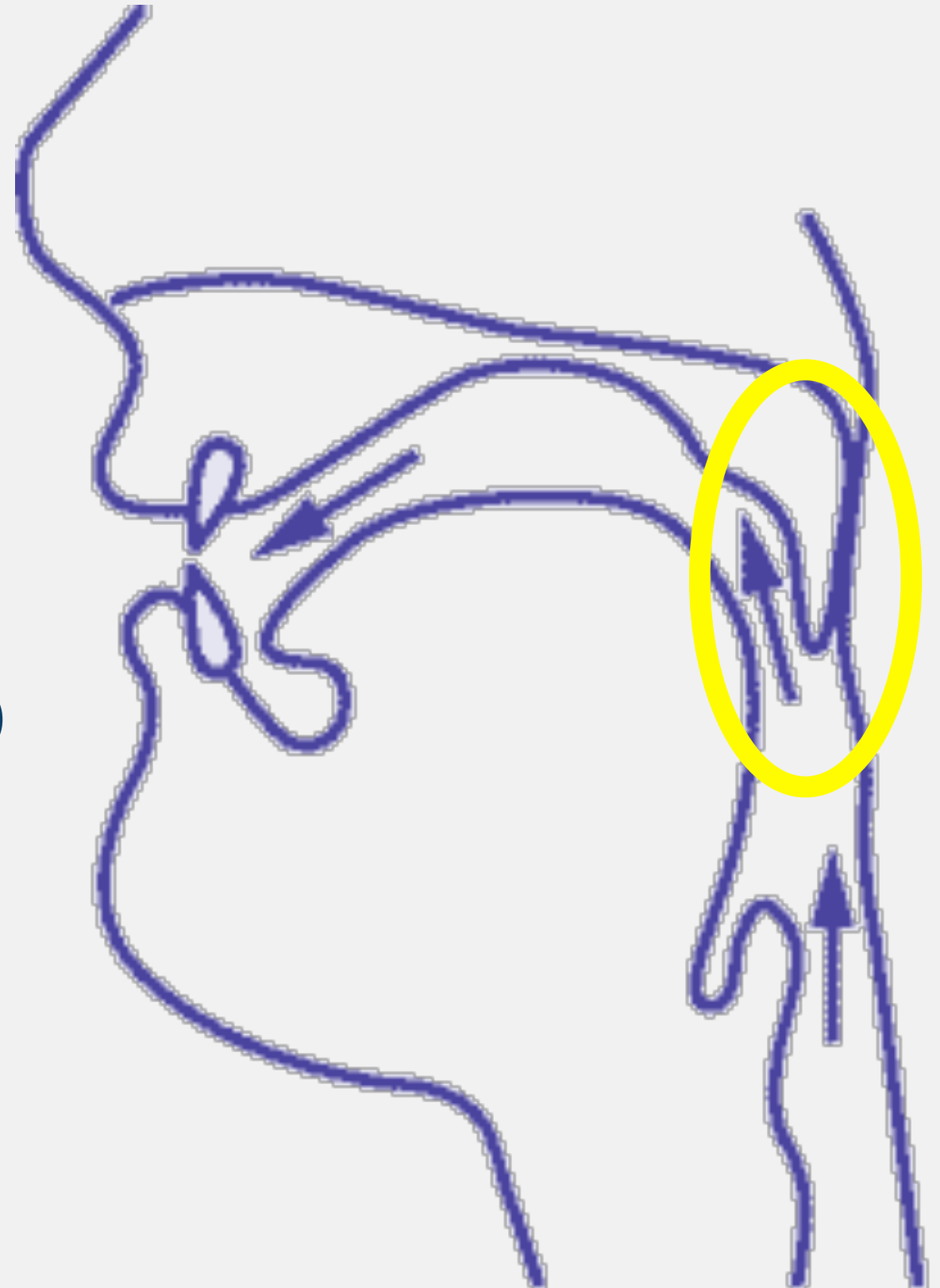
Mannar: Nasal

- **Nasal:**
Open velum;
air flows through
nasal cavity
- Example sounds
 - [m] **pam**
 - [n] **pan**
 - [ŋ] **ping**



Oral/Nasal

- **Oral:**
Velum closed
oral air-flow only
- Example sounds:
 - [b] da**b** (vs [m] da**m**)
 - [d] pa**d** (vs [n] pa**n**)
 - [g] pi**g** (vs [ŋ] pi**ng**)



Manner: Stops

- **Closure:**

How narrow is the mouth at the place of the sound?

- **Stop:** **complete closure** in mouth or glottis, creating a **build up of pressure** usually followed by a release

- [p] **pat** [b] **bat**
- [t] **tip** [d] **dip**
- [k] **back** [g] **bag**
- [m] **ram** [n] **ran** [ŋ] **rang**
- [ʔ] **uh-oh!**

NB: Nasal consonants are stops, because they involve oral closure. Oral stops are sometimes called **plosives**.

Manner: Flaps/taps

- **Flap** or **tap**: like a brief stop, with no build up of pressure
- **Compare:**
 - [t] in city (rather careful speech)
 - an alveolar stop
 - [ɾ] in city (casual American speech)
 - an alveolar flap
 - [ʔ] in city (rather casual British speech)
 - a glottal stop

Manner: trills

- **Trill:** A vibration of one articulator against another
 - [r] (in, e.g., Spanish perro): an alveolar trill
 - (compare Spanish pero, typically pronounced with a flap [r])
 - [R]: a uvular trill
 - occurs in French and German (but often pronounced as a fricative)

Manner: Fricative

- **Fricative:**
opening **too narrow** for the air to flow smoothly;
this creates turbulence
- [f] **fan** [v] **van**
- [θ] **bath** [ð] **bathe**
- [s] **sap** [z] **zap**
- [ʃ] **shine** [ʒ] **treasure**
- [h] **hit**

Manner: Affricate

- **Affricate:** a stop with a fricative release
- [tʃ] **watch**
- [dʒ] **judge**

Manner: Approximant

- **Approximant:** relatively slight closure
- **Liquid:**
 - [l] lip
 - [ɹ] rip
- **Glide:**
 - [j] yes
 - [w] **w**weather (labiovelar: tongue back towards velum with rounded lips)
 - The initial sound in **wh**ether is unvoiced ([ɰ]) for some speakers

Describing Consonants with Features

- **All consonants** can be described using **these 3 properties** (voicing, place, manner)
- **Examples:**
 - voiceless bilabial stop [p]
 - voiceless palatal affricate [tʃ]
 - voiced interdental fricative [ð]
 - voiced velar nasal [ŋ]

IPA Consonant chart

THE INTERNATIONAL PHONETIC ALPHABET (2005)

CONSONANTS (PULMONIC)

Place

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

Where symbols appear in pairs, the one to the right represents a modally voiced consonant, except for murmured ɦ. Shaded areas denote articulations judged to be impossible. Light grey letters are unofficial extensions of the IPA.

[Clickable IPA Chart with sounds](#)

IPA Consonant chart

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Plosive	p b	ɸ β	t d			ʈ ɖ	c ɟ	k ɡ	q ɢ	ʔ		ʔ
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	ħ ʕ	h ɦ
Approximant		ʋ	ɹ			ɻ	j	ɰ				
Trill	ʙ		r						ʀ		ʀ	
Tap, Flap		ⱱ	ɾ			ɽ						
Lateral fricative			ɬ ɮ			ɮ	ɬ	ɮ				
Lateral approximant			l			ɭ	ʎ	ʟ				
Lateral flap			ɭ			ɮ						

Where symbols appear in pairs, the one to the right represents a modally voiced consonant, except for murmured ɦ. Shaded areas denote articulations judged to be impossible. Light grey letters are unofficial extensions of the IPA.

Manner

[Clickable IPA Chart with sounds](#)