Phonetics- I

HUL 242

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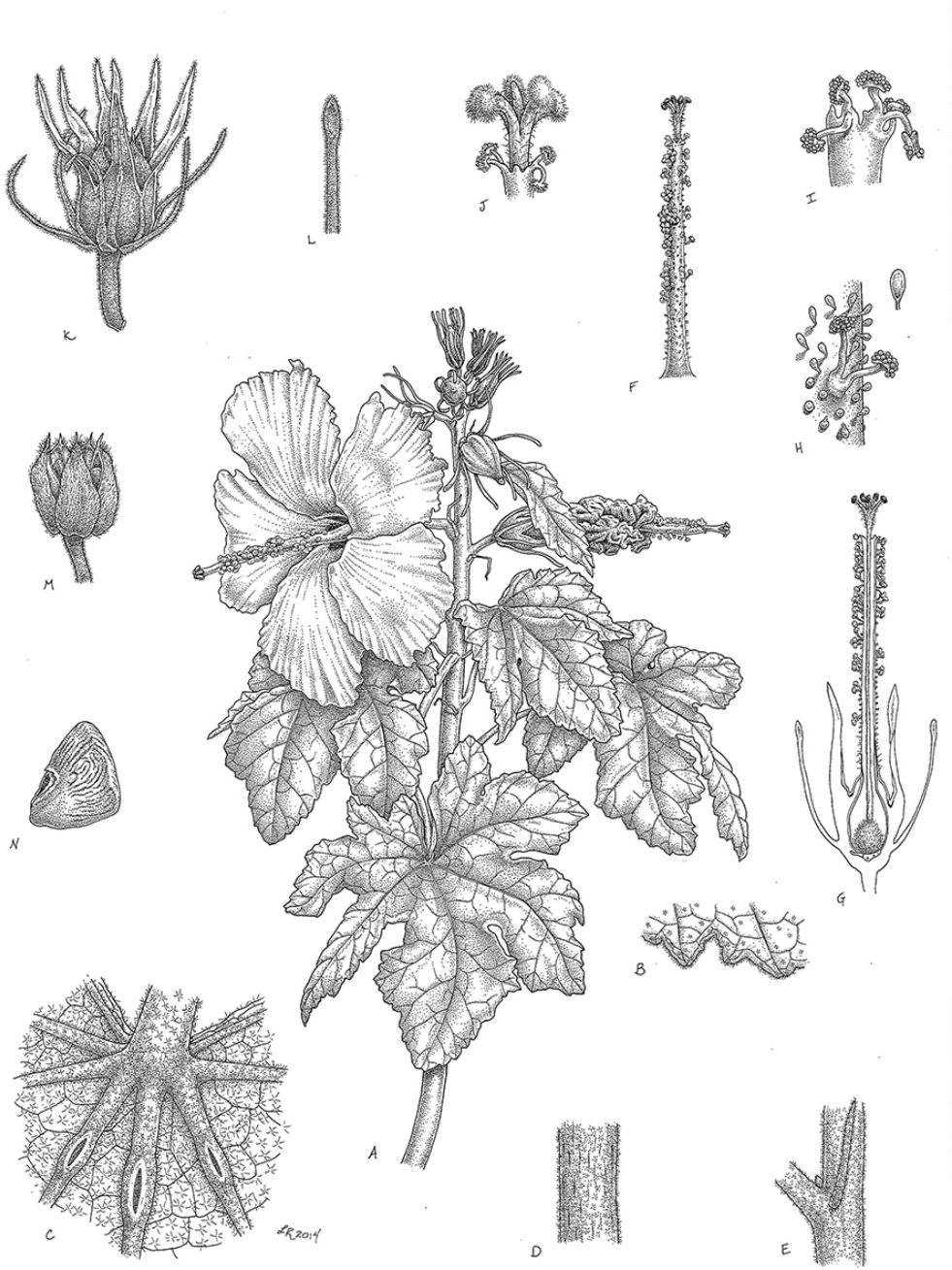
23rd Jan 2023

Primitives of human language

- In this part of the course, the focus will be on the levels of analysis of language
  - Phonetics: sounds of human speech
  - Phonology: sound patterns of language(s)
  - Morphology: internal structure of words, word formation
  - Syntax: words combined into phrases and sentences


K
L
J
F
I
H
M
N
A
G
B
C
D
E

Phonetics

- How do you sing a song in a language you don't know?
- When we study language, the first thing to learn are its sounds

Image source:discogs.com

- **Phonetics** is the study of speech sounds

Speech sounds

- To describe speech sounds, it is necessary to know what an individual sound is
- When we hear *bus*, we are able to distinguish three sounds b-u-s, i.e. **segment** the stream of speech
- Pauses between words are often less distinct than we imagine– (*There's a bad moon on the rise* $\rightarrow$ *There's a bathroom on the right*)
- When we know a language, despite obvious cues we are able to understand what people mean

Speech sounds

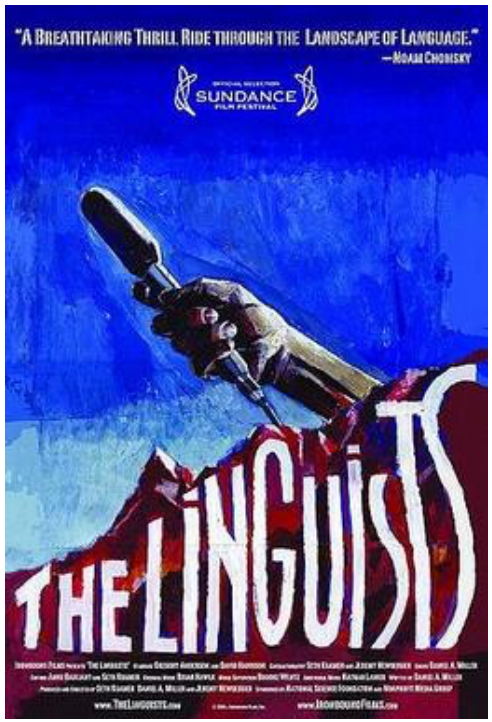
- A language has an inventory of sounds that distinguishes it from others
- E.g. *the thermos* in English will be difficult to produce for French speakers "*ze sermos*"
- To describe a language, we begin with the most basic building blocks: the sounds that it contains
- Other ways to study sounds:
  - *acoustic phonetics*:- physical properties of sounds
  - *auditory phonetics*:- how listeners perceive sounds
  - *articulatory phonetics* :- how the vocal tract produced the sounds of language

Sound systems vs. writing systems

- When we write language, it is not as precise as speech
- Writing systems have evolved differently worldwide–from alphabetic, logographic to alpha-syllabic (most of our Indic scripts)
- Writing systems can be very imprecise: English writing system 
  - Words that rhyme with *I* are *try*, *buy*, *cry*
  - Same sound- many different letters!
  - *face*, *much*, *chrome*, *candy*
  - How do we pronounce 'c' in the above words?

Not all languages have a writing system!

- There are many languages in the world that lack a written form
- How do we represent the sounds of such languages?
- Questions that faced many early linguists documenting languages



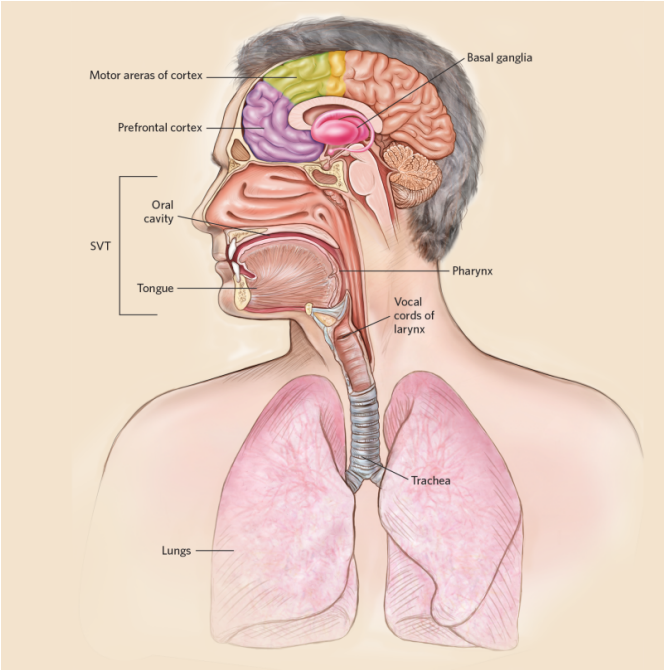
Early notations

- 'Visible Speech' by Melville Bell: a tool to help hearing impaired students learn spoken language (1860s)
- Noting the sounds of speech independent of the choice of particular language or dialect
- Melville Bell's demonstrations and lecture tours with his three sons on Visible Speech were popular
- Early phoneticians wanted to represent speech precisely: Henry Sweet/Henry Higgins (elocution lessons for Eliza Doolittle)

Transcription

- Eventually, this resulted in IPA: International Phonetic Alphabet to *transcribe* sounds (1886)
- Transcription: Process of writing sounds as they are spoken
- In order to represent sounds across languages and within a language

Producing sound



- Lungs, vocal cords, vocal tract responsible for the production of airflow, pitch and speech sounds
- Increased synaptic connectivity between cortical and subcortical regions (fine motor movements)

Image: www.the-scientist.com

Articulators in the vocal tract

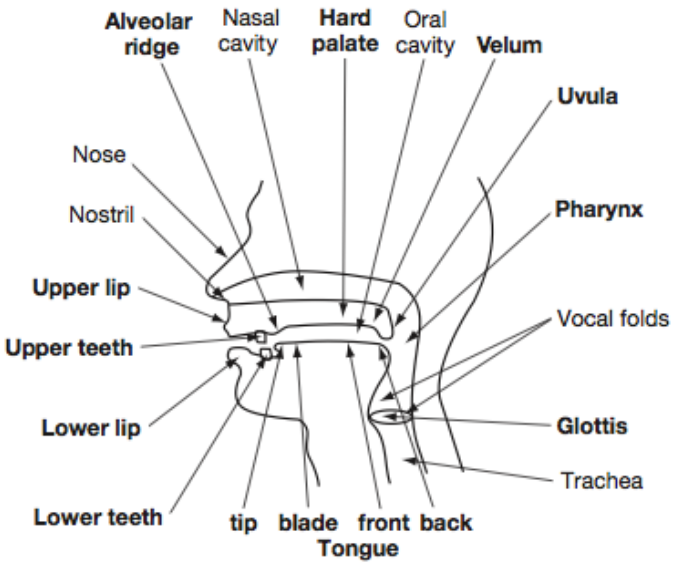
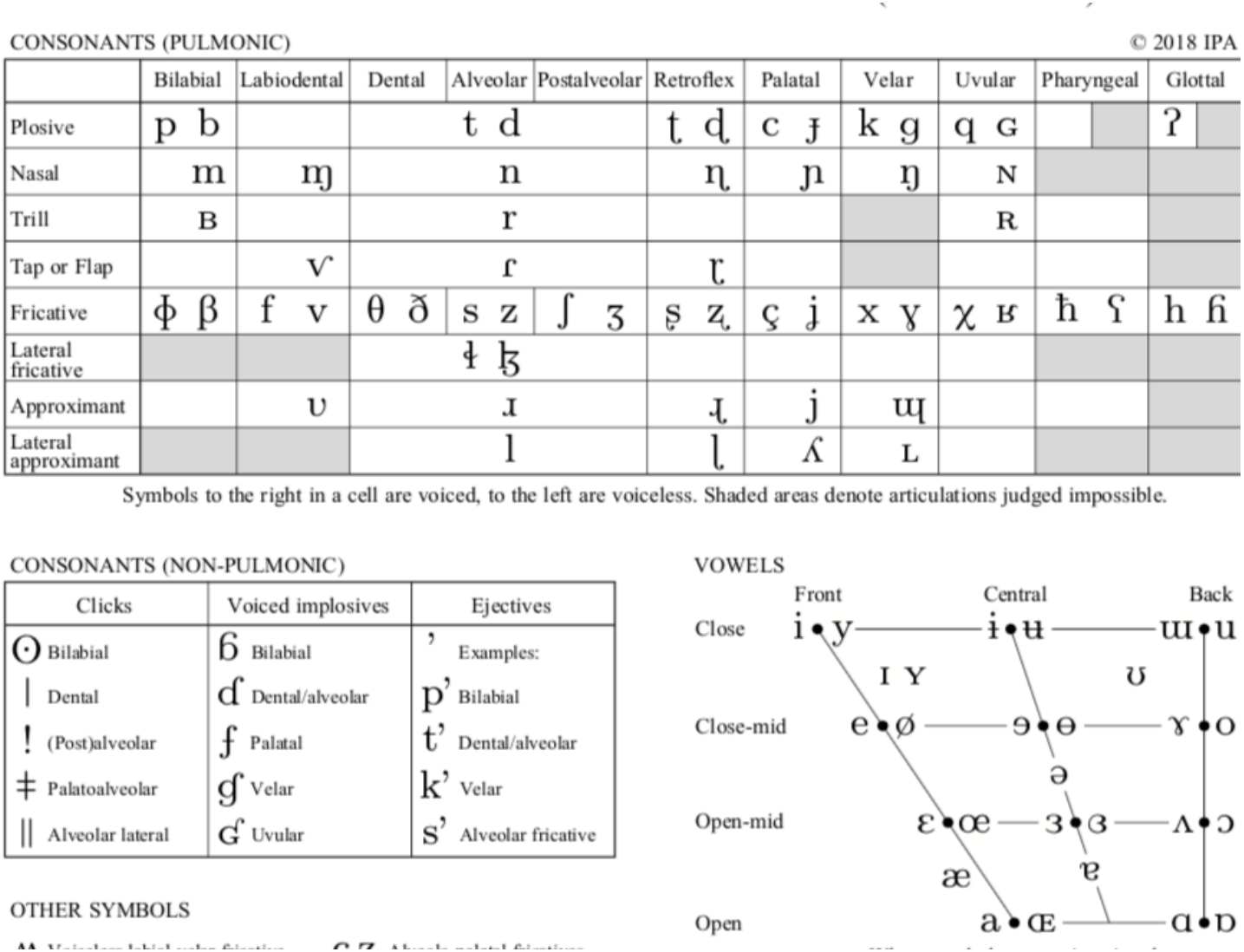


Figure 3.1 The vocal tract

- MRT (Magnetic resonance tomography) of a person speaking German
- `https://youtu.be/6dAEE7FYQfc`

A portion of the IPA (2018) chart

https://upload.wikimedia.org/wikipedia/commons/8/8e/IPA_chart_2018.pdf



CONSONANTS (PULMONIC) © 2018 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
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		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	’ Examples:
ǀ Dental	ɗ Dental/alveolar	pʼ Bilabial
ǃ (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

OTHER SYMBOLS

VOWELS

Consonants and Vowels

Consonants vs. vowels

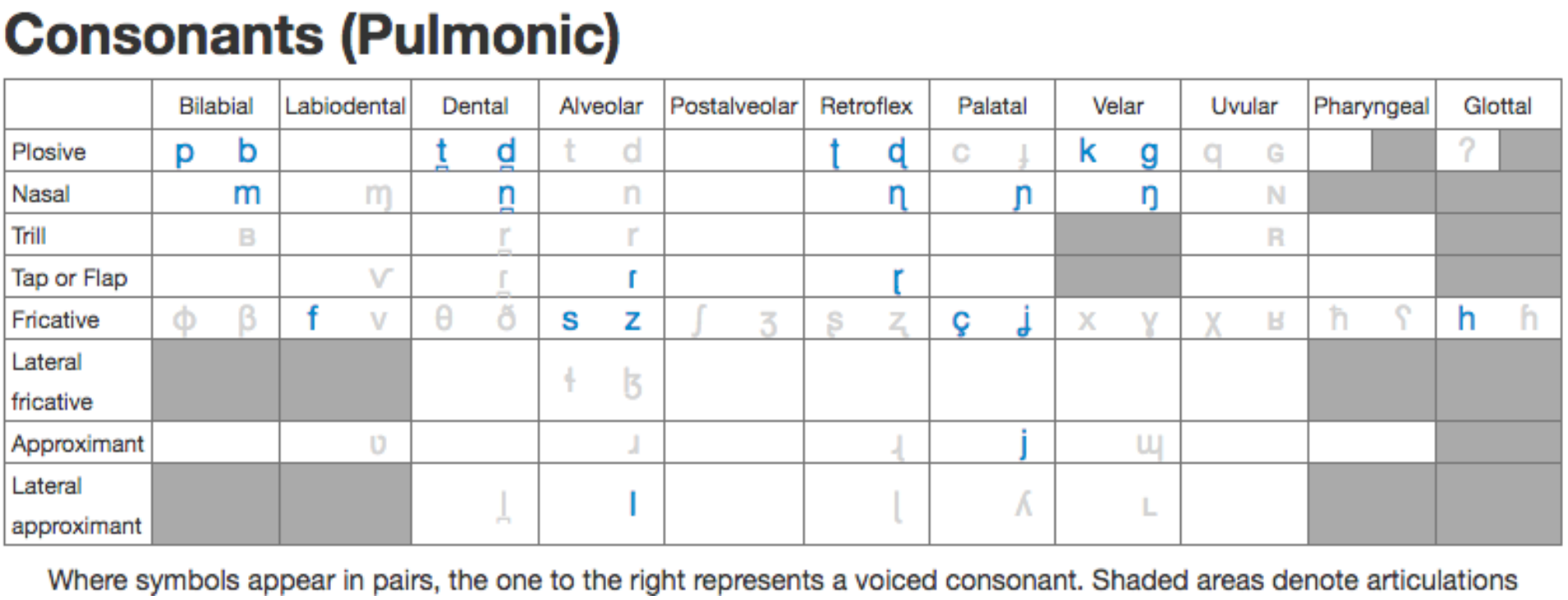
In general, consonants are produced with a greater degree of constriction in the vocal tract that impedes air flow coming through the lungs
Vowels are produced without constriction

Classification of consonants

1. Place of articulation
2. Manner of articulation

Hindi consonants in IPA

(Non-Hindi sounds are greyed out)



Consonants (Pulmonic)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t̪ d̪	t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ	n̪	n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ		r̪	r					ʀ		
Tap or Flap		ⱱ	ɾ̪	ɾ		ɽ					
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		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant			l̪	l		ɭ	ʎ	ʟ			

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

Pulmonic consonants: an air stream coming from the lungs pushed out from mouth/nose

Source: phoible.org

The ordering of *varnamala*

vyanjana (Consonants)

- **Bilabial**: Bottom lip + top lip: Examples: /p/,/p^h/,/b/, /b^h/,/m/ [oshthya]

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- **Retroflex**: Tongue tip (curled back) + place between hard palate and alveolar ridge /ʈ/, /$ʈ^h$/ ,/ɖ/, /$ɖ^h$/, /ɳ/ [murdhanya]

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- **Palatal**: Front of the tongue + hard palate /ʧ/, / ʧʰ /, /ʤ/, /ʤʰ/, /ɲ/ [talavya]

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- **Palatal**: Front of the tongue + hard palate /ʧ/, / ʧʰ /, /ʤ/, /ʤʰ/, /ɲ/ [talavya]
- **Velar**: Back of the tongue + velum. Examples /k/,/kʰ/,/g/, /gʰ /, /ŋ/ [kanthya]

Consonants

Additionally..

- Alveolar: Tongue tip + alveolar ridge /s/
- Post-alveolar: Tongue tip + Region behind alveolar ridge. /ʃ/
- Glottal: Vocal folds /ɦ/

What is the place of articulation for /m/

1. Dental
2. Velar
3. Alveolar
4. Bilabial

What is the place of articulation for /m/

1. Dental
2. Velar
3. Alveolar
4. Bilabial ✓

What is the place of articulation for /k/

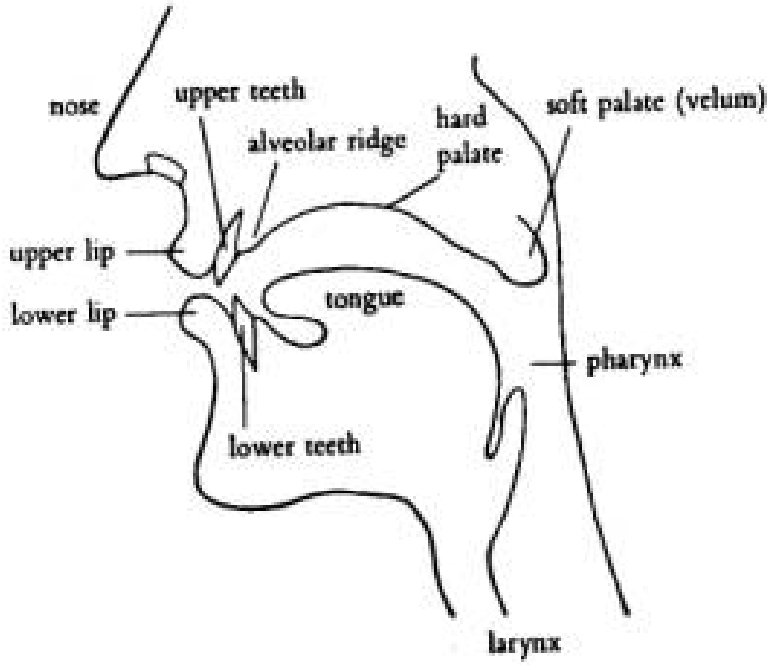
1. Dental
2. Velar
3. Alveolar
4. Bilabial

What is the place of articulation for /k/

1. Dental
2. Velar ✓
3. Alveolar
4. Bilabial

Manner of articulation

- How are the articulators coming together?
- Buzz! Hiss! Pop!



Source:Max Planck

- Plosive or Stop: Air trapped between the articulators is suddenly released, creating a burst of sound. E.g. /p/.

Figure 4.2 Manner diagram for a plosive

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. /p^h/

- Fricative: Air escapes through a narrow constriction, making a continuous hissing sound.

Figure 4.3 Manner diagram for a fricative

Unlike plosives, it is possible to 'hold' a fricative for a long time. Try saying ssssss. Examples /s/, /ʃ/

- Nasal: Articulated in the same manner as a plosive but with the velum or soft palate lowered.

Figure 4.7 Manner diagram for a nasal

E.g. try alternating between a /d/ and /n/ to feel the movement of the velum.

- Approximant: Articulators are positioned in wide approximation, such that airflow is not restricted to such an extent as to cause friction.

Figure 4.4 Manner diagram for an approximant

Place the tongue in position to produce a /l/, /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 /j/, the air is felt around the centre of the mouth.

Trill

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**.

- How do the following speakers pronounce *store* ?

- http://accent.gmu.edu/browse_language.php?function=detail&speakerid=82 (glasgow)
- http://accent.gmu.edu/browse_language.php?function=detail&speakerid=503 (toronto)
- http://accent.gmu.edu/browse_language.php?function=detail&speakerid=496 (s. africa)
- http://accent.gmu.edu/browse_language.php?function=detail&speakerid=131 (australia)

https://en.wikipedia.org/wiki/Rhoticity_in_English

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Distinguishing between English dialects

In *rhotic* varieties, the /r/ sound is preserved in all pronounciation contexts in *non-rhotic* varieties /r/ sound is not produced immediately after a vowel (and not followed by another vowel)

https://en.wikipedia.org/wiki/Rhoticity_in_English

- 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 /ʧ/,/ʤ/

Figure 4.5 Manner diagram for an affricate

Distinction between voiced and voiceless sounds

- Vocal chords vibrate in voiced sounds like /b/,/d̪/,/g/ and do not in voiceless sounds /p/,/t̪/,/k/.

Voicing can be experienced by placing the fingers on the larynx and alternating between producing a voiced/voiceless sound.

Describing a consonant

- When we describe a consonant, we mention
  - Where is the sound made?
  - How are we making it?
  - Is it voiced or not ?
- For example, /p/ is a voiceless bilabial plosive

How will we describe the sound /g/ ?

1. Voiceless bilabial plosive
2. Voiced dental fricative
3. Voiced velar plosive
4. Voiceless retroflex

How will we describe the sound /g/ ?

1. Voiceless bilabial plosive
2. Voiced dental fricative
3. Voiced velar plosive ✓
4. Voiceless retroflex

References

- Rachael-Anne Knight. Phonetics: A coursebook. Cambridge University Press (2012)
- Mark Liberman's Linguistics course (`https://www.ling.upenn.edu/courses/ling001/phonology.html`