

Phonetics

Speech involves the production of an airflow, typically from the lungs, which gets obstructed in various ways in the vocal tract.

One way of categorizing the obstructions to the airflow in the vocal tract is by **place of articulation**.

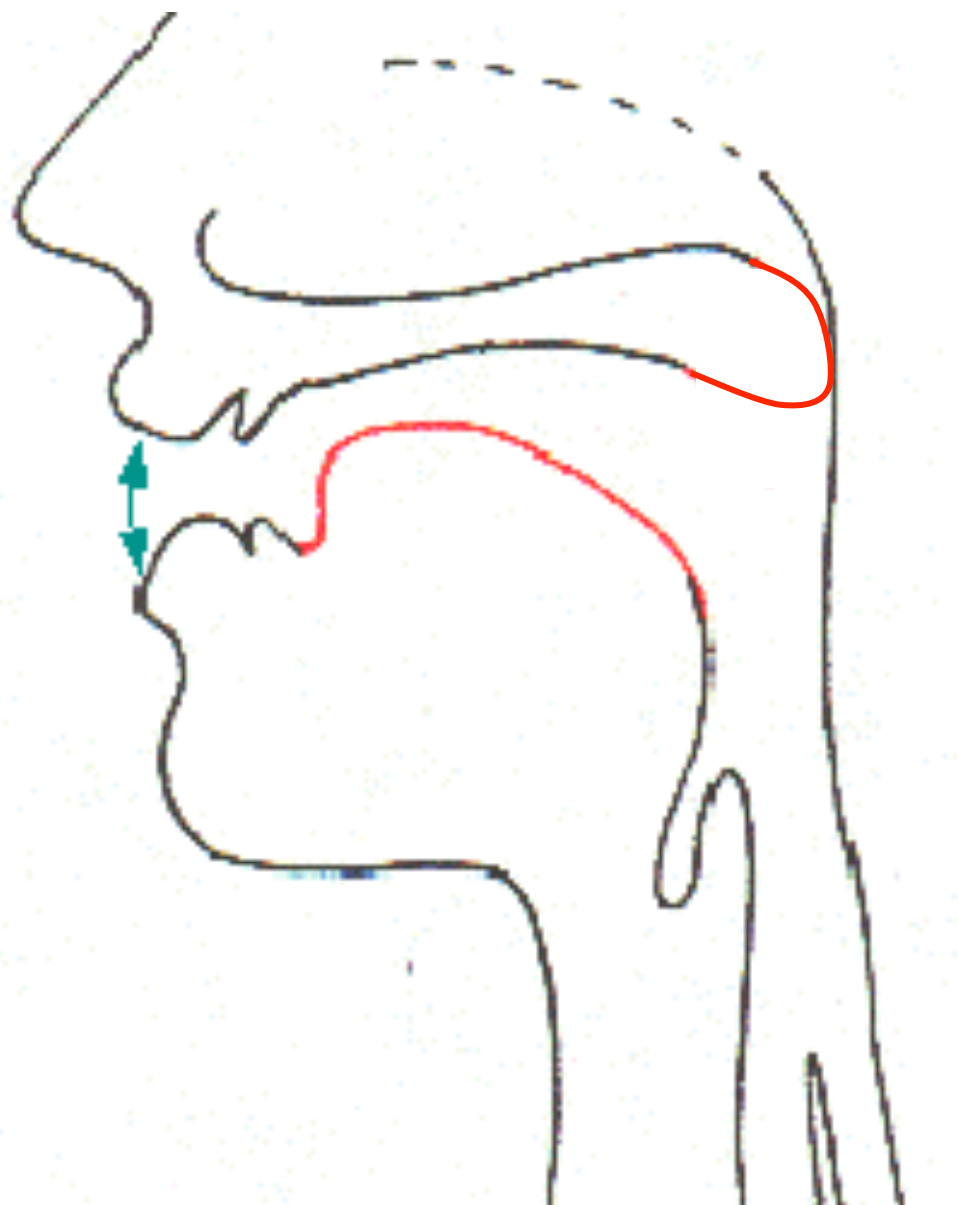
Bilabial: both lips.

[p] **p**aint

[b] **b**ath

[m] **m**ath

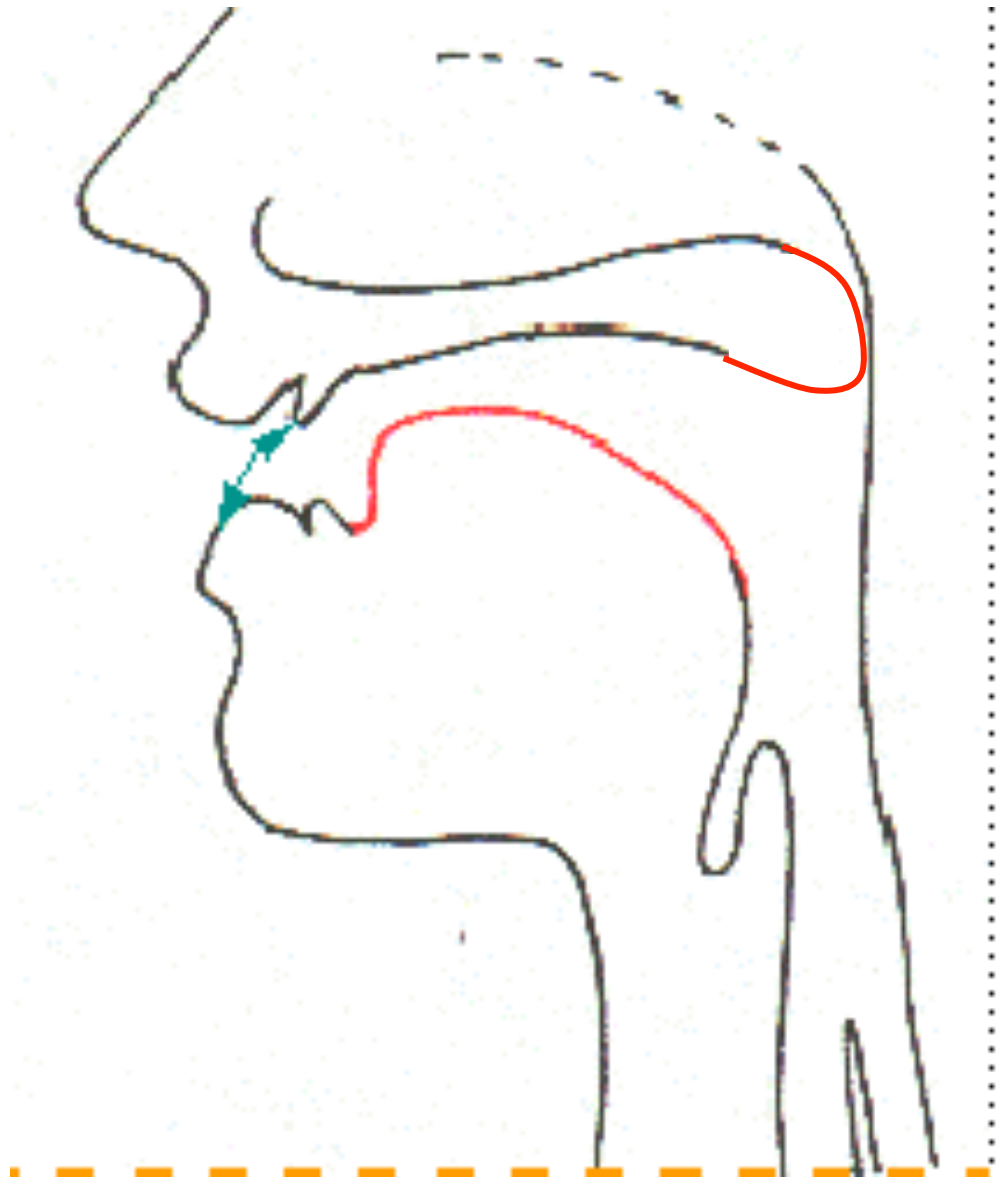
[w] **w**ipe



Labiodental: top teeth
and lower lip.

[f] **f**ace

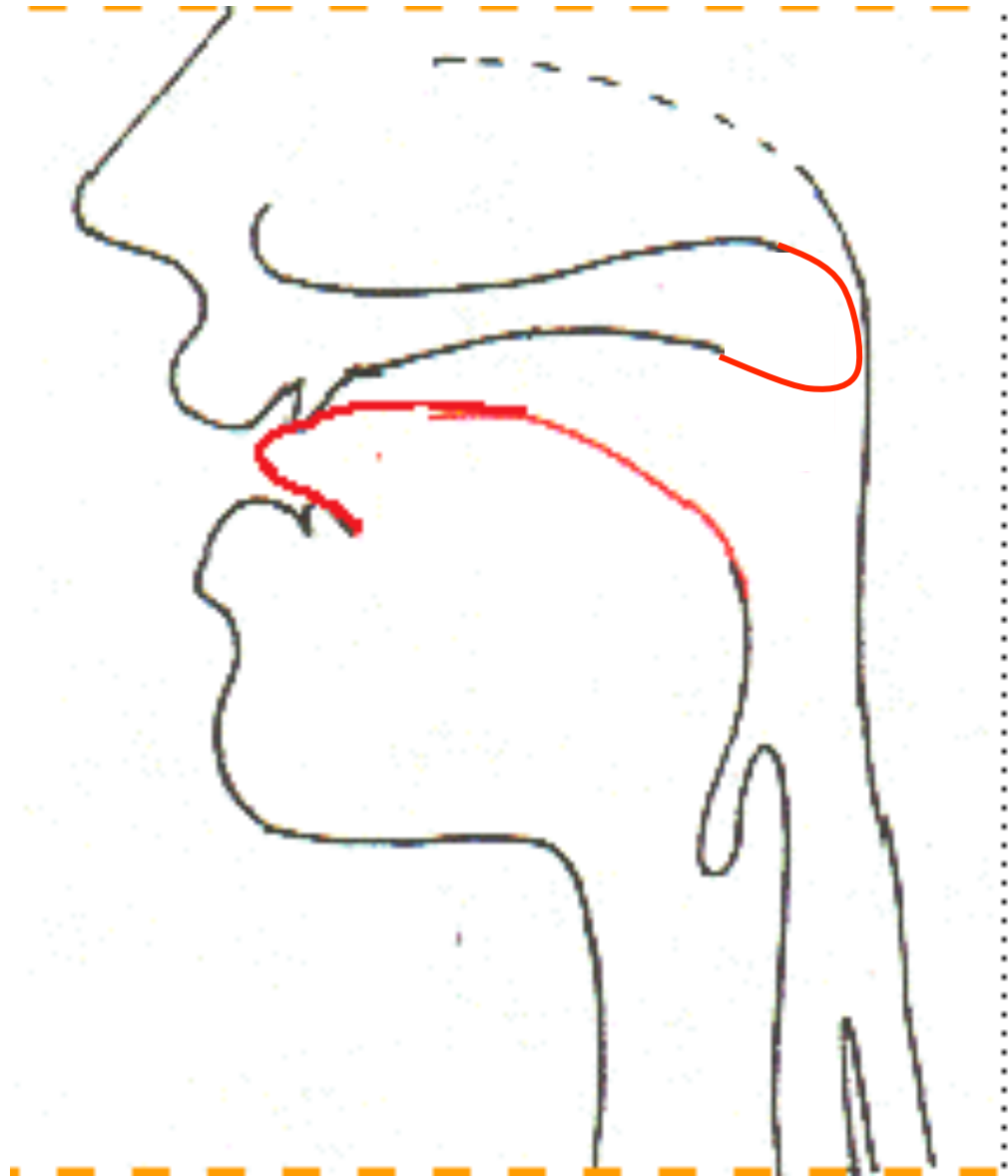
[v] **v**ase



Interdental: tongue
between the teeth.

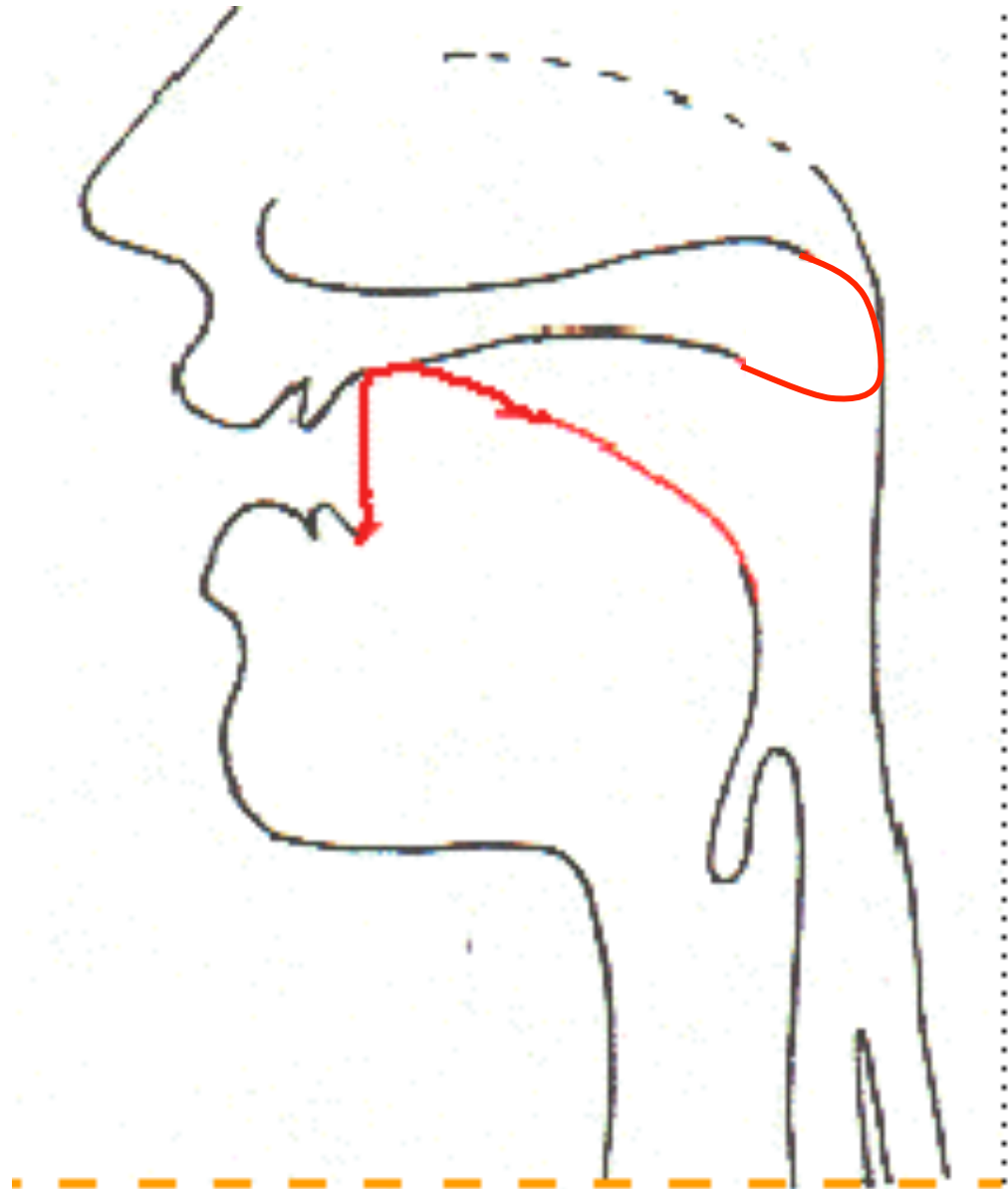
[θ] **th**istle

[ð] **th**is



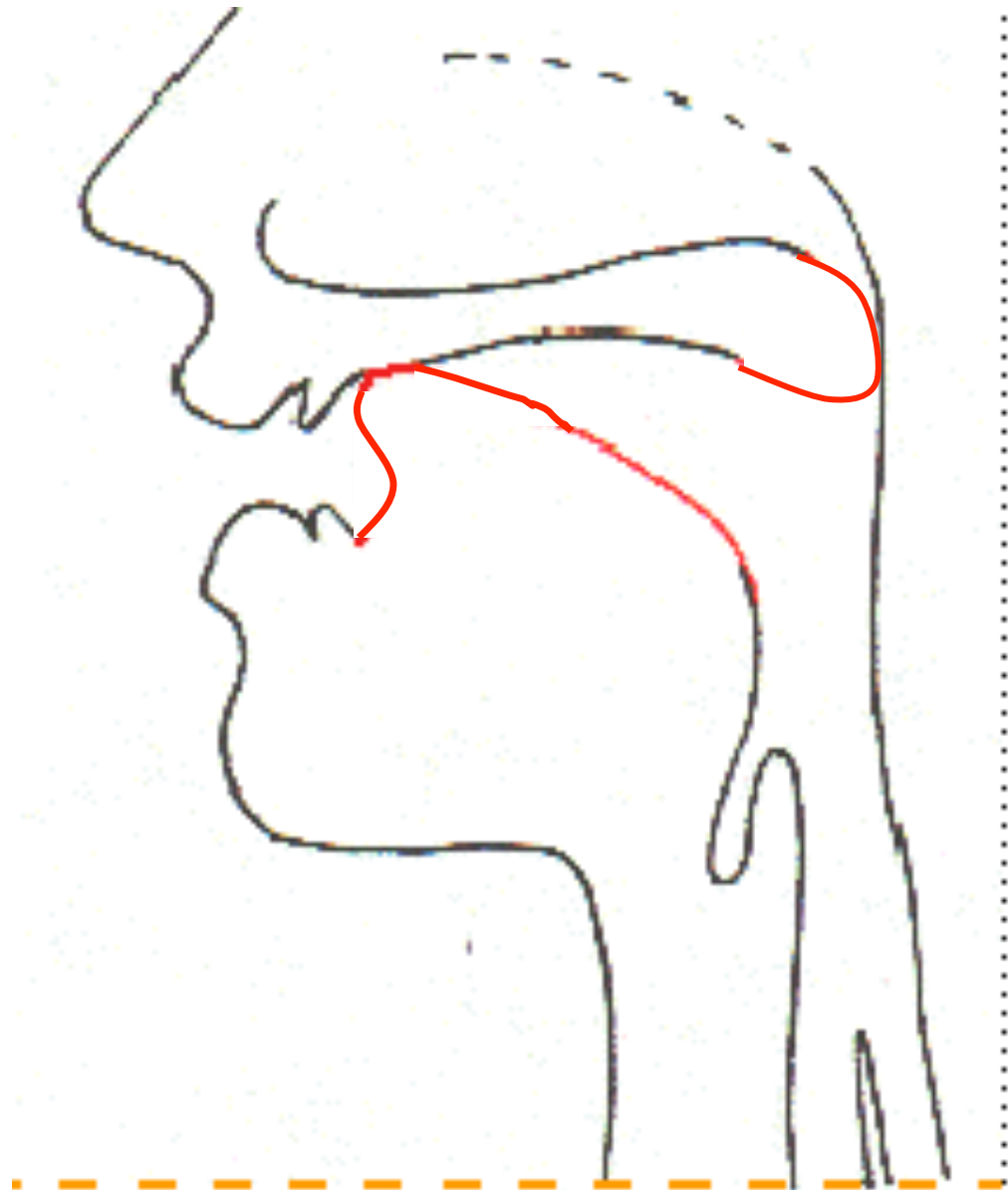
Alveolar: tongue tip
against the alveolar ridge,
just behind the top teeth.

[t]	<u>t</u>ee<u>t</u>h
[d]	<u>d</u>uc<u>k</u>
[s]	<u>s</u>ai<u>l</u>
[z]	<u>z</u>oo<u>m</u>
[n]	<u>n</u>ai<u>l</u>



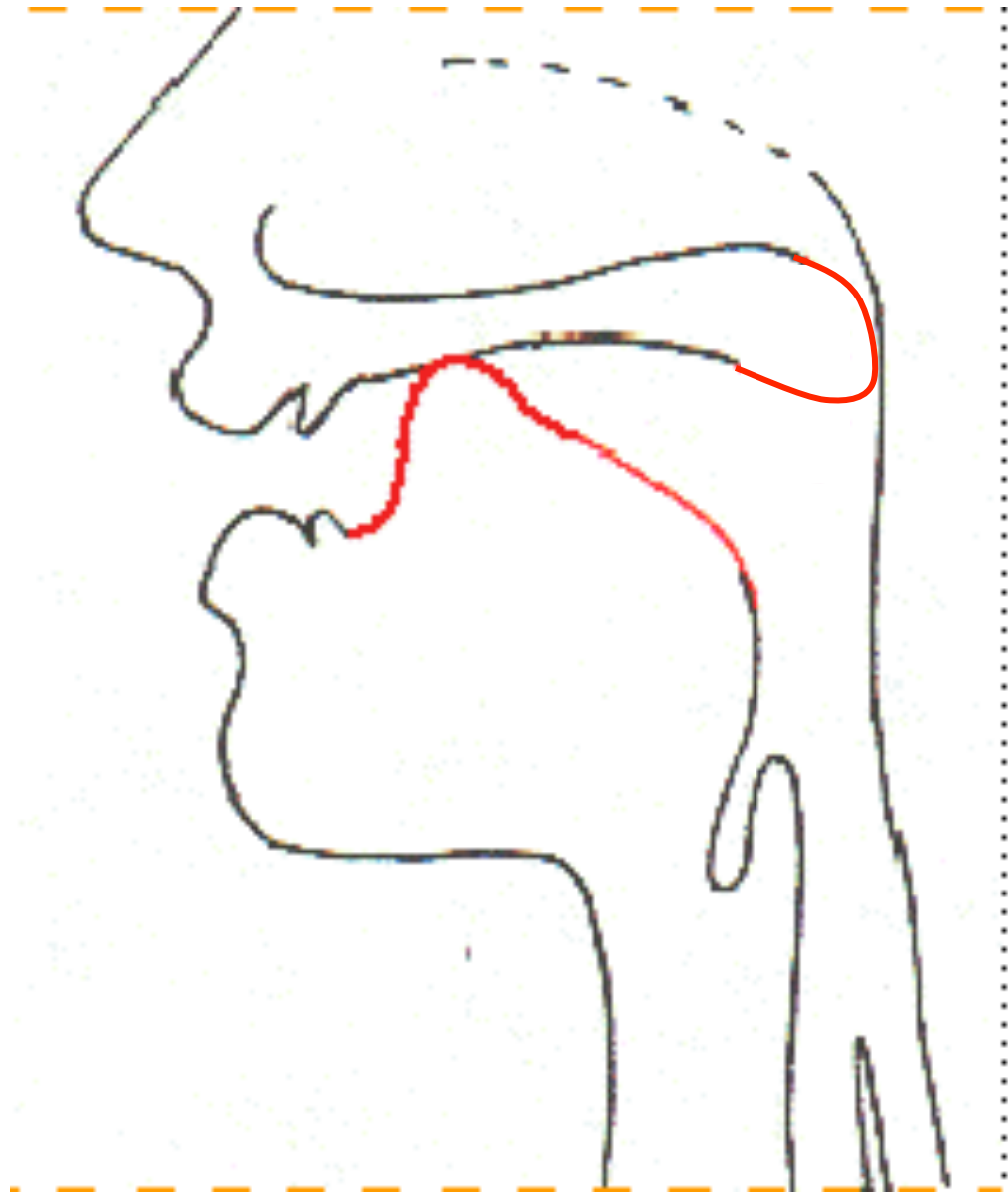
Alveopalatal: tongue blade slightly behind the alveolar ridge (also called "postalveolar").

[ʃ] ship
[ʒ] azure



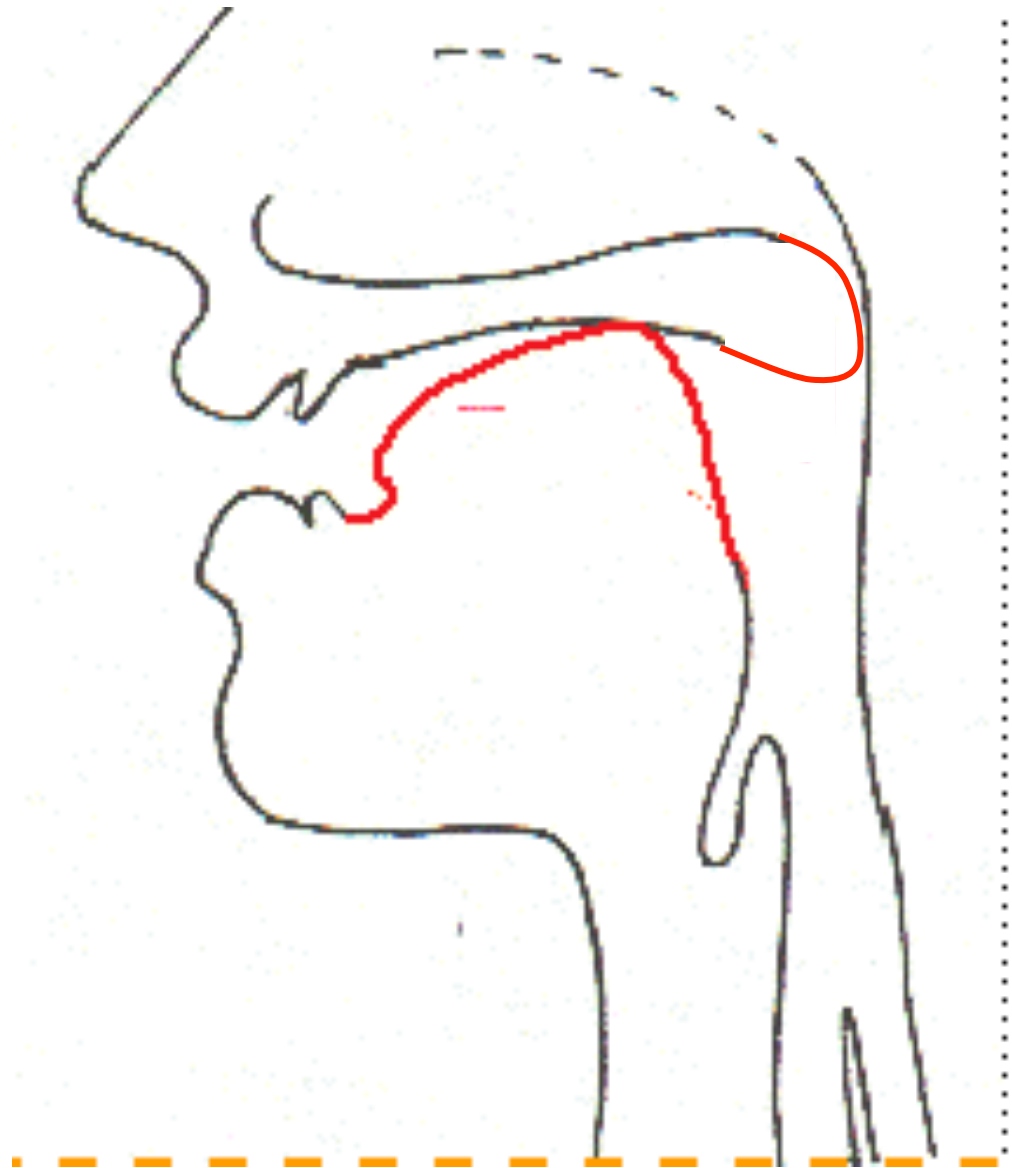
Palatal: even further behind the alveolar ridge, back where the roof of the mouth reaches its height.

[j] year



Velar: tongue body against the velum, the soft tissue at the back of the mouth.

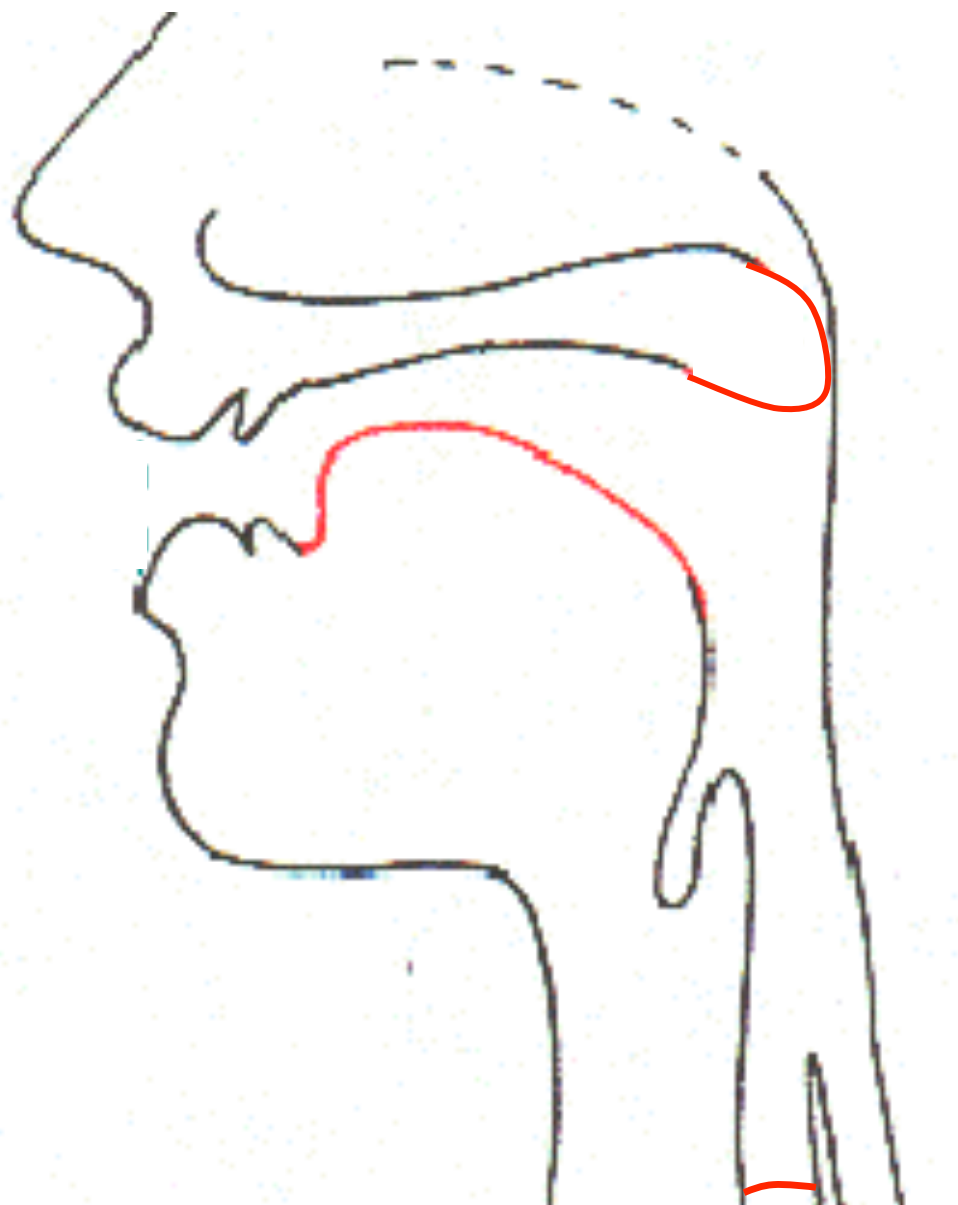
[k] **kernel, caught**
[g] **gone**
[ŋ] **sing**



Glottal: the glottis (vocal cords).

[ʔ] uh-uh ("no")

[h] **h**elp



But place of articulation isn't the whole story, as we've already seen.

What distinguishes [s] from [z], or [θ] from [ð], or [t] from [d]?

...Voicing: vocal cords can either vibrate or not.

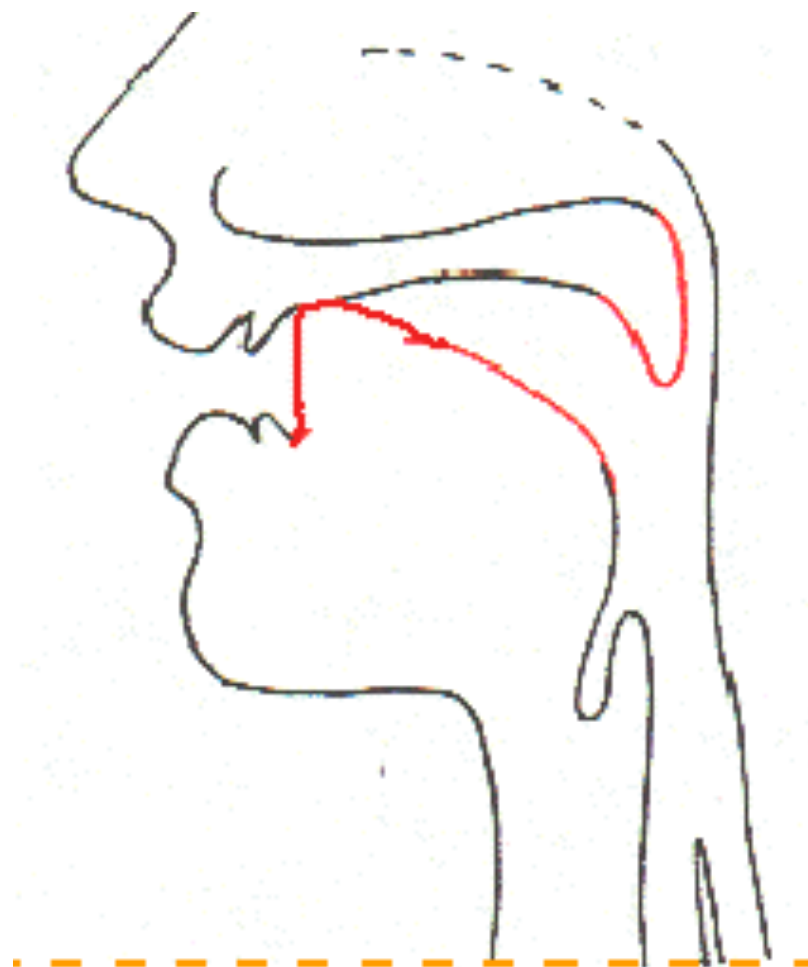
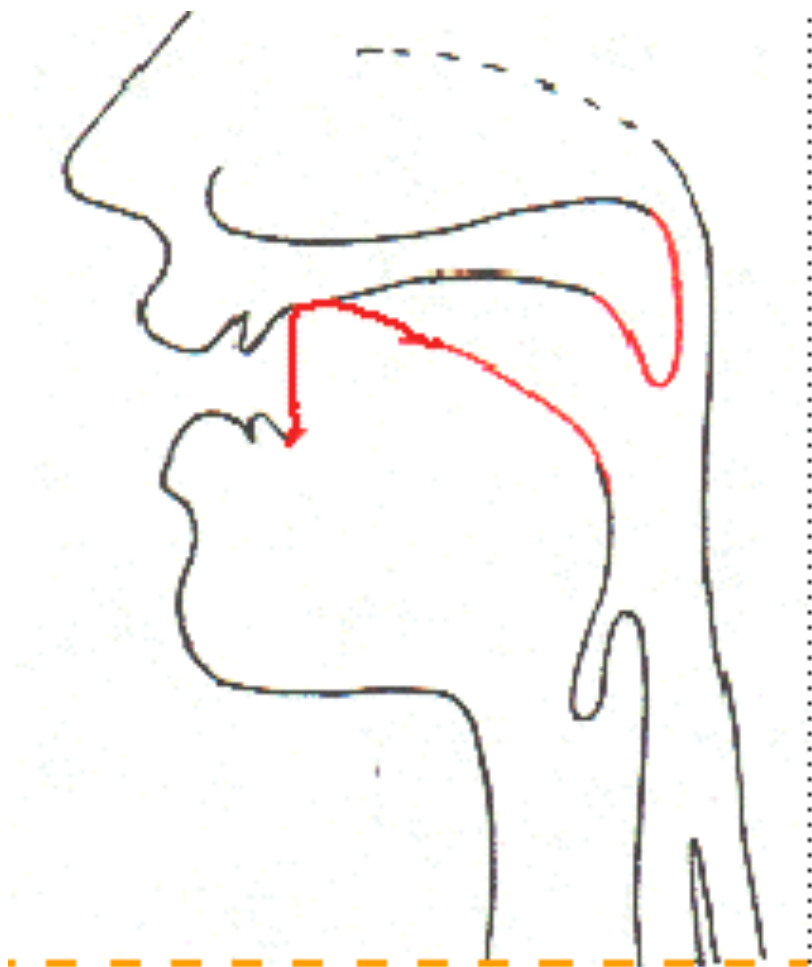
[s], [z], [t], and [d] are all **alveolar**,
but [s] and [t] are **voiceless** and [z] and [d] are **voiced**.

So if [s] and [t] are both voiceless alveolars, what distinguishes [s] from [t]? or [d] from [z]?

...Manner of Articulation: [t] is a **stop** (or a **plosive**),
and [s] is a **fricative**.

[t], [d]: airflow stopped

[s], [z]: airflow restricted, but not stopped



- **place, manner, voicing:**

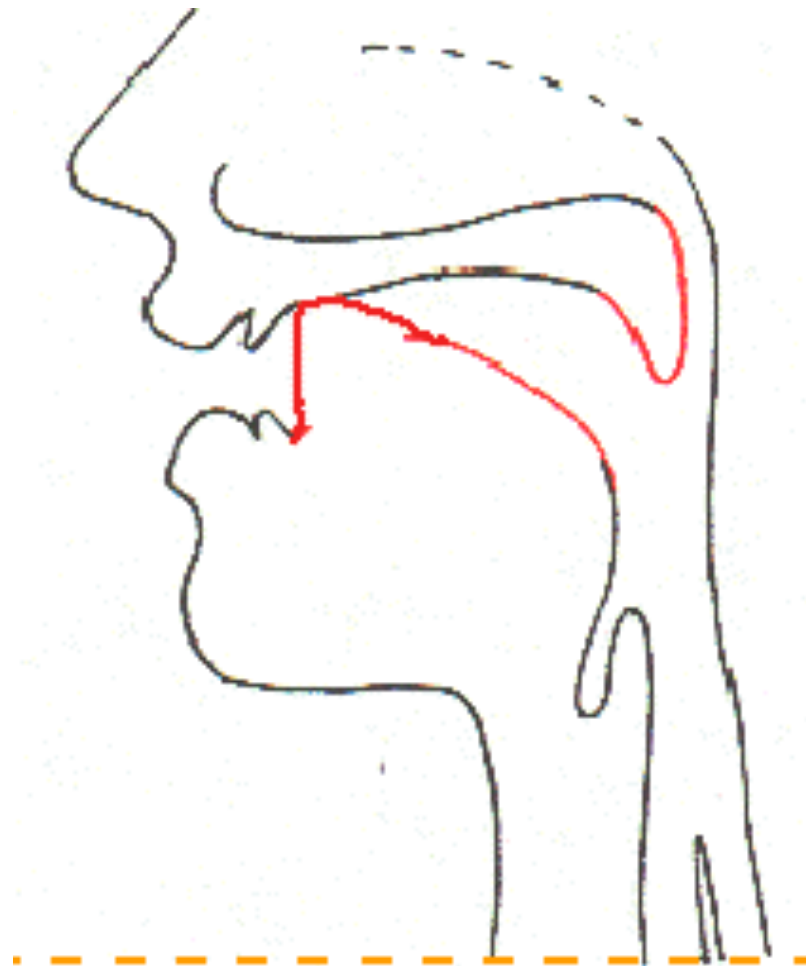
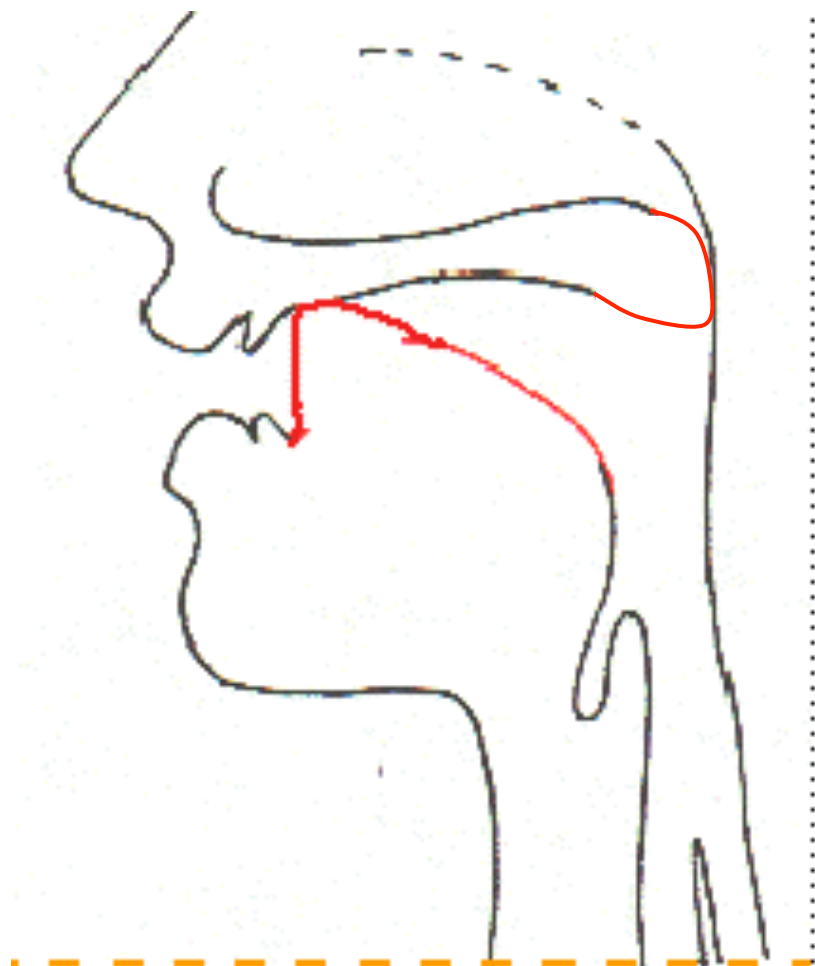
	stop	fricative
bilabial	[b], [p]	
labiodental		[v], [f]
interdental		[ð], [θ]
alveolar	[d], [t]	[z], [s]
alveopalatal		[ʃ], [ʒ]
palatal		
velar	[g], [k]	
glottal	[ʔ]	[h]

So if [d] is a voiced alveolar stop, and [z] is a voiced alveolar fricative, then what's [n]? it's voiced, and a stop...

...and it's **nasal**.

[t], [d]: airflow stopped
(at the alveolar ridge)

[n]: no flow through mouth, but
lowered velum allows air to flow
through nose



	stop	fricative	nasal (stop)
bilabial	[b], [p]		[m]
labiodental		[v], [f]	
interdental		[θ], [ð]	
alveolar	[d], [t]	[z], [s]	[n]
alveopalatal		[ʒ], [ʃ]	
palatal			
velar	[g], [k]		[ŋ]
glottal	[ʔ]	[h]	

(voiceless, voiced)

This way of classifying the sounds leads us to wonder about gaps:

	stop	fricative	nasal (stop)
bilabial	[p], [b]	[?], [?]	[m], [?]
labiodental		[f], [v]	
interdental		[θ], [ð]	
alveolar	[t], [d]	[s], [z]	[n]
alveopalatal		[ʃ], [ʒ]	
palatal	[?], [?]	[?], [?]	[?]
velar	[k], [g]	[?], [?]	[ŋ]
glottal	[ʔ]	[h]	[?]

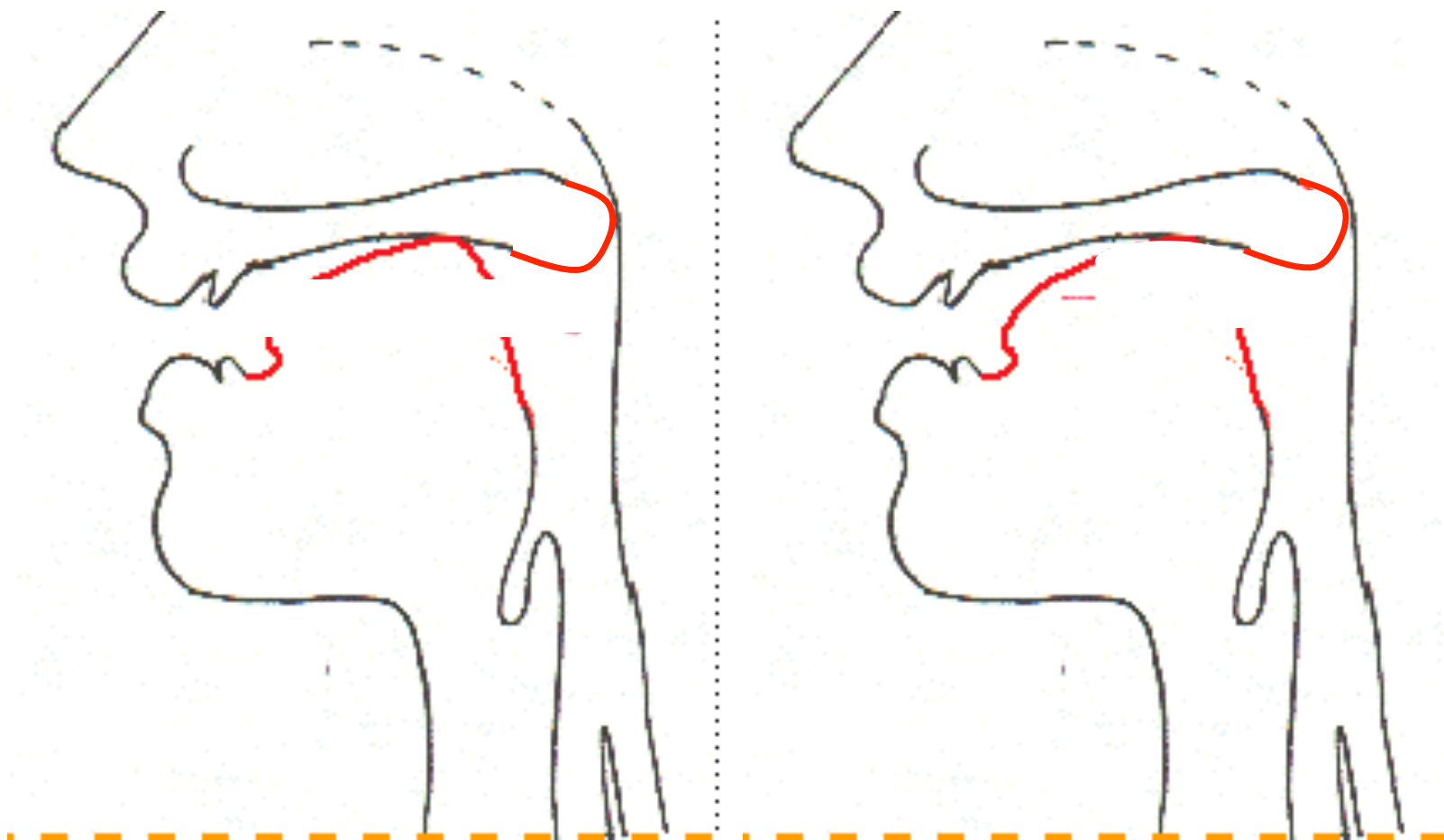
some of the gaps:

	stop	fricative	nasal (stop)
bilabial	[p], [b]	[ɸ], [β]	[m], [m̥]
labiodental		[f], [v]	
(inter)dental	[t̪], [d̪]	[θ], [ð]	
alveolar	[t], [d]	[s], [z]	[n]
alveopalatal		[ʃ], [ʒ]	
palatal	[c], [ɟ]	[ç], [j]	[ɲ] ([ɲ̃])
velar	[k], [g]	[x], [ɣ]	[ŋ]
glottal	[ʔ]	[h]	[ʔ]

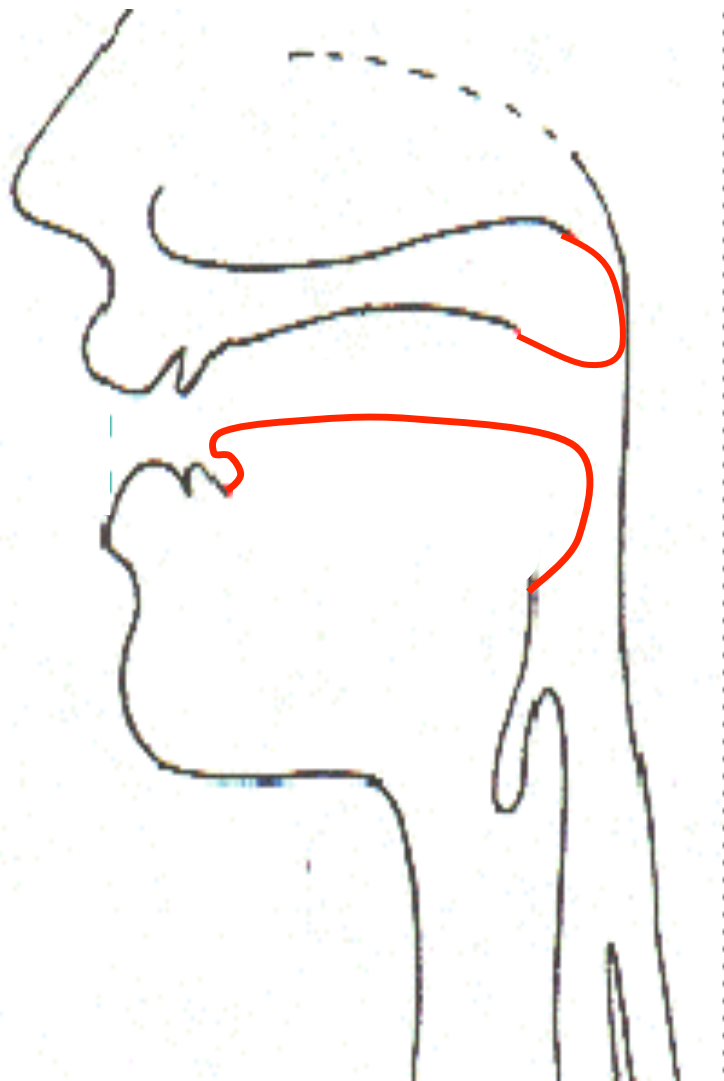
some other gaps:

retroflex: tongue tip
on palate: [ʈ] [ɖ] [ʂ] [ʐ] [ɳ]

uvular: tongue body
touches near uvula: [q] [ɢ] [χ] [ʁ] [ɴ]



pharyngeal: constriction near pharyngeal wall:
[ħ] [ʕ] (fricatives)



	stop	fricative	nasal (stop)
bilabial	[p], [b]	[ɸ], [β]	[m], [m̥]
labiodental		[f], [v]	
(inter)dental	[t̪], [d̪]	[θ], [ð]	
alveolar	[t], [d]	[s], [z]	[n]
alveopalatal		[ʃ], [ʒ]	
retroflex	[ɽ], [ɖ]	[ʂ], [ʐ]	[ɳ]
palatal	[ç], [j]	[ç], [j]	[ɲ] ([ɲ̃])
velar	[k], [g]	[x], [ɣ]	[ŋ]
uvular	[q], [ɢ]	[χ], [ʁ]	[ɴ]
pharyngeal		[ħ], [ʕ]	
glottal	[ʔ]	[h]	

some neglected manners of articulation:

Approximants: tongue gestures briefly at another articulatory point, without making contact:

w [w], **y** [j], **l** [l], **r** [ɹ] (sometimes written [r],
which we'll use)

These are sometimes divided into **glides**([w], [j])
and **liquids** ([l], [r])

Affricates: like a stop immediately followed by a fricative
ch [tʃ], **j** [dʒ]

	stop	fricative	nasal	glide liquid affr.
bilabial	[p], [b]	[ɸ], [β]	[m], [m̥]	[w]
labiodental		[f], [v]		[ʋ]
interdental		[θ], [ð]		
alveolar	[t], [d]	[s], [z]	[n]	[l]
alveopalatal		[ʃ], [ʒ]		[tʃ],[dʒ]
retroflex	[ɽ], [ɽ]	[ʂ], [ʐ]	[ɳ]	[r]
palatal	[ç], [ʝ]	[ç], [j]	[ɲ] ([ɲ̃])	[j]
velar	[k], [g]	[x], [ɣ]	[ŋ]	[ɥ]
uvular	[q], [ɢ]	[χ], [ʁ]	[ɴ]	
pharyngeal		[ħ], [ʕ]		
glottal	[ʔ]	[h]		

...not that this exhausts the range of possible speech sounds (linguo-labial stops! ejectives! clicks! voiceless liquids!), but it'll do for now...

Time to go through the vowels systematically.

compare: [i] bead
 [æ] bad

in fact:	[i]	<u>h</u> eat	High
	[e]	<u>h</u> ate	Mid
	[æ]	<u>h</u> at	Low

Now compare:

[i] he

[u] who

	<u>Front</u>		<u>Back</u>	
High	[i]	he'd	[u]	who'd
Mid	[e]	hate	[o]	hoed
Low	[æ]	had	[ɑ]	hot

	<u>Front</u>	<u>Back</u>	
High	[i] he'd	[u] who'd	<u>rounded</u>
Mid	[e] hate	[o] hoed	
Low	[æ] had	[ɑ] hot	

What's the difference between...

[u] (who'd) and [ʊ] (hood)?

[i] (he'd) and [ɪ] (hid)?

[e] (raid) and [ɛ] (red)?

[o] (coat) and [ɔ] (caught)?

tense vs. **lax**; no English monosyllables end in lax vowels that are either front or high...

[fli], [flu], [fle], *[flɪ], *[flʊ], *[flɛ]

	<u>Front</u>	<u>Back</u>	
High	[i] he'd, [ɪ] h <u>id</u>	[u] who'd, [ʊ] h <u>ood</u>	<u>rounded</u>
Mid	[e] h <u>ate</u> , [ɛ] h <u>ead</u>	[o] h <u>oed</u> , [ɔ] h <u>awed</u>	
Low	[æ] h <u>ad</u> <u>tense</u> , <u>lax</u>	[ɑ] h <u>ot</u>	

Not all English dialects have all of these vowels.

How do you say caught and cot?

And not all English dialects have these in the same distribution.

Mary, merry, marry

one more pair of vowels:

	<u>Front</u>	<u>Central</u>	<u>Back</u>	<u>rounded</u>
High	[i] he'd, [ɪ] hid		[u] who'd, [ʊ] hood	
Mid	[e] hate, [ɛ] head	[ə] machine [ʌ] dove	[o] hoed, [ɔ] hawed	
Low	[æ] had tense, lax		[ɑ] hot	

Not all speakers distinguish between [ə] and [ʌ].

"above"= əbʌv

English has (about) 14 vowels, and 5 letters to spell them with...

Reading practice:

ʃi seɪz si ʃeɪz

su seɪz hi:z ə bæd ɛg

ə mæn, ə plæn, ə kənæl, pænəmə

təp tʃəpstɪk ʃəps stæk təp tʃəpstɪks

	<u>Front</u>	<u>Central</u>	<u>Back</u>	<u>rounded</u>
High	[i] he'd, [ɪ] h <u>id</u>		[u] who'd, / [ʊ] h <u>ood</u>	
Mid	[e] h <u>ate</u> , [ɛ] h <u>ead</u>	[ə] m <u>ach</u> ine [ʌ] d <u>ov</u> e	[o] h <u>oed</u> , [ɔ] h <u>aw</u> ed	
Low	[æ] h <u>ad</u>		[ɑ] h <u>ot</u>	

plus diphthongs:

[aj] mice [aw] mouse [ɔj] joy

(and several English tense vowels are sort of diphthongal:

[e]=[ej], [o]=[ow])

Again, this categorization has (at least) two benefits:

- leads us to look for gaps
- helps with theories of sound change

	<u>Front</u>	<u>Central</u>	<u>Back</u>	<u>rounded</u>
High	[i] he'd, [ɪ] h <u>id</u>		[u] who'd, / [ʊ] h <u>ood</u>	
Mid	[e] h <u>ate</u> , [ɛ] h <u>ead</u>	[ə] m <u>ach</u> ine [ʌ] d <u>ov</u> e	[o] h <u>oed</u> , [ɔ] h <u>aw</u> ed	
Low	[æ] h <u>ad</u>		[ɑ] h <u>ot</u>	

In English, all and only nonlow back vowels are rounded.

But is that necessary?

	<u>Front</u>	<u>Central</u>	<u>Back</u>	<u>rounded</u>
High	[i] he'd, [ɪ] h <u>id</u>		[u] who'd, / [ʊ] h <u>ood</u>	
Mid	[e] h <u>ate</u> , [ɛ] h <u>ead</u>	[ə] m <u>ach</u> ine [ʌ] d <u>o</u> ve	[o] h <u>oe</u> d, [ɔ] h <u>aw</u> ed	
Low	[æ] h <u>ad</u>		[ɑ] h <u>ot</u>	

[y], German Gefühl 'feeling'
(high front rounded vowel)

[ɯ], Korean [kunɛ] 'swing'
(high back unrounded vowel)

	<u>Front</u>	<u>Central</u>	<u>Back</u>	<u>rounded</u>
High	[i] he'd, [ɪ] h <u>id</u>		[u] who'd, [ʊ] h <u>ood</u>	/
Mid	[e] h <u>ate</u> , [ɛ] h <u>ead</u>	[ə] m <u>ach</u> ine [ʌ] d <u>o</u> ve	[o] h <u>oe</u> d, [ɔ] h <u>aw</u> ed	
Low	[æ] h <u>a</u> d		[ɑ] h <u>o</u> t	

[y], German Gefühl 'feeling'

(high front rounded vowel)

[ɯ], Korean [kunɛ] 'swing'

(high back unrounded vowel)

[ɛ̃], French [mɛ̃], 'hand' (vs. [mɛ] 'dish')

(front mid lax **nasalized** vowel)

other ways to manipulate airflow

- ejectives
- clicks
- implosives

(...and others)

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