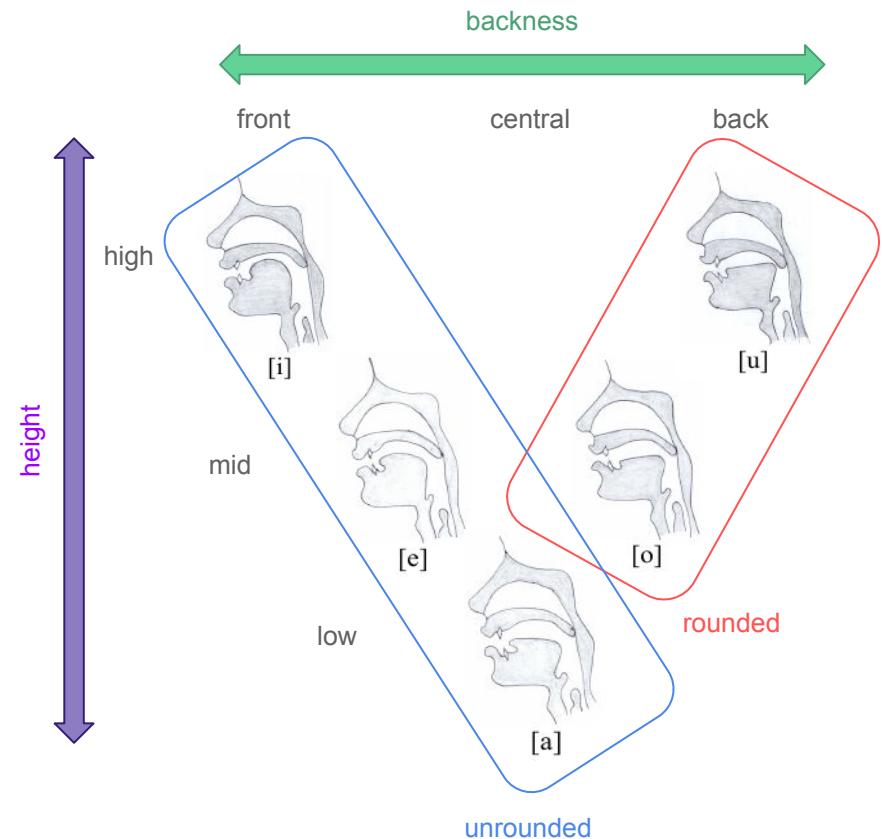


Week 11 Lecture: Phonetics

Ling 201 - Fall 2025

Vowels and consonants

- Last week we discussed **vowels**.
- We saw that vowels can be described in terms of **three features**:
 - **tongue height**
 - **tongue backness**
 - **lip roundedness**



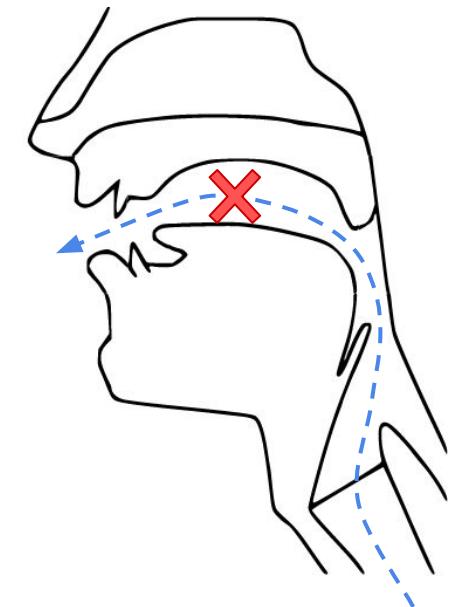
Vowels and consonants

- We also learned about how vowels and consonants differ in articulation:
 - **Airflow** – when we speak, we exhale, forcing air to flow outward through our **vocal tract**
 - With consonants, we block this airflow completely or partially. With vowels, we don't
 - **Voicing** – when we cause our vocal cords to vibrate during speech.
 - Vowels are usually voiced. Consonants may be voiced or voiceless.

	Vowels	Consonants
Obstruction of airflow	No obstruction in vocal tract; air flows freely	Total or partial obstruction in vocal tract, blocking or restricting airflow
Voicing	Usually voiced	May or may not be voiced

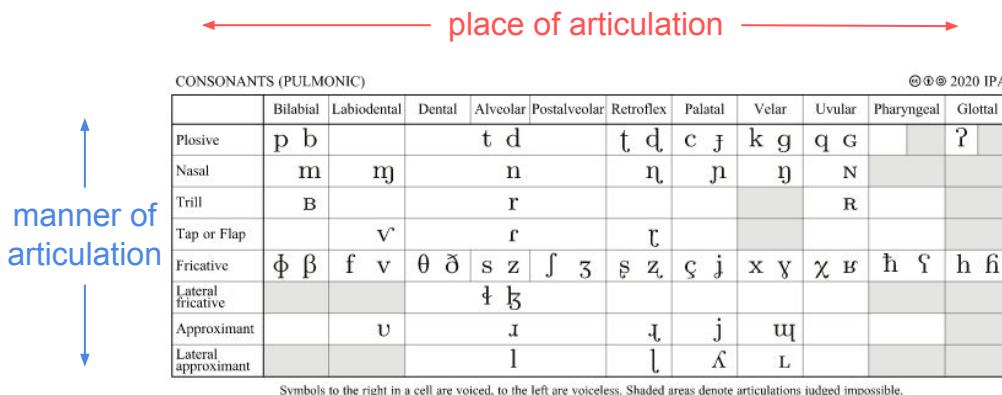
Consonants and vowels

- All consonants are produced by restricting or obstructing the airflow in some way – whether partially or totally.
- But the nature of the obstruction varies from consonant to consonant.
- We describe consonants in terms of three **features** – which all serve to describe that obstruction:
 - **Manner of articulation** – what is the nature of the obstruction? is it partial or complete?
 - **Place of articulation** – where in the vocal tract is the obstruction made.
 - **Voicing** – are the vocal folds vibrating throughout this period of obstruction?



Consonants

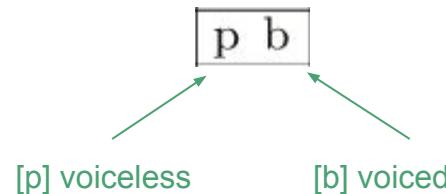
- The IPA consonant chart is arranged by these three features:
voicing, place, manner
- And we use these features to **describe** consonants:
[f] is a *voiceless labiodental fricative*
- Once you understand this terminology, you can use it to understand how to pronounce any consonant on this chart.



The IPA consonant chart is a grid of 40 cells, each containing a consonant symbol. The columns represent the place of articulation (Bilabial, Labiodental, Dental, Alveolar, Postalveolar, Retroflex, Palatal, Velar, Uvular, Pharyngeal, Glottal) and the rows represent the manner of articulation (Plosive, Nasal, Trill, Tap or Flap, Fricative, Lateral fricative, Approximant, Lateral approximant). Red arrows at the top indicate the horizontal range of the place of articulation. A blue double-headed vertical arrow on the left indicates the vertical range of the manner of articulation. The chart includes a legend below it stating: "Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible." The chart is titled "CONSONANTS (PULMONIC)" and has a copyright notice "© 2020 IPA".

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d		t̪ d̪	c j	k g	q ɣ		?	
Nasal	m	n̪		n		n̪	j̪	ɳ	N		
Trill		B		r					R		
Tap or Flap		v̪		r̪		ʈ̪					
Fricative	f̪ β̪	f v̪	θ̪ ð̪	s z̪	ʃ ʒ̪	ʂ ʐ̪	ç j̪	x y̪	χ w̪	h̪ f̪	h̪ f̪
Lateral fricative				ɬ̪	ɻ̪						
Approximant		v̪		ɹ̪		ɺ̪	j̪	ɻ̪			
Lateral approximant				l̪		ɺ̪	ɻ̪	ɻ̪			

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



Consonants

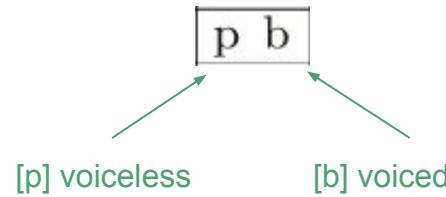
- You may notice that some cells are empty and some are grayed out.
- Cells that are grayed out are judged **impossible** to pronounce based on the anatomy of the vocal tract.
- Cells that are empty but not gray are **possible but unattested**:
 - We have not found a language that uses them as part of words.
 - If we did, we would add a new symbol to the chart.

CONSONANTS (PULMONIC)

© 2020 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d		t̪ d̪	c j	k g	q ɣ		?	
Nasal	m	n̪		n		n̪	j̪	ŋ	N		
Trill	B			r					R		
Tap or Flap		v̪		r̪		l̪					
Fricative	f̪ β̪	f v̪	θ̪ ð̪	s z̪	ʃ ʒ̪	ʂ ʐ̪	ç j̪	x y̪	χ w̪	h̪ f̪	h̪ fi̪
Lateral fricative				ɬ̪ ɺ̪							
Approximant		v̪		ɹ̪		ɻ̪	j̪	ɻ̪			
Lateral approximant				l̪		ɬ̪	ɻ̪	ɻ̪	L		

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



Voicing

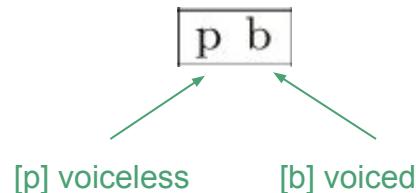
Voicing

- Difference between [s] and [z] is voicing:
 - [s] is **voiceless**
 - [z] is **voiced**
- Many other consonants differ in voicing:
 - [p, b], [t, d], [k, g], [f, v], [θ, ð], [ʃ, ʒ]
- On the consonant chart, this is indicated by the alignment of the symbol in the cell:
 - left = voiceless
 - right = voiced

CONSONANTS (PULMONIC)

	Bilabial	Labiobidental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d		t̪ d̪	c j	k g	q ɣ			?
Nasal	m	nj		n		ɳ	n	ɳ		N	
Trill		B		r						R	
Tap or Flap		v̪		r̪		t̪					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç j	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɭ							
Approximant		v		ɹ		ɻ	j	w			
Lateral approximant				l		ɺ	ɻ	ɺ			

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



Manner of articulation

Manner of articulation

- As we've seen, all consonants are produced with some obstruction.
- Manner of articulation** indicates the type of obstruction:
 - Is there a complete blockage of airflow?
 - Is there a partial blockage?
 - Is the airflow blocked in one part of the vocal tract but allowed to flow through a different part?

manner of articulation

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		t d	c j	k g	q g		?
Nasal	m	nj		n		n	n	n	n	N	
Trill	B			r						R	
Tap or Flap		v̚		r̚		t̚					
Fricative	f̚ β̚	f v̚	θ̚ ð̚	s z̚	ʃ ʒ̚	s̚ z̚	ç̚ j̚	x y̚	χ̚ w̚	h̚ f̚	h̚ fi̚
Lateral fricative					t̚ l̚						
Approximant		v̚		r̚		l̚	j̚	w̚			
Lateral approximant				l̚		l̚	f̚	L̚			

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

Manner of articulation: Plosives/Stops

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		t d	c ʃ	k g	q G		?

- Say the sounds *papapapa* and *tatatatata*. What is your mouth doing to restrict the flow of air?
- **Plosives** (aka **stops** or **oral stops**) are articulated with a **complete closure** somewhere in the vocal tract.
- After you make the closure, you continue exhaling, so air pressure builds up behind the closure.
- Then you release the closure, causing a small burst or explosion of pressurized air – hence "plosive"



Manner of articulation: Plosives/Stops

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		t d	c ʃ	k g	q G		?

- English stops include:
 - **Voiceless stops** [p, t, k]:
spin [spɪn], *stop* [stɒp], *scar* [skɑːr]
 - **Voiced stops** [b, d, g]:
about [əbawt], *adore* [ədɔːr], *ago* [əgəʊ]
 - English voiceless stops are often **aspirated** – pronounced with a short [h] sound after the release:
tip [tʰɪp], *pen* [pʰɛn], *cat* [kʰæt]



Manner of articulation: Fricatives

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ɟ	x ɣ	χ ʁ	ħ ʕ	h ħ

- Say the words **see** and **tea**. Your tongue will move to a similar but not identical position for both consonants. With which word does your tongue touch the upper part of your mouth?
- **Fricatives** are produced with an **incomplete obstruction**:
 - You bring two articulators close together but don't quite let them touch, creating a narrow opening for air to flow through.
 - Forcing air through a narrow opening produces a turbulent airstream that makes a hissing sound, like air escaping a tire.



Manner of articulation: Fricatives

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ɟ	x ɣ	χ ʁ	ħ ʕ	h ħ

- English fricatives include (which of these are voiced/voiceless?):
 - [f] and [v]: *fit* ['fit], *vet* ['vet]
 - [θ] and [ð]: *think* ['θɪŋk], *that* ['ðæt]
 - [s] and [z]: *see* ['si], *zoo* ['zu]
 - [ʃ] and [ʒ]: *ship* ['ʃɪp], *measure* ['mɛʒər]
 - [h]: *heat* ['hit]
- [s, z, ʃ, ʒ] are a special class of fricatives known as **sibilants** because they produce a louder, more strident sound than the other fricatives



Manner of articulation: Affricates

- Say the words *tie, shy, chai*.

With which words does your tongue touch the upper part of your mouth?

Which words produce a hissing sound?

- **Affricates** are a sort of combination between stops and fricatives:

- A complete closure is made, building up pressure.
 - When it is released, the articulators are kept close together enough to produce the hissing sound characteristic of fricatives.

- We consider affricates one sound, but with two phases, and we write them with two IPA symbols joined with a tie bar: *check* [tʃek]



Manner of articulation: Affricates

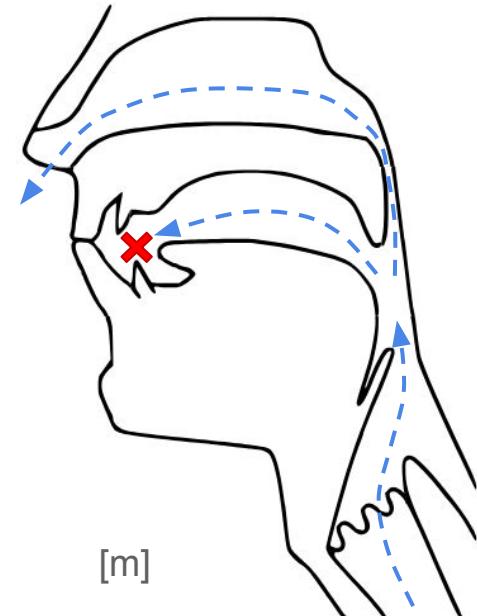
- English affricates include:
 - [tʃ]: *choose* [tʃuz]
 - [dʒ]: *judge* [dʒʌdʒ]
- Other languages may have other affricates:
 - Japanese *tsuru* ['tʃurw] 'crane (bird)'
 - German *Salz und Pfeffer* [załts unt pfefer] 'salt and pepper'
 - Italian *zero* [dʒe:ro] 'zero'



Manner of articulation: Nasals

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Nasal	m	m̪		n		ɳ	ɲ	ŋ	N		

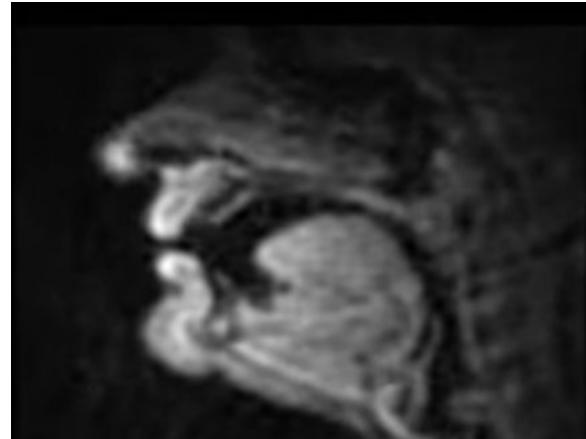
- Try saying [m] while pinching your nose. Can you do it?
- We produce most consonants by breathing out our mouth. But with **nasal** consonants, we're actually breathing our our nose.
- We do this by making a complete obstruction in the mouth, and lowering our **velum** or **soft palate**, allowing air to pass through the **velar port** into the **nasal cavity**.
- English nasals: [m, n, ɳ]:
mat [mæt], *nine* [najn], *sing* [sɪŋ]



Manner of articulation: Approximants

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Approximant		v		ɹ		ɭ	j	w			

- **Approximants** – like fricatives – feature a partial closure.
- But the articulators are held slightly further apart so the airstream isn't turbulent and there's no hissing.
- Glides like [j] yes and [w] we are technically approximants.
- As is American English *r* [ɹ], which can be pronounced as:
 - “bunched *r*”: tongue back is arched in back of mouth
 - “retroflex *r*”: tongue tip is curled backward

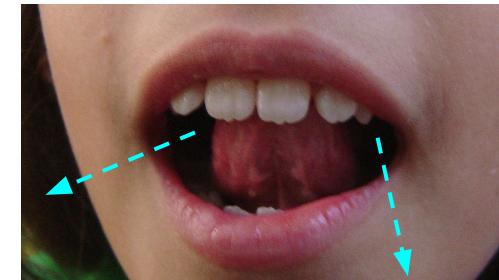


English “bunched *r*”

Manner of articulation: L laterals

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Lateral fricative				ʃ ʒ							
Lateral approximant				l		ɺ	ɻ				

- Say the following word: *light*. What is your mouth doing when you say the [l]? Is there a complete obstruction of airflow?
- **L laterals** are produced with an obstruction in the center of the vocal tract, but air flows past the tongue on one or both sides.
 - **Lateral fricative:** the airstream is restricted enough to make a hissing sound: Welsh *Lwyd* [ɬuɪd] 'Lloyd'
 - **Lateral approximant:** the airstream is not as restricted, no hissing sound: English *lose* [luz]



Manner of articulation: Trills, taps, and flaps

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Trill	B			r					R		
Tap or Flap		v		f		t					

- Say the words **ladder** and **adore**. Are you pronouncing the *d* the same in both words?
- In English, the sounds spelled <t> and <d> are often pronounced as a **flap** [ɾ] before unstressed vowels: *ladder, water, meadow, little, battle, city, ready*
- Flaps and the similar **taps** (Spanish *para* [pa.ra] 'for') block air completely like stops but don't hold the closure long enough to build up pressure, so there's no burst.
- **Trills** are like flaps and taps, but feature repeated closures: Spanish *rojo* [ro.xo] 'red'

Manner of articulation

- This gives us our **manners of articulation** – classes of consonants based on *type of obstruction*:
 - **Plosive** (stop) – complete obstruction, release with burst [p, t, k, b, d, g]
 - **Fricative** – narrow obstruction, hissing sound [f, v, θ, ð, s, z, ʃ, ʒ, h]
 - **Affricate** – complete obstruction, release to narrow obstruction [tʃ, dʒ]
 - **Nasal** – complete obstruction in mouth, air flows through nose [m, n, ɳ]
 - **Lateral** – obstruction on centerline of mouth, air flows on side(s) [l]
 - **Approximant** – narrow obstruction, not narrow enough for hissing [j, w, ɿ]
 - **Tap/flap/trill** – very brief obstruction, repeated for trills [ɾ]

Natural classes

- We can also group manners of articulation into several larger **natural classes**:
 - **Obstruent** = plosives, affricates, fricatives (consonants with greater constriction of airflow)
 - **Sonorant** = nasals, laterals, approximants (consonants with lesser constriction of airflow)
 - **Rhotics** = *r*-sounds, which can differ from language to language
 - **Liquids** = laterals + rhotics (*l*-sounds + *r*-sounds)

Place of articulation

Place of articulation

- We've seen **manner of articulation**:
 - Type of obstruction
 - Rows on the consonant chart
- Let's move on to **place of articulation**:
 - Location of obstruction in vocal tract
 - Columns on the consonant chart

place of articulation

manner of articulation

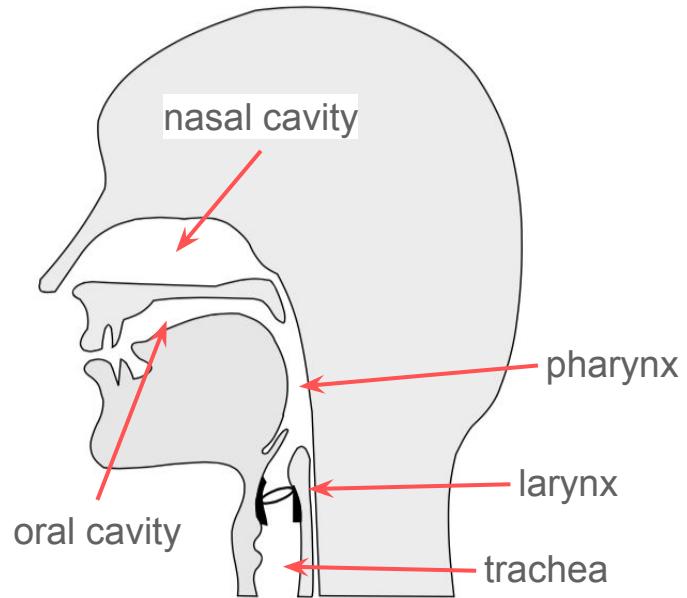
	CONSONANTS (PULMONIC) © ⑧ ⑨ 2020 IPA										
	Bilabial	Labiobidental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d		t̪ d̪	c j	k g	q ɣ			?
Nasal	m	n̪		n		ɳ	j̪	ɳ̪	N		
Trill	B		r						R		
Tap or Flap		v̪	r̪		ʈ̪						
Fricative	f̪ β̪	f v̪	θ̪ ð̪	s z̪	ʃ̪ ʒ̪	ʂ̪ ʐ̪	ç̪ j̪	x y̪	χ̪ ɣ̪	h̪ ɣ̪	h̪ f̪
Lateral fricative				ɬ̪ ɻ̪							
Approximant		v̪		ɹ̪		ɺ̪	j̪	ɻ̪			
Lateral approximant				l̪		ɭ̪	ɻ̪	ɭ̪			

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

[p] voiceless **[b] voiced**

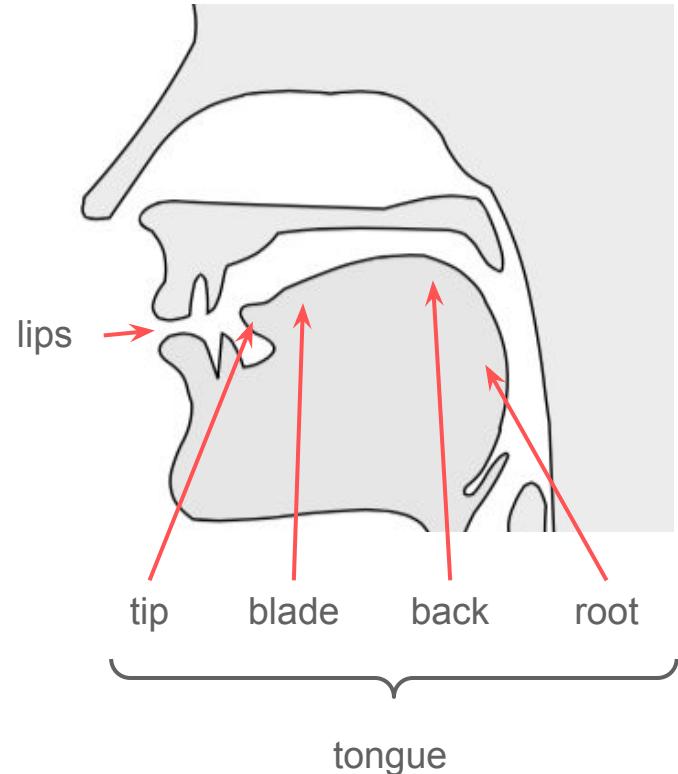
Anatomy of the vocal tract

- Before we talk about place of articulation, we have to discuss a bit of **anatomy**.
- As we exhale:
 - Air flows up from our lungs via the **trachea**.
 - Through the **larynx** (source of voicing).
 - Through the **pharynx** (open space behind tongue).
 - Through the **oral cavity** (mouth) and/or **nasal cavity** (nasal sinuses).
 - And out of the body.



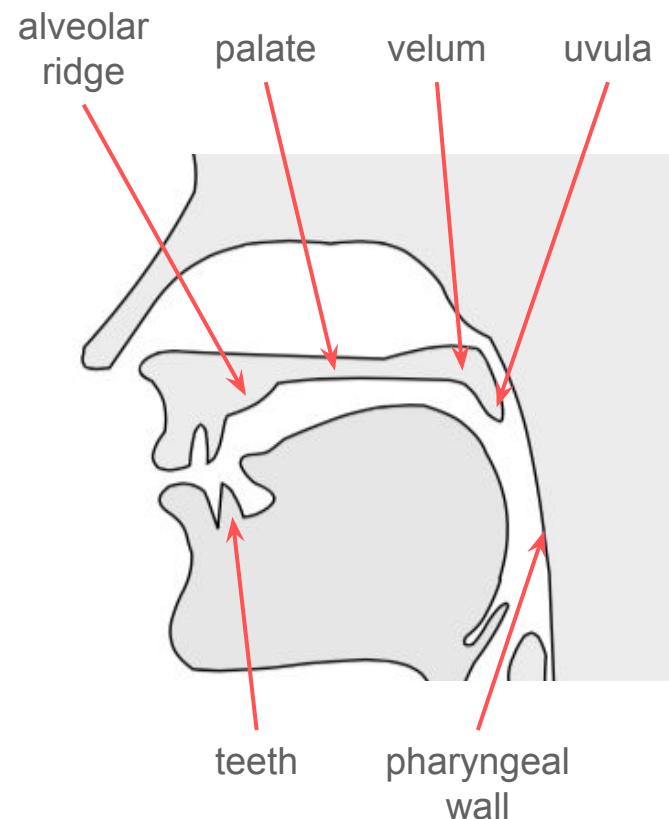
Anatomy of the vocal tract

- To make a consonant, we obstruct the airflow.
- We do this by moving an **active articulator** toward a **passive articulator** to restrict airflow.
- Active articulators are:
 - **Lips**
 - **Tongue**: tongue tip, blade, back, root



Anatomy of the vocal tract

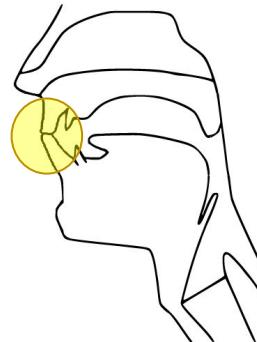
- Passive articulators are:
 - teeth
 - alveolar ridge
 - (hard) palate
 - velum (soft palate)
 - uvula
 - pharyngeal wall



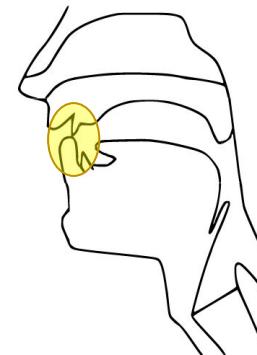
Place of articulation: Labials

- Say the following words: **pa**, **fee**. What two articulators touch when you pronounce the first consonant in each word?
- **Labials** are articulated with your **lips**. These include:
 - **Bilabials** – both lips: *bee* ['bi], *ma* ['ma], Japanese *tōfu* [to:ɸɯ] 'tofu'
 - **Labiodentals** – lower lip and upper teeth: *fin* [fɪn], *vote* [vowt]

bilabial



labiodental

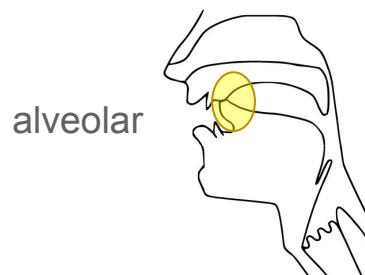
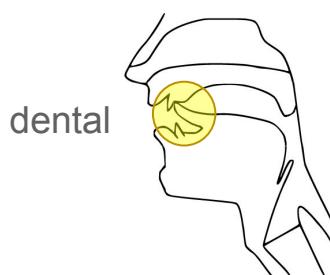


	Bilabial	Labiodental
Plosive	p b	
Nasal	m	m̪
Trill	B	
Tap or Flap		v̪
Fricative	ɸ β	f v
Lateral fricative		
Approximant		v̪
Lateral approximant		

Place of articulation: Coronals

- Say the following words: **too**, **now**. Where does your tongue tip touch when you say the first consonant?

	Dental	Alveolar	Postalveolar			
Plosive	t	d				
Nasal		n				
Trill		r				
Tap or Flap		t				
Fricative	θ	ð	s	z	ʃ	ʒ
Lateral fricative		ɬ	ɺ			
Approximant		ɹ				
Lateral approximant		ɻ				

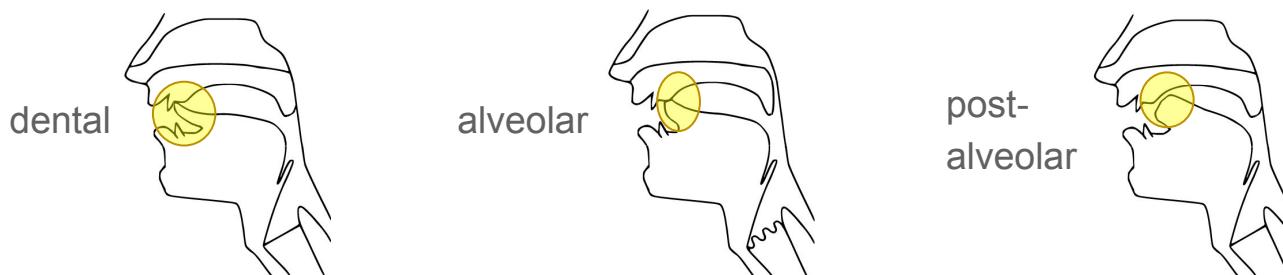


Many coronal symbols don't specify exact place of articulation. You can use diacritics like [t̪] (dental) if necessary.

Place of articulation: Coronals

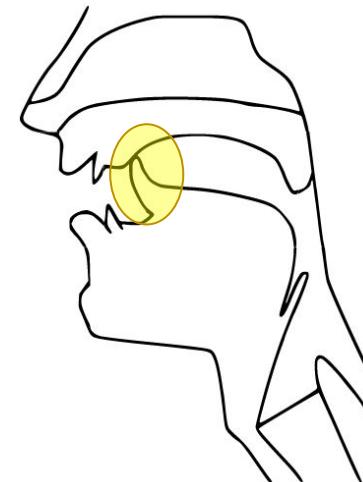
- **Coronals** have constriction in the front part of mouth:
 - **Dentals** – tongue tip and teeth
[θ] *think*, [ð] *that*
 - **Alveolars** – tongue tip/blade and alveolar ridge
[t] *tea*, [d] *day*, [n] *night*, [l] *late*
 - **Postalveolars** – tongue blade and area behind alveolar ridge
[ʃ] *shake*, [ʒ] *vision*, [tʃ] *check*, [dʒ] *jay*

	Dental	Alveolar	Postalveolar
Plosive	t d		
Nasal		n	
Trill		r	
Tap or Flap		f	
Fricative	θ ð	s z	ʃ ʒ
Lateral fricative		ɬ ɺ	
Approximant		ɹ	
Lateral approximant		ɻ	



Place of articulation: Retroflexes

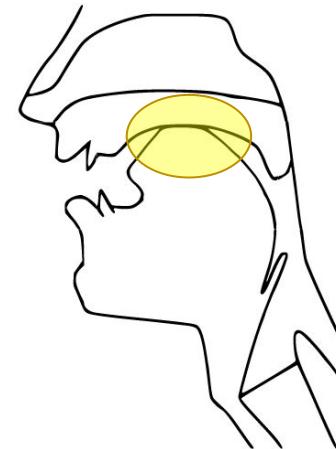
- **Retroflexes** are articulated with the tongue tip arched backward.
- American English *r* may be pronounced as retroflex, but it depends on the speaker.
- Other languages with retroflexes:
 - Hindi/Urdu [t̪a:l t̪ha:l d̪a:l d̪ha:l]
'postpone, wood shop, branch, shield'
 - [ɖ] – Swedish *nord* [nu:d̪] 'north'
 - [ɻ] – Portuguese (São Paulo state)
carta [ˈkaɾtɐ] 'letter'



	Retroflex
Plosive	t̪ d̪
Nasal	ɳ
Trill	
Tap or Flap	t̪
Fricative	s̪ z̪
Lateral fricative	
Approximant	ɻ
Lateral approximant	ɻ

Place of articulation: Palatals

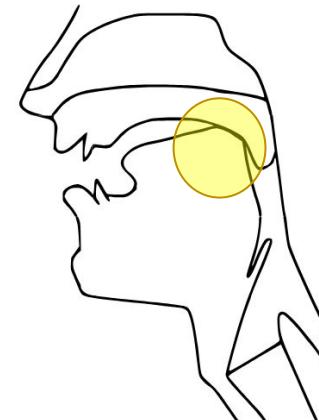
- **Palatals** are produced with the tongue body raised against the hard palate
- English [j] yes is considered a palatal approximant.
- Palatals in other languages:
 - Spanish *niño* [nijo] 'child'
 - Portuguese *velho* [vεʎu] 'old'



	Palatal
Plosive	c j
Nasal	n
Trill	
Tap or Flap	
Fricative	ç j
Lateral fricative	
Approximant	j
Lateral approximant	ʎ

Place of articulation: Velars

- Say the following words: **car**, **go**. Where does your tongue touch when you pronounce the first consonant of each word?
- **Velars** are articulated with the back of the tongue against the **velum** (soft palate).
- English velars:
 - [k] *cat* [kʰæt], [g] *goat* [gowt], [ŋ] *song* [saŋ]
- Other velars:
 - [χ] Mexican Spanish *jefe* [xefe] 'boss'
 - [ɣ] Spanish *hago* [aɣo] 'I do'



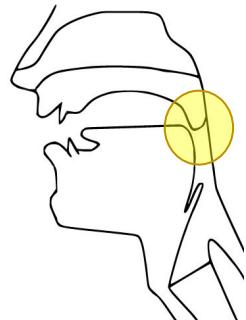
	Velar
Plosive	k g
Nasal	ŋ
Trill	
Tap or Flap	
Fricative	x y
Lateral fricative	
Approximant	w
Lateral approximant	l

Place of articulation: Gutturals

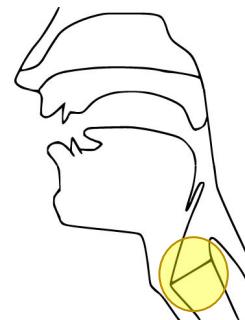
- Guttural consonants are pronounced in the back of the mouth:
 - Uvulars:** back of tongue against the uvula:
Madrid Spanish *jefe* [χefe], Quechua *qusa* [qosa] 'husband'
 - Pharyngeals:** root of tongue obstructing the pharynx:
Arabic [ħar] 'heat', [qajn] 'eye'
 - Glottals:** vocal folds obstructing the glottis:
[h] *hold* [howld], [?] *uh-oh* [ʌ?ow], Caribbean Spanish *jefe* [hefɛ]

	Uvular	Pharyngeal	Glottal
Plosive	q G		?
Nasal	N		
Trill	R		
Tap or Flap			
Fricative	χ ʁ	ħ ʕ	h f
Lateral fricative			
Approximant			
Lateral approximant			

uvular



glottal



[ħ]

voiceless
pharyngeal
fricative



[ʕ]

voiced
pharyngeal
fricative



Place of articulation

- This gives us our **place of articulation** – *where* in the vocal tract obstruction is made:
 - **bilabials** – lips
 - **labiodentals** – lips and teeth
 - **dentals** – tongue tip and teeth
 - **alveolars** – tongue tip/blade and alveolar ridge
 - **postalveolars** – tongue blade and area behind alveolar ridge
 - **palatals** – tongue blade and palate
 - **velars** – tongue back and velum
 - **uvulars** – tongue back and uvula
 - **pharyngeals** – tongue root and pharyngeal wall
 - **glottals** – glottis

Describing consonants

- Consonants are sounds that feature some **obstruction of airflow**.
- We describe this obstruction using three features:
 - voicing**
is there voicing?
 - place of articulation**
where is the obstruction?
 - manner of articulation**
what kind of obstruction is it?

CONSONANTS (PULMONIC) © 2020 IPA

	Bilabial	Labiobidental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glossal
Plosive	p b		t d		t̪ d̪	c j	k g	q ɣ		χ ʁ	?
Nasal	m	n̪		n		n̪	j̪	ŋ	N		
Trill	B		r						R		
Tap or Flap		v̪	r̪			ʈ̪					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ɟ	x ɣ	χ ʁ	h ɦ	h̪ f̪
Lateral fricative				ɬ	ɺ						
Approximant		v̪		ɹ̪		ɻ̪	j̪	ɻ̪			
Lateral approximant				l̪		ɺ̪	ɻ̪	ɺ̪			

place of articulation

manner of articulation

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

[p] voiceless [b] voiced

Describing consonants

- With these three features:
 - voicing
 - place of articulation
 - manner of articulation
- We can now fully describe consonants:
 - [p] voiceless bilabial plosive
 - [l] voiced alveolar lateral
 - [ŋ] voiced velar nasal
 - [h] voiceless glottal fricative

CONSONANTS (PULMONIC) © 2020 IPA

	Bilabial	Labiobidental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d		t̪ d̪	c j	k g	q ɣ			?
Nasal	m	n̪		n		ɳ	j̪	ɳ̪	N		
Trill	B			r					R		
Tap or Flap		v̪		r̪		ʈ̪					
Fricative	f̪ β̪	f v̪	θ̪ ð̪	s z̪	ʃ̪ ʒ̪	ʂ̪ ʐ̪	ç̪ j̪	x y̪	χ̪ ɣ̪	h̪ f̪	h̪ fi̪
Lateral fricative				ɬ̪							
Approximant		v̪		ɹ̪		ɻ̪	j̪	ɻ̪			
Lateral approximant				l̪		ɺ̪	ɻ̪	ɺ̪			

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

[p] voiceless [b] voiced