

# LSci 51/CogS 56L: Acquisition of Language

Lecture 7  
Phonological development I

# Announcements

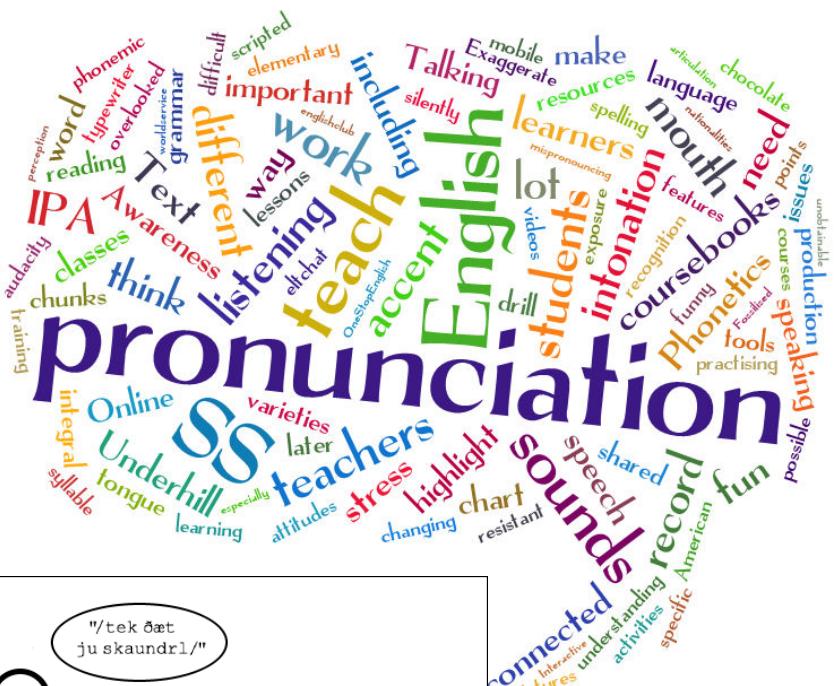
Review questions for phonological development available

HW3 available (due 8/22/25)

All kinds of useful sound charts available (including interactive ones, in case you forget what sound corresponds to what symbol).

Many helpful lingspace video links included in the lecture notes as references.

# Sounds of Language



[www.tagxedo.com](http://www.tagxedo.com)

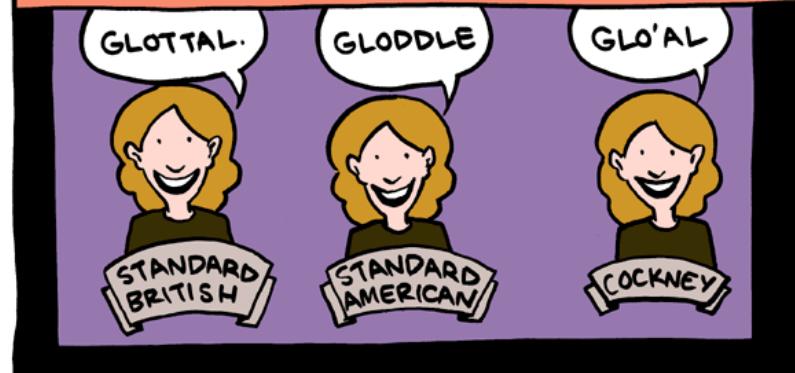
[http://specgram.com/  
CLIII.1/09.parenchyma.cartoon.e.html](http://specgram.com/CLIII.1/09.parenchyma.cartoon.e.html)



"Why do I have to keep writin' in  
these K's when they don't make  
any noise anyway?"

<http://language.log.ldc.upenn.edu/nll/?p=3946>

THERE IS A SOUND CALLED A "GLOTTAL STOP," WHICH IS MADE BY HALTING AIR FLOW WITH YOUR GLOTTIS. IN ENGLISH, WE OFTEN ASSOCIATE IT WITH THE COCKNEY ACCENT AND MID-WORD Ts.

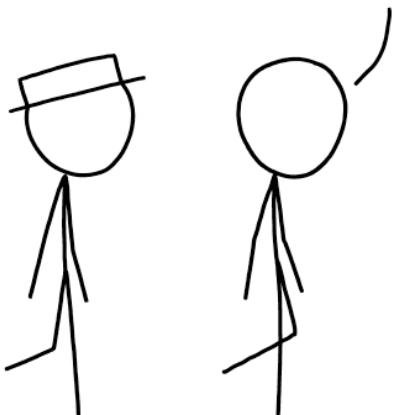


# Spelling vs. Pronunciation

I SOMETIMES MISSPELL "MISSPELL"  
AND "MISPRONUNCIATION," AND I  
MISPRONOUNCE "MISPRONUNCIATION,"

1

BUT THE EPITOME OF  
MISPRONUNCIATION IS  
PROBABLY THE WAY I  
PRONOUNCE "EPITOME."



<https://xkcd.com/1816/>

# Forget Spelling!

Sounds ≠ Spelling

[Extra]

# Forget spelling

<https://www.youtube.com/watch?v=XTzkT3j9pHI>

<http://www.thelingspace.com/episode-12>

beginning through 2:27



## Our Strange Lingo, by Lord Cromer (1902)

When the English tongue we speak.  
Why is break not rhymed with freak?  
    Will you tell me why it's true  
    We say sew but likewise few?  
    And the maker of the verse,  
Cannot rhyme his horse with worse?  
    Beard is not the same as heard  
    Cord is different from word.  
    Cow is cow but low is low  
    Shoe is never rhymed with foe.  
    Think of hose, dose, and lose  
And think of goose and yet with choose

...

...

Think of comb, tomb and bomb,  
Doll and roll or home and some.

Since pay is rhymed with say

Why not paid with said I pray?

Think of blood, food and good.

Mould is not pronounced like could.

Wherfore done, but gone and lone -

Is there any reason known?

To sum up all, it seems to me

Sound and letters don't agree.

# One sound – Many letters

he	e	seas	ea
believe	ie	amoeba	oe
Caesar	ae	key	ey
see	ee	machine	i
people	eo	seize	ei

International Phonetic Alphabet (IPA): [i]

# One sound – Many letters

too

oo

threw

ew

to

o

ieu

ieu

clue

ue

shoe

oe

through

ough

beautiful

eau

IPA: [u]

Courtesy of <https://www.dictionaryscoop.com/article/9-of-the-Hardest-Tongue-Twisters-in-the-English-Language>

English can be understood through tough thorough thought, though  
u              ^f              o              ɔ              o

# One sound – Many letters

<u>sh</u> oot	s
e <u>i</u> ther	ð
<u>ch</u> aracter	k
d <u>ea</u> l	i
<u>Th</u> omas	t
<u>ph</u> ysics	f
rou <u>gh</u>	f

# One letter – Many sounds

d <u>a</u> me	e
d <u>a</u> d	æ
f <u>a</u> ther	ɑ
c <u>all</u>	ɔ, a
vill <u>a</u> ge	ɪ, ə
m <u>a</u> ny	ɛ

# One letter – Not one sound

**m**nemonic

**p**sychology

res**ign**

**ghost** = no sound!

**is**land

**w**hole

de**b**t

cute    **kj**uwt  
= 2 sounds!

[Extra]

## One letter – Not one sound: Silent Letter Day



Silent Letter Day

<https://www.youtube.com/watch?v=sOUqHr9tcVY>

One letter – Not one sound

**kjuvwxyz**

= 2 sounds!

# Differences across languages

English: judge, juvenile, Jesus

dʒ

Spanish: jugar, Jesus

h

German: Jugend, jubeln, Jesus

j

French: Jean, j'accuse, jambon

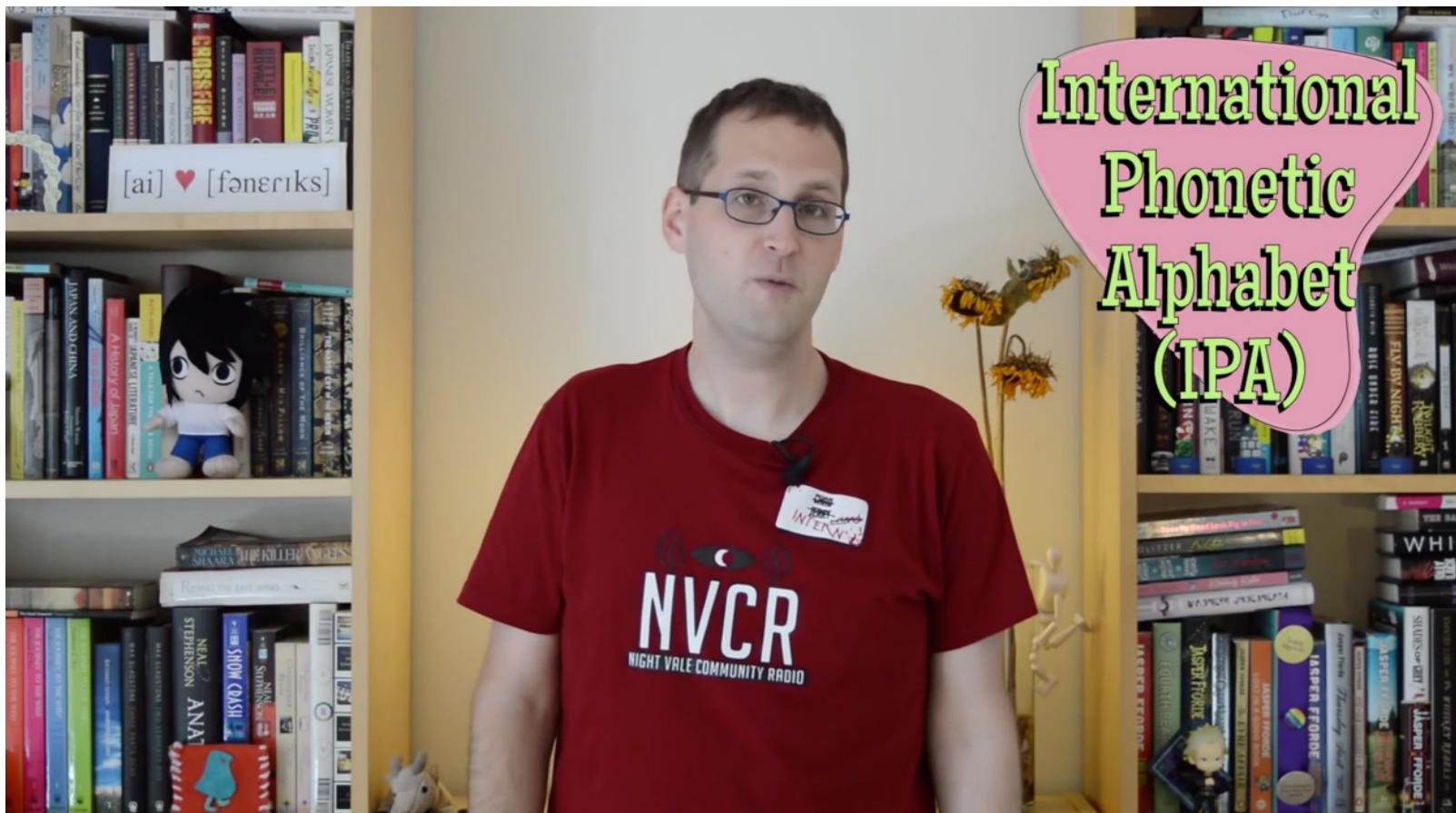
ʒ

# [Extra] Why we need the IPA

<https://www.youtube.com/watch?v=XTzkT3j9pHI>

<http://www.thelingspace.com/episode-12>

2:27-5:27, 8:42-9:05



# International Phonetic Alphabet

# One symbol per sound



## THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

## CONSONANTS (PULMONIC)

© 2005 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		t̪ d̪ c̪ f̪	k g	q G			?
Nasal	m	m̪		n		n̪	n̪	n̪		N	
Trill	B			r					R		
Tap or Flap		v̄		f̄		t̄					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç j	x y	χ ʁ	ħ ʕ	h f
Lateral fricative			ɬ ɭ								
Approximant		v̄		x̄		ɻ̄ j̄		ɻ̄			
Lateral approximant				l̄		ɺ̄ ɻ̄		ɺ̄			

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

### CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
○ Bilabial	b	' Examples: Bilabial
Dental	d	p' Bilabial
! (Post)alveolar	f	t' Dental/alveolar
‡ Palatoalveolar	g	k' Velar
Alveolar lateral	g̊	s' Alveolar fricative

## OTHER SYMBOLS

<b>M</b>	Voiceless labial-velar fricative	<b>C</b>	Z	Alveolo-palatal fricatives
<b>W</b>	Voiced labial-velar approximant		<b>J</b>	Voiced alveolar lateral flap
<b>Ψ</b>	Voiced labial-palatal approximant	<b>ħ</b>		Simultaneous <b>ʃ</b> and <b>X</b>
<b>H</b>	Voiceless epiglottal fricative			Affricates and double articulations
<b>ʕ</b>	Voiced epiglottal fricative			can be represented by two symbols joined by a tie bar if necessary
<b>ʔ</b>	Epiglottal plosive			

**DIACRITICS** Diacritics may be placed above a symbol with a descender, e.g. Þ.

○	Voiceless	ն դ	..	Breathy voiced	բ ա	ն	Dental	տ ծ
χ	Voiced	չ տ	~	Creaky voiced	բ ա	ւ	Apical	տ ծ
h	Aspirated	թ ժ	~	Linguolabial	տ ծ	ո	Laminal	տ ծ
›	More rounded	զ	W	Labilized	տ <sup>w</sup> ժ <sup>w</sup>	~	Nasalized	է
՝	Less rounded	զ	j	Palatalized	տ <sup>j</sup> ժ <sup>j</sup>	ն	Nasal release	ճ <sup>n</sup>
+	Advanced	ւ	Յ	Velarized	տ <sup>Յ</sup> ժ <sup>Յ</sup>	լ	Lateral release	ճ <sup>լ</sup>
-	Retracted	ե	Ռ	Pharyngealized	տ <sup>Ռ</sup> ժ <sup>Ռ</sup>	Ռ	No audible release	ճ <sup>Ռ</sup>
..	Centralized	ö	~	Velarized or pharyngealized	†			
×	Mid-centralized	ɛ	↑	Raised	Է	(I = voiced alveolar fricative)		
՝	Syllabic	ն	↓	Lowered	Ե	(Բ = voiced bilabial approximant)		
՞	Non-syllabic	օ	↑	Advanced Tongue Root	Ե			
~	Rhoticity	Թ Ձ	↓	Retracted Tongue Root	Ե			

The diagram illustrates the IPA vowel system using a grid where the vertical axis represents height (Close at top, Open at bottom) and the horizontal axis represents frontness/backness (Front on the left, Back on the right). The central column represents near-central vowels.

	Front	Central	Back
Close	i • y	ɪ • ʊ	ɯ • u
Close-mid	e • ɸ	ə • θ	ɔ • o
Open-mid	ɛ • ɔ	œ • ʌ	ɒ • ɑ
Open	a • ɶ		ɒ • ɑ

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

SUPRASEGMENTALS

- Primary stress
- Secondary stress
- $f\text{oo}\text{nə}t\text{ʃən}$
- Long       $\text{e}^{\cdot}$
- Half-long     $\text{e}^{\cdot}$
- Extra-short     $\ddot{\text{e}}$
- Minor (foot) group
- Major (intonation) group
- Syllable break     $. \text{ɪ.ækt}$
- Linking (absence of a break)

TONES AND WORD ACCENTS		LEVEL	CONTOUR
é	or	Extra high	↗ Rising
é	—	High	↖ Falling
é	—	Mid	— High
é	—	Low	— Low
é	—	Extra low	↑ rising-falling
↓	Downstep		↗ Global rise
↑	Upstep		↘ Global fall

# Interactive chart of the International Phonetic Alphabet

<http://www.ipachart.com/>

Click on a symbol to hear the sound it represents.

## Pulmonic consonants

Where symbols appear in pairs, the one to the right represents a voiced consonant.

Areas shaded grey indicate articulations judged impossible.

## **Non-pulmonic consonants**

Clicks	Voiced implosives	Ejectives
○ Bilabial	b Bilabial	p' Bilabial
Dental	d Dental/alveolar	t' Dental/alveolar
! (Post)alveoalar	f Palatal	k' Velar
‡ Palatoalveolar	g Velar	s' Alveolar fricative
Alveolar lateral	G Uvular	' etc...

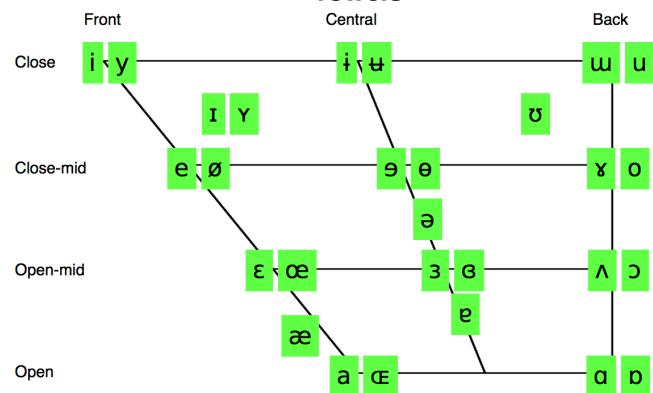
## Other symbols

M	Voiceless labial-velar fricative
w	Voiced labial-velar approximant
ɥ	Voiced labial-palatal approximant
H	Voiceless epiglottal fricative
ɸ	Voiced epiglottal fricative
χ	Epiglottal plosive
ç	Voiceless alveolo-palatal fricative
ʐ	Voiced alveolo-palatal fricative
ɹ	Alveolar lateral flap
ħ	Simultaneous ʃ and X

## Affricates

$\text{ts}$	Voiceless alveolar affricate
$\text{tʃ}$	Voiceless palato-alveolar affricate
$\text{tʂ}$	Voiceless alveolo-palatal affricate
$\text{ʈʂ}$	Voiceless retroflex affricate
$\text{dʒ}$	Voiced alveolar affricate
$\text{dʒ}$	Voiced post-alveolar affricate
$\text{dʐ}$	Voiced alveolo-palatal affricate
$\text{ɖʐ}$	Voiceless retroflex affricate

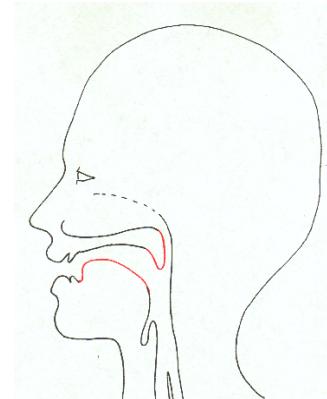
## Vowels



# Sounds: Speech production

**“Speech is a river of breath, bent into hisses and hums by the soft flesh of the mouth and throat.”**

- Pinker, *The Language Instinct*



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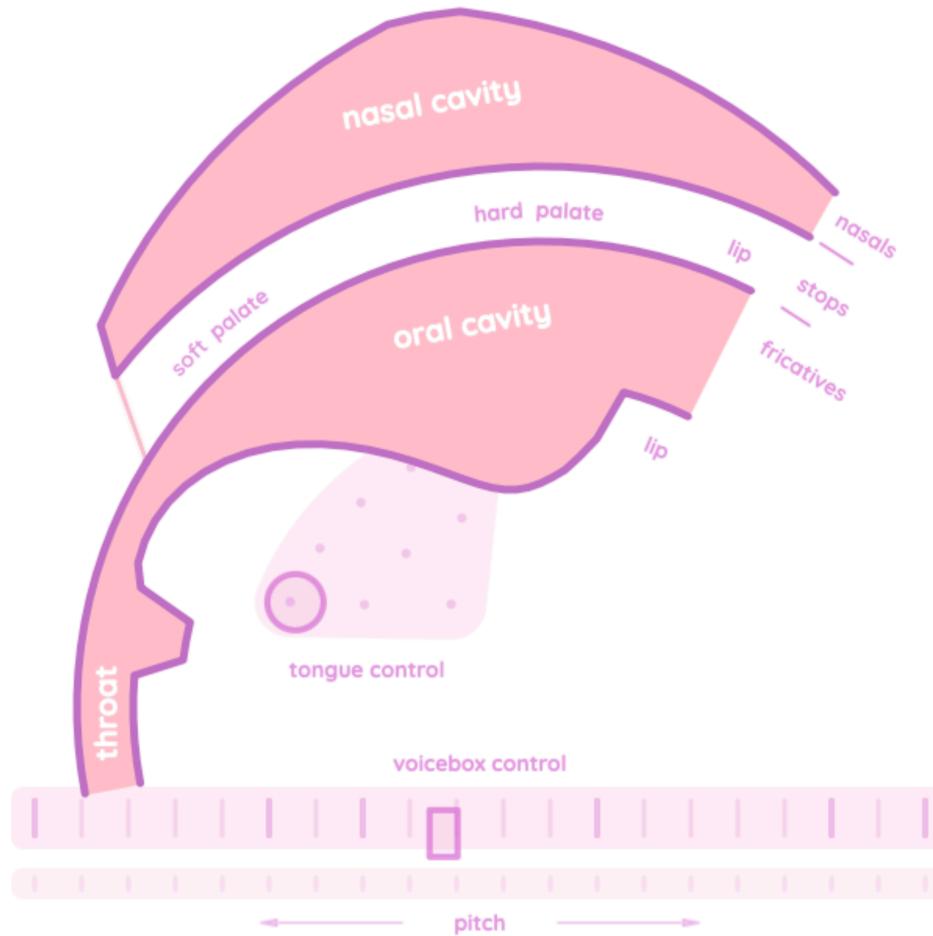
**“Speech production is an invisible ballet that requires precise and rapid coordination of the many muscle groups that control the lips, tongue, jaw, larynx, and respiration.”**

- Myers 2017

# Sounds: The vocal tract as an instrument

[Demo if time]

<https://www.imaginary.org/program/pink-trombone>



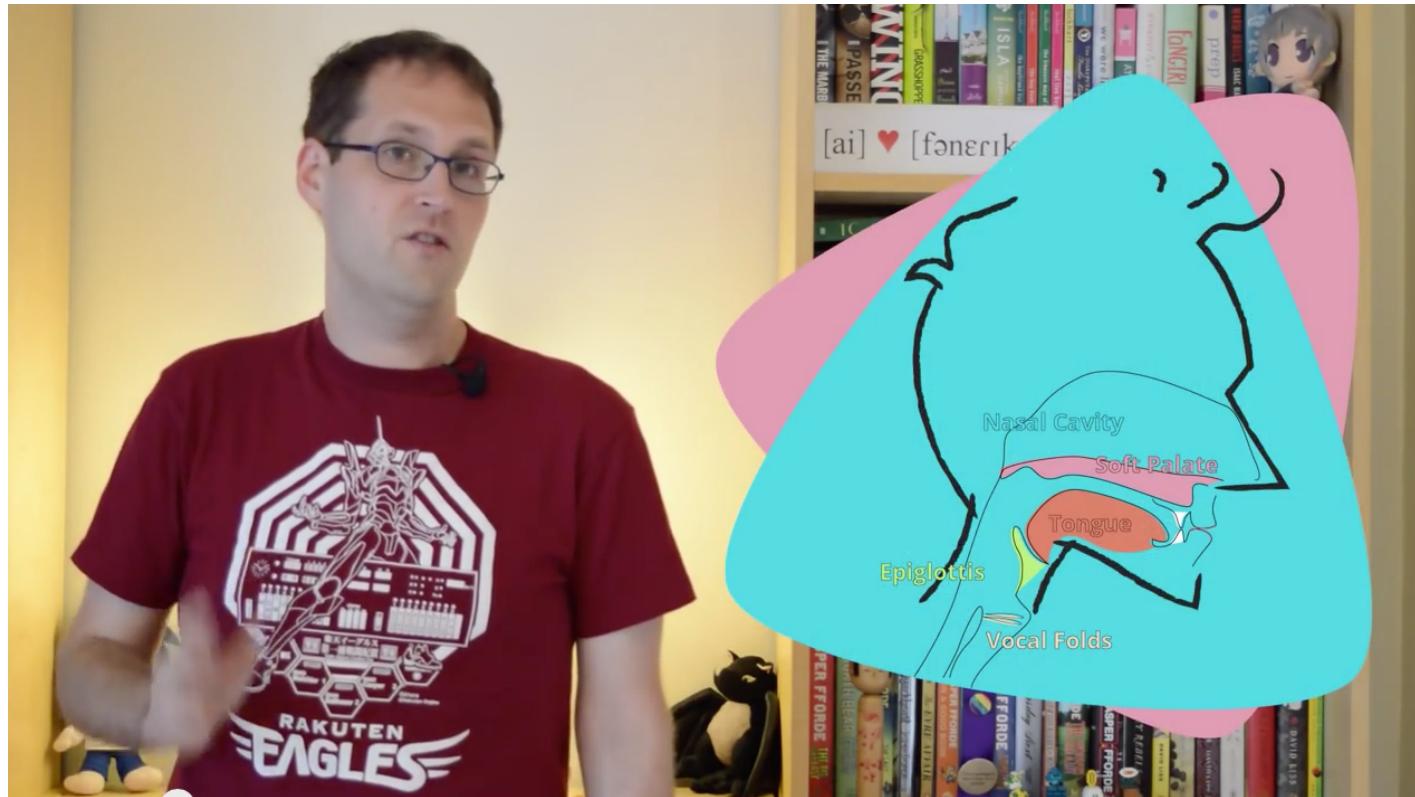
[Extra]

## Sounds: Vocal tract overview

<https://www.youtube.com/watch?v=dtf8zGQj9GY>

<http://www.thelingspace.com/episode-4>

0:38 through 1:17

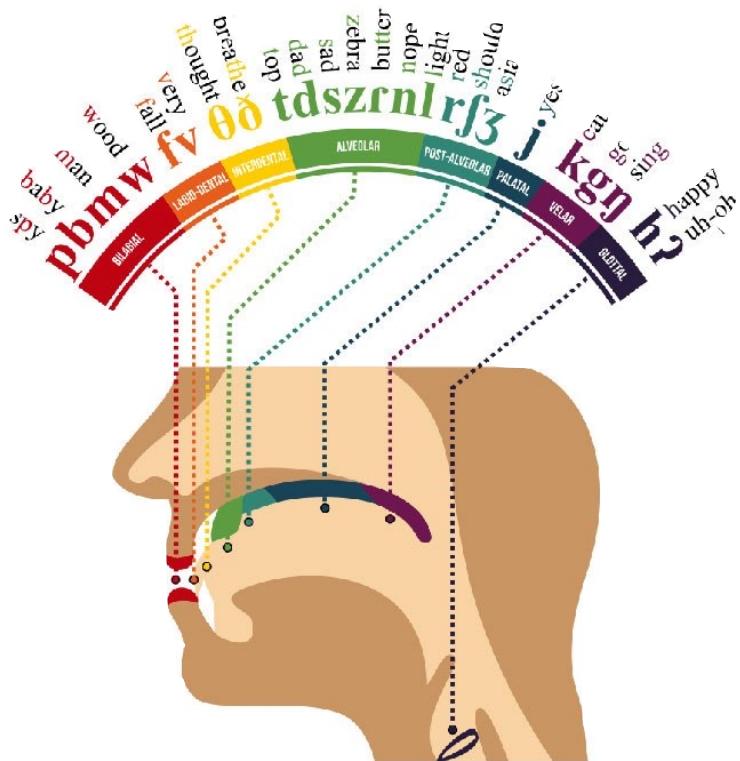


# Major division: consonants vs vowels

**Consonantal** sounds: narrow or complete closure somewhere in the vocal tract.

**Vowels**: very little obstruction in the vocal tract. Can form the basis of syllables (also possible for some consonants).

# Consonants



# On a handy chart

## THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

### CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
<b>Stop</b>	p b			t d				k g			
Nasal	m			n				ŋ			
Trill											
Tap or Flap				r							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
<b>Glide</b>							j w				
<b>Liquid</b>				ɹ l							

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

# Place of articulation:

## Where the airflow is blocked

Front to back

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
<b>Stop</b>	p b		t d				k g				
Nasal	m	baby	n				ŋ	happy	uh-oh		
Trill			r								
Tap or Flap											
Fricative	f v	θ ð	s z	ʃ ʒ	tʃ dʒ						h
Lateral fricative											
<b>Glide</b>			j	w							
<b>Liquid</b>			l								

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

# Place of articulation:

## Where the airflow is blocked

Front to back



CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
<b>Stop</b>	p b			t d				k g			
Nasal	m			n				ŋ			
Trill											
Tap or Flap				r							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
<b>Glide</b>							j w				
<b>Liquid</b>				ɹ l							

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

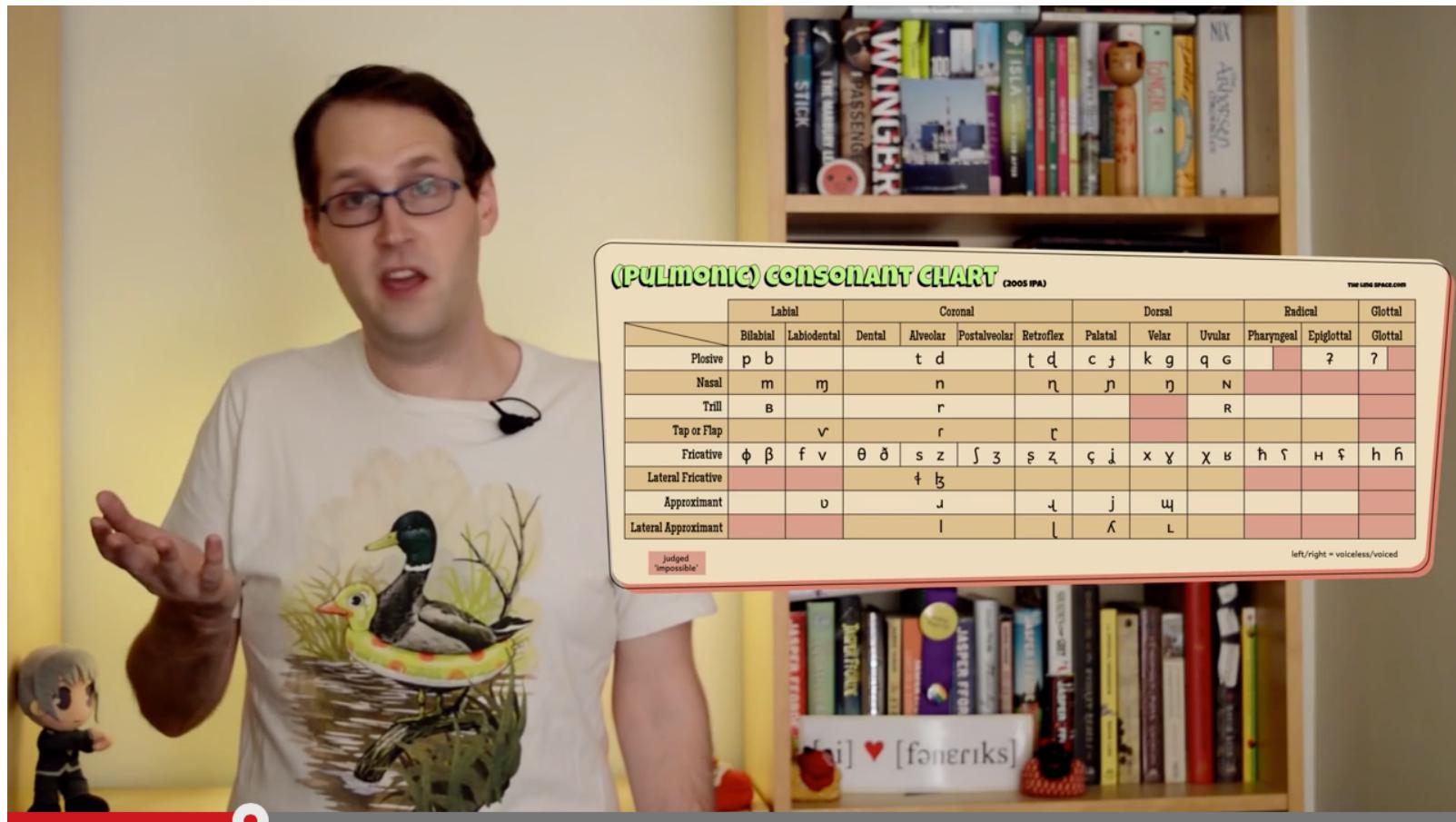
# Place of articulation: Where the airflow is blocked

[Extra]

<https://www.youtube.com/watch?v=zEaPQP3pXQc>

<http://www.thelingspace.com/episode-20>

beginning through 5:53



# Manner of articulation: How the airflow is blocked

## THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

### CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
<b>Stop</b>	p b			t d				k g			
Nasal		m		n				ŋ			
Trill											
Tap or Flap				r							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
<b>Glide</b>							j w				
<b>Liquid</b>				ɹ l							

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

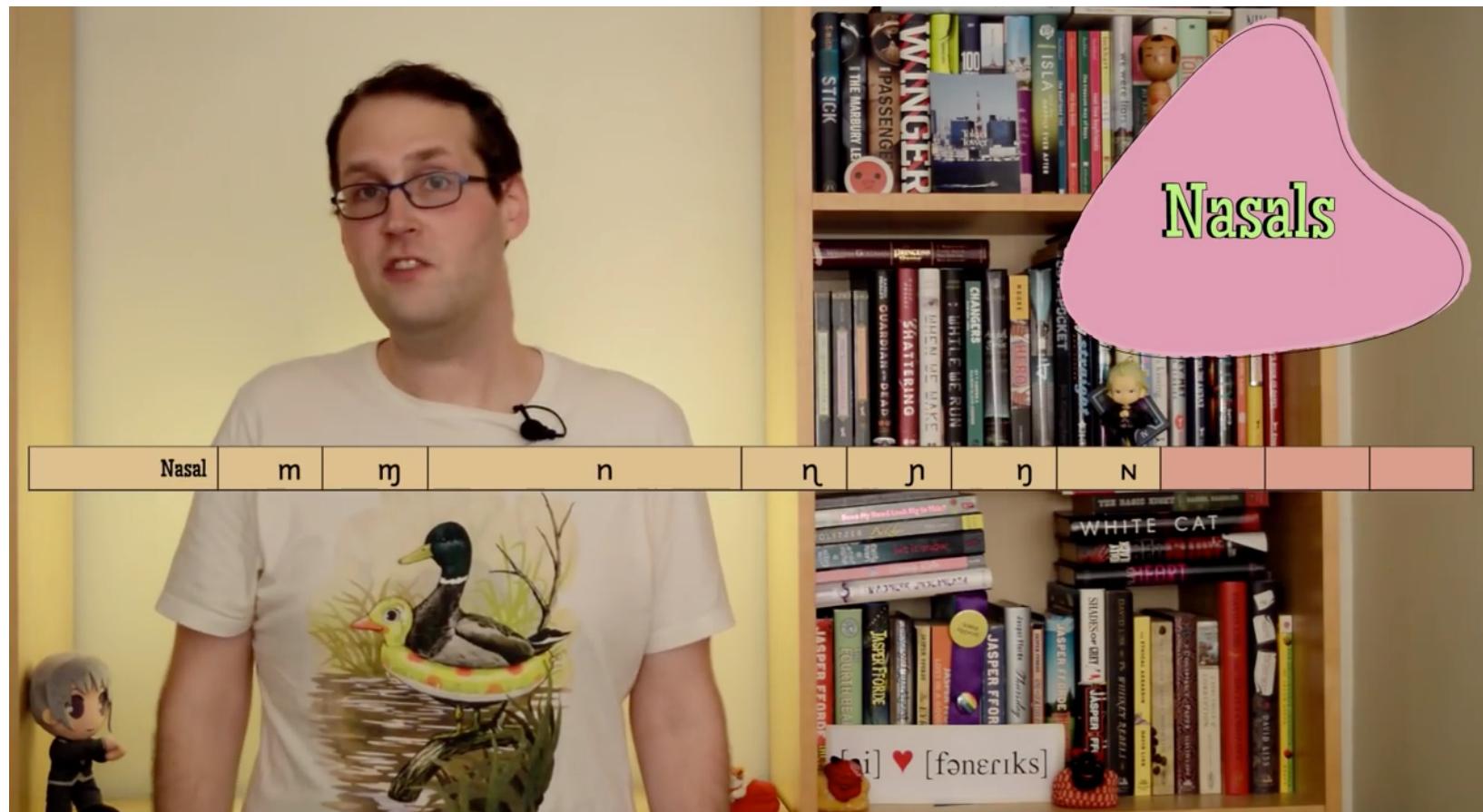
# Manner of articulation: How the airflow is blocked

[Extra]

<https://www.youtube.com/watch?v=zEaPQP3pXQc>

<http://www.thelingspace.com/episode-20>

5:54 - 9:19



# Manner: How the air is flowing

**Stops** (sometimes called plosives)

[p] [t] [k] [b] [d] [g] [m] [n] [ŋ]

**Fricatives**

[f] [v] [θ] [ð] [s] [z] [ʃ] [ʒ]

Approximants/**Glides**

[w] [j] (Like in “water” and “you”)

**Liquids**

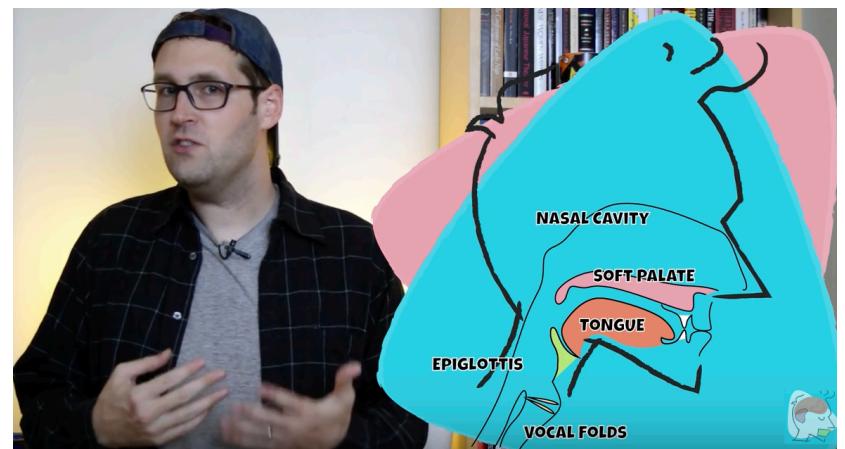
[ɹ] [l]

**Tap/Flap**

[ɾ] (Like in “water” and “but<sup>ɾ</sup>ter”)

## [Extra] The acoustics of sonorants

<https://www.youtube.com/watch?v=g8BgfHEDbFY&feature=youtu.be>  
especially 1:11 - 1:46 (intro to sonorants)  
2:34 - 3:37 (producing nasals)



# Fricatives & Affricates

Postalveolar sounds [ʒ] [ʃ]  
(fricatives)

Palatal sounds [dʒ] [tʃ]  
(affricates)

Affricates - combination of stop + fricative - [dʒ] [tʃ],  
as in *judge*, *church*

Ex: affricates in fast speech:

“What **should**...?”  
[tʃ]  
becomes  
“Wh**a**chould...?”

“What **did** **you**...?”  
[dʒ]  
becomes  
“What **did** **zha**...?”  
[dʒ]  
becomes  
“Wh**a**ja...?”

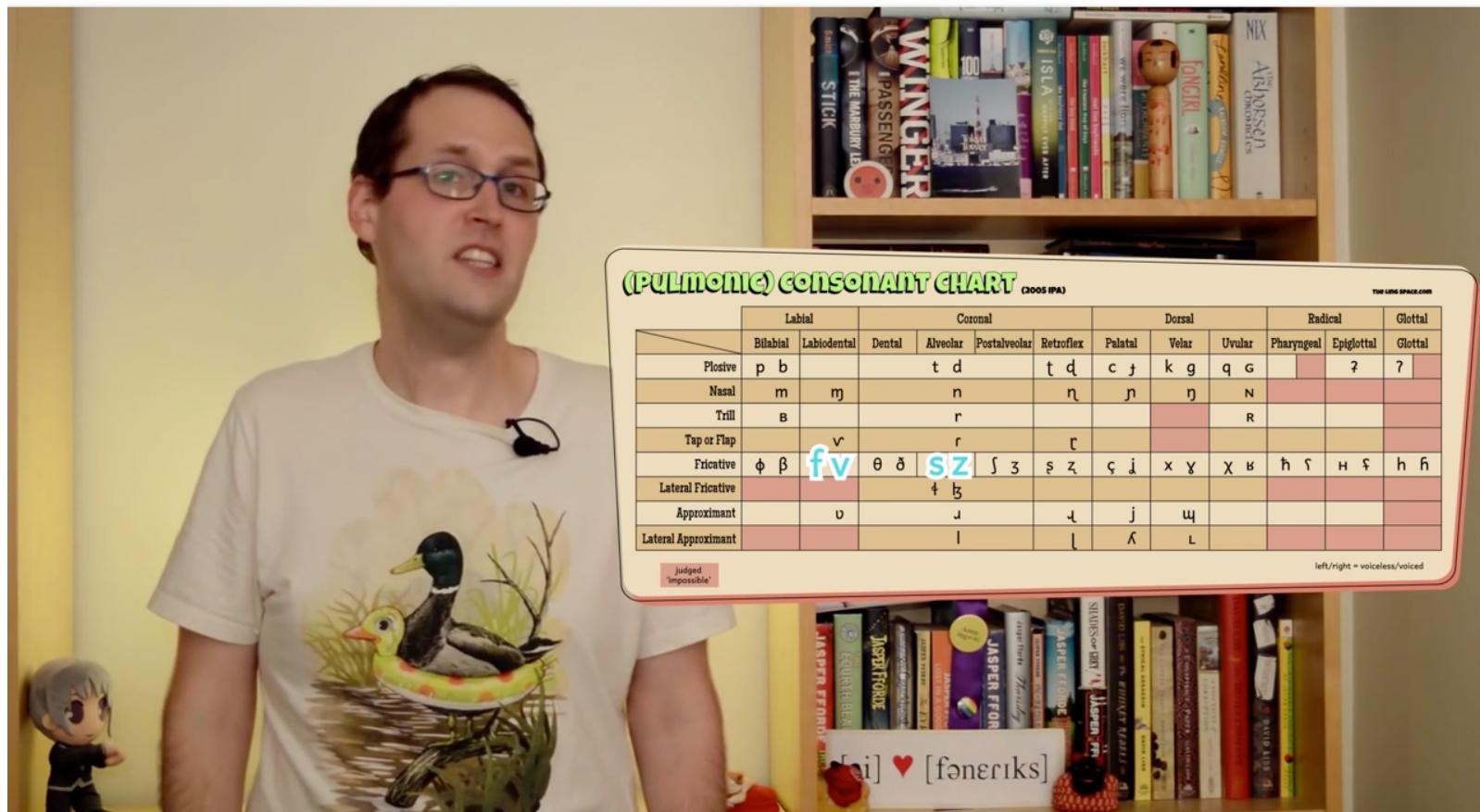
# Voicing: What the vocal folds are doing

## [Extra]

<https://www.youtube.com/watch?v=zEaPQP3pXQc>

<http://www.thelingspace.com/episode-20>

9:20 - 9:52



# What are the vocal folds doing?

**closed**  
**voiced**



**open**  
**voiceless**



“The air leaves the lungs through the trachea (windpipe), which opens into the larynx (the voice-box, visible on the outside as the Adam's apple). The larynx is a valve consisting of an opening (the glottis) covered by two flaps of retractable muscular tissue called the vocal folds...The vocal folds can also be partly stretched over the glottis to produce a buzz as the air rushes past.” - Pinker, *The Language Instinct*

# Voiced & Voiceless consonants

Consonants are either **voiced** or **voiceless**.

English pairs:

b p

v f

d t

z s

ð θ

ʃ ʒ

tʃ dʒ

# Voicing – usually indicated by position in cell

## Voiceless voiced

### CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	p	b		t	d			k	g		
Nasal		m			n			ŋ			
Trill											
Tap or Flap				r							
Fricative		f	v	θ	ð	s	z	tʃ	dʒ		h
Lateral fricative											
Glide							j	w			
Liquid				ɹ	l						

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

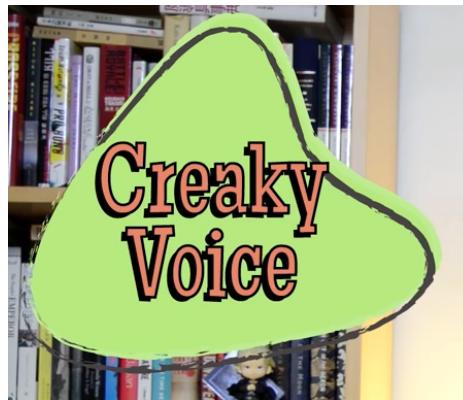
# Other Glottal States (besides just +/-voiced)

[Extra]

<http://www.thelingspace.com/episode-53>

<https://www.youtube.com/watch?v=edYLoMRgaFw>

Discusses glottal states like breathy voice & creaky voice



# Describing sounds

# IPA full(er) chart

## THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

### CONSONANTS (PULMONIC)

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

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

# The parts we care about for this class

## THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

### CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
<b>Stop</b>	p b			t d				k g			
Nasal	m			n				ŋ			
Trill											
Tap or Flap				r							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
<b>Glide</b>							j w				
<b>Liquid</b>				ɹ l							

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

# Features

Ways of *describing* sounds

e.g., [t] = voiceless, alveolar, stop



*Atoms of Speech*

Roman Jakobson, 1896-1982

# Describing speech sounds: Recap

Where is the air-flow blocked? (**place** of articulation)

*labial, alveolar, palatal, velar* etc.

Where/how is the air flowing? (**manner** of articulation)

*nasal/oral, stop, fricative, liquid, tap/flap* etc.

What are the vocal folds doing? (**voicing**)

*voiced* vs. *voiceless*

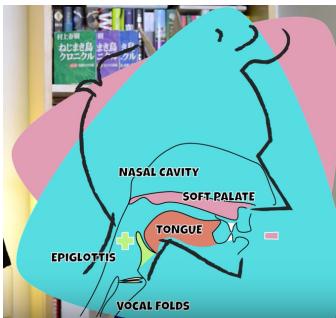
# Other ways of producing consonants

## [Extra]

<https://www.youtube.com/watch?v=JKP10ARLnzM&feature=youtu.be>  
Discusses clicks, implosives, and ejectives



Clicks	Voiced Implosives	Ejectives
○ Bilabial	b Bilabial	p' Bilabial
Dental	c Dental/Alveolar	t' Dental/Alveolar
! Post-Alveolar	f Palatal	k' Velar
‡ Palatoalveolar	g Velar	s' Alveolar Fricative
Alveolar Lateral	ç Uvular	' (Ejective Marker)



# Vowels

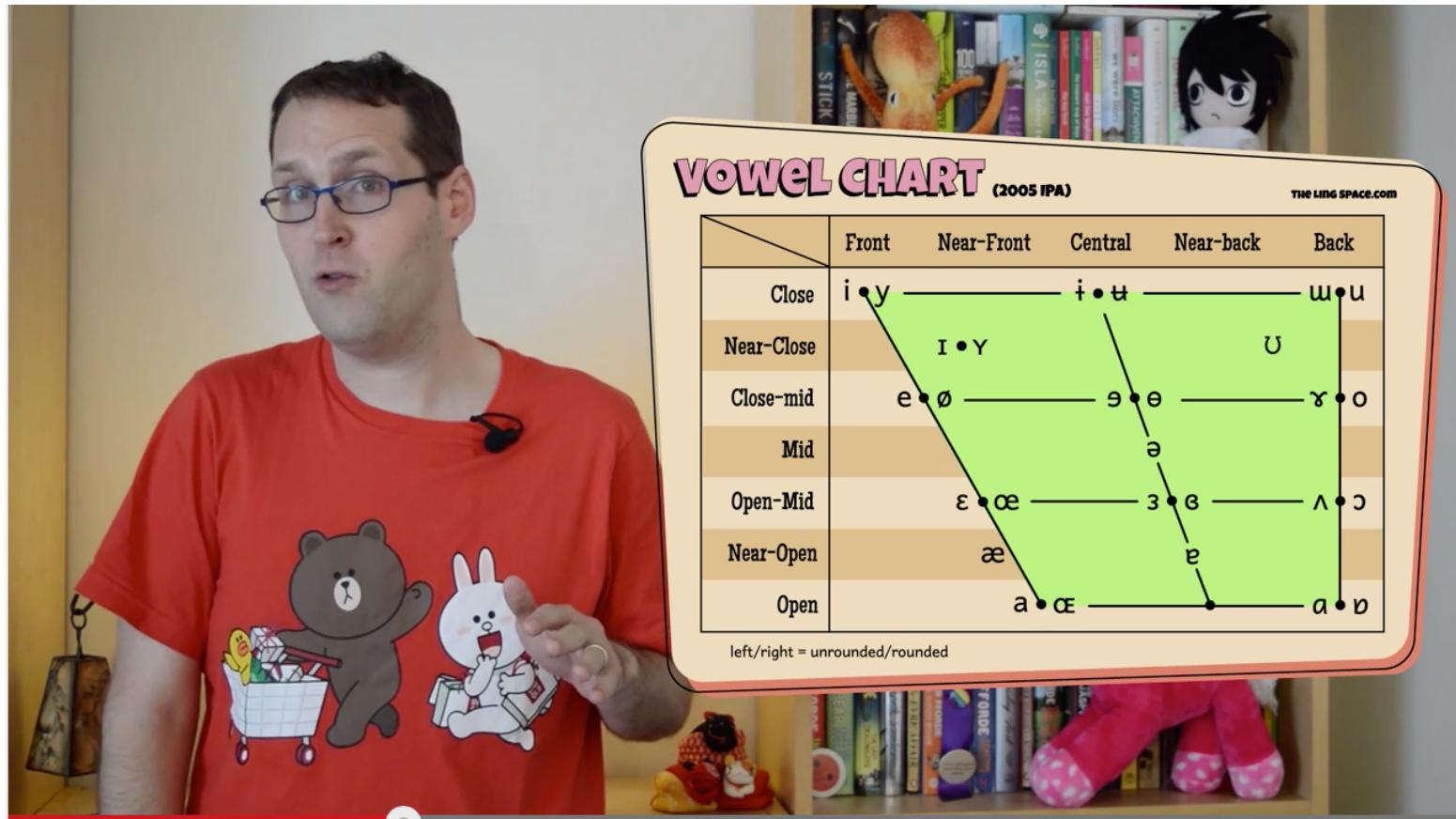
## [Extra]

# Vowels

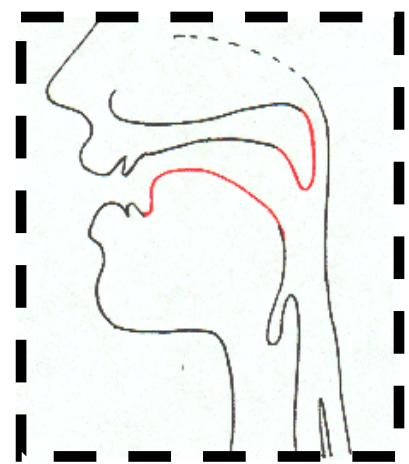
<https://www.youtube.com/watch?v=arMntA15A0s>

<http://www.thelingspace.com/episode-27>

# beginning through 4:10

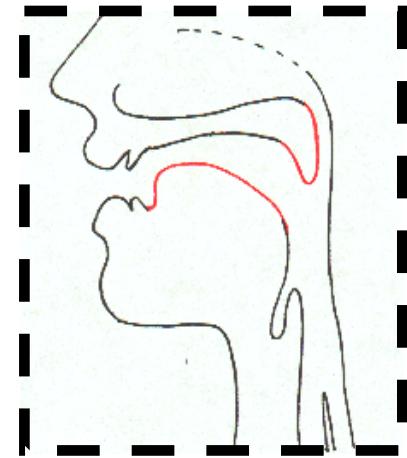


What can you do to alter the shape of your vocal tract?



You can....

- (1) Raise or lower your tongue  
(high, mid, low)
- (2) Advance or retract your tongue  
(front, central, back)
- (3) Round or spread your lips  
(round, spread)
- (4) Tense or not tense your mouth  
(tense, lax)



## A quick note about tense/lax

"...by advancing the tongue root....the tongue becomes tense and humped rather than lax and flat, and the hump narrows the air chamber in the mouth above it, changes the resonances."

- Pinker, *The Language Instinct*

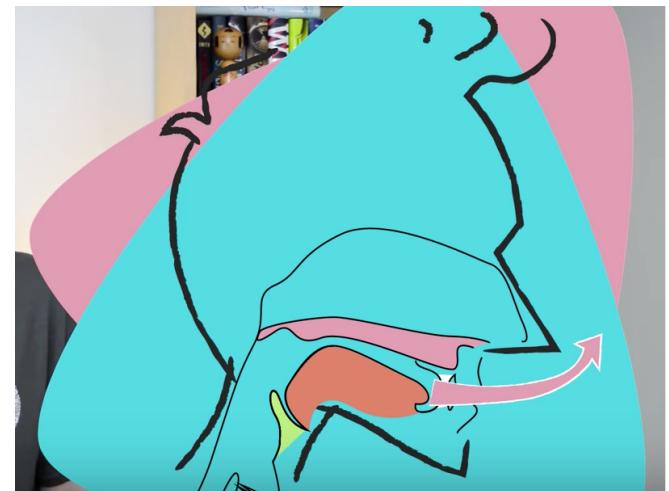
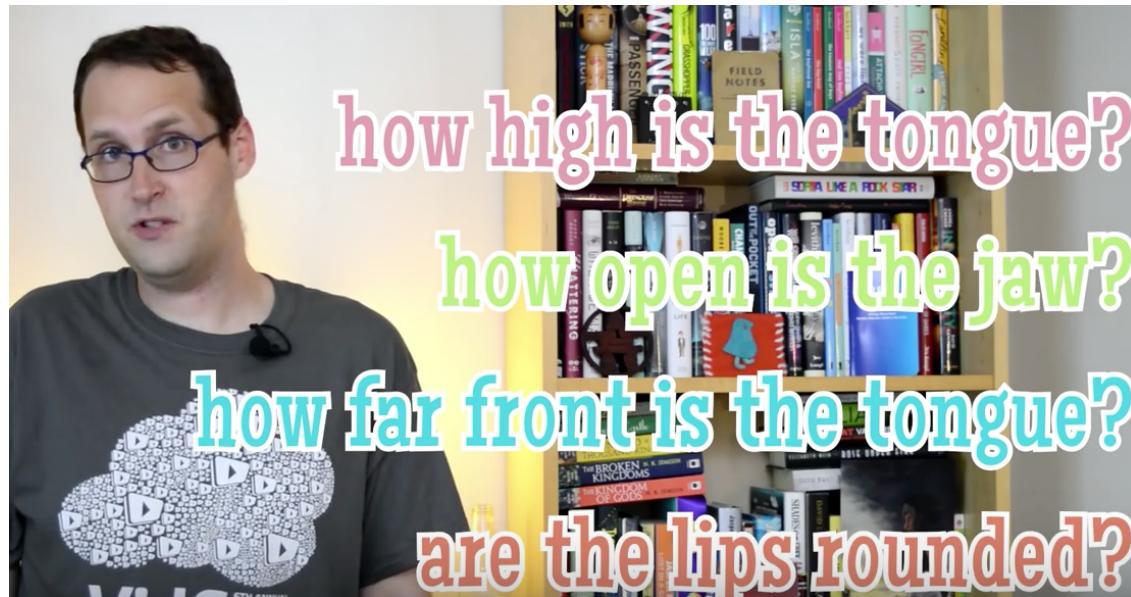
- (4) Tense or not tense your mouth  
(tense, lax)

# More precision when talking about vowels

## [Extra]

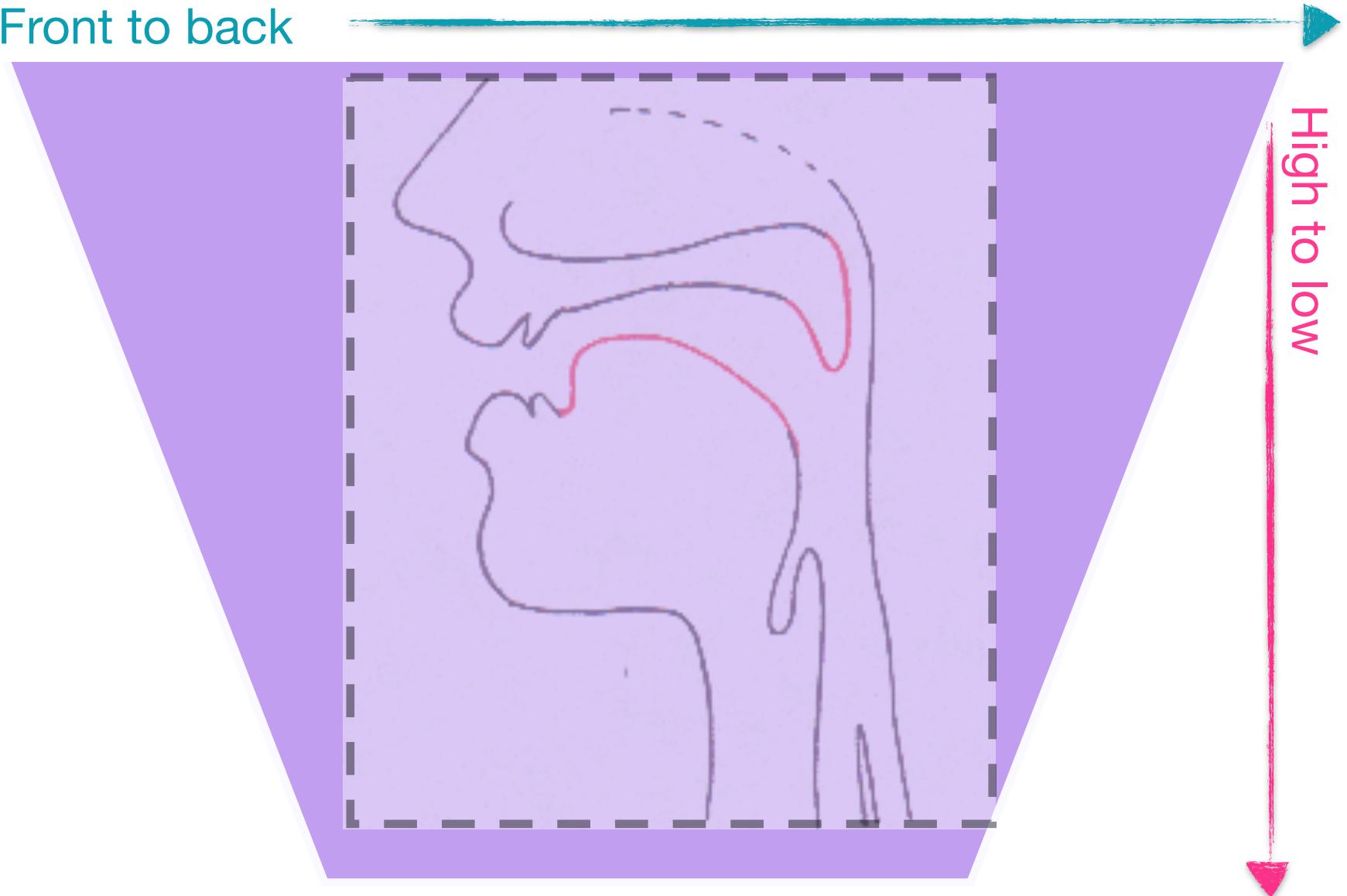
<https://www.youtube.com/watch?v=jl4zGRSYqkE&feature=youtu.be>

Discusses frequency & formants relevant for describing vowels



# So what vowels do you have?

Front to back



# So what vowels do you have?

Front to back



i

“sheep, sleep”

I

“ship, slip”

High to low



# So what vowels do you have?

Front to back



i

I

e

ɛ

“laid, spade, trade”

“led, sped, tread”

High to low



# So what vowels do you have?

Front to back



i

I

e

ɛ

æ

“bat, lad”

High to low



# So what vowels do you have?

Front to back



i

I

“Luke, who’d, suit”

u

U

“look, hood, soot”

e

ɛ

High to low

æ

# So what vowels do you have?

Front to back



i

I

e

ɛ

æ

U

u

“coat, wrote, hoed”

ɔ

“caught, wrought, hawed”

ɑ

High to low



# So what vowels do you have?

Front to back

i

I

e

ɛ

æ

U

u

ɔ

ʌ

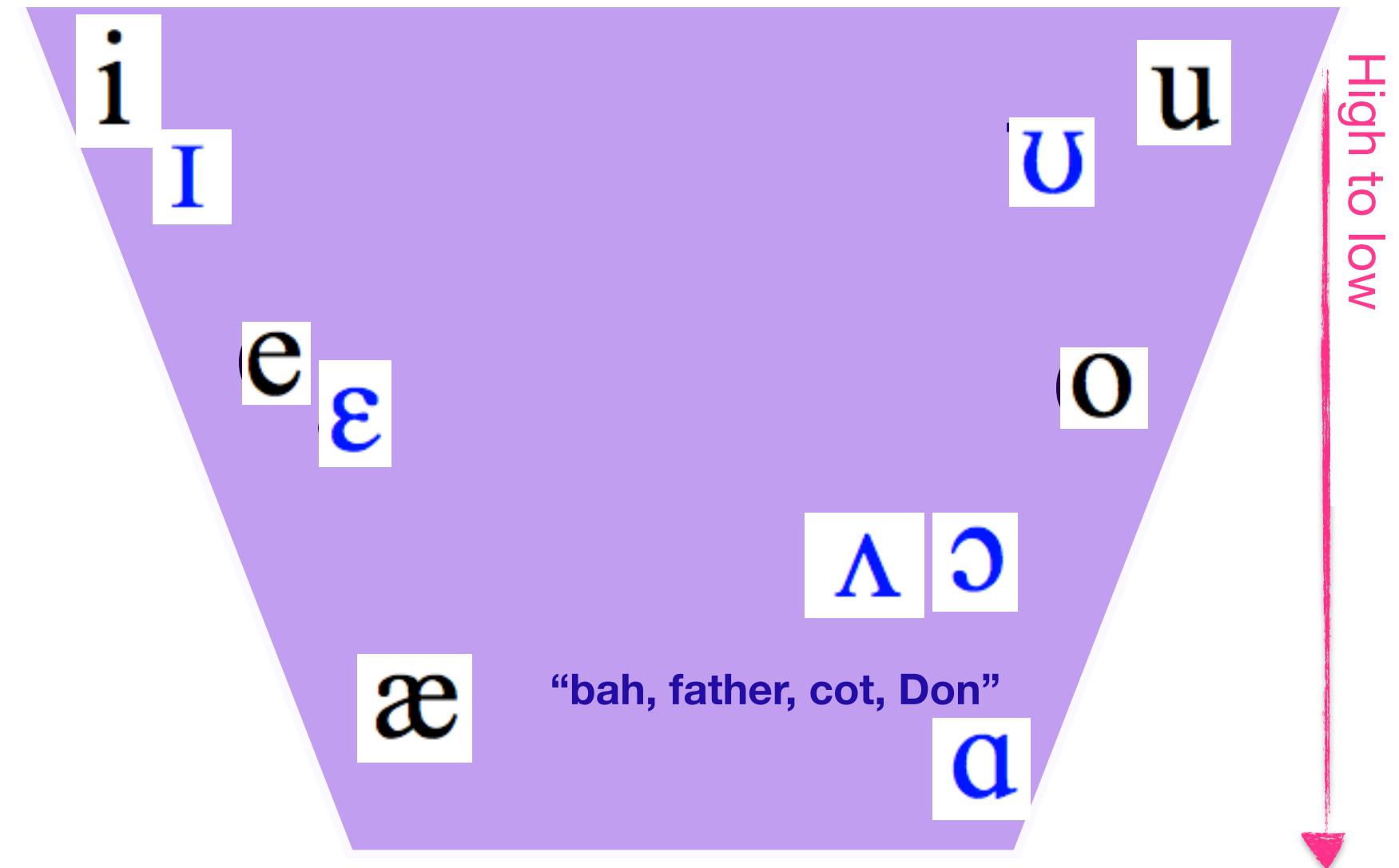
“cut, rut, hut”

High to low



# So what vowels do you have?

Front to back



# So what vowels do you have?

Front to back



High to low

i

I

e

ɛ

æ

e

ʌ

a

ʊ

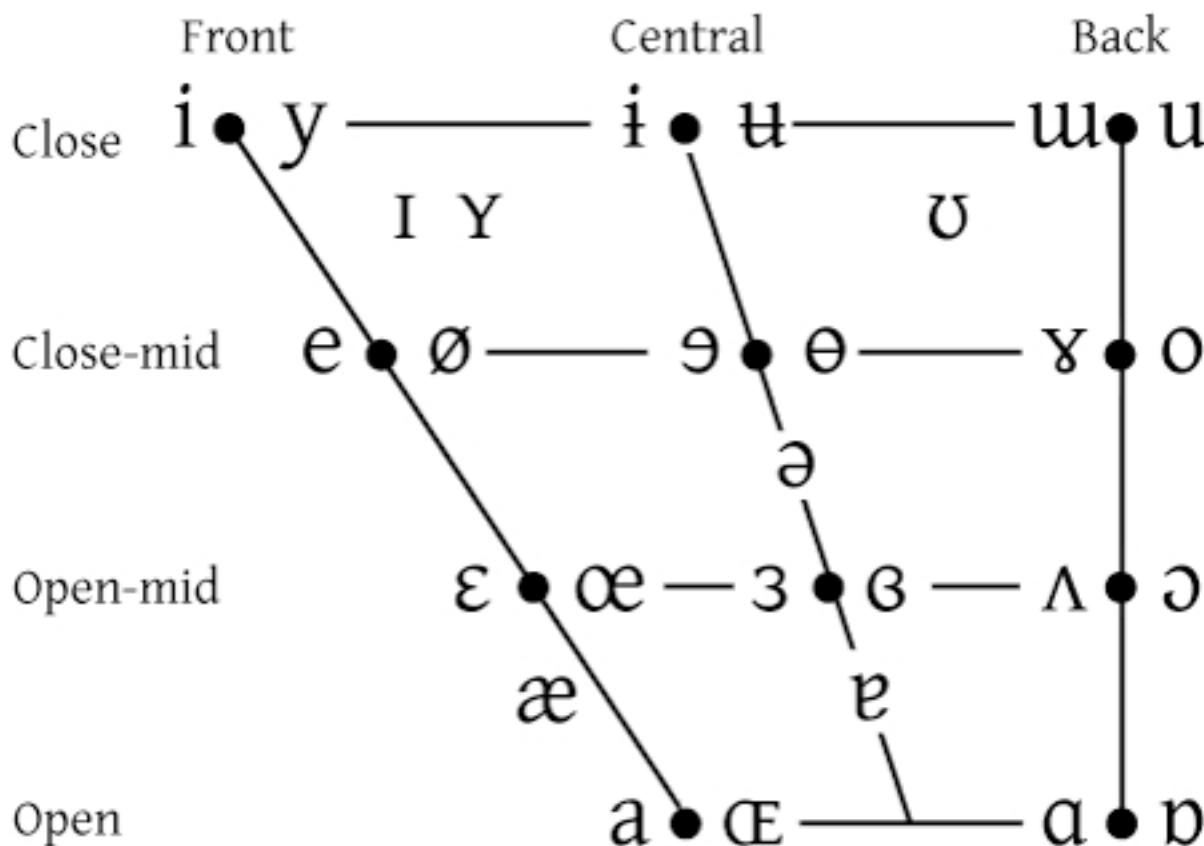
u

ɔ

“metallic, Texas”

# The full(er) vowel chart

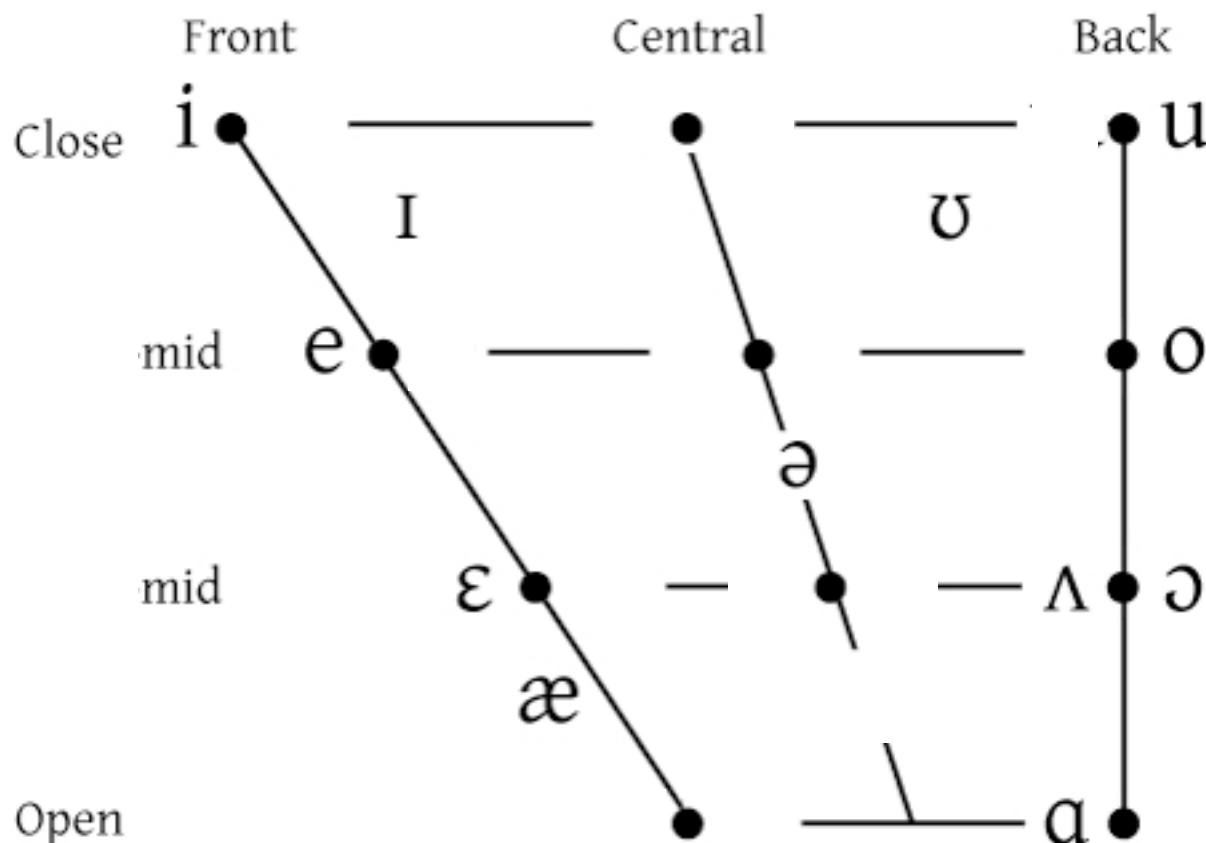
## VOWELS



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

# The parts we care about for this class

## VOWELS



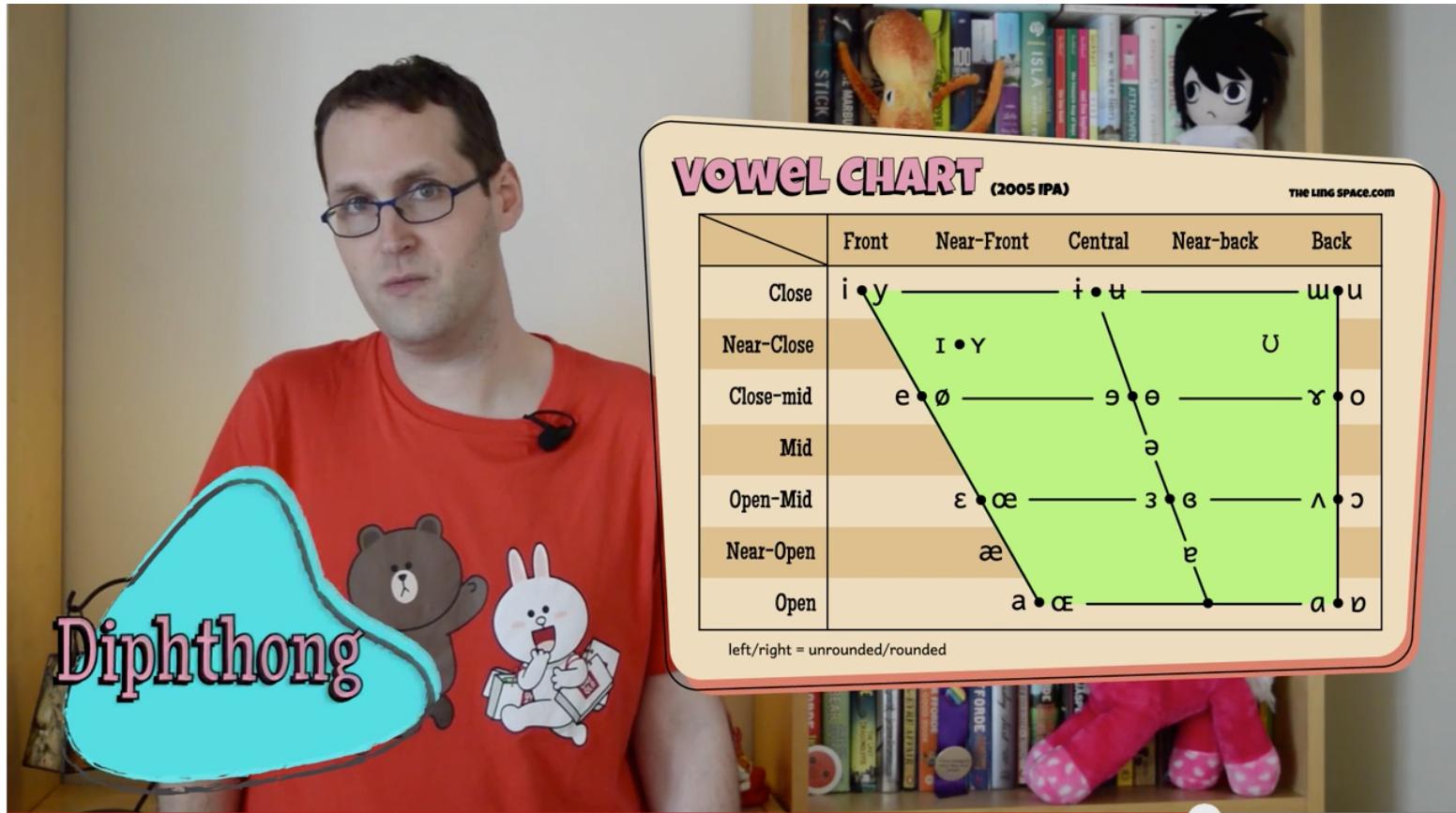
Where symbols appear in pairs, the one to the right represents a rounded vowel

# [Extra] Diphthongs

<https://www.youtube.com/watch?v=arMntA15A0s>

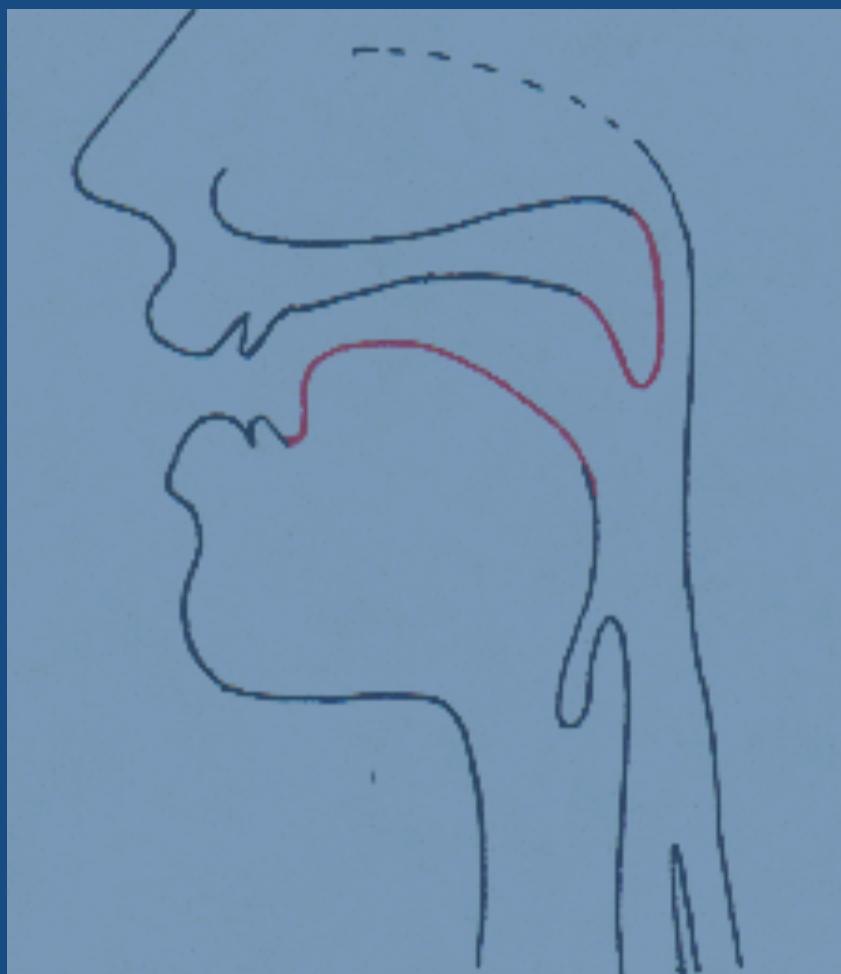
<http://www.thelingspace.com/episode-27>

7:02 through 7:38



# Diphthongs: Two vowel-ish sounds together

Front to back

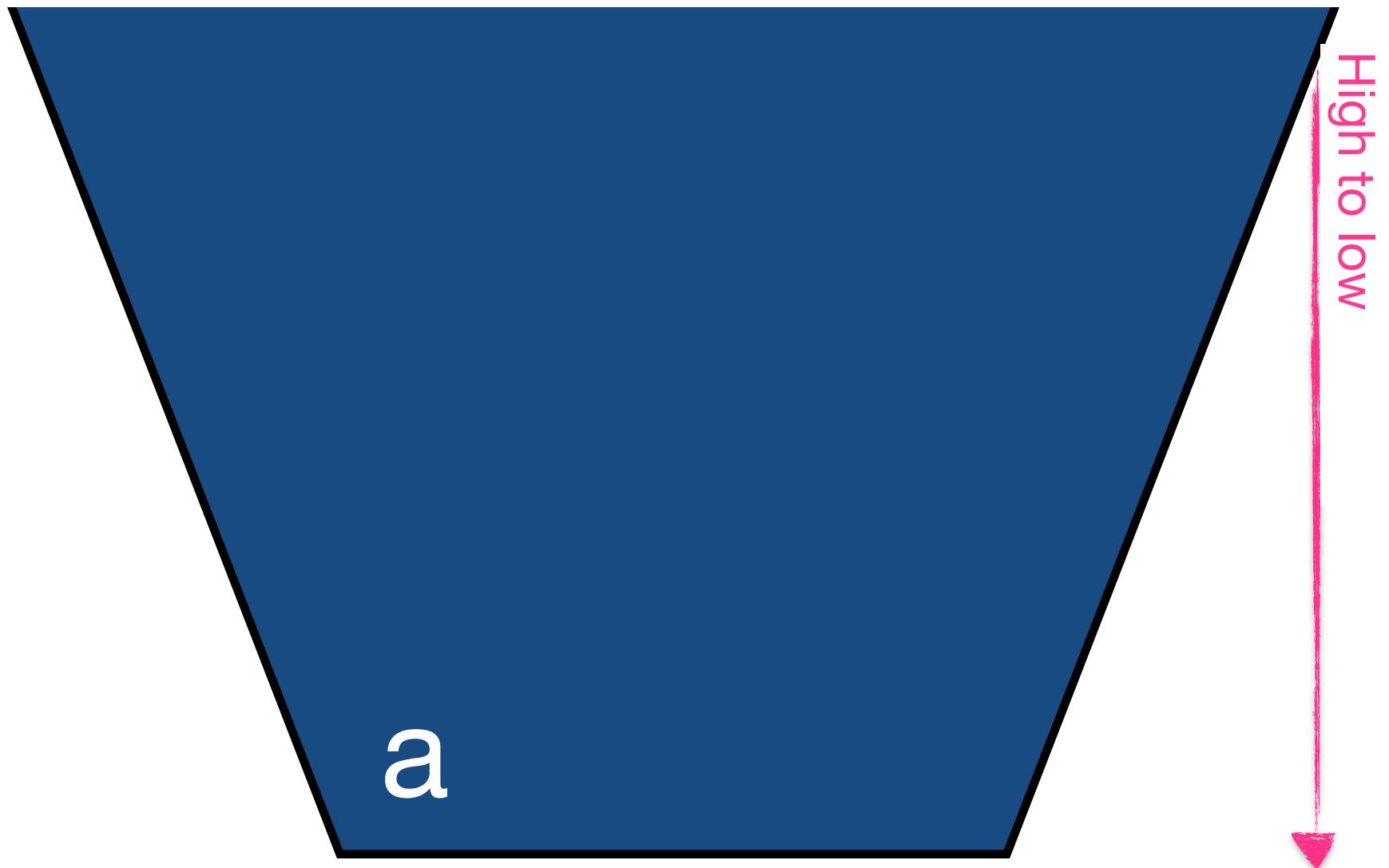


High to low



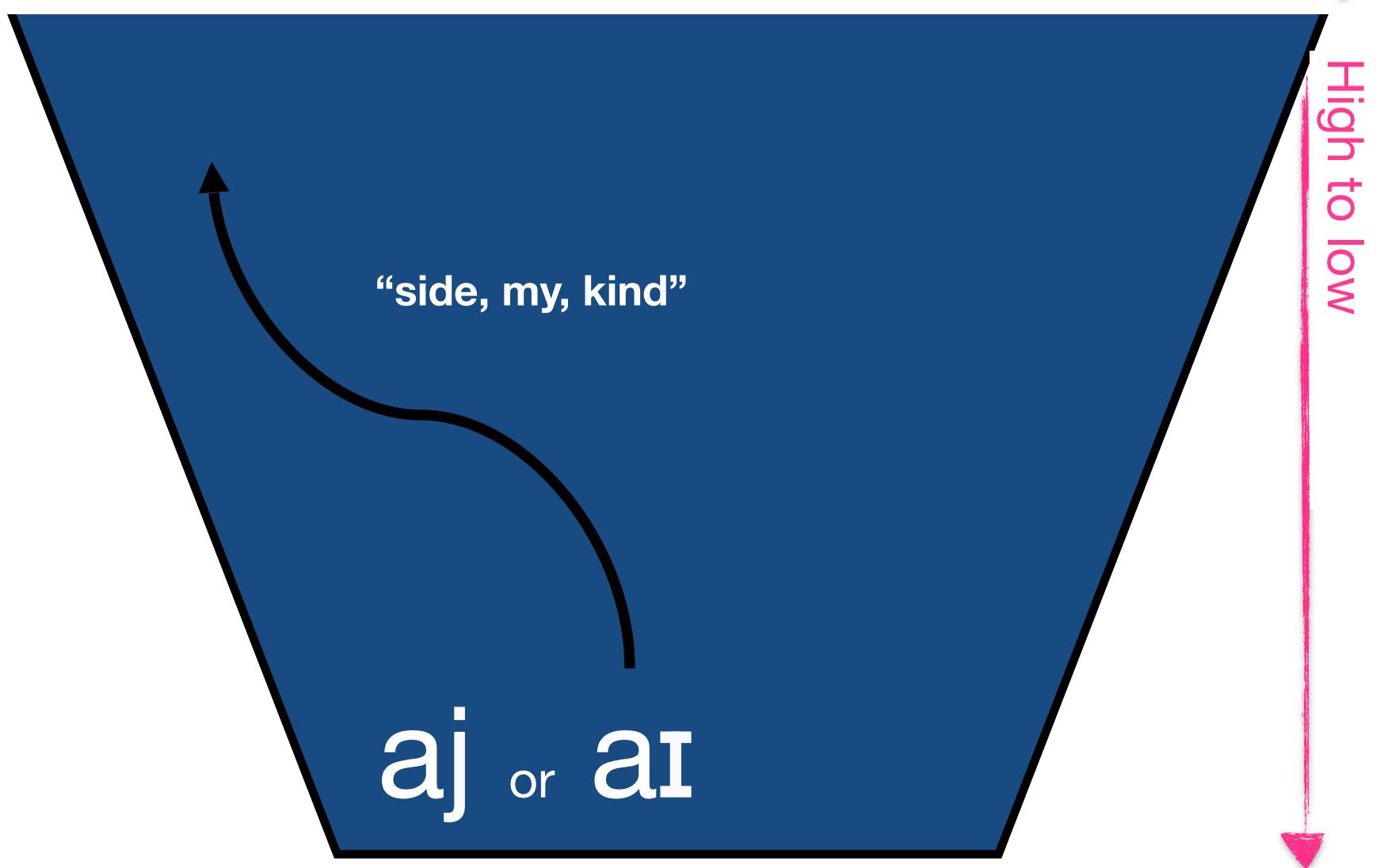
Diphthongs: Two vowel-ish sounds together

Front to back



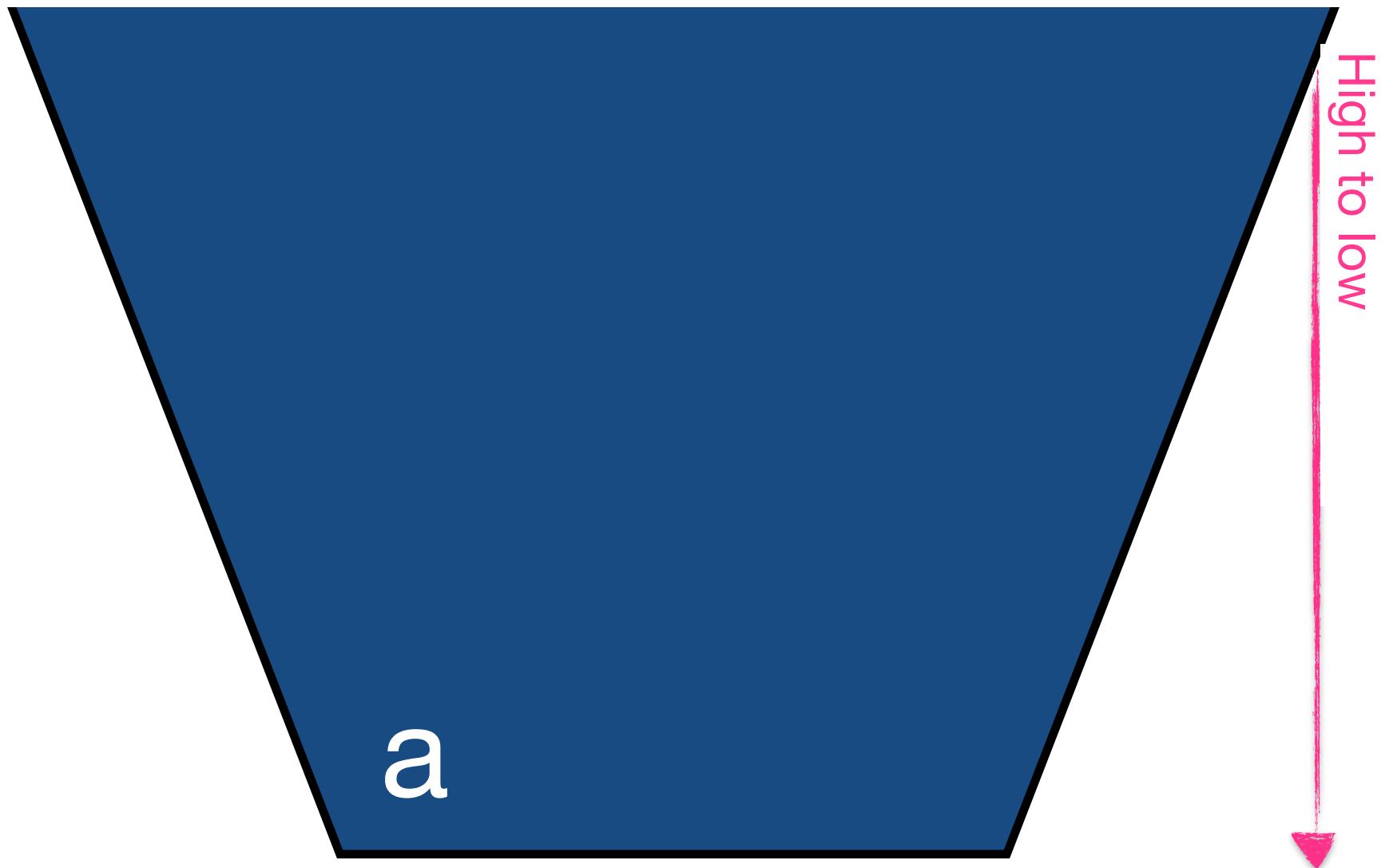
# Diphthongs: Two vowel-ish sounds together

Front to back



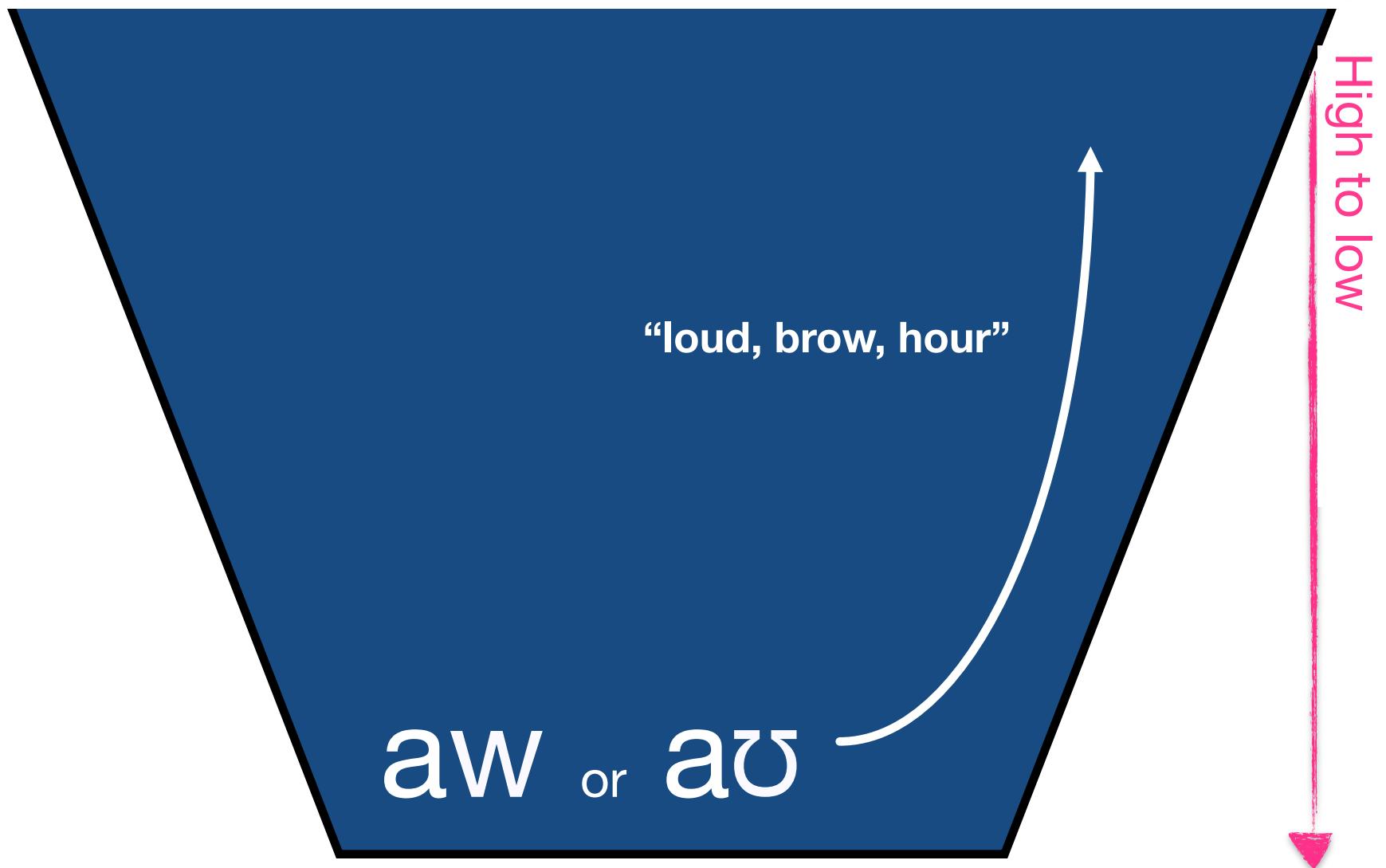
Diphthongs: Two vowel-ish sounds together

Front to back



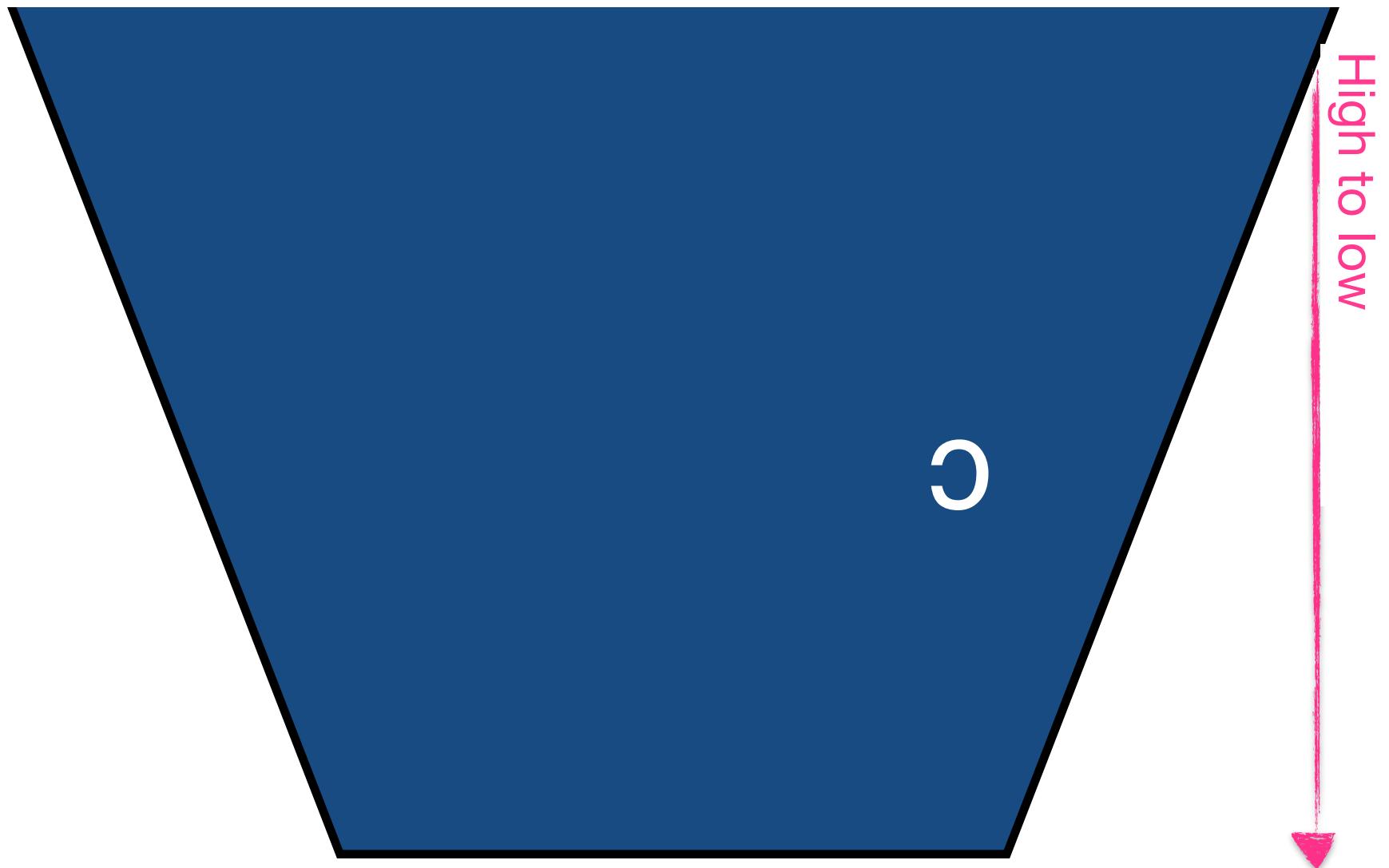
# Diphthongs: Two vowel-ish sounds together

Front to back



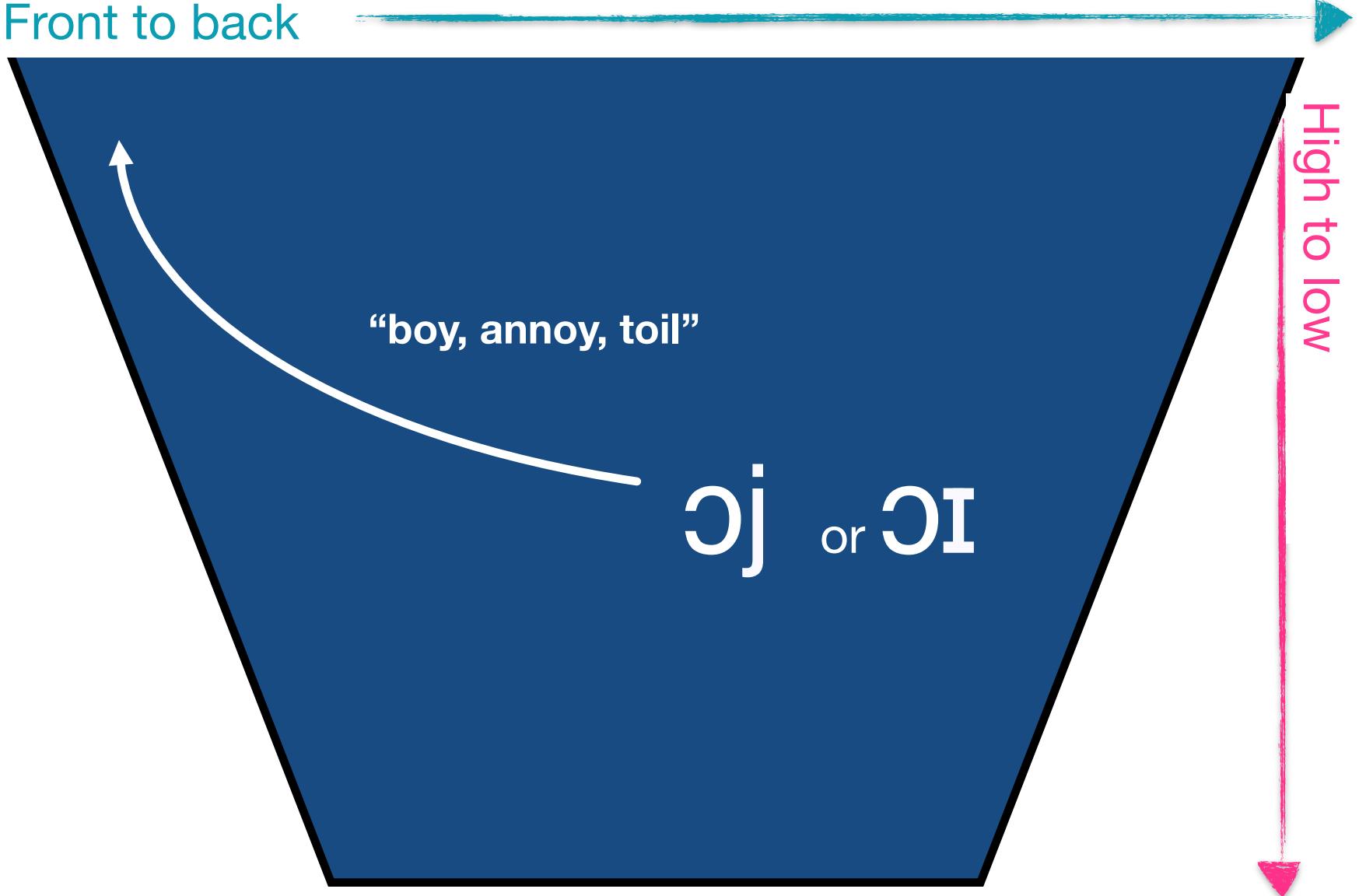
Diphthongs: Two vowel-ish sounds together

Front to back

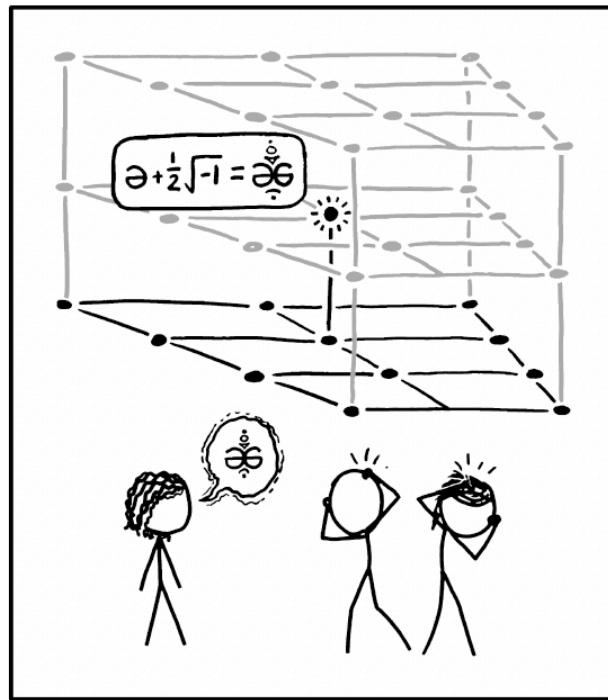


# Diphthongs: Two vowel-ish sounds together

Front to back



# Humor in the vowel space



LINGUISTICS TIP:

EXTEND THE IPA VOWEL PLANE ALONG  
THE IMAGINARY AXIS TO PRODUCE THE  
COMPLEX VOWELS, CURSED SOUNDS WHICH  
THE HUMAN MIND CANNOT COMPREHEND.

<https://xkcd.com/2657/>

# Speech production summary

Airflow set in vibration by vocal folds and modified by vocal tract

**Consonants:** narrowing or blocking of oral/nasal cavity

**Vowels:** shaping of oral cavity

Different languages choose different selections of these

Acquisition:

Children have to learn the specific set of sounds their language uses

# Cross-linguistic variation in speech sounds

## Interactive chart of the International Phonetic Alphabet

<http://www.ipachart.com>

Click on a symbol to hear the sound it represents.

<http://www.ipachart.com/>

# Interactive chart of the

# International Phonetic Alphabet

Pulmonic consonants												
	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glotal	
<b>Plosive</b>	p b			t d		t̪ d̪	c ŋ	k g	q χ	g ɣ	?	
<b>Nasal</b>	m	n̪		n		n̪	ɳ	ɳ	ɳ	ɳ	N	
<b>Trill</b>	r̪			r̪						R̪		
<b>Tap or Flap</b>				t̪		t̪						
<b>Fricative</b>	f̪ β v̪ θ̪ ð̪ s̪ z̪ ʃ̪ ʒ̪			s̪ z̪ ʃ̪ ʒ̪		ʂ̪ ʐ̪ ʐ̪ ʐ̪	ç̪ ʐ̪ ʐ̪ ʐ̪	χ̪ ʐ̪ ʐ̪ ʐ̪	χ̪ ʐ̪ ʐ̪ ʐ̪	χ̪ ʐ̪ ʐ̪ ʐ̪	h̪ ʐ̪ ʐ̪ ʐ̪	
<b>Lateral Fricative</b>				t̪ ʈ̪								
<b>Approximant</b>		w̪		r̪		ɻ̪ ɻ̪						
<b>Lateral Approximant</b>				l̪		ɻ̪ ɻ̪						

Where symbols appear in pairs, the one to the right represents a voiced consonant.

Areas shaded grey indicate articulations judged impossible.

## **Non-pulmonic consonants**

Clicks	Voiced implosives	Ejectives
○ Bilabial	b Bilabial	p' Bilabial
Dental	d Dental/alveolar	t' Dental/alveolar
! (Post)alveoalar	f Palatal	k' Velar
‡ Palatoalveolar	g Velar	s' Alveolar fricative
Alveolar lateral	G Uvular	' etc...

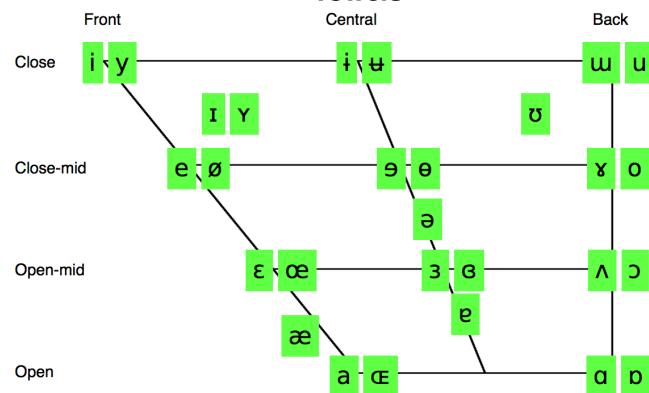
## Other symbols

M	Voiceless labial-velar fricative
W	Voiced labial-velar approximant
ɥ	Voiced labial-palatal approximant
H	Voiceless epiglottal fricative
ʕ	Voiced epiglottal fricative
ʗ	Epiglottal plosive
ç	Voiceless alveolo-palatal fricative
ڙ	Voiced alveolo-palatal fricative
J	Alveolar lateral flap
ڻ	Simultaneous ڻ and X

## Affricates

$\overline{t}\bar{s}$	Voiceless alveolar affricate
$\overline{t}\bar{j}$	Voiceless palato-alveolar affricate
$\overline{t}\bar{\chi}$	Voiceless alveolo-palatal affricate
$\overline{t}\bar{s}$	Voiceless retroflex affricate
$\overline{d}\bar{z}$	Voiced alveolar affricate
$\overline{d}\bar{z}$	Voiced post-alveolar affricate
$\overline{d}\bar{\chi}$	Voiced alveolo-palatal affricate
$\overline{d}\bar{z}$	Voiceless retroflex affricate

## Vowels



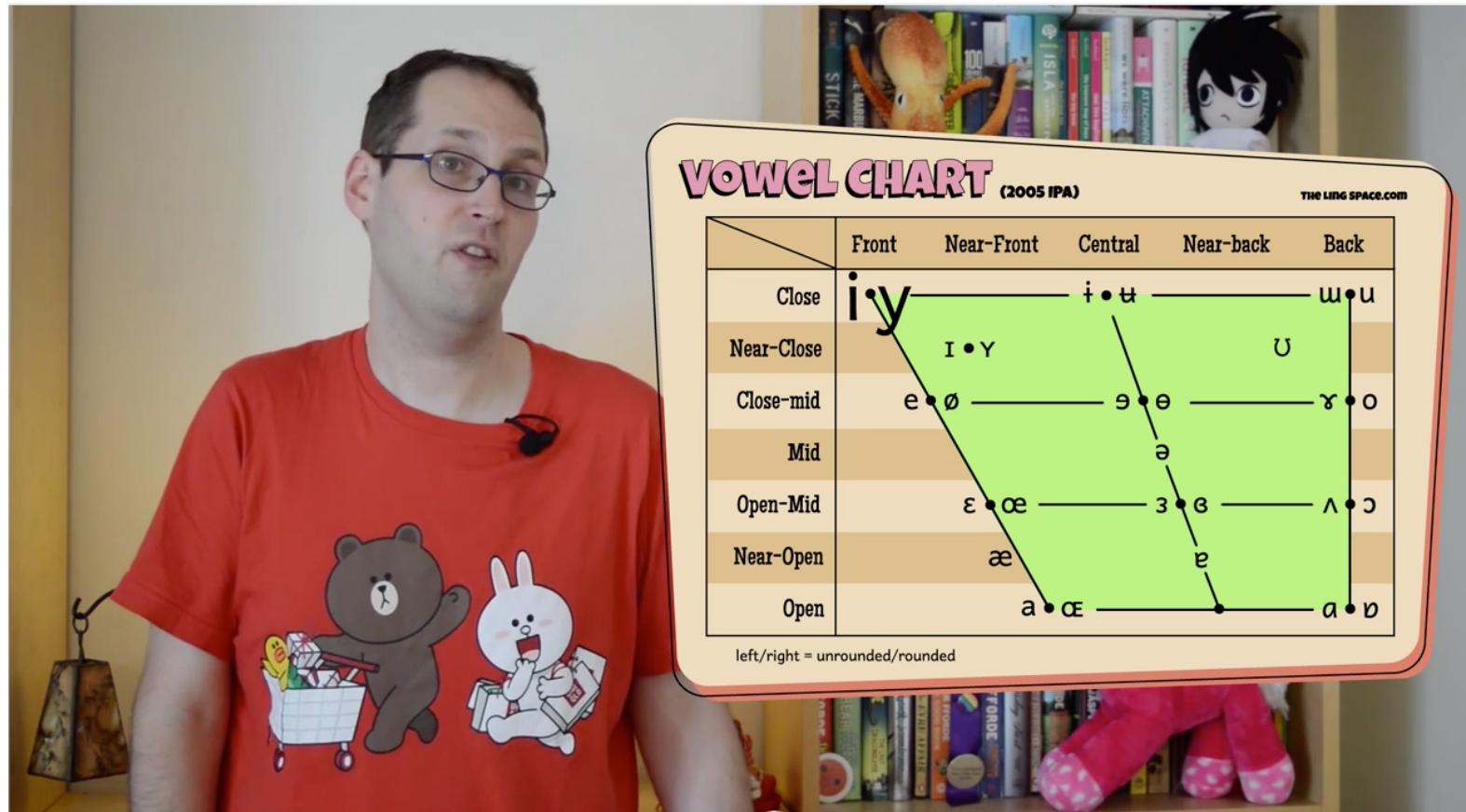
## [Extra]

# Cross-language differences

<https://www.youtube.com/watch?v=arMntA15A0s>

<http://www.thelingspace.com/episode-27>

4:10 through 5:08



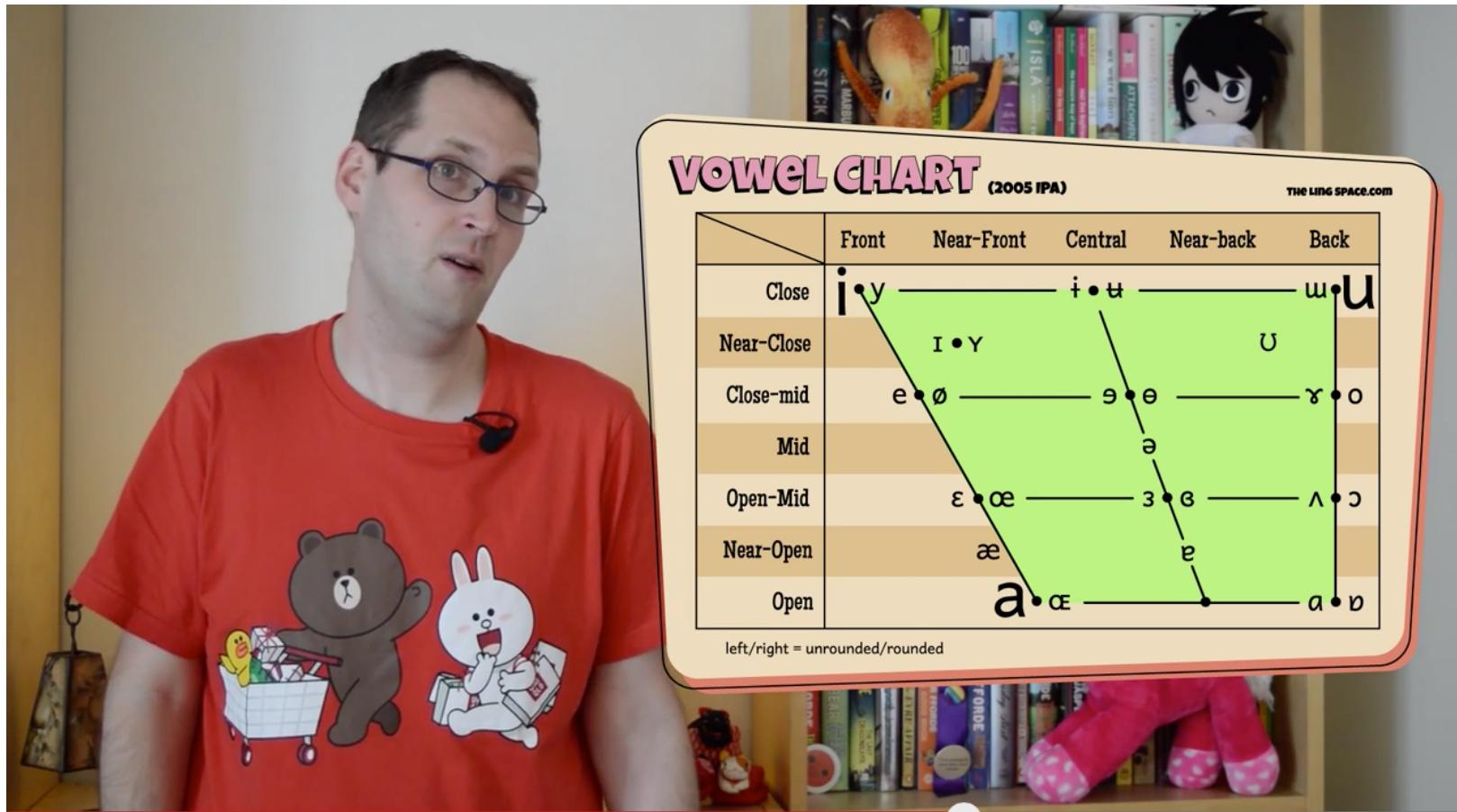
## [Extra]

# Cross-language differences

<https://www.youtube.com/watch?v=arMntA15A0s>

<http://www.thelingspace.com/episode-27>

**5:08 through 7:02**



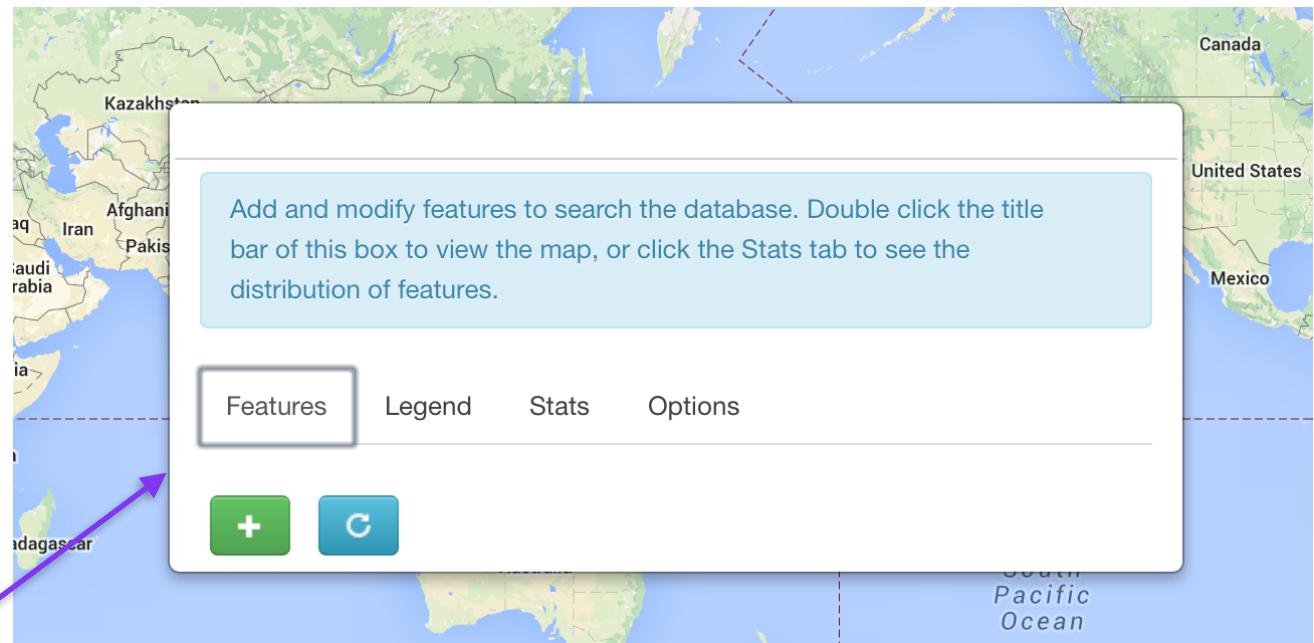
# Cross-linguistic variation in sounds (called segments)

<http://phonotactics.anu.edu.au/index.php>

[Extra]

**WORLD PHONOTACTICS  
DATABASE**

- Home
- Introduction to phonotactics
- How to use this site
- Features
- Sample
- Contributing
- Citing
- Downloads
- Contact
- Launch database**



Click on this  
to get this

# Questions?



You should be able to do question 3 on HW3, and up through question 2 on the phonological review questions.