

Forget Spelling!

Sounds ≠ Spelling

Forget spelling

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

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

beginning through 2:27



Courtesy of <http://www.spellingsociety.org/news/media/poems.php>

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

...

Courtesy of <http://www.spellingsociety.org/news/media/poems.php>

...

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.
Wherefore 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	se <u>a</u> s	ea
bel <u>ie</u> ve	ie	am <u>oe</u> ba	oe
Ca <u>e</u> sar	ae	key	ey
<u>se</u> e	ee	mach <u>i</u> ne	i
pe <u>o</u> ple	eo	se <u>i</u> ze	ei

International Phonetic Alphabet: [i]

One sound – Many letters

too	oo	threw	ew
to	o	lieu	ieu
clue	ue	shoe	oe
through	ough	beautiful	eau

IPA: [u]

One sound – Many letters

shoot	ʃ
either	ð
character	k
deal	i
Thomas	t
physics	f
rough	f

One letter – Many sounds

dame	e
dad	æ
father	ɑ
call	ɔ, ɑ
village	ɪ, ə
many	ɛ

One letter – Not one sound

mnemonic
psychology
resign
ghost
island
whole
debt

= no sound!

cute kjuwt
= 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

Why we need the IPA

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

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



International Phonetic Alphabet

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005) © 2005 IPA

CONSONANTS (PALMATIC)										
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Plosive	p b		t d	t̪ d̪	ʈ ɖ	k g	q ɢ			ʔ
Nasal	m	ɱ	n	ɲ	ɳ	ŋ	ɟ	ŋ	ɴ	
Fricative		f v	s z	ʃ ʒ	ʂ ʐ	x ɣ	ç ʝ	ħ	ʕ	h ɦ
Approximant			l	ɭ		ʎ	j	ɥ		ɹ
Liquoid			l	ɭ		ʎ	j	ɥ		ɹ
Approximant			l	ɭ		ʎ	j	ɥ		ɹ

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

CONSONANTS (NON-PALMATIC)									
	Labial	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Plosive	p b		t d	ʈ ɖ	k g	q ɢ			ʔ
Nasal	m		n	ɳ	ɳ	ɟ	ŋ	ɴ	
Fricative		f v	s z	ʃ ʒ	ʂ ʐ	x ɣ	ç ʝ	ħ	ʕ
Approximant			l	ɭ		ʎ	j	ɥ	
Liquoid			l	ɭ		ʎ	j	ɥ	
Approximant			l	ɭ		ʎ	j	ɥ	

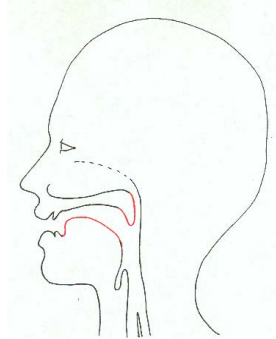
OTHER SYMBOLS

Symbol	Description
ʱ	Voiced velar fricative
ʍ	Voiced labiodental fricative
ɸ	Voiced labial fricative
β	Voiced bilabial fricative
ɸ̞	Voiced labiodental fricative
β̞	Voiced labial fricative
ɸ̠	Voiced labiodental fricative
β̠	Voiced labial fricative
ɸ̣	Voiced labiodental fricative
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β̤	Voiced labial fricative
ɸ̥	Voiced labiodental fricative
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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*



Sounds: The vocal tract as an instrument

https://www.ted.com/talks/tom_thum_the_orchestra_in_my_mouth?language=en
0:45-2:14, 3:25-3:41, 4:43-6:20



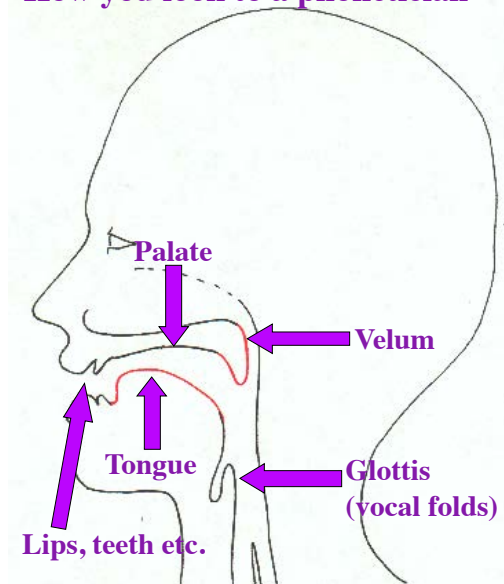
Sounds: Vocal tract overview

<https://www.youtube.com/watch?v=dtf8zGQj9GY>
<http://www.thelingspace.com/episode-4>

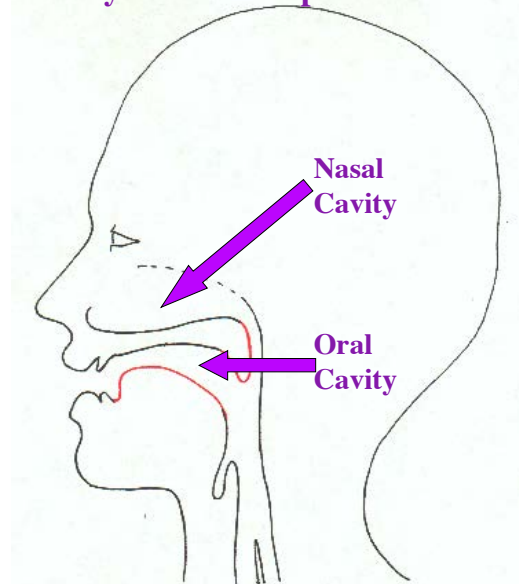
0:38 through 1:17



How you look to a phonetician



How you look to a phonetician



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

Place of articulation: Where the airflow is blocked

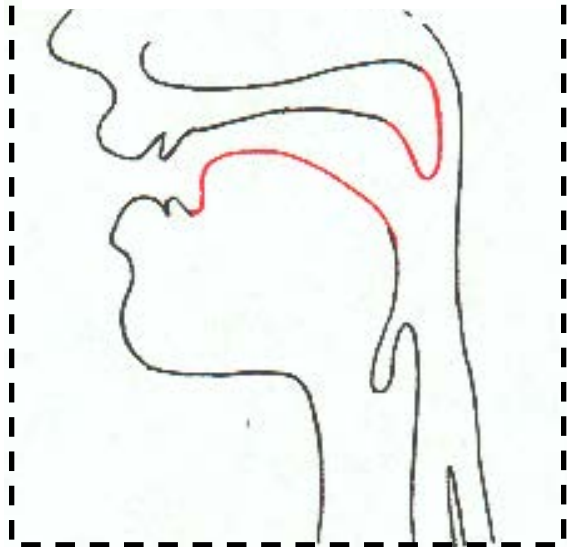
<https://www.youtube.com/watch?v=zEaQP3pXQc>

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

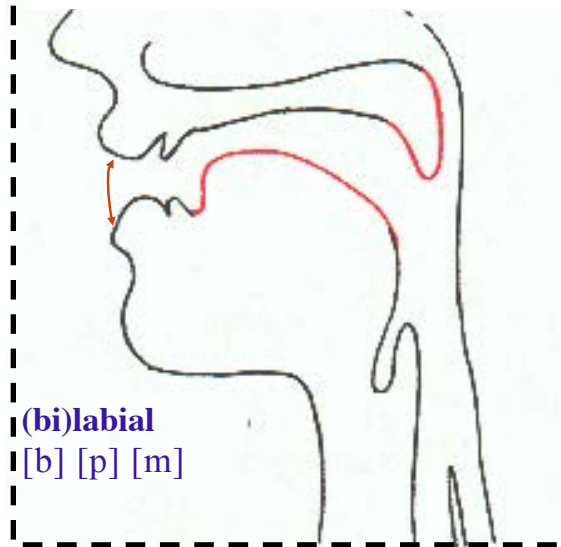
beginning through 5:53



Where is the air flow blocked?

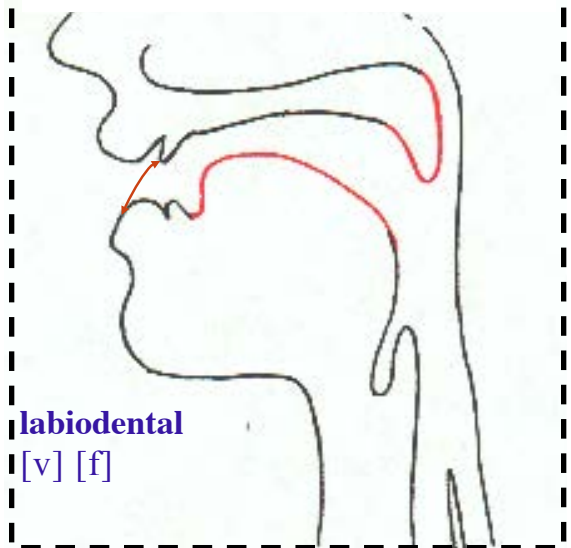


Where is the air flow blocked?



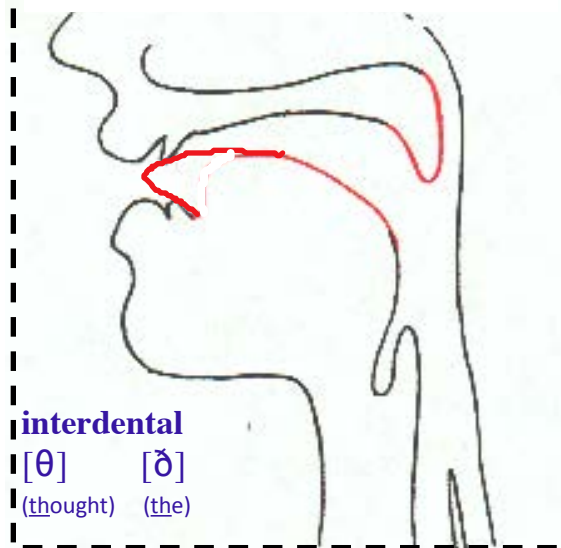
(bi)labial
[b] [p] [m]

Where is the air flow blocked?



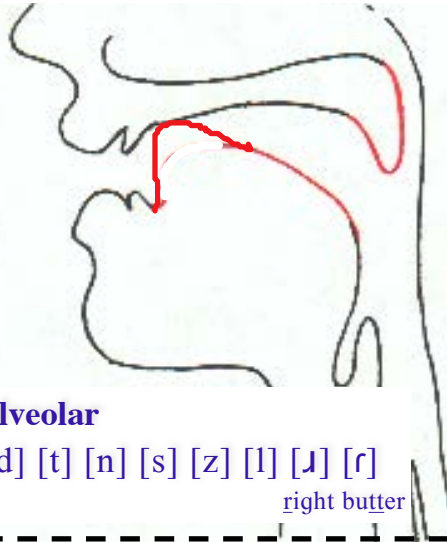
labiodental
[v] [f]

Where is the air flow blocked?



interdental
[θ] [ð]
(thought) (the)

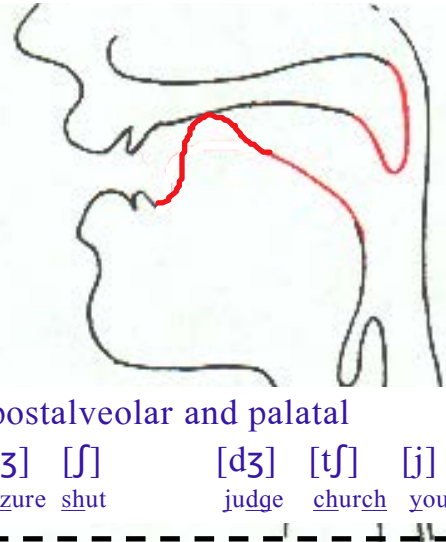
Where is the air flow blocked?



alveolar

[d] [t] [n] [s] [z] [l] [ʃ] [r]
right butter

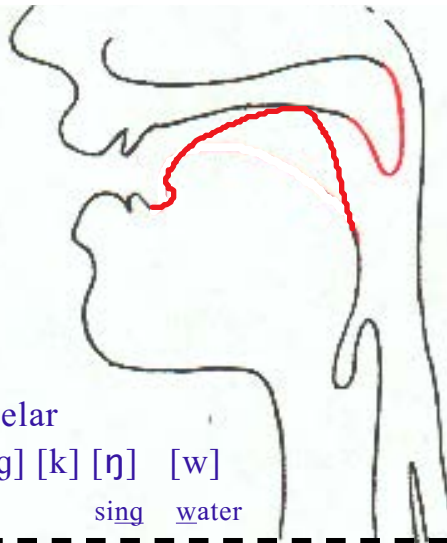
Where is the air flow blocked?



postalveolar and palatal

[ʒ] [ʃ] [dʒ] [tʃ] [j]
azure shut judge church you

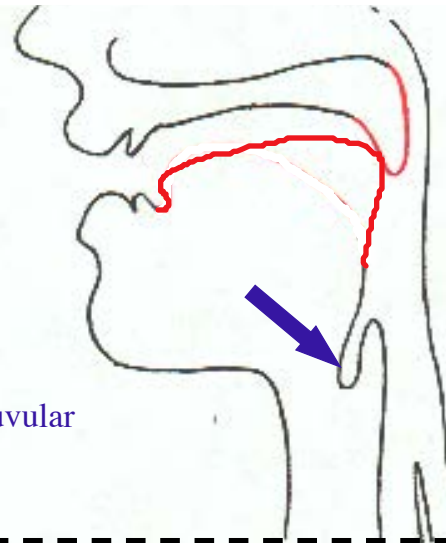
Where is the air flow blocked?



velar

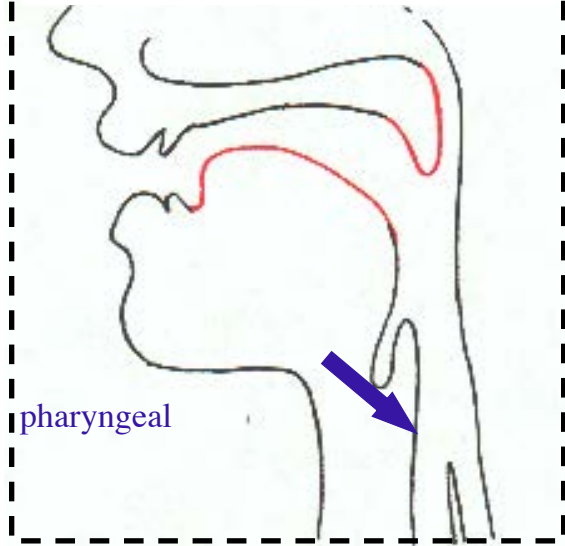
[g] [k] [ŋ] [w]
sing water

Where is the air flow blocked?

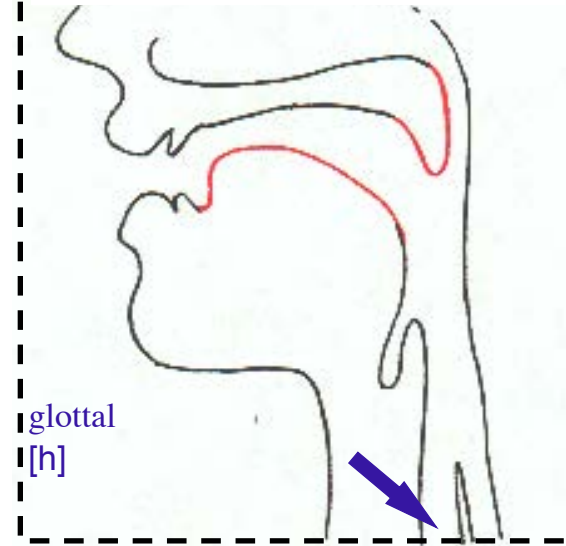


uvular

Where is the air flow blocked?



Where is the air flow blocked?



Manner of articulation: How the airflow is blocked

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

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

beginning through 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 "butter")

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 “Whachould...?”

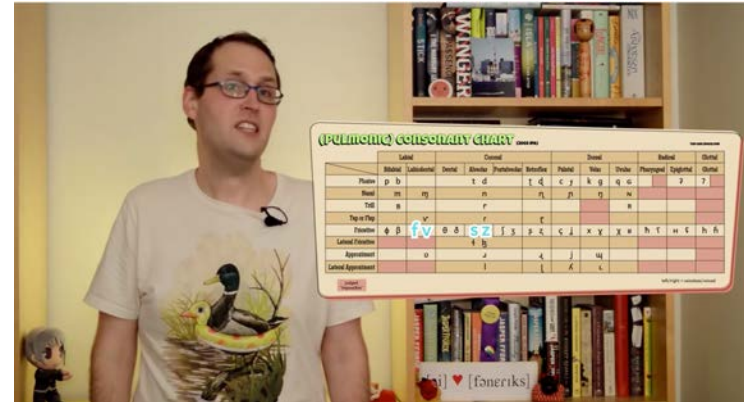
“What did you...?”
[dʒ]
becomes “What did zha...?”
[dʒ]
becomes “Whaja...?”

Voicing: What the vocal folds are doing

<https://www.youtube.com/watch?v=zEaQP3pXQc>

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

beginning through 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**

Describing sounds

Features

Ways of *describing* sounds

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

Stronger claim: features are the *smallest building blocks of language*, used to store sounds in the mind

Atoms of Speech



Roman Jakobson, 1896-1982

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		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill				ʀ					ʁ		
Tap or Flap				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			

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
Stop	p b			t d				k ɡ			
Nasal	m			n				ŋ			
Trill											
Tap or Flap				ɾ							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
Glide							j	w			
Liquid				ɹ	ɻ						

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

Describing speech sounds

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*

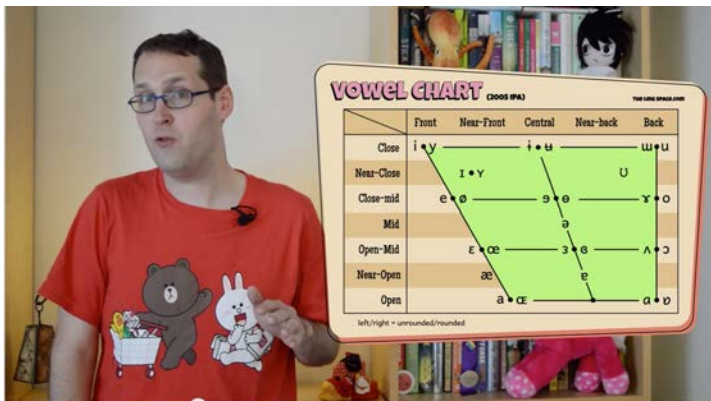
Vowels

Vowels

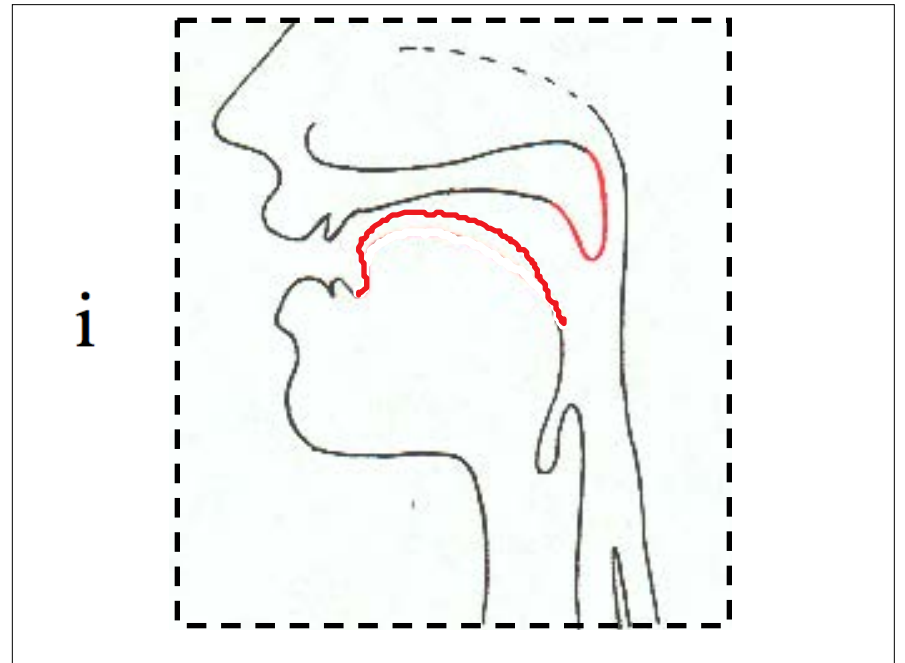
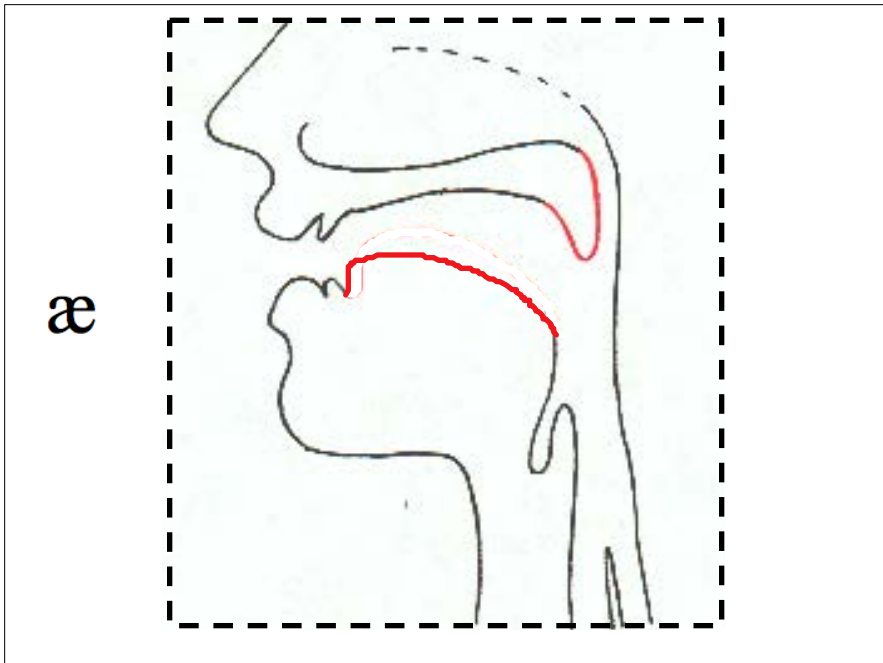
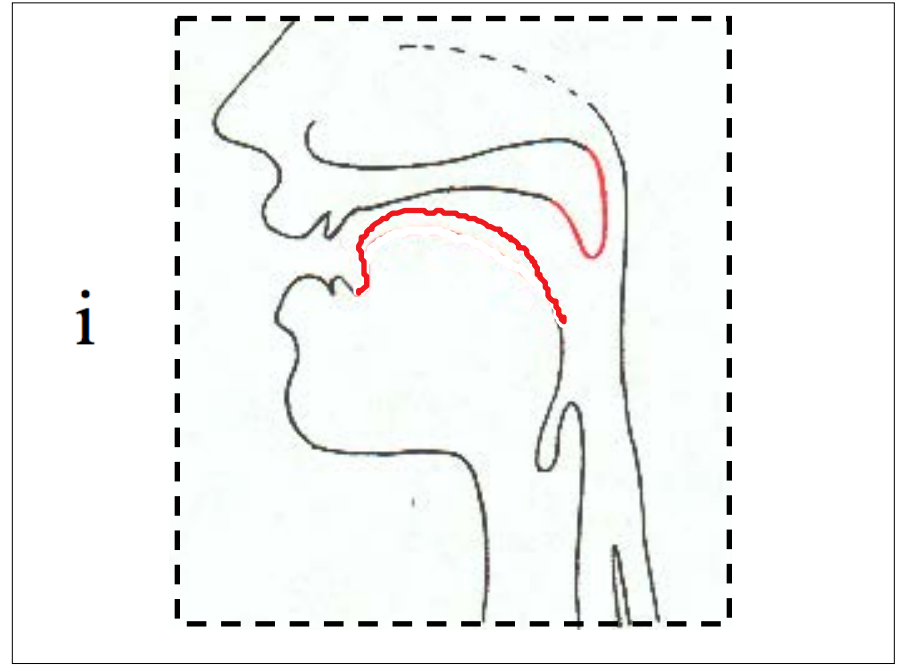
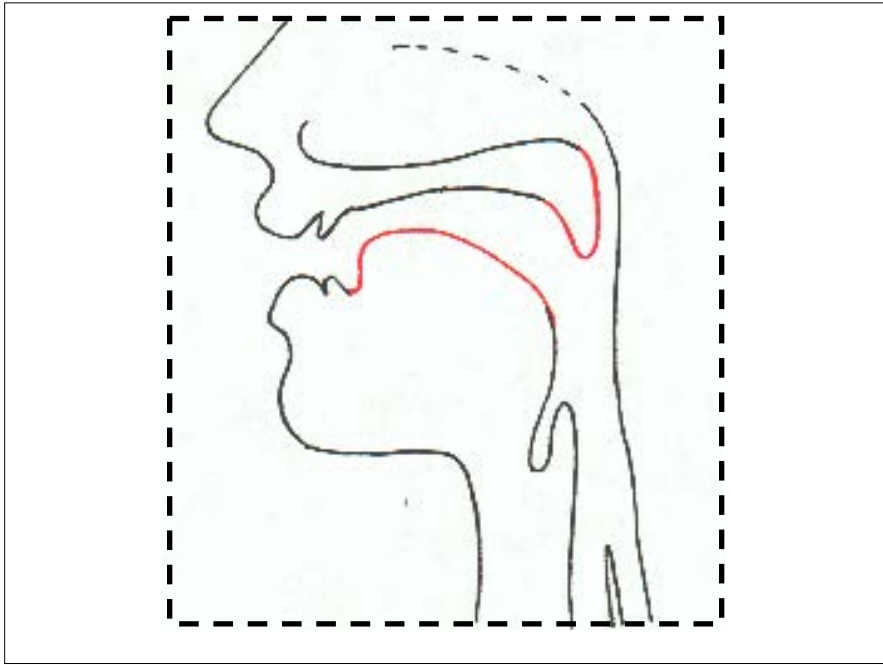
<https://www.youtube.com/watch?v=arMntA15A0s>

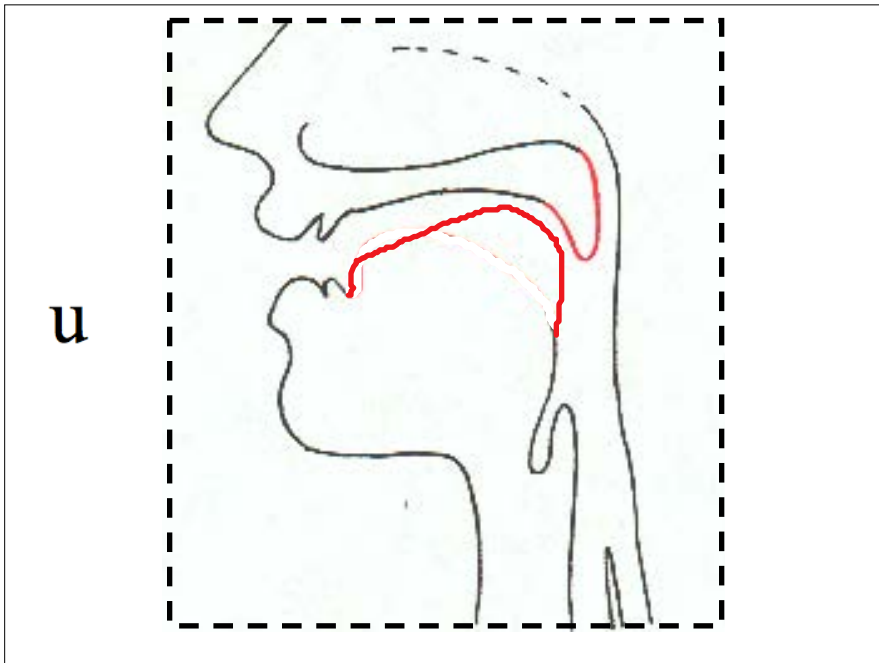
<http://www.thelingspace.com/episode-27>

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)

So what vowels do you have?

i "sheep, sleep"
I "ship, slip"

So what vowels do you have?

i

I

e "laid, spade, trade"

ε "led, sped, tread"

So what vowels do you have?

i

I

e

ε

æ

"bat, lad"

So what vowels do you have?

i

I

"Luke, who'd, suit"

"look, hood, soot"

U

u

e

ε

æ

So what vowels do you have?

i

I

U

u

"coat, wrote, hoed"

e

ε

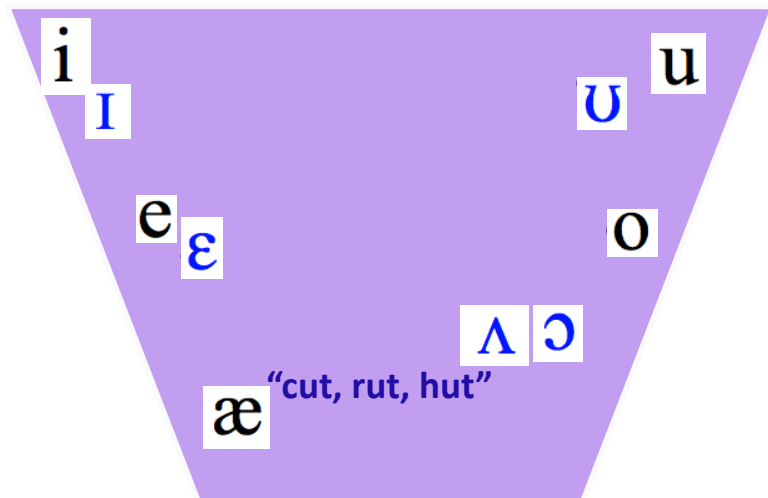
o

"caught, wrought, hawed"

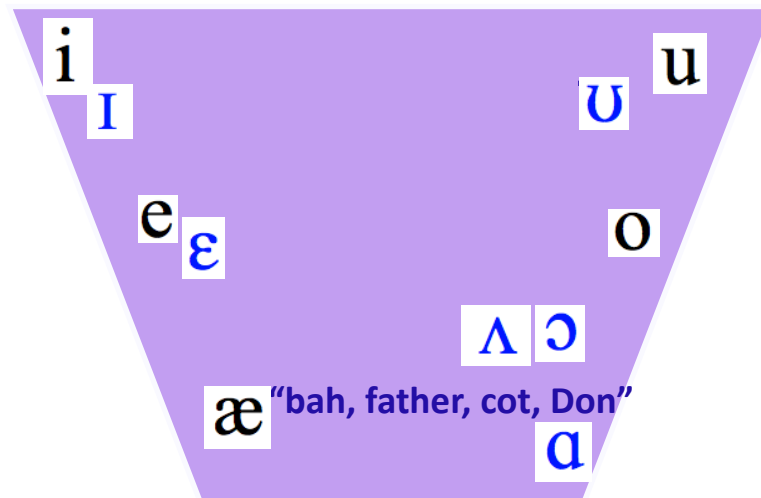
ɔ

æ

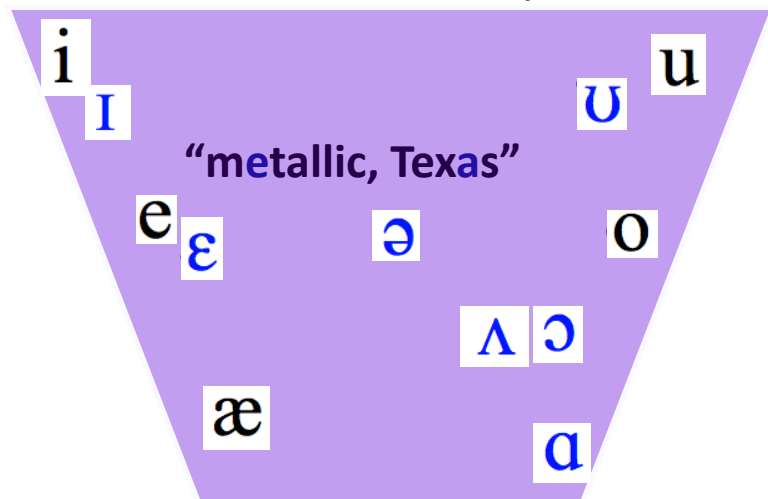
So what vowels do you have?



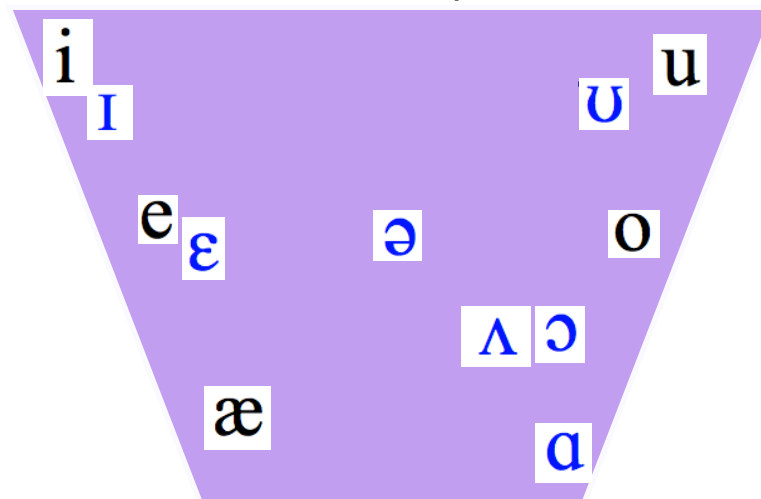
So what vowels do you have?



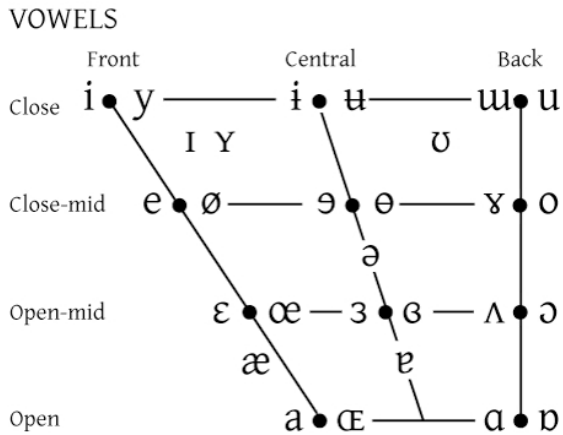
So what vowels do you have?



So here they are!

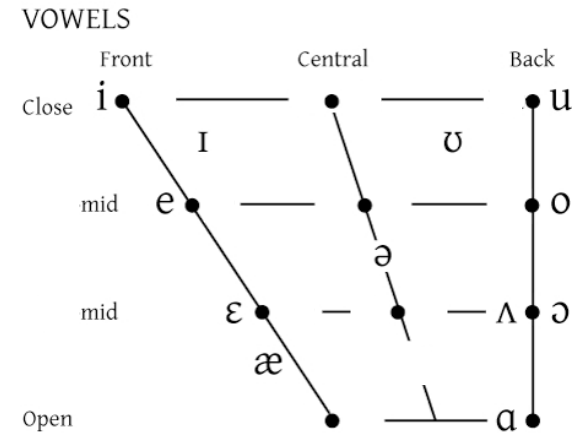


The full(er) vowel chart



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

The parts we care about for this class

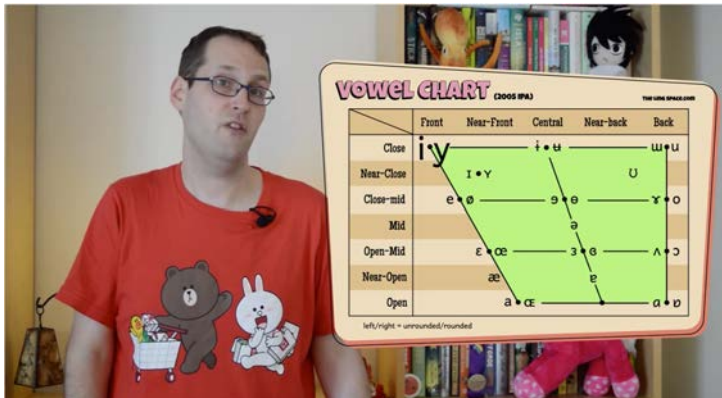


Where symbols appear in pairs, the one to the right represents a rounded vowel

Cross-language differences

<https://www.youtube.com/watch?v=arMntA15A0s>
<http://www.thelingspace.com/episode-27>

4:10 through 5:08



Cross-language differences

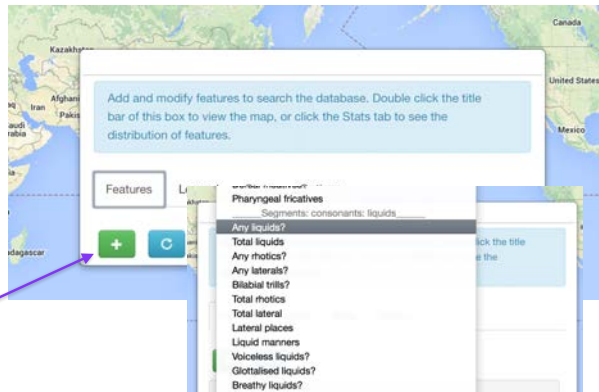
Feature Combinations

- English: back vowels are rounded, others are not
- German/French has high, front, rounded vowel [y]
- Russian has high back unrounded vowel [ɯ]

- Many languages don't make the tense/lax distinction found in English (ex: Spanish [i], rather than [i] and [ɪ])
- Many languages distinguish short and long vowels (unlike English), ex: Japanese [i] vs. [i:]

Cross-linguistic variation in sounds (called segments)

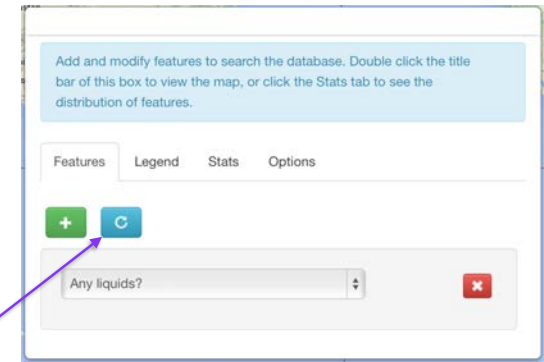
<http://phonotactics.anu.edu.au/index.php>



Select something of interest

Cross-linguistic variation in sounds (called segments)

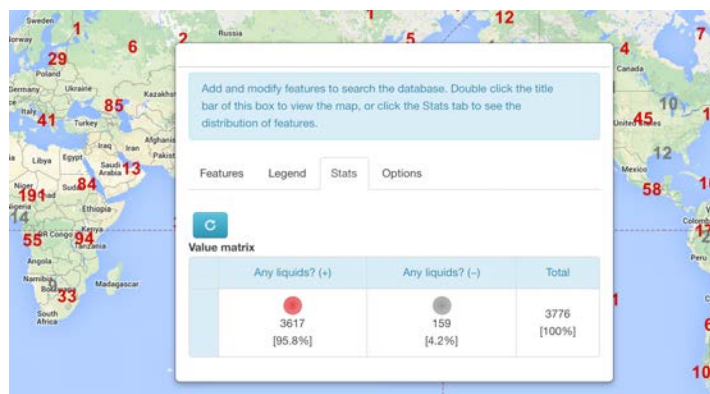
<http://phonotactics.anu.edu.au/index.php>



And see how the languages of the world look

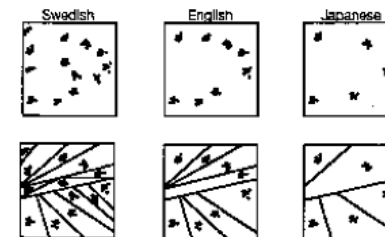
Cross-linguistic variation in sounds (called segments)

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



The world's languages are full of lots of fun variation when it comes to the sounds they use.

Cross-language differences



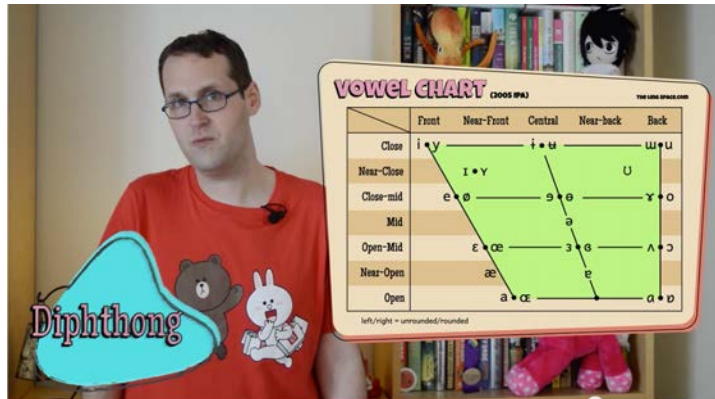
Languages carve up the acoustic space in different ways. Children find these categories (called phonemes), based on the distributions of sounds they hear in their linguistic environment.

Diphthongs

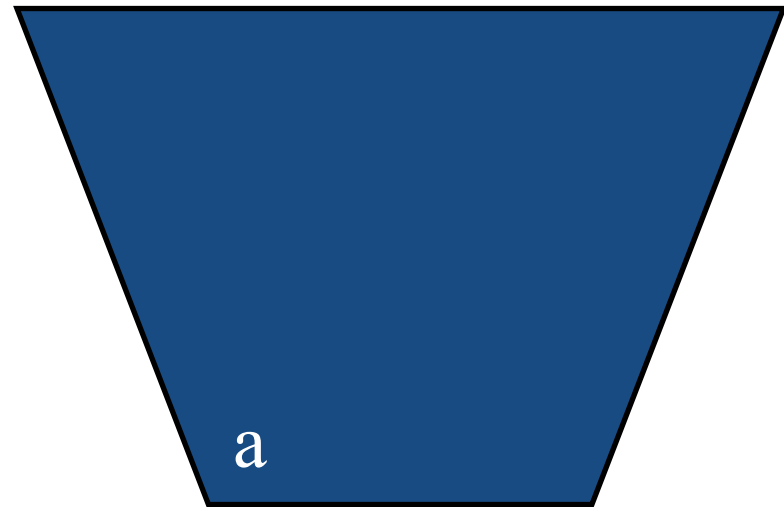
<https://www.youtube.com/watch?v=arMntA15A0s>

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

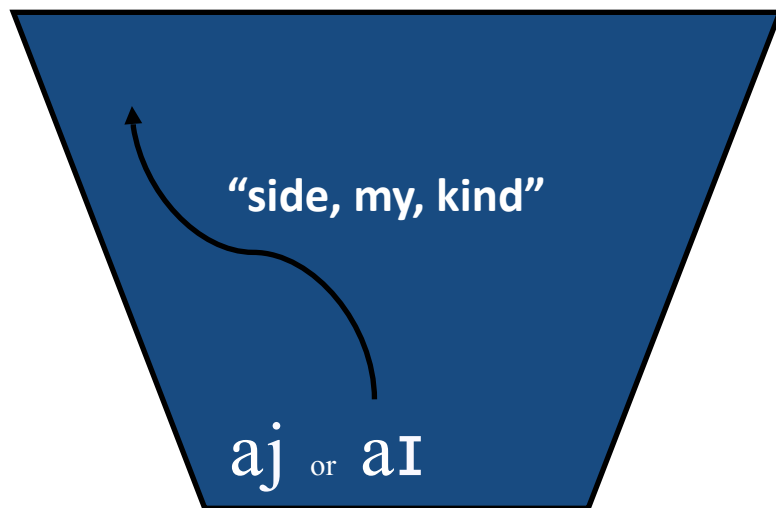
7:02 through 7:38



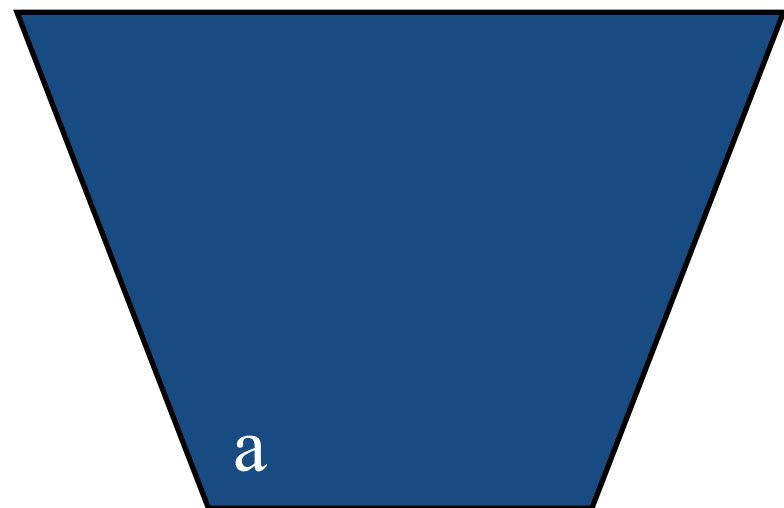
Diphthongs: Two vowel-ish sounds together



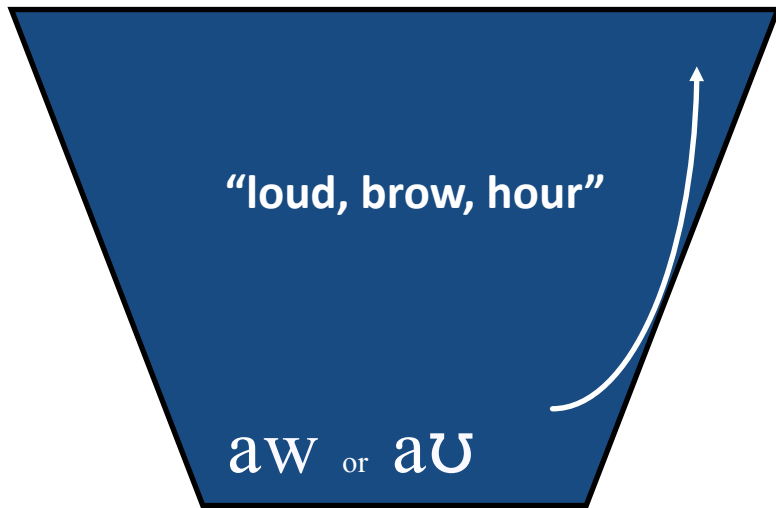
Diphthongs: Two vowel-ish sounds together



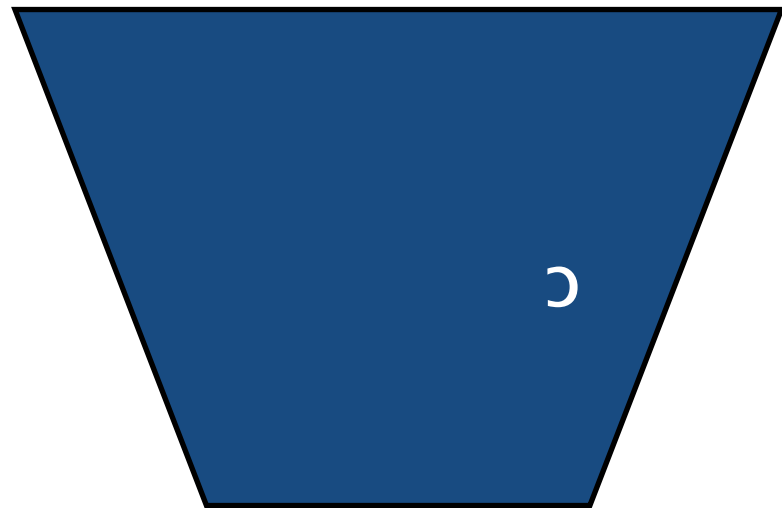
Diphthongs: Two vowel-ish sounds together



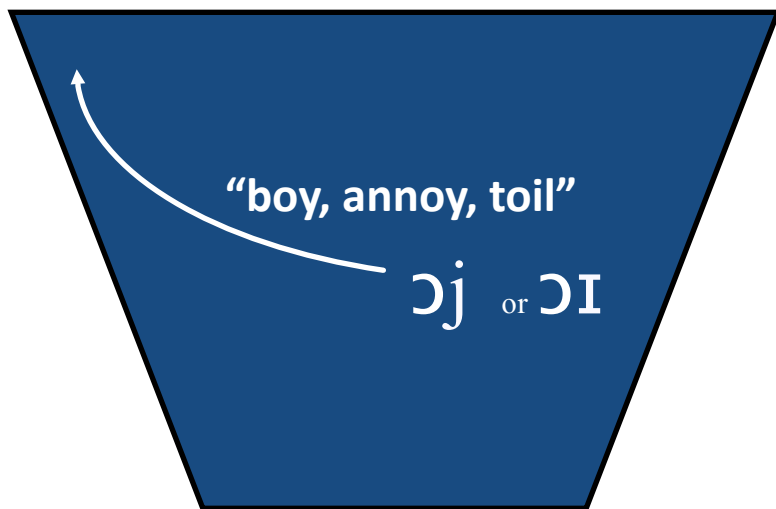
Diphthongs: Two vowel-ish sounds together



Diphthongs: Two vowel-ish sounds together



Diphthongs: Two vowel-ish sounds together



More details of American English pronunciation

http://en.wikipedia.org/wiki/General_American

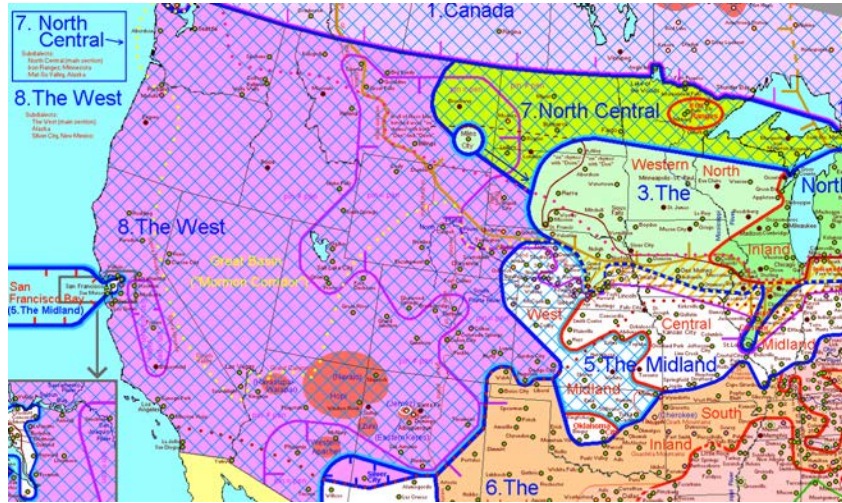
Monophthongs	Front	Central		Back
		plain	/rhotacized	
Close	i			u
Near-close	ɪ			ʊ
Close-mid	e ^[4]			ɔ ^[4]
Mid		ə	ɚ	
Open-mid	ɛ		ɜ	ʌ • ɔ
Near Open	æ			ɑ

Depending on one's analysis, people who merge the vowels of *cot* and *caught* to /ɑ/ either have /noʊ/ and /noʊs/, but since all accents with *cot* and *caught* merged to /kɑ/ have also underg in these cases, the [ə] before /ɪ/ can be analyzed as an allophone of /ɑ/. [ɜ] and [ɚ] are often unstressed syllables. Since the occurrence of [ə] is mostly predictable, it need not be consid Among speakers who distinguish between /ɑ/ and /ɔ/, the vowel of *cot* (usually transcribed /ɪ closer to [ɔ].^[6] Among *cot*-*caught* merged speakers, /ɑ/ usually remains a back vowel, [ɑ], or /ɔ/, their retracted allophones for /ɑ/ may be identical to the lowered allophones of /ɔ/ among The diphthongs of General American are shown in the next table:

Diphthongs	Offglide is a front vowel	Offglide is a back vowel
Opener component is unrounded	aɪ eɪ ^[4]	aʊ
Opener component is rounded	ɔɪ ^[4]	oʊ ^[4]

Dialect variation in North American English

<http://aschmann.net/AmEng/>



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

Speech perception

Speech production processes must be *undone* by the ear

Motions of articulators must be *reconstructed* from patterns of air vibration

Requires extremely precise hearing, possibly a system specialized for hearing speech

Substantially developed at birth



Questions?



You should be able to do question 4 on HW2, and up through question 3 on the phonological review questions.

Extra Material

Features

Prediction: by combining a small number of atomic features, it should be possible to create a larger number of speech sounds

Goal: a set of universal features should make it possible to describe the speech sounds of all of the languages of the world

Different languages choose different feature combinations

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
(oral) stop	p b			t d			k g	
nasal (stop)	m			n			ŋ	
fricative		f v	θ ð	s z	ʃ ʒ			h
affricate						tʃ dʒ		
liquid				l ɹ				
glide				j			w	
flap				ɾ				

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
(oral) stop	p b			t d			k g	
nasal (stop)	m			n		?	ŋ	
fricative	?	f v	θ ð	s z	ʃ ʒ		?	h
affricate						tʃ dʒ		
liquid				l ɹ		?		
glide				j			w	
flap				ɾ				

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
(oral) stop	p b			t d			k g	
nasal (stop)	m			n		ɲ ?	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		?	h
affricate						tʃ dʒ		
liquid						l ?		
glide					j		w	
flap				r				

“Fuji”
“Cuba”

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
(oral) stop	p b			t d			k g	
nasal (stop)	m			n		ɲ ?	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		?	h
affricate						tʃ dʒ		
liquid					l ɹ		?	
glide					j		w	
flap				r				

“año”

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
(oral) stop	p b			t d			k g	
nasal (stop)	m			n		ɲ ?	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		x ɣ	h
affricate							tʃ dʒ	
liquid					l ɹ		?	
glide					j		w	
flap				r				

“Bach”
“agua”

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
(oral) stop	p b			t d			k g	
nasal (stop)	m			n		ɲ ?	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		x ɣ	h
affricate							tʃ dʒ	
liquid					l ɹ		ʔ	
glide					j		w	
flap				r				

“caballo”

	(bi)labial	labio-dental	inter-dental	al-veolar	post-alveolar	palatal	velar	glottal
oral stop	p b			t d			k g	
nasal (stop)	m			n		ɲ	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		x ɣ	h
affricate						tʃ dʒ		
liquid				l ɭ		ʎ		
glide					j		w	
flap				r				