

Psych 56L/ Ling 51:
Acquisition of Language

Lecture 6
Phonological Development I

Announcements

HW1 due at the end of class today

- Please note that multiple submissions are possible, but only the latest one will be graded.
- Answers are not saved between submissions, so please keep a separate document with your answers that you can transfer to the EEE interface.

Review questions for phonological development available

HW2 available (not due till 11/18/14 – after midterm), but helpful for studying for the midterm

Announcements

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

Resources available for typing IPA characters (useful for HW2) – if all else fails, you can always copy and paste from the IPA virtual keyboard (linked in the references).

Sounds of Language



<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://languageolog.ldc.upenn.edu/nll/?p=3946>



Forget Spelling!

Sounds ≠ Spelling

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

h <u>e</u>	e	se <u>a</u> s	ea
bel <u>i</u> eve	ie	am <u>oe</u> ba	oe
Ca <u>e</u> sar	ae	key	ey
se <u>e</u>	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	th <u>rew</u>	ew
to	o	li <u>eu</u>	ieu
clu <u>e</u>	ue	sh <u>oe</u>	oe
throu <u>gh</u>	ough	be <u>au</u> tiful	eau

IPA: [u]

One sound – Many letters

sh <u>oo</u> t	ʃ
ei <u>th</u> er	ð
ch <u>ar</u> acter	k
de <u>a</u> l	i
Th <u>o</u> mas	t
ph <u>ys</u> ics	f
rou <u>gh</u>	f

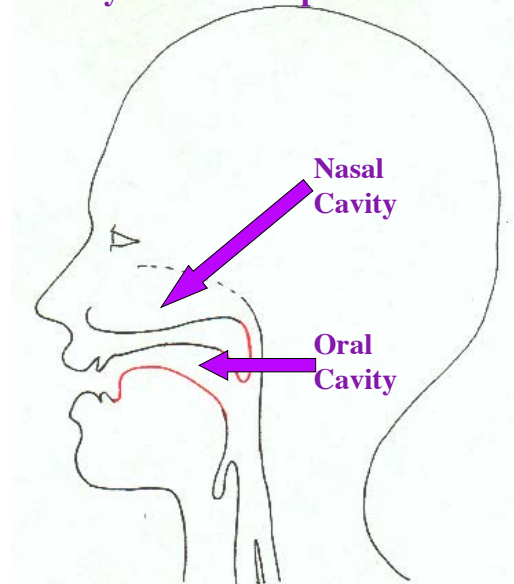
One letter – Many sounds

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

One letter – Not one sound

<u>m</u> nemonic	
<u>p</u> sychology	
res <u>i</u> gn	
g <u>h</u> ost	= no sound!
is <u>l</u> and	
w <u>h</u> ole	
de <u>b</u> t	
cute	kjuwt
	= 2 sounds!

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

Describing speech sounds

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

labial, alveolar, palatal, velar etc.

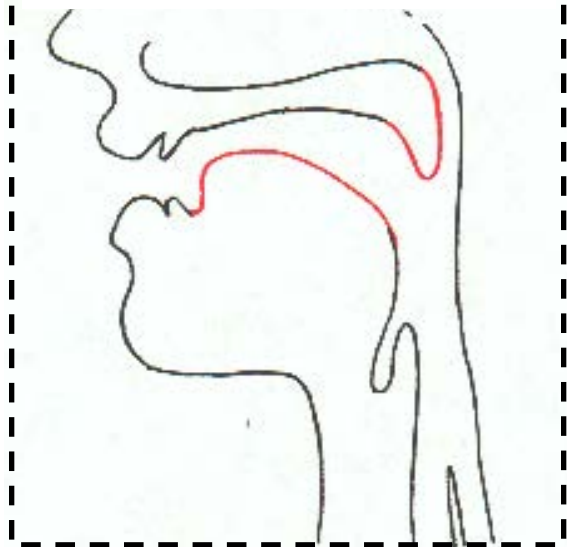
Where/how is the air flowing? (manner of articulation)

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

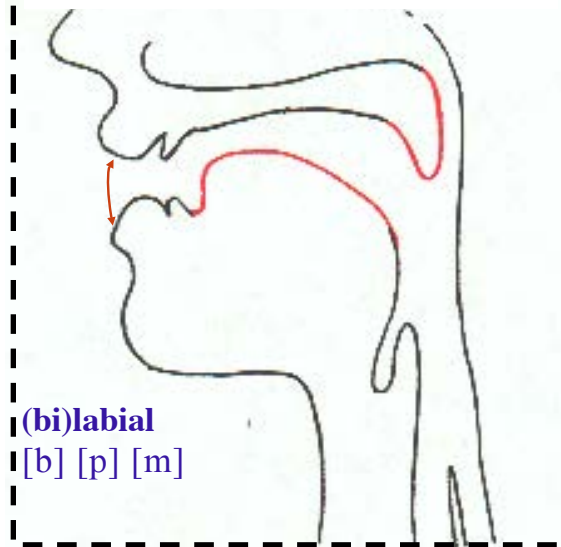
What are the vocal folds doing? (voicing)

voiced vs. *voiceless*

Where is the air flow blocked?

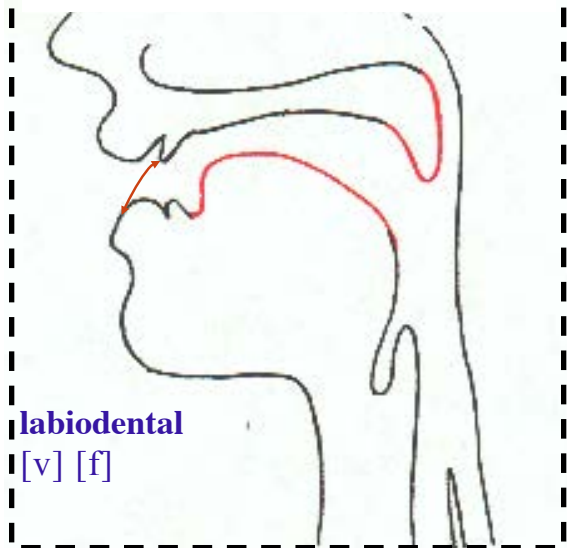


Where is the air flow blocked?



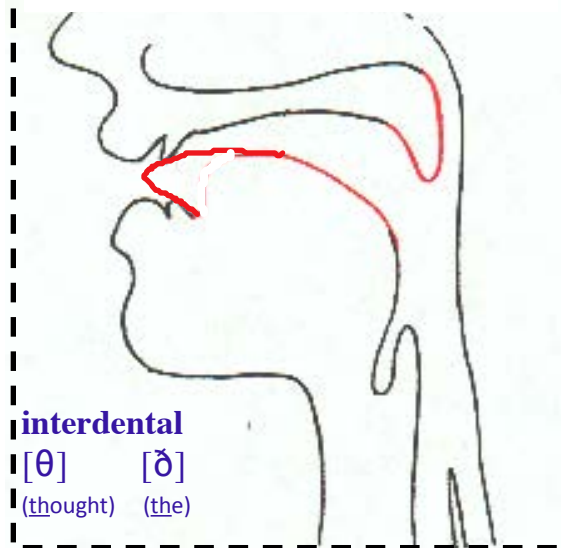
(bi)labial
[b] [p] [m]

Where is the air flow blocked?



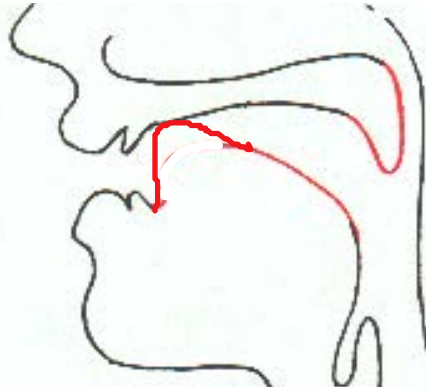
labiodental
[v] [f]

Where is the air flow blocked?



interdental
[θ] [ð]
(thought) (the)

Where is the air flow blocked?

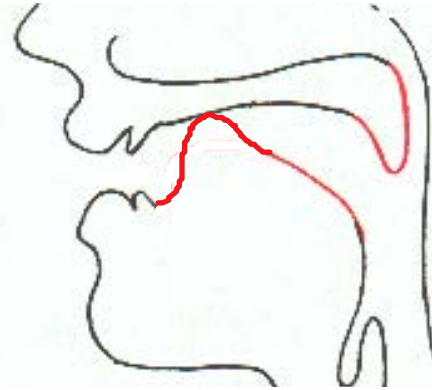


alveolar

[d] [t] [n] [s] [z] [l] [ʃ] [r]

right butter

Where is the air flow blocked?



postalveolar and palatal

[ʒ] [ʃ]

azure shut

[dʒ]

judge

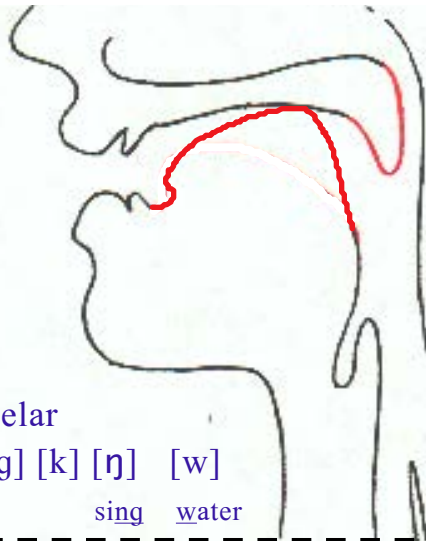
[tʃ]

church

[j]

you

Where is the air flow blocked?

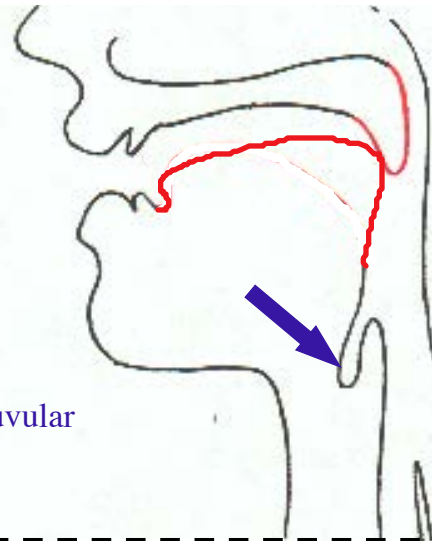


velar

[g] [k] [ŋ] [w]

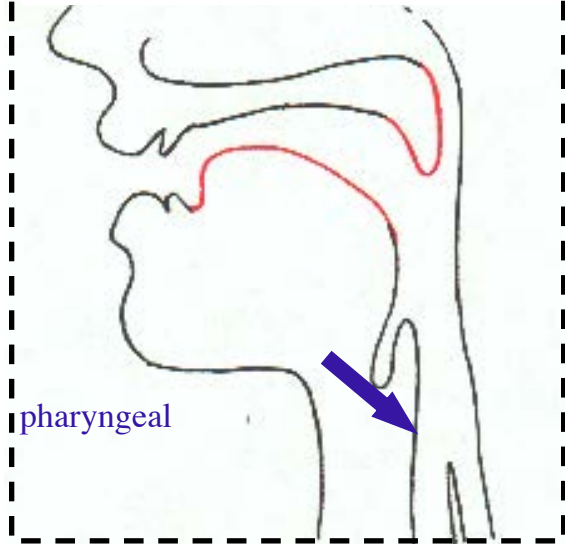
sing water

Where is the air flow blocked?



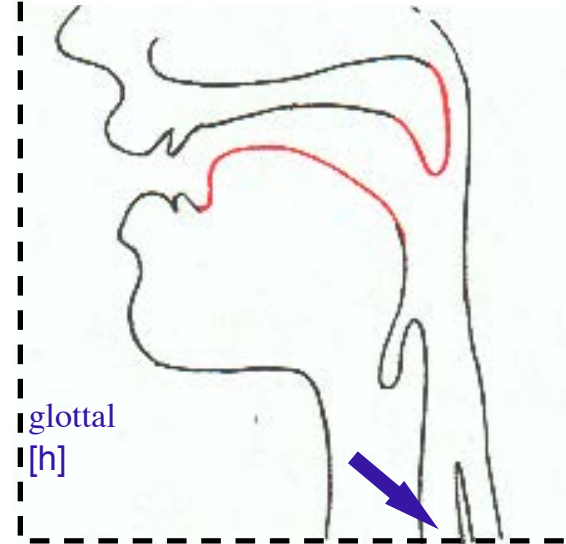
uvular

Where is the air flow blocked?



pharyngeal

Where is the air flow blocked?



glottal
[h]

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...?"

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 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



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			ɲ			ŋ	
fricative		f v	θ ð	s z	ʃ ʒ			h
affricate							tʃ dʒ	
liquid				l	ɹ			
glide					j		w	
flap				r				

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

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

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				r					ʀ		
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)

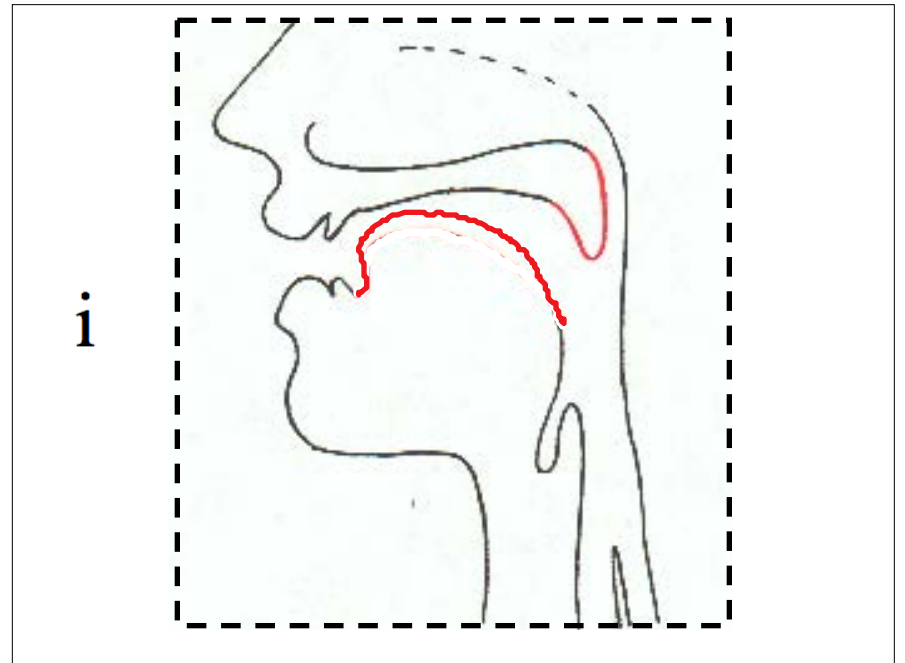
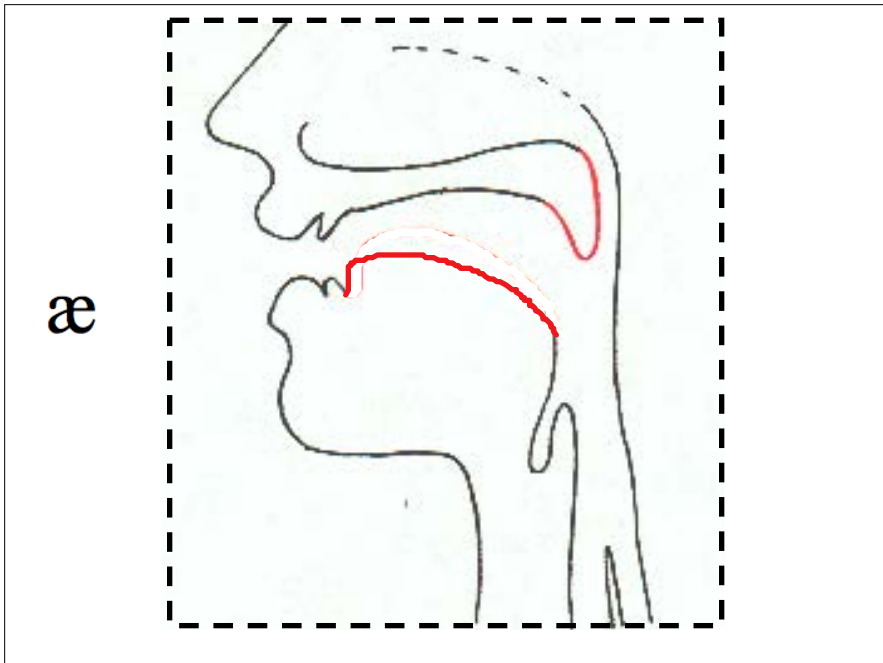
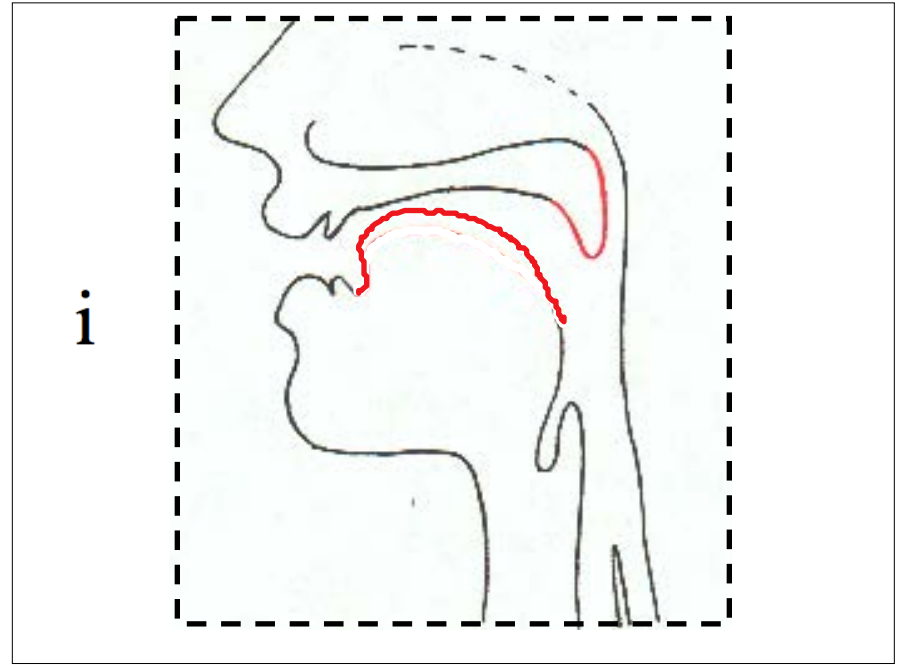
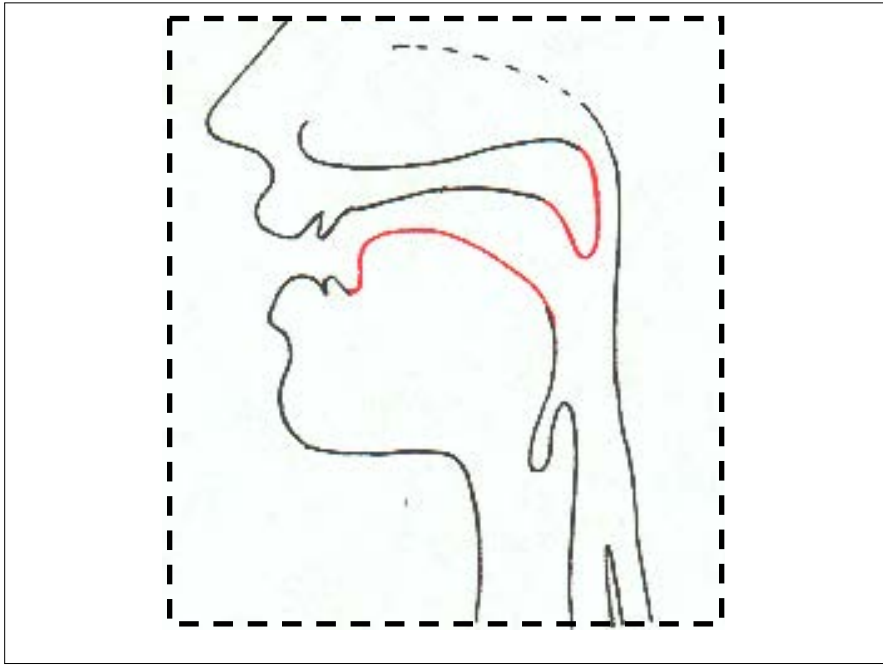
CONSONANTS (PULMONIC)

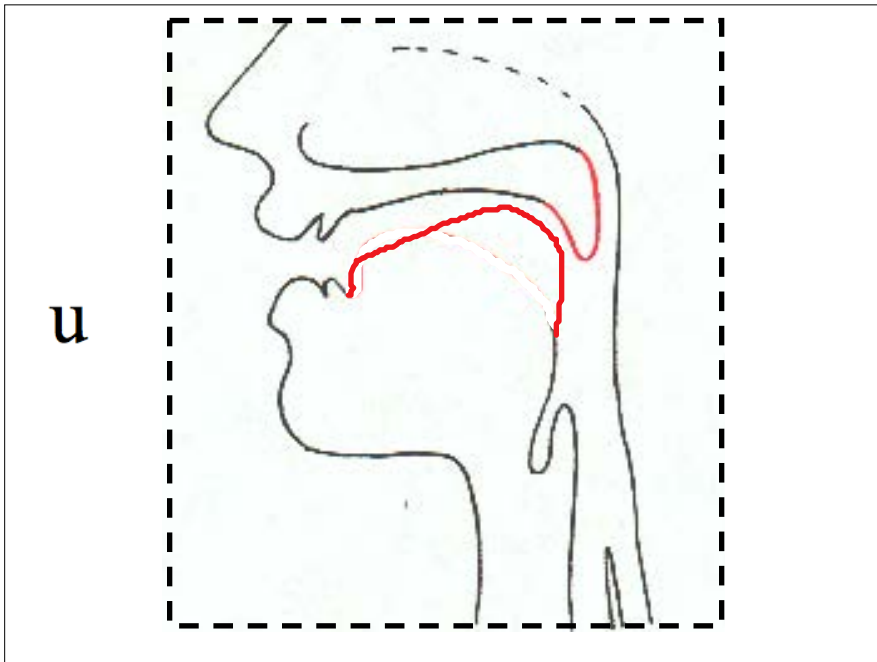
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	p b			t d				k ɡ			
Nasal	m			n				ŋ			
Trill											
Tap or Flap				ɾ							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
Glide							j	w			
Liquid				ɹ	l						

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

Vowels

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

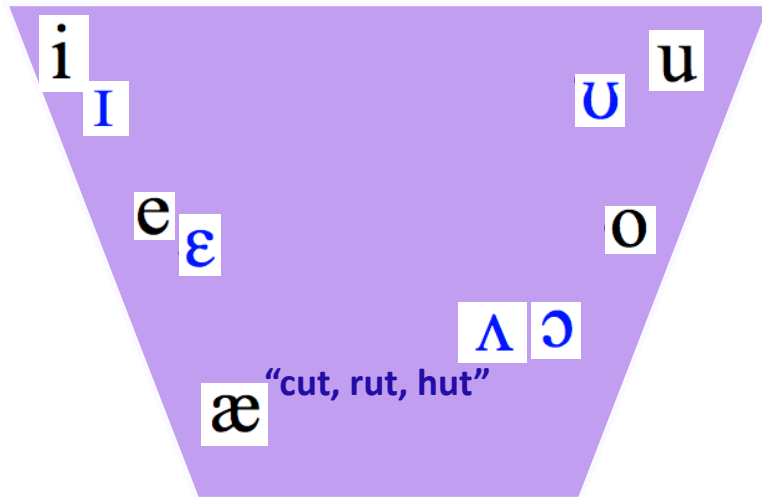
o

"caught, wrought, hawed"

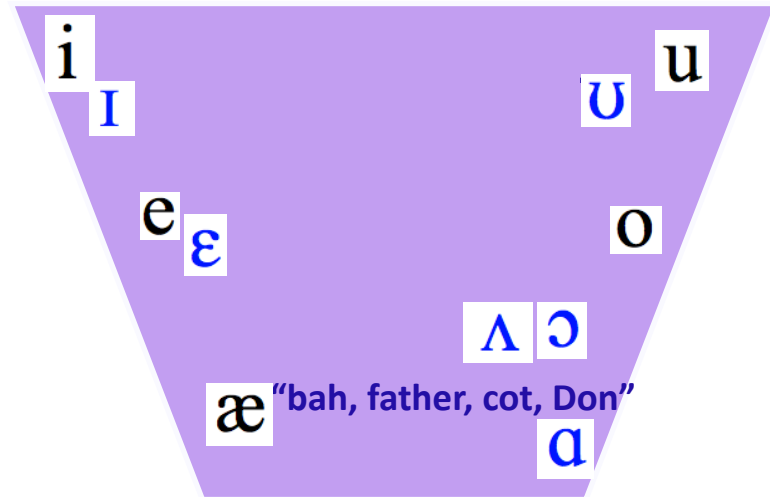
ɔ

æ

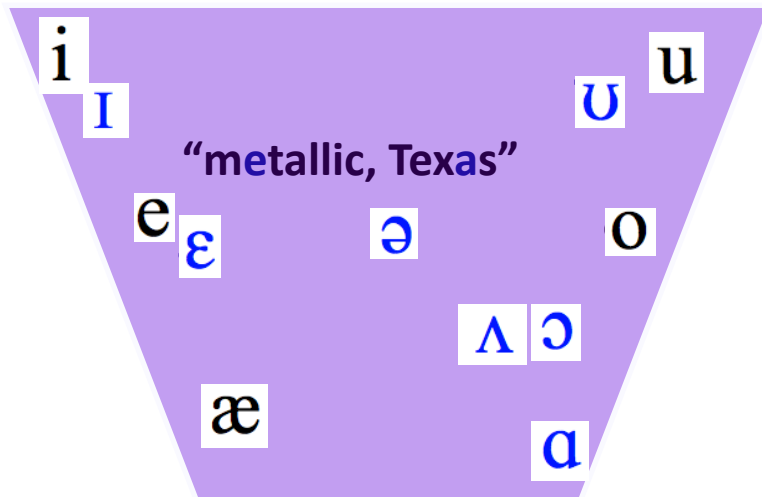
So what vowels do you have?



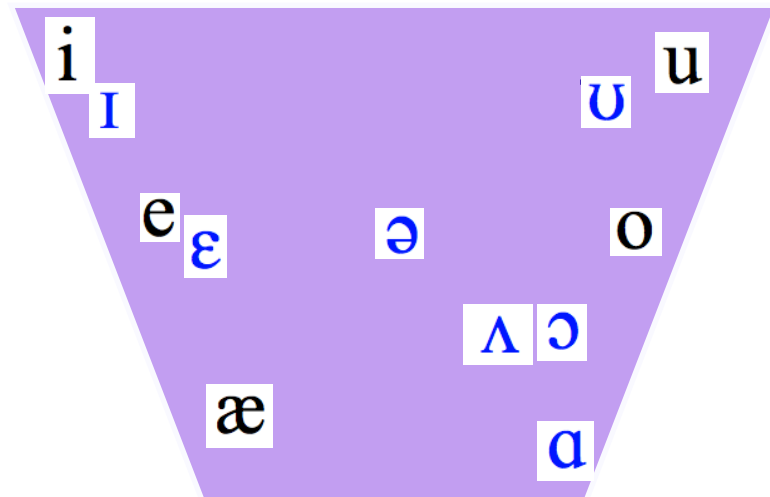
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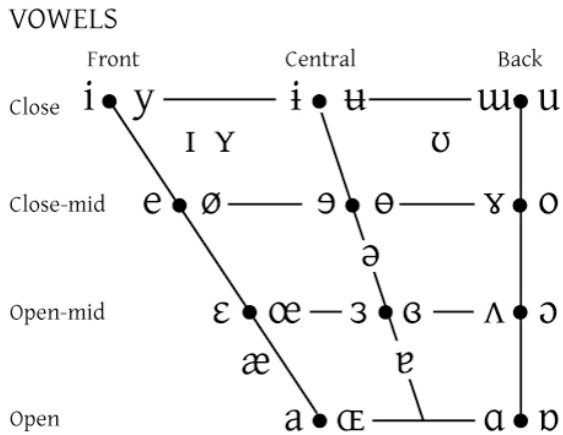
So what vowels do you have?



So here they are!

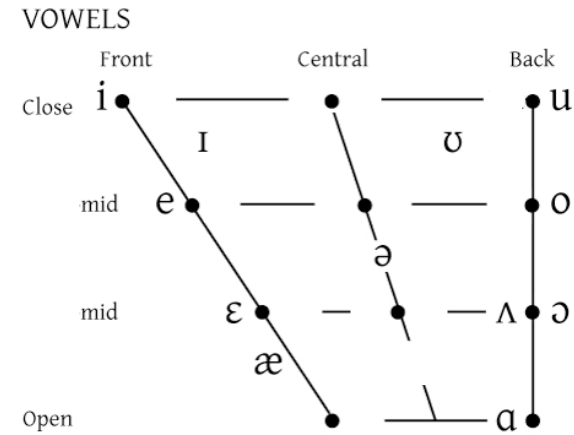


The full(er) vowel chart



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

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:]

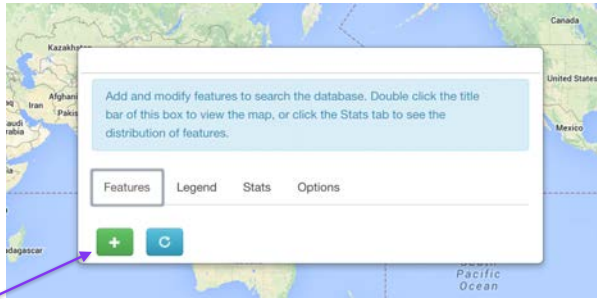
Cross-linguistic variation in sounds (called segments)

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

Click on this to get this

Cross-linguistic variation in sounds (called segments)

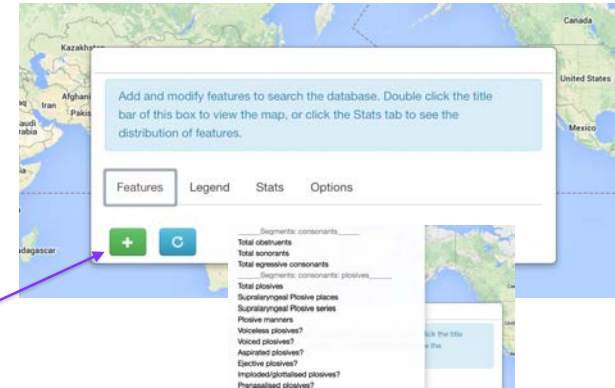
<http://phonotactics.anu.edu.au/index.php>



Then look through the features

Cross-linguistic variation in sounds (called segments)

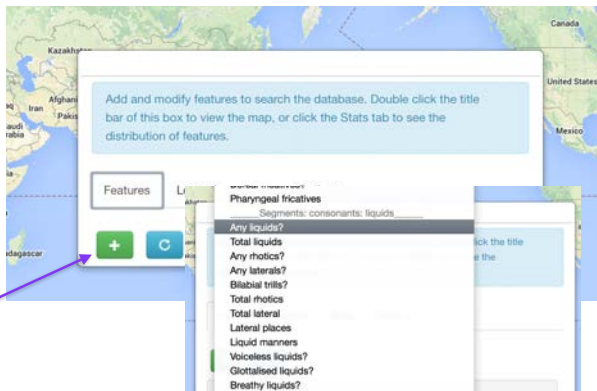
<http://phonotactics.anu.edu.au/index.php>



Then look through the features till you find segments

Cross-linguistic variation in sounds (called segments)

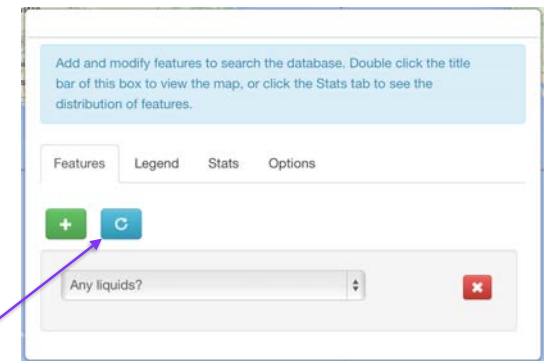
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Select something of interest

Cross-linguistic variation in sounds (called segments)

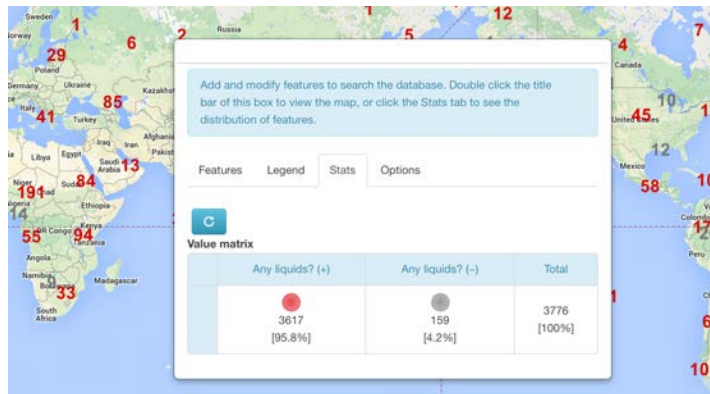
<http://phonotactics.anu.edu.au/index.php>



And see how the languages of the world look

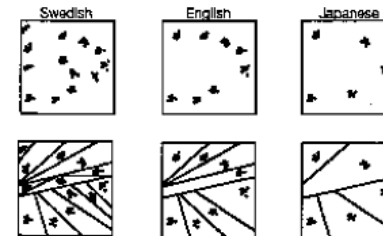
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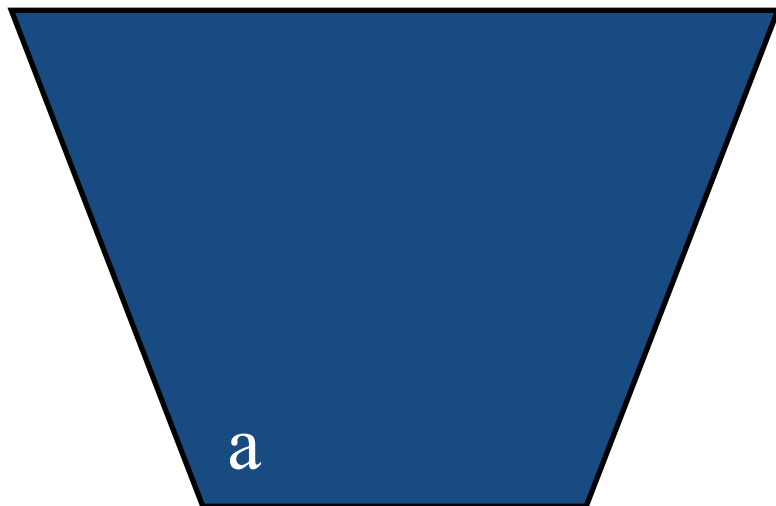
The world's languages are full of lots of fun variation when it comes to the sounds they use.

Cross-language differences

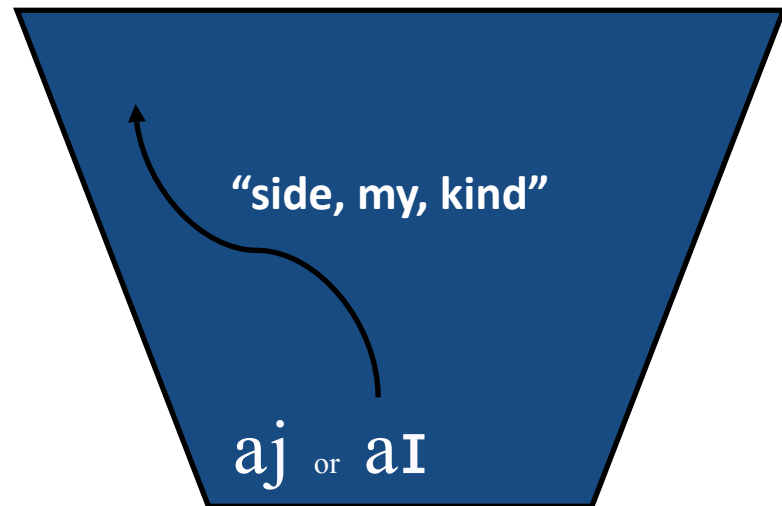


Languages carve up the acoustic space in different ways. Children find these categories (called phonemes), based on the distributions of sounds they hear in their linguistic environment.

Diphthongs: Two vowel-ish sounds together



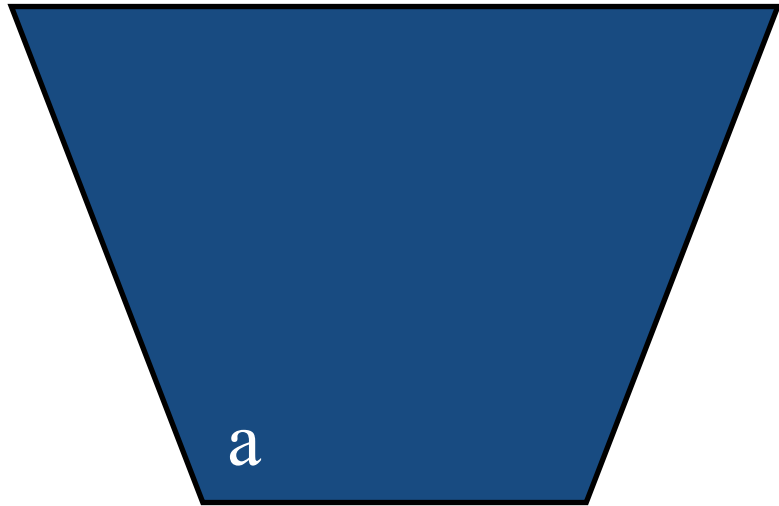
Diphthongs: Two vowel-ish sounds together



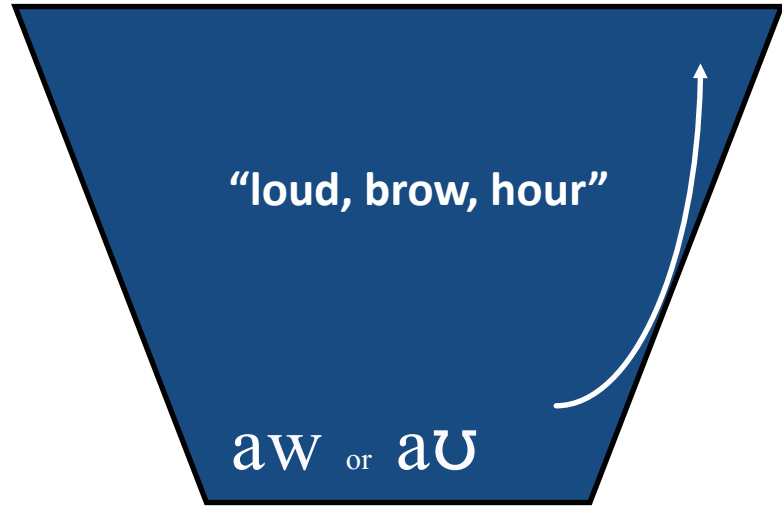
"side, my, kind"

aj or aI

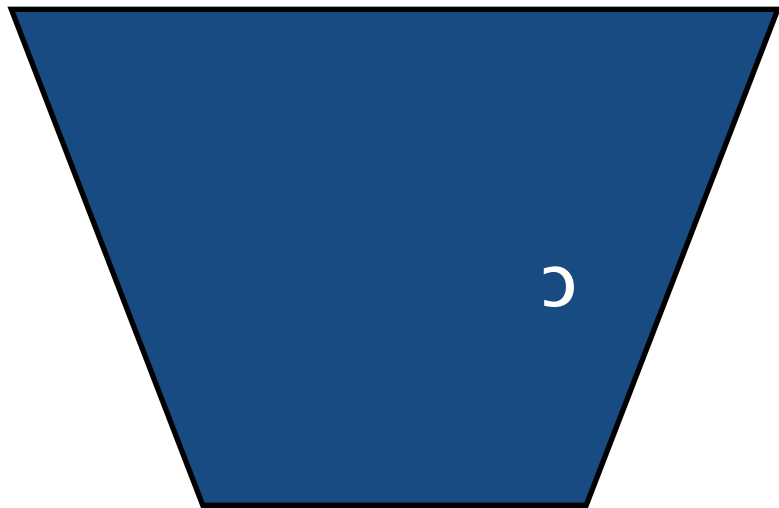
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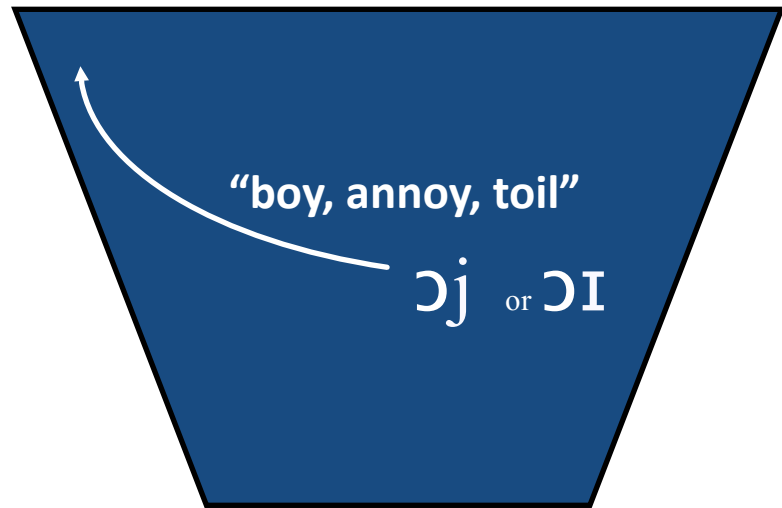
Diphthongs: Two vowel-ish sounds together



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

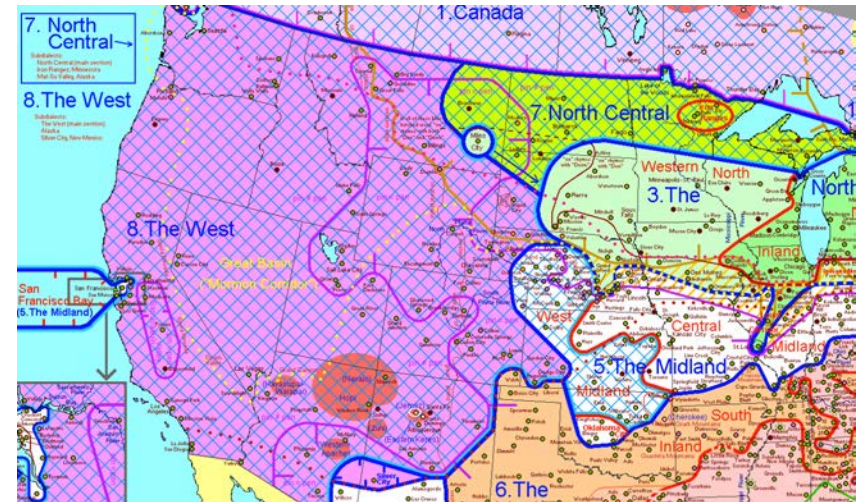
Monophthongs	Central			Back
	Front	plain	rhotacized	
Close	i			u
Near-close	ɪ			ʊ
Close-mid	e ^[4]			ɔ ^[4]
Mid		ə	ɚ	
Open-mid	ɛ			ʌ • ɔ
Near Open	æ			ɑ

Depending on one's analysis, people who merge the vowels of *cot* and *caught* to /ɑ/ either h /noʊ/ and /hoʊ/, but since all accents with *cot* and *caught* merged to /kɑ/ have also underg in these cases, the [ɑ] before /ɑ/ can be analyzed as an allophone of /ɑ/. [ɹ] and [ɚ] are ofte unstressed syllables. Since the occurrence of [ɹ] is mostly predictable, it need not be consid Among speakers who distinguish between /ɑ/ and /ɔ/, the vowel of *cot* (usually transcribed /k closer to [ɑ].^[4] Among cot-caught merged speakers, /ɑ/ usually remains a back vowel, [ɑ], s /ɑ/, 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	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

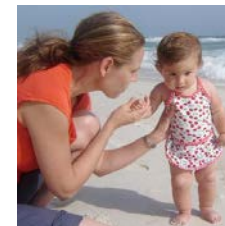
Speech perception

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 3 on HW2, and up through question 3 on the phonological review questions.