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

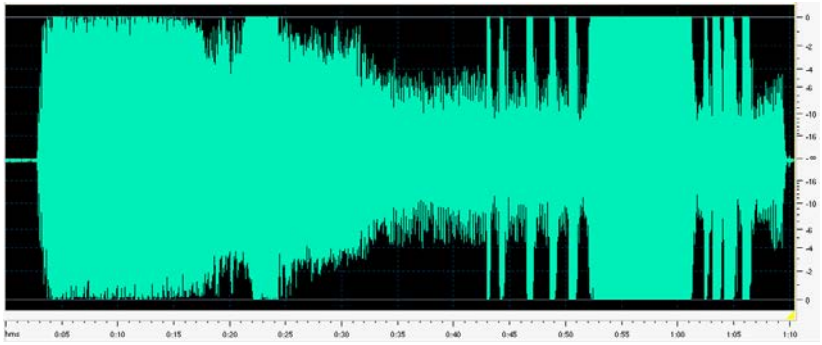
HW2 available (not due till 2/20/14 – after midterm), but helpful for studying for the midterm

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



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**e**	e	s**ea**s	ea
bel**ie**ve	ie	am**oe**ba	oe
C**ae**sar	ae	k**ey**	ey
s**ee**	ee	mach**i**ne	i
p**eo**ple	eo	s**ei**ze	ei

International Phonetic Alphabet: **[i]**

One sound – Many letters

t**oo**	oo	thr**ew**	ew
t**o**	o	l**ieu**	ieu
cl**ue**	ue	sh**oe**	oe
thr**ough**	ough	b**eau**tiful	eau

IPA: [u]

One sound – Many letters

shoot	ʃ
ei**th**er	ð
character	k
d**ea**l	i
Thomas	t
physics	f
rou**gh**	f

One letter – Many sounds

d**a**me	e
d**a**d	æ
f**a**ther	ɑ
c**a**ll	ɔ, ɑ
vill**a**ge	ɪ, ə
m**a**ny	ɛ

One letter – Not one sound

mnemonic
psychology
resi**g**n
ghost
i**s**land
whole
de**b**t

= **no sound!**

cute kjuwt

= **2 sounds!**

Differences across languages

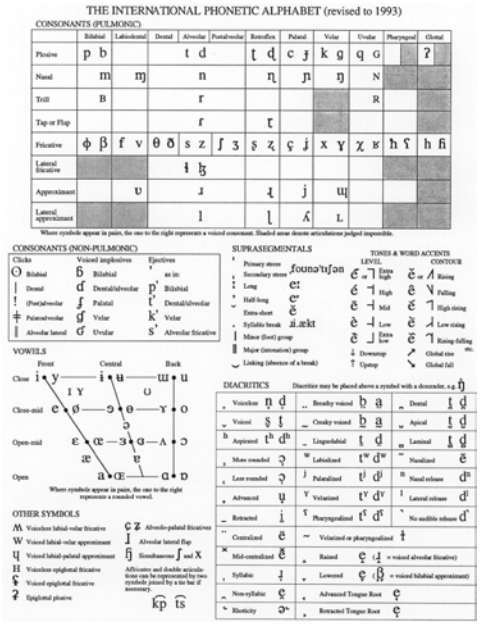
English: judge, juvenile, Jesus — dʒ

Spanish: jugar, Jesus — h

German: Jugend, jubeln, Jesus — j

French: Jean, j'accuse, jambon — ʒ

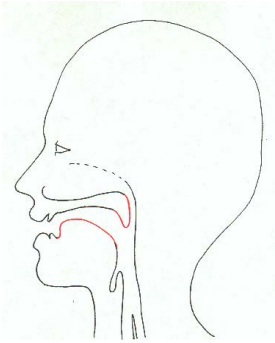
International Phonetic Alphabet



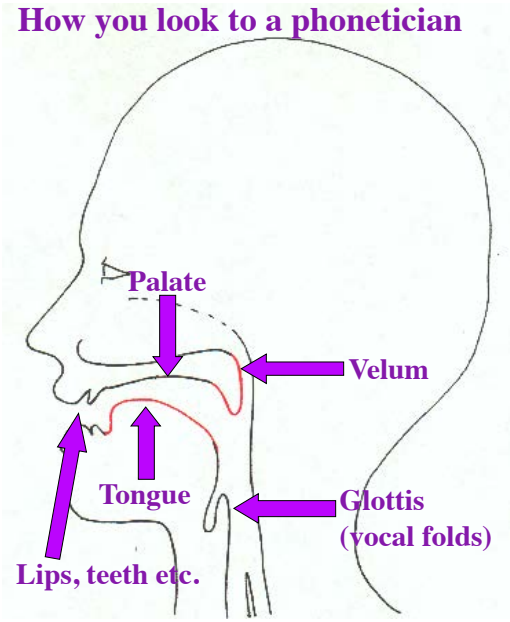
Sounds: Speech production

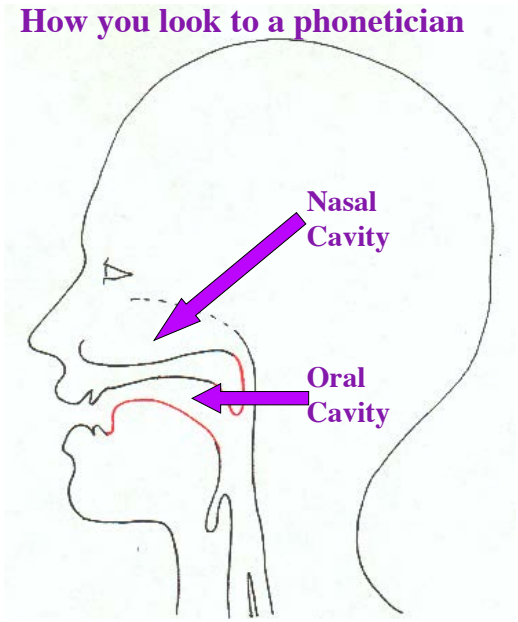
"Speech is a river of breath, bent into hisses and hums by the soft flesh of the mouth and throat."

- Pinker, *The Language Instinct*



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

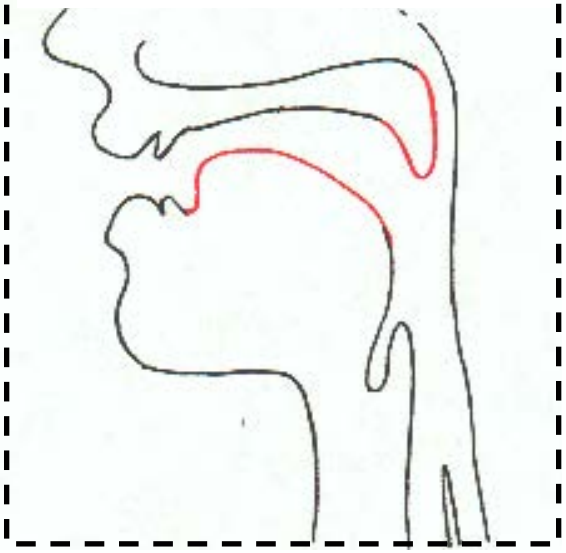
Describing speech sounds

Where/how is the air flowing? (manner of articulation)
nasal/oral, *stop*, *fricative, liquid, tap/flap* etc.

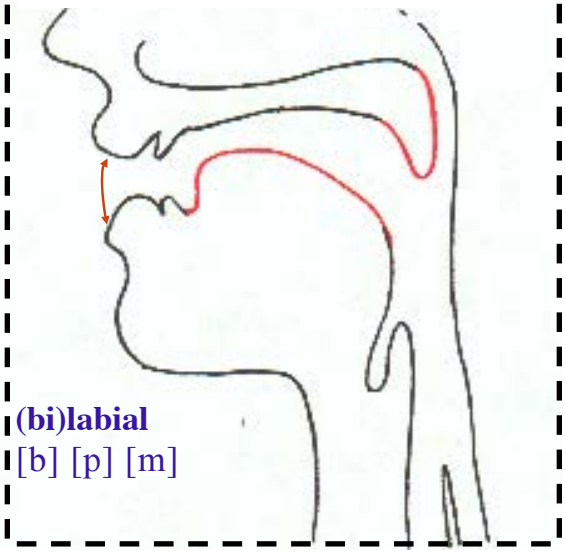
Where is the air-flow blocked? (place of articulation)
labial, alveolar, palatal, velar etc.

What are the vocal folds doing? (voicing)
voiced vs. *voiceless*

Where is the air flow blocked?

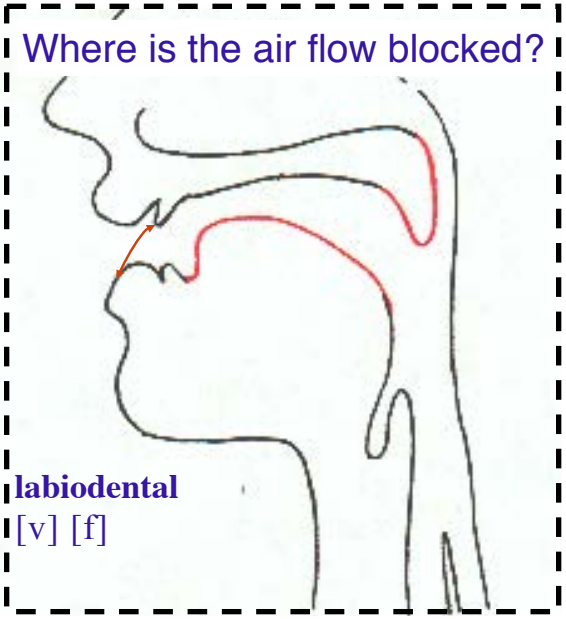


Where is the air flow blocked?



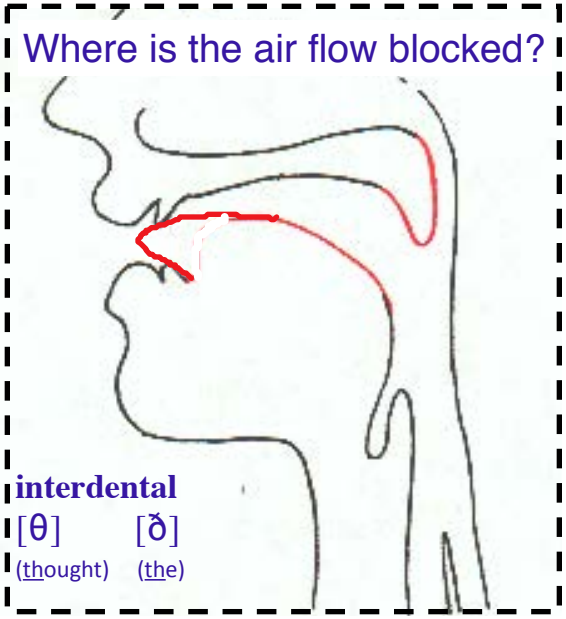
(bi)labial
[b] [p] [m]

Where is the air flow blocked?



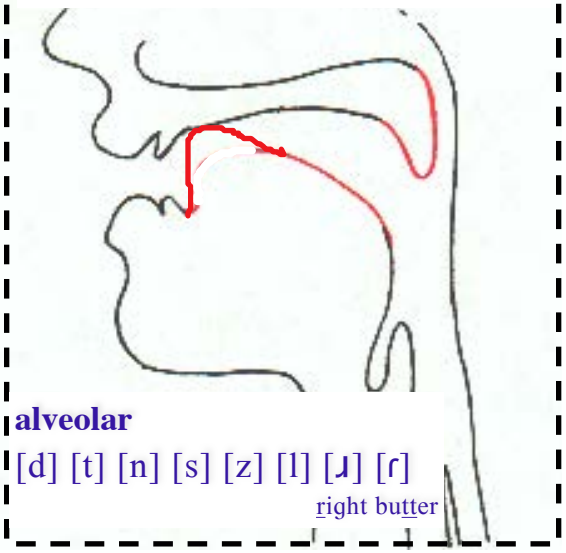
labiodental
[v] [f]

Where is the air flow blocked?



interdental
[θ] [ð]
(thought) (the)

Where is the air flow blocked?

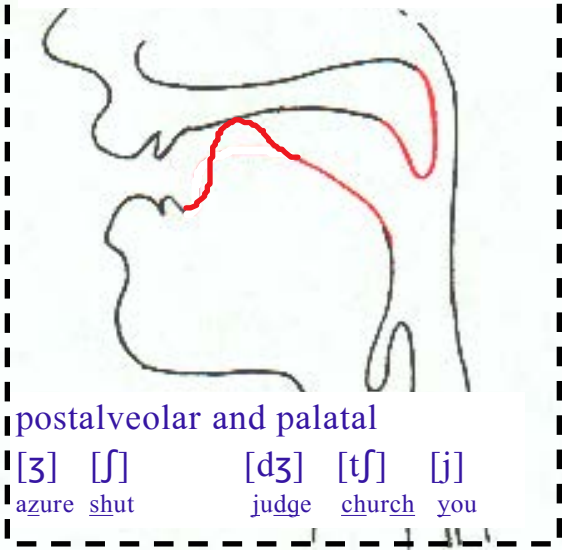


alveolar

[d] [t] [n] [s] [z] [l] [ɹ] [ɾ]

right butter

Where is the air flow blocked?

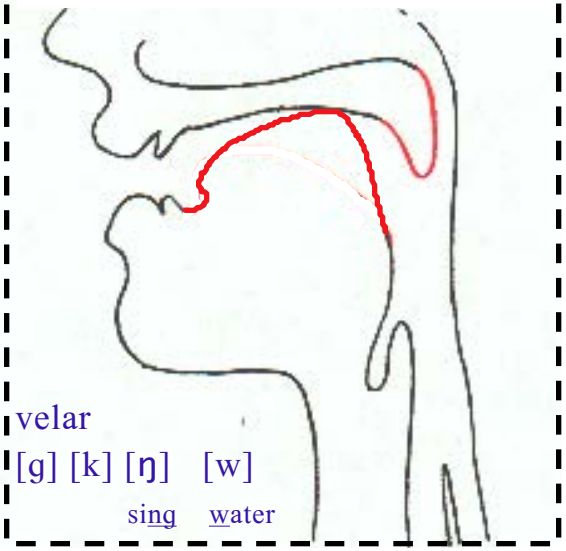


postalveolar and palatal

[ʒ] [ʃ] [dʒ] [tʃ] [j]

azure shut judge church you

Where is the air flow blocked?

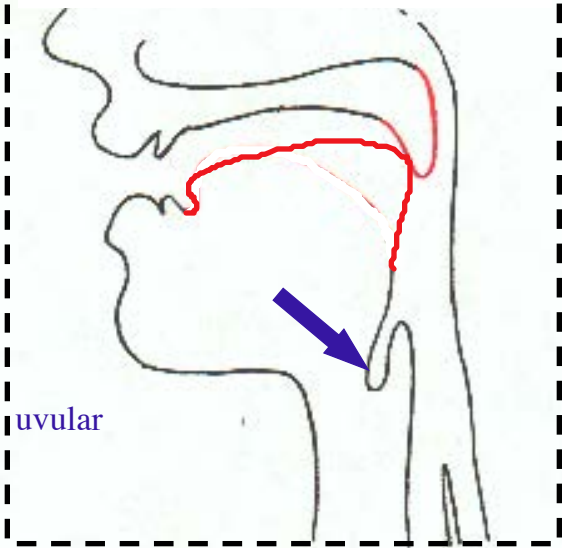


velar

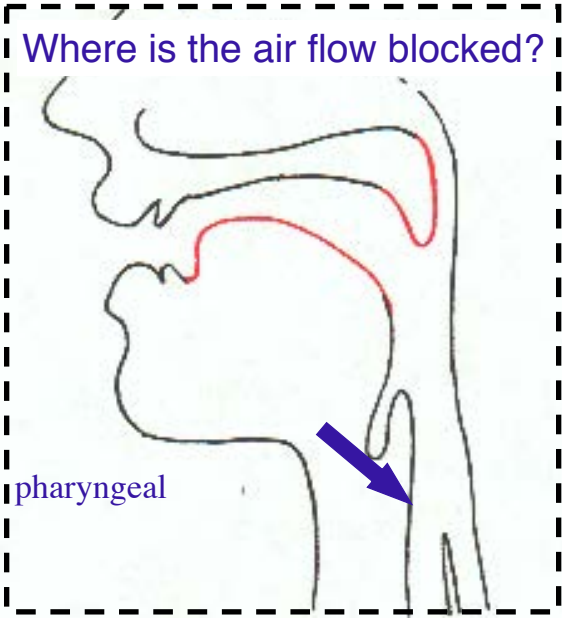
[g] [k] [ŋ] [w]

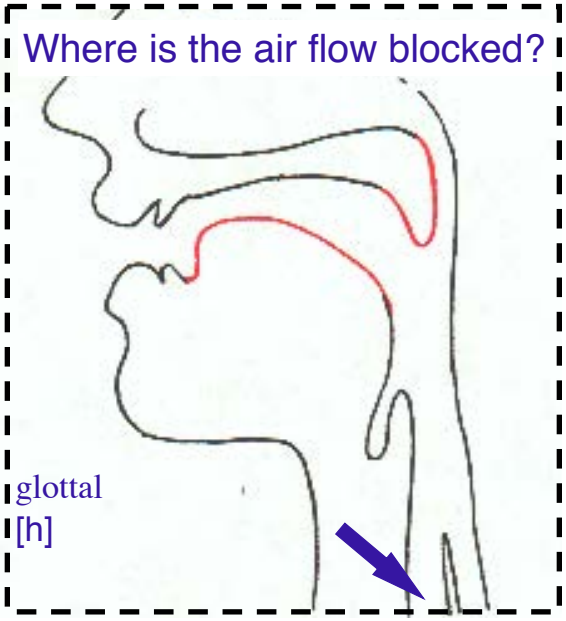
sing water

Where is the air flow blocked?



uvular





Manner: How the air is flowing

Stops
[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*

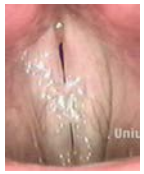
Ex: affricates in fast speech:

"What should…?" [t ʃ] becomes "Whachould…?"

"What did you…?" [d j] becomes "What did zha…?" [d ʒ] 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			ŋ			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			ŋ		?	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			ŋ		?	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		?	h
affricate						tʃ dʒ		
liquid				ɹ		?		
glide					j		w	
flap				ɾ				

"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			ŋ		ɳ	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		?	h
affricate						ʧ		
liquid				l ɹ		?		
glide					j		w	
flap				ɾ				

“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			ŋ		ɳ	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		x ɣ	h
affricate								
liquid				l ɹ		?		
glide					j		w	
flap				ɾ				

“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			ŋ		ɳ	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		x ɣ	h
affricate						ʧ ʤ		
liquid				l ɹ		ʎ		
glide					j		w	
flap				ɾ				

“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			ŋ		ɳ	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		x ɣ	h
affricate						ʧ ʤ		
liquid				l ɹ		ʎ		
glide					j		w	
flap				ɾ				

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 g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			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)

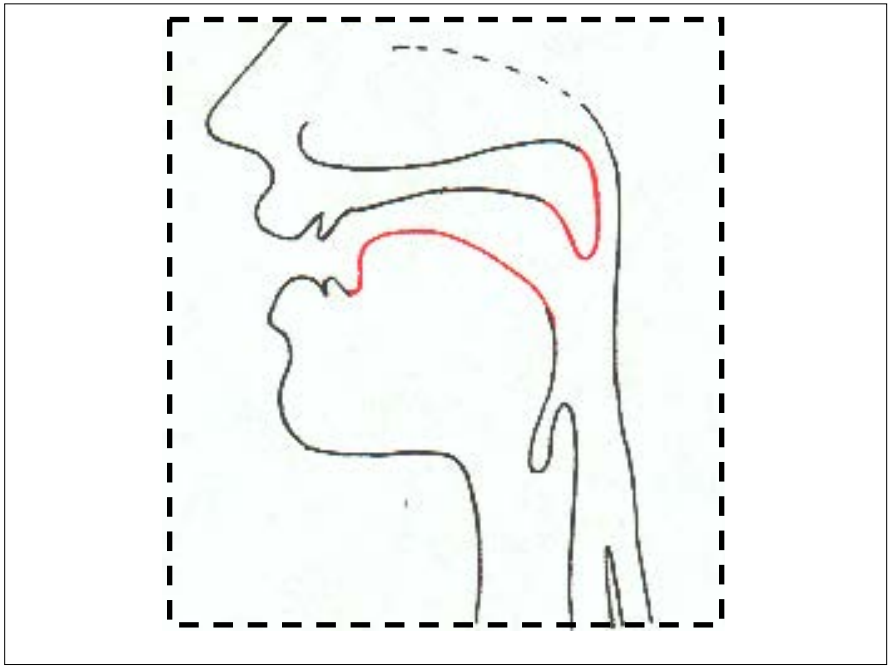
CONSONANTS (PULMONIC)

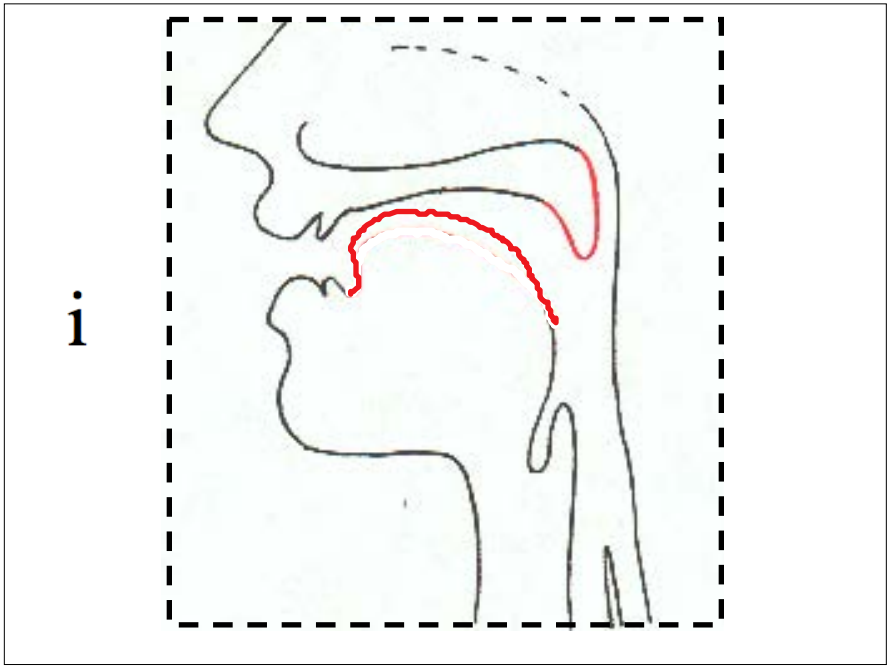
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	p b			t d				k g			
Nasal	m			n				ŋ			
Trill											
Tap or Flap				ɾ							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
Glide							j	w			
Liquid				ɹ l							

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?





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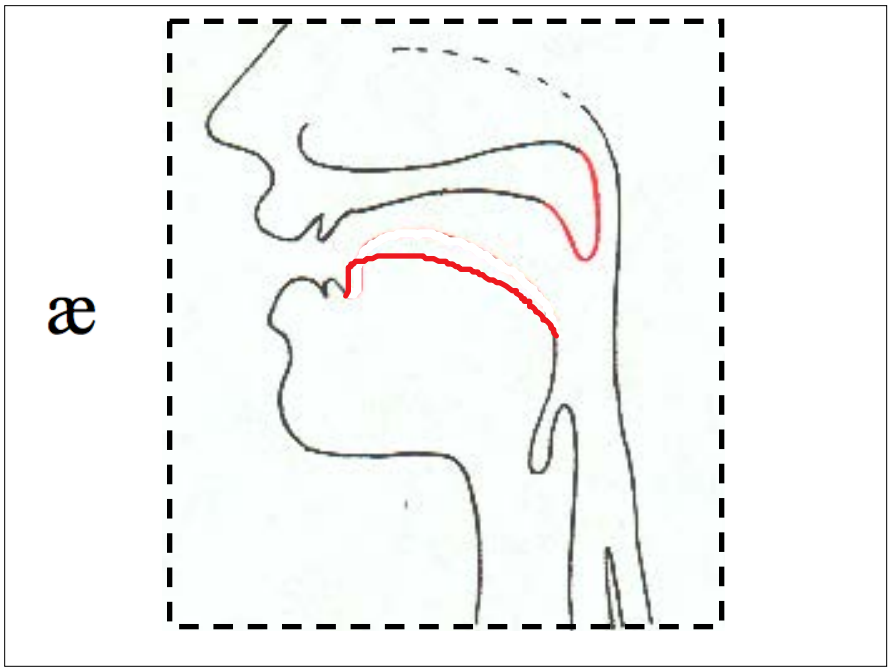

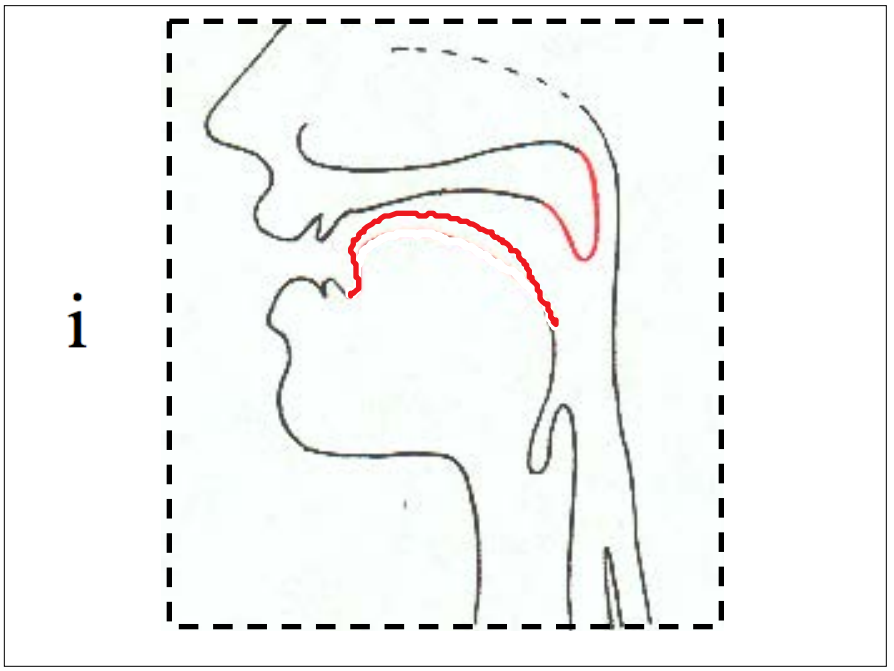

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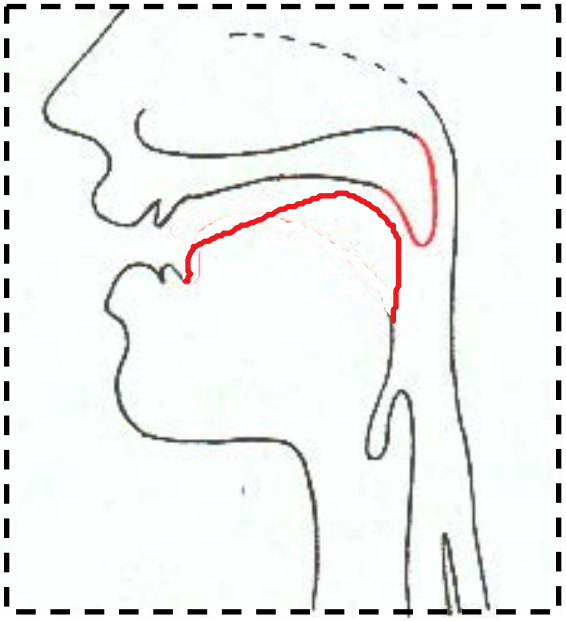
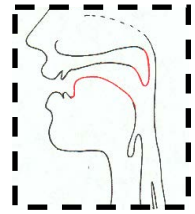


You can....



(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*

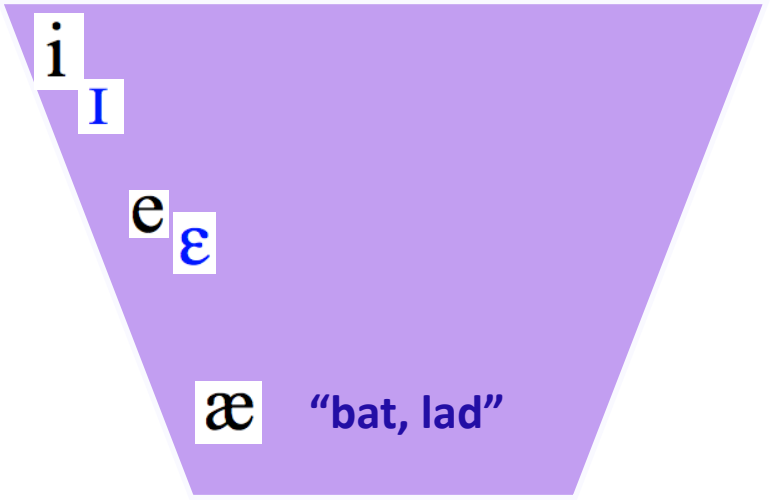
(4) Tense or not tense your mouth
(tense, lax)

So what vowels do you have?

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

So what vowels do you have?

So what vowels do you have?



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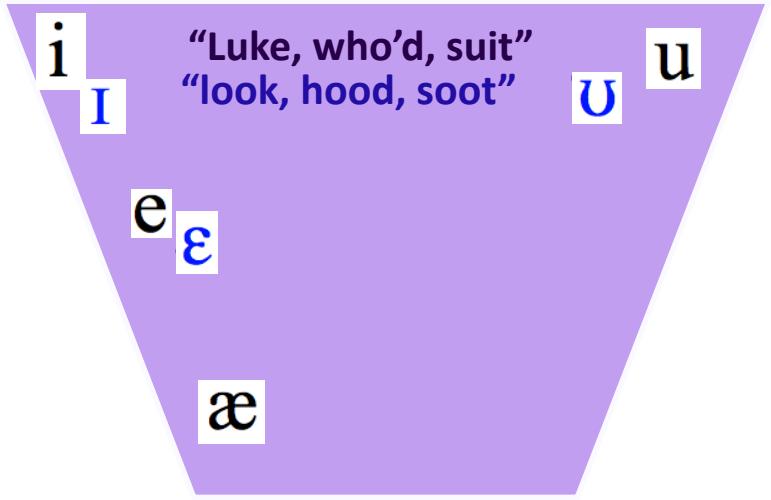

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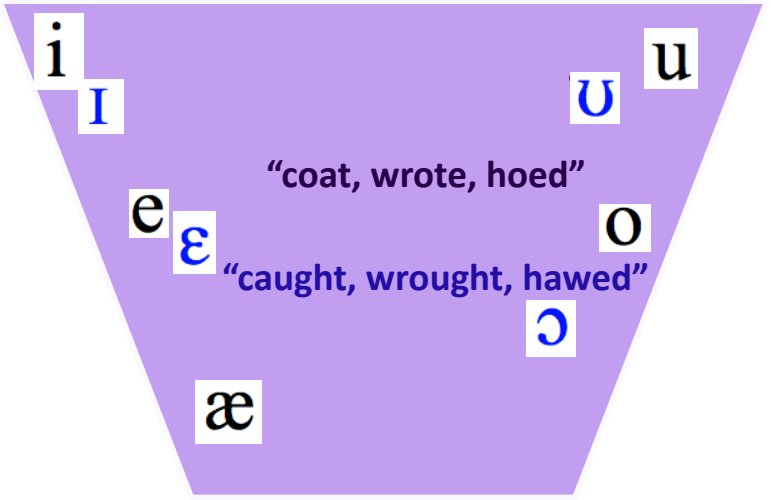

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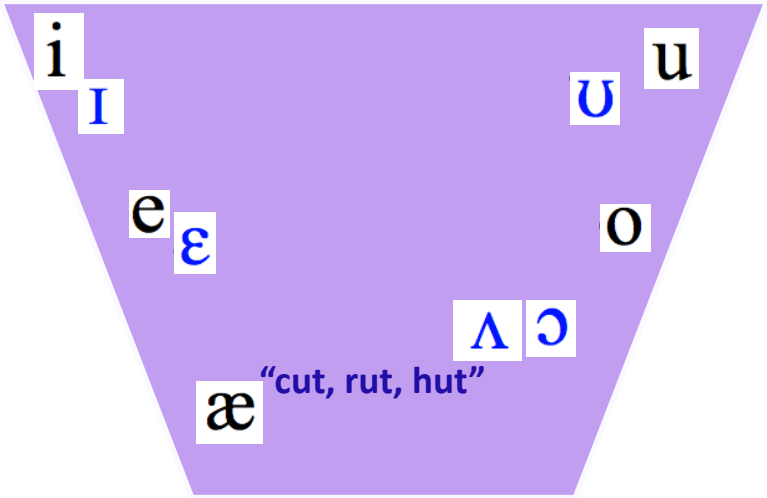

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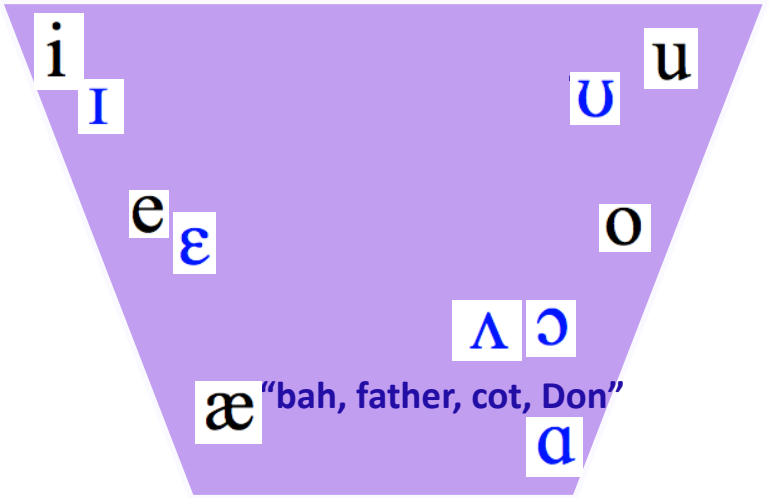
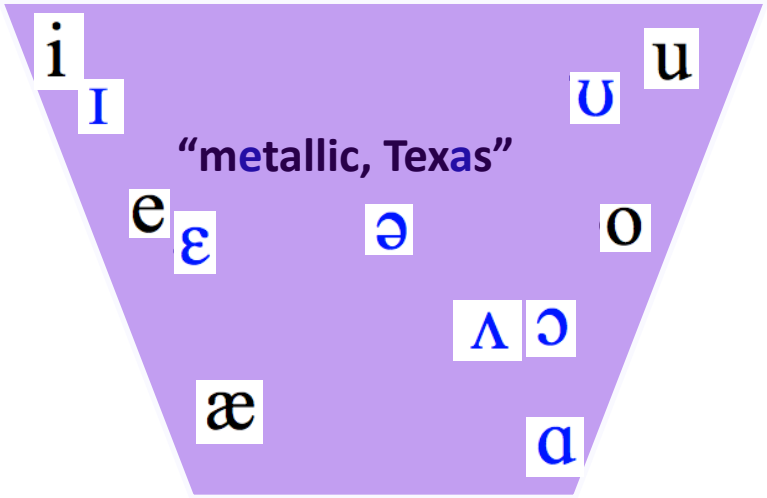
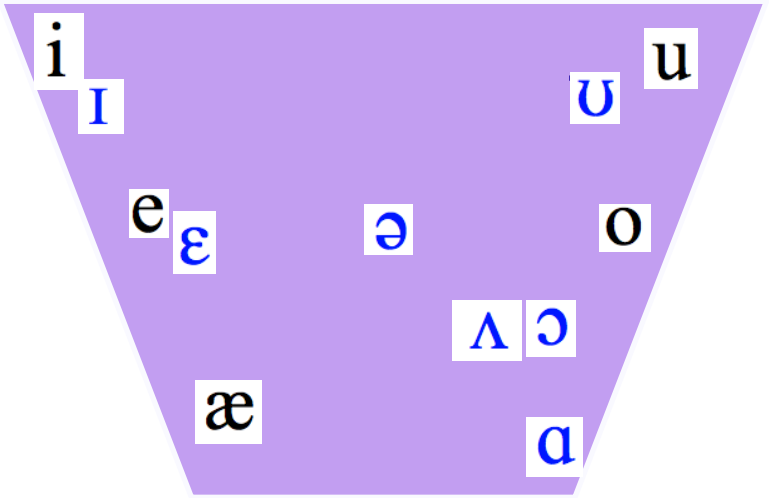


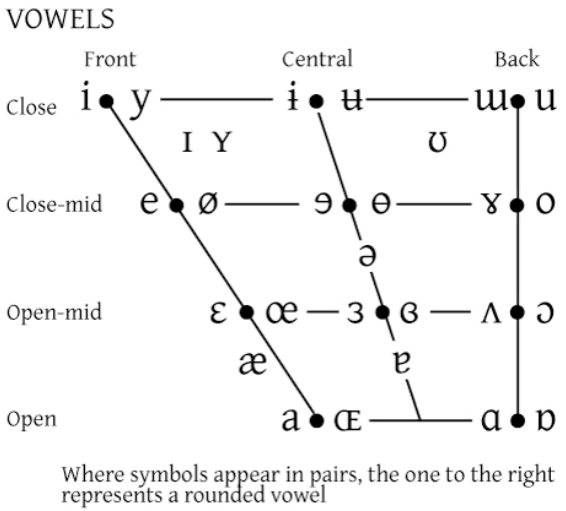
So what vowels do you have?



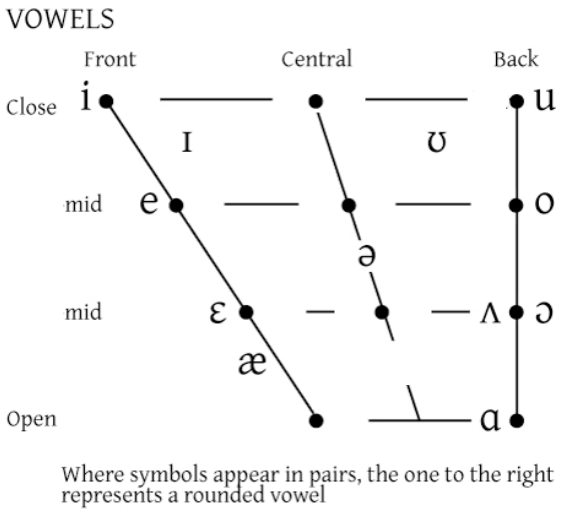
So here they are!



The full(er) vowel chart



The parts we care about for this class



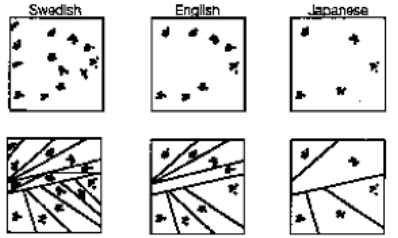
Cross-language differences

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]

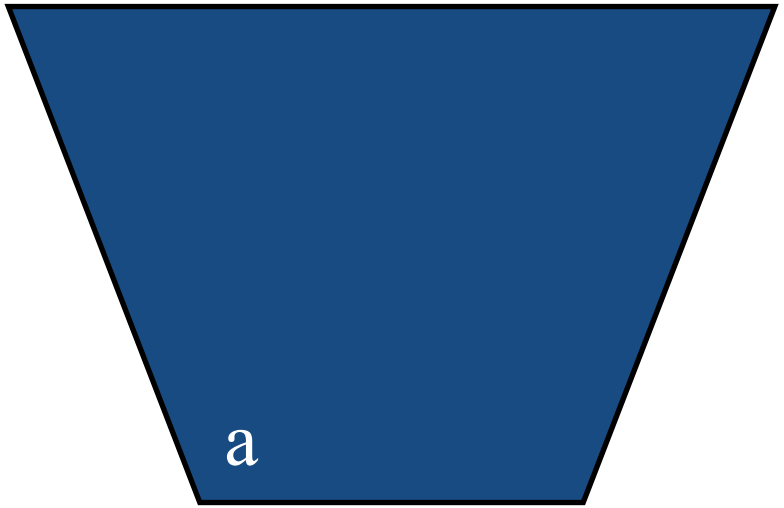
- Many languages don't make the tense/lax distinction found in English (ex: Spanish [i], rather than [i] and [ɪ])
- Many languages distinguish short and long vowels (unlike English), ex: Japanese [i] vs. [i:]

Cross-language differences

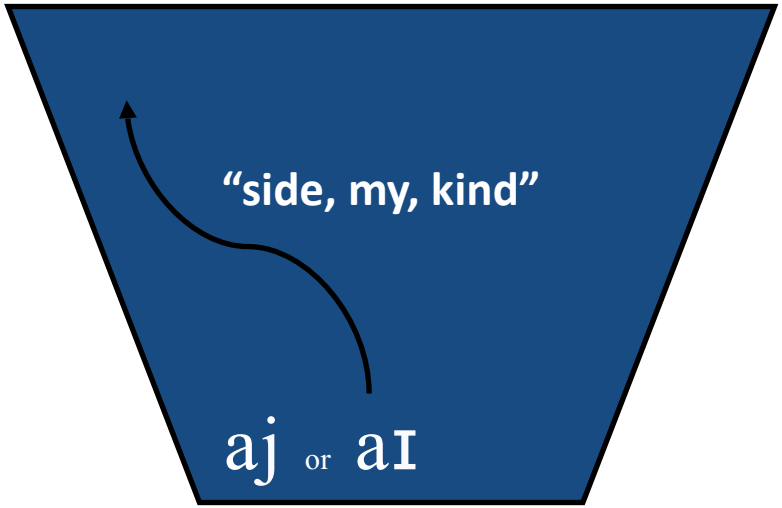


Languages carve up the acoustic space in different ways. Children find these categories (called phonemes), based on the distributions of sounds they hear in their linguistic environment (using statistical learning).

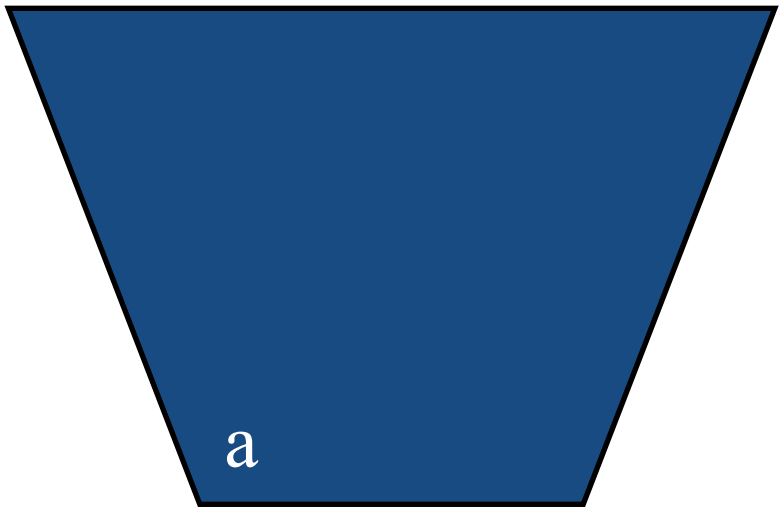
Diphthongs: Two vowel-ish sounds together



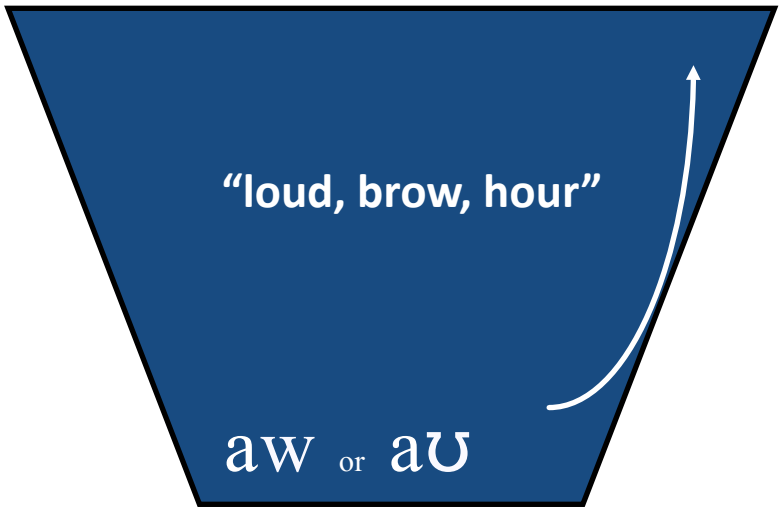
Diphthongs: Two vowel-ish sounds together



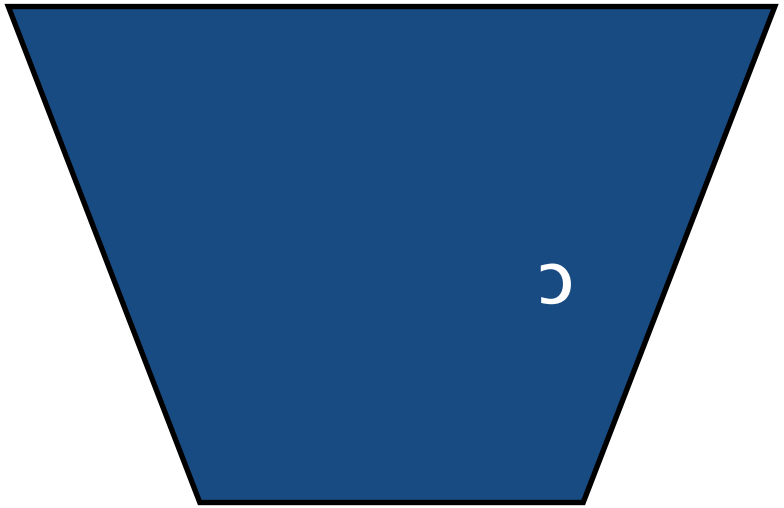
Diphthongs: Two vowel-ish sounds together



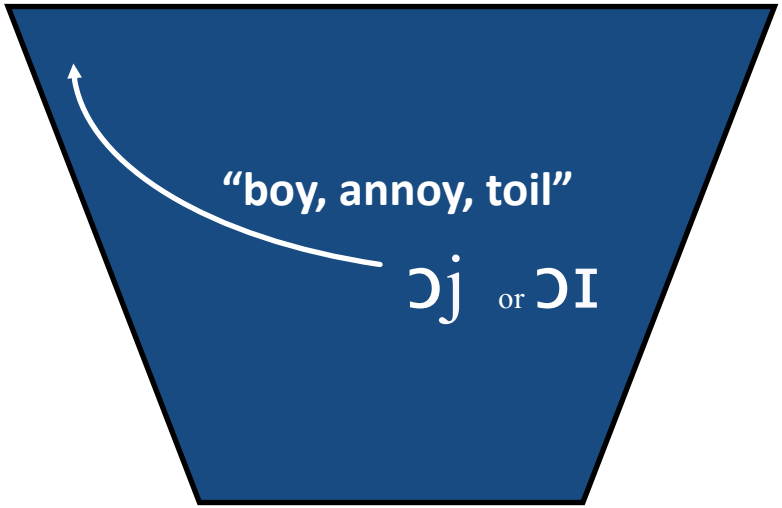
Diphthongs: Two vowel-ish sounds together



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]			o[4]
Mid		ə	ɚ	
Open-mid	ɛ		ɝ	ʌ • ɔ
Near Open	æ			ɑ

Depending on one's analysis, people who merge the vowels of *cot* and *caught* to /ɑ/ either h
/nɔɪθ/ and /hɔɪs/, but since all accents with *cot* and *caught* merged to /kɑt/ have also underg
in these cases, the [ɔ] before /ɹ/ can be analyzed as an allophone of /o/. [ɜˠ] and [əˠ] are ofte
unstressed syllables. Since the occurrence of [ə] is mostly predictable, it need not be consid

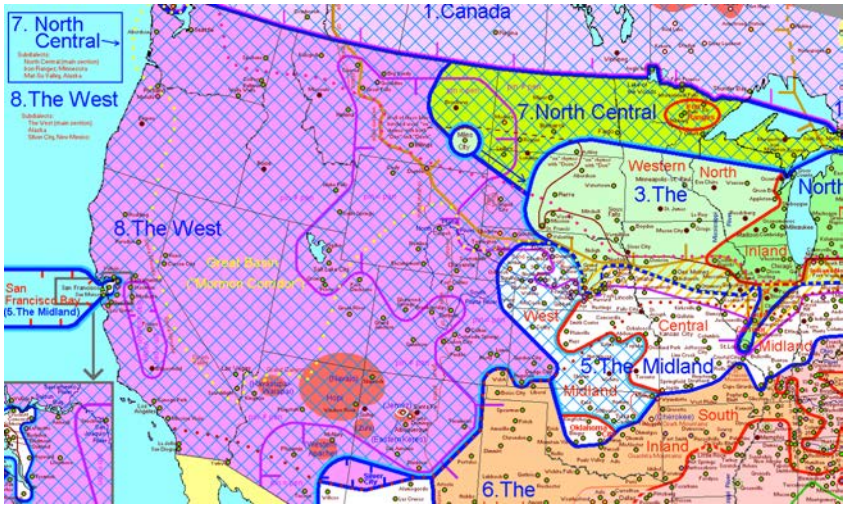
Among speakers who distinguish between /ɑ/ and /ɔ/, the vowel of *cot* (usually transcribed /ɑ
closer to [ɒ].[6] Among cot-caught merged speakers, /ɑ/ usually remains a back vowel, [ɑ], s
/ɔ/, their retracted allophones for /ɑ/ may be identical to the lowered allophones of /ɔ/ among

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	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.