

Psych 56L/ Ling 51:
Acquisition of Language

Lecture 6
Phonological Development I

Announcements

HW1 due at the end of class today

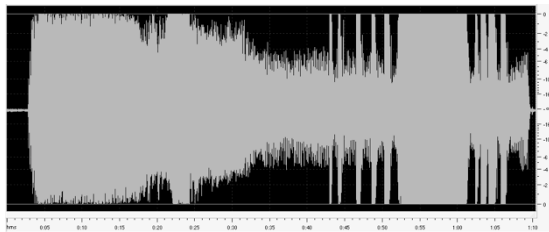
Review questions for phonological development available

HW2 available (not due till 2/21/13 – after midterm), but helpful for studying for the midterm

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 Characters

<u>h</u> e	e	<u>s</u> ea <u>s</u>	ea
bel <u>ie</u> ve	ie	am <u>oe</u> ba	oe
<u>C</u> aesar	ae	<u>k</u> ey	ey
<u>s</u> ee	ee	mach <u>i</u> ne	i
<u>p</u> eople	eo	<u>s</u> eize	ei

International Phonetic Alphabet: [i]

One Sound - Many Characters

<u>to</u> o	oo	th <u>r</u> ew	ew
<u>t</u> o	o	<u>l</u> ieu	ieu
<u>cl</u> ue	ue	sh <u>oe</u>	oe
th <u>ro</u> ugh	ough	<u>b</u> eautiful	eau

IPA: [u]

One Character - 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
man <u>y</u>	ɛ

One Sound - Multiple Letters

<u>sh</u> oot	ʃ
<u>ei</u> ther	ð
<u>ch</u> aracter	k
<u>de</u> al	i
<u>Th</u> omas	t
<u>ph</u> ysics	f
rou <u>gh</u>	f

One Letter - 0, 1, 2 Sounds

m nemonic	
p sychology	
r esign	
g host	= no sound!
i sland	
w hole	
d ebt	
c ute	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

THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

CONSONANTS (SPERMATIC)

Place	Labial	Dental	Alveolar	Palatoalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d	tʃ dʒ	k g			ʔ	
Fricative	f v	θ ð	s z	ʃ ʒ	x				
Nasal	m		n	ɲ	ɲ	ŋ			
Tap or Flap			ɾ						
Liquids			l						
Approximant				j					
Glottal approximant								h	

CONSONANTS (NON-SPERMATIC)

Place	Labial	Dental	Alveolar	Palatoalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive									
Fricative									
Nasal									
Tap or Flap									
Liquids									
Approximant									
Glottal approximant									

VOVELS

Place	Labial	Dental	Alveolar	Palatoalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive									
Fricative									
Nasal									
Tap or Flap									
Liquids									
Approximant									
Glottal approximant									

OTHER SYMBOLS

Place	Labial	Dental	Alveolar	Palatoalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
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Nasal									
Tap or Flap									
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Nasal									
Tap or Flap									
Liquids									
Approximant									
Glottal approximant									

Sounds: Speech Production

The image shows a violin on the left and a human head in profile on the right. The violin is labeled with parts like 'Body', 'F-hole', 'Bridge', 'Tailpiece', 'Sound hole', 'Strings', and 'Bow'. The human head profile shows the vocal tract, including the larynx, pharynx, oral cavity, and nasal cavity.

How you look to a phonetician

This diagram shows a sagittal cross-section of the human head and neck, focusing on the vocal tract. Arrows point to the following parts: Palate (top), Velum (soft palate), Tongue (bottom), Glottis (vocal folds) (larynx), and Lips, teeth etc. (mouth).

How you look to a phonetician

This diagram shows a sagittal cross-section of the human head and neck, focusing on the vocal tract. Arrows point to the Nasal Cavity and the Oral Cavity.

Major division: consonants vs vowels

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

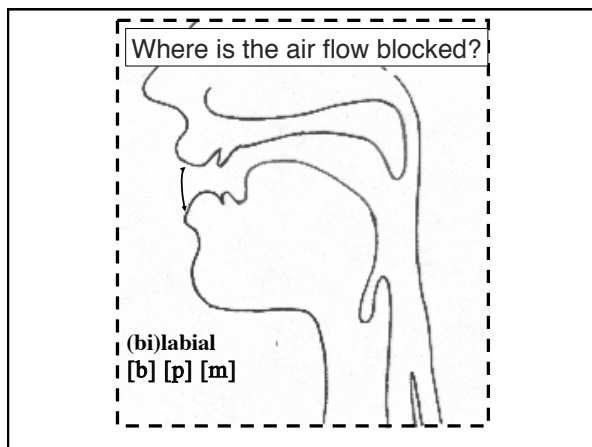
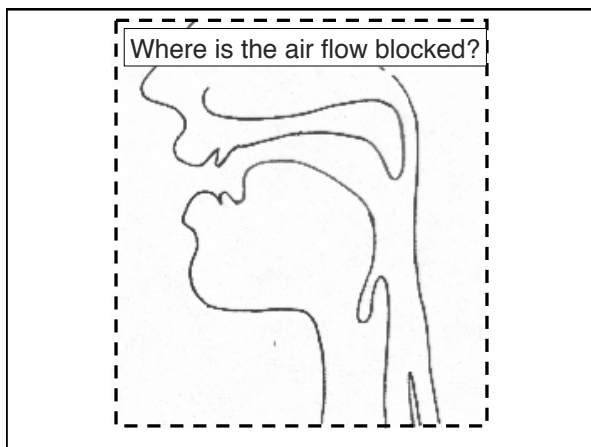
Vowels: very little obstruction in the vocal tract. Can form the basis of syllables (also possible for some consonants).

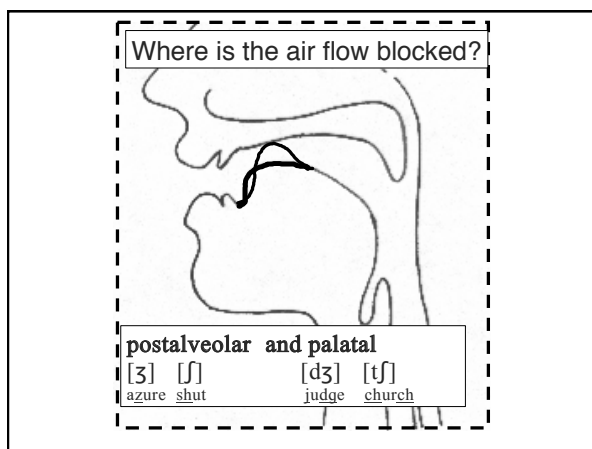
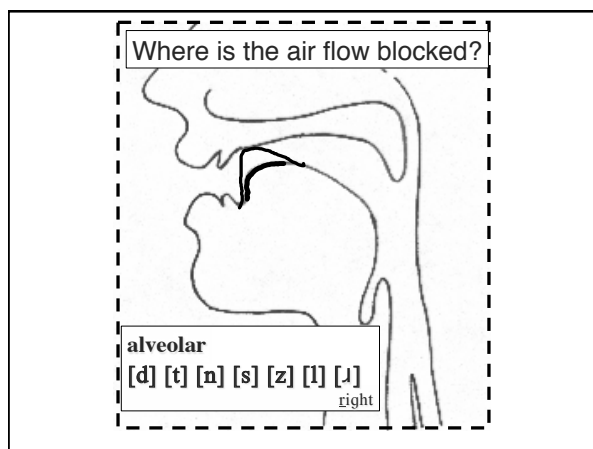
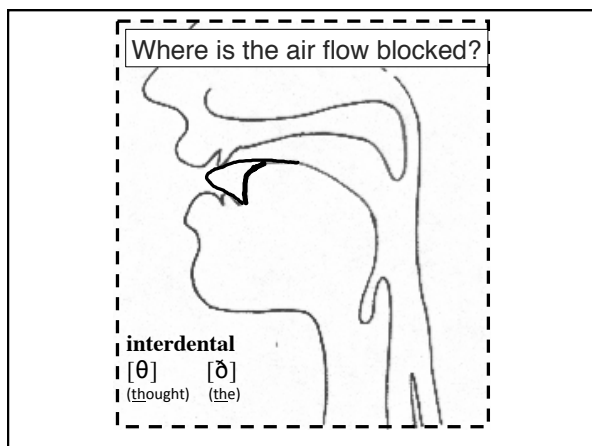
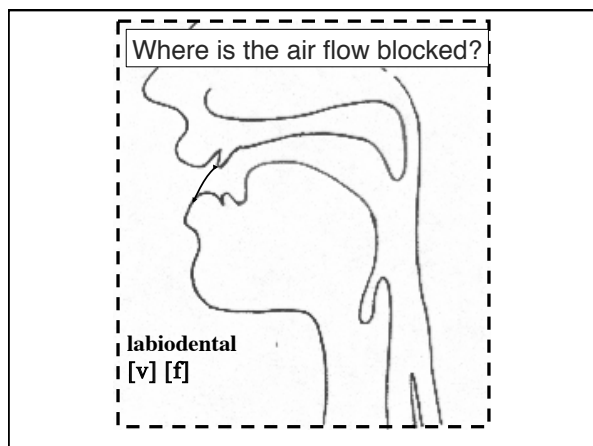
Describing Speech Sounds

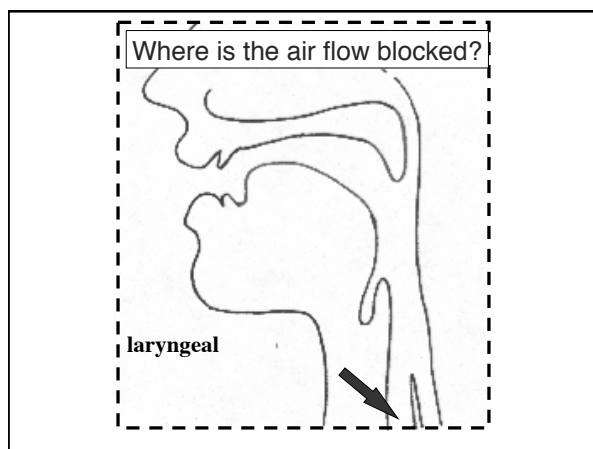
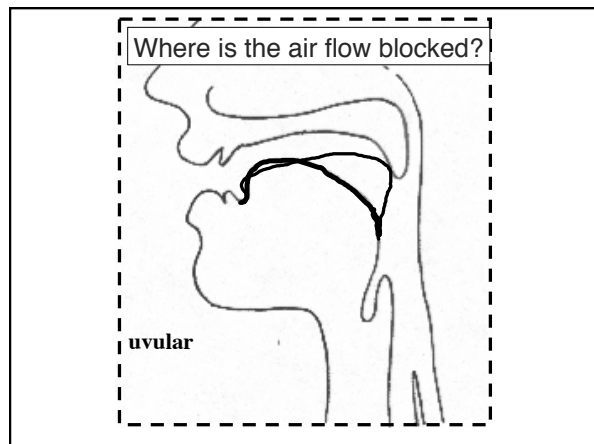
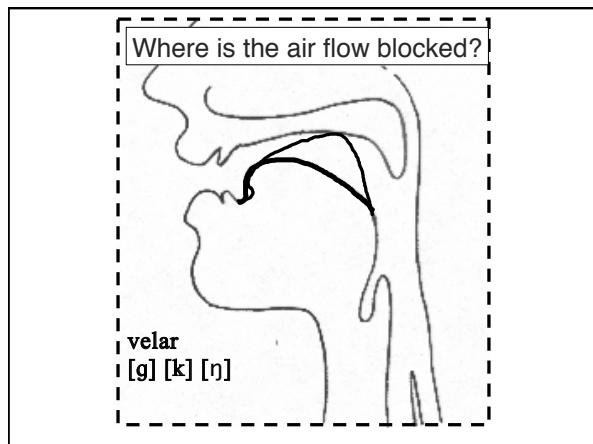
Where/how is the air flowing? (manner of articulation)
nasal/oral, stop, fricative, liquid, tap/flap etc.

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

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







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
[l] [r]

Tap/Flap
[ɾ] (Like in "water" and "butter")

Fricatives & Affricates

Palatal sounds [ʃ] [ʒ] [tʃ] [dʒ]

Palatal Fricatives – [ʃ] [ʒ]

[note: according to IPA chart these are strictly 'post-alveolar']

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

Ex: affricate in fast speech: "What should...?",

"What did you do? = Whad ja do)

Said fast, this sounds like "Whachould...?" or "Whajado?"

[tʃ]

[dʒ]

What are the vocal folds doing?

**closed
voiced**



**open
voiceless**



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	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	ɰ w	

	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	□
nasal stop	m			n	?		
fricative	?		θ ð	s z	ʃ ʒ	?	
affricate					tʃ dʒ		
liquid				l	ɹ	?	
glide					j	ɰ w	

	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	<input type="checkbox"/>
nasal stop	m			n	?		
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ		ç ʝ
affricate					tʃ dʒ		
liquid				l	ʎ	ʟ	ʟ
glide				j		ʷ	w

“Fuji”
“Cuba”

	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	<input type="checkbox"/>
nasal stop	m			n	ɲ	ŋ	
fricative	ɸ β	f v		θ ð	ʃ ʒ		ç ʝ
affricate					tʃ dʒ		
liquid				l	ʎ	ʟ	ʟ
glide				j		ʷ	w

“año”

	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	<input type="checkbox"/>
nasal stop	m			n			
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	χ ʁ	h
affricate					tʃ dʒ		
liquid				l	ʎ	ʟ	ʟ
glide				j		ʷ	w

“Bach”
“agua”

	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	<input type="checkbox"/>
nasal stop	m			n	ɲ	ŋ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	χ ʁ	h
affricate					tʃ dʒ		
liquid				l	ʎ	ʟ	ʟ
glide				j		ʷ	w

“caballo”

	bi-labial	labio-dental	inter-dental	al-veolar	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	ç ʝ	h
affricate					tʃ dʒ		
liquid				l	ɭ		
glide					j	ɰ	w

IPA full(er) chart

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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	ʙ			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				ɹ			j	ɰ			
Lateral approximant				l				ɭ			

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)

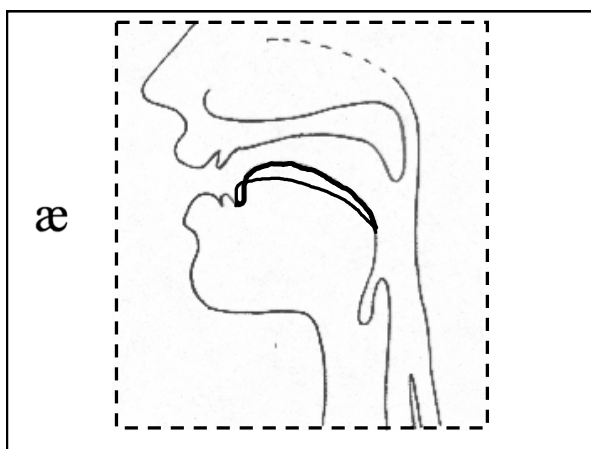
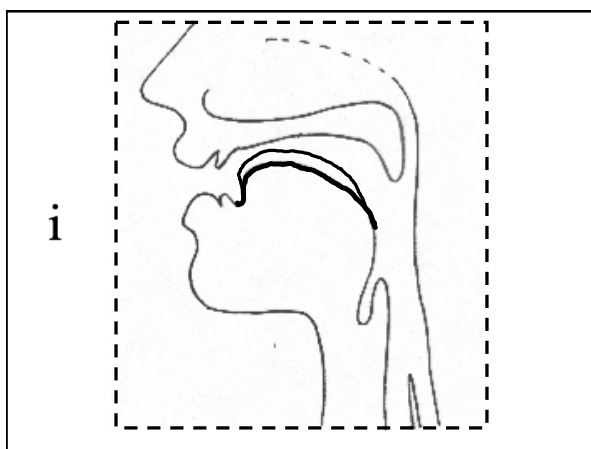
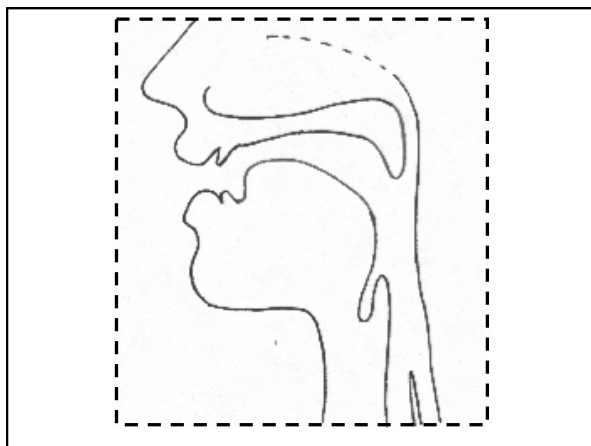
CONSONANTS (PULMONIC)

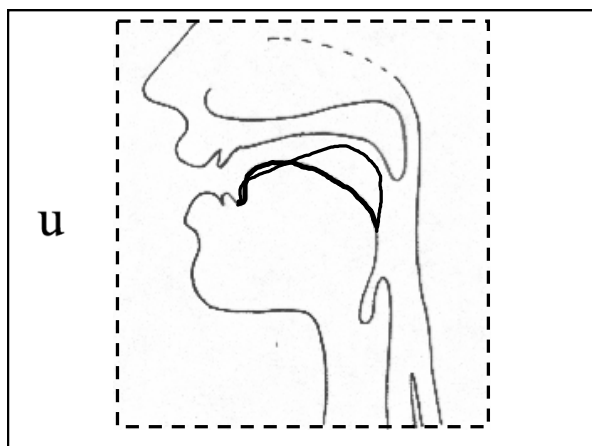
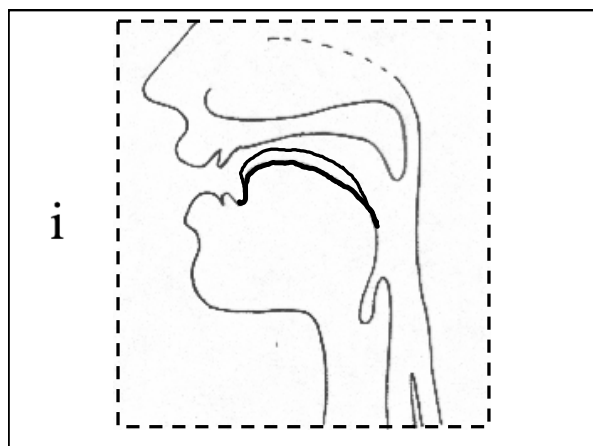
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d				k ɡ			ʔ
Nasal	m			n				ŋ			
Trill											
Tap or Flap				ɾ							
Fricative		f v	θ ð	s z	ʃ ʒ		tʃ dʒ				h
Lateral fricative											
Approximant				ɹ			j	ɰ			
Lateral approximant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

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?





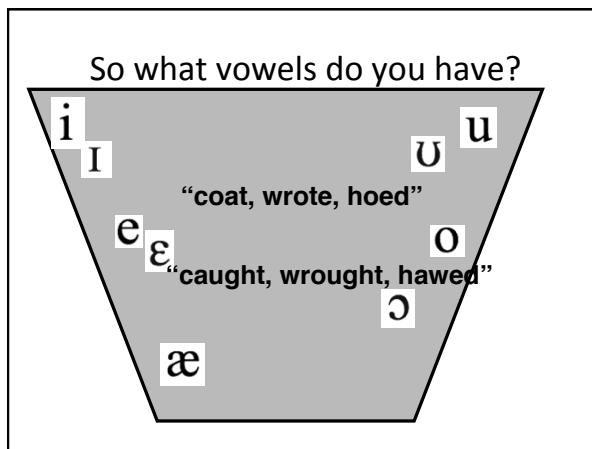
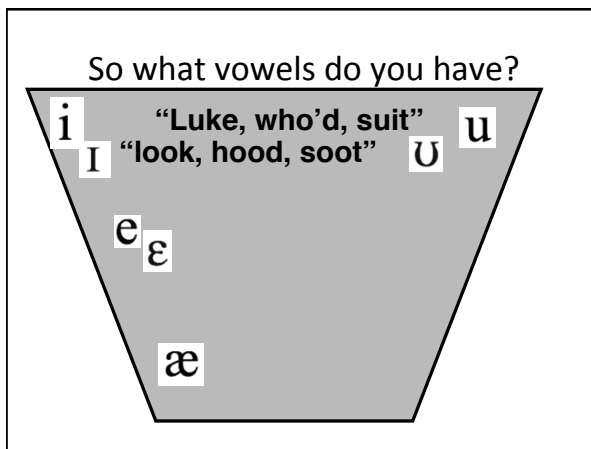
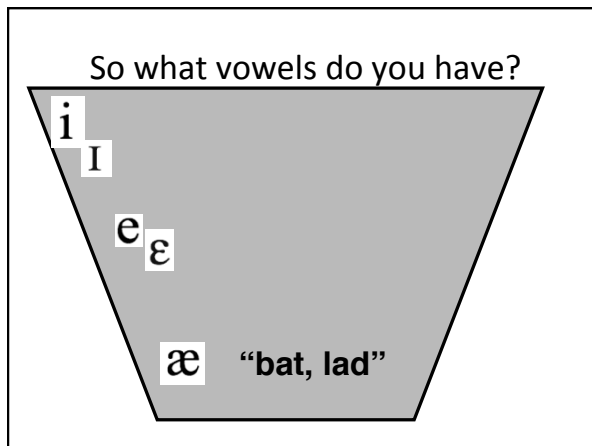
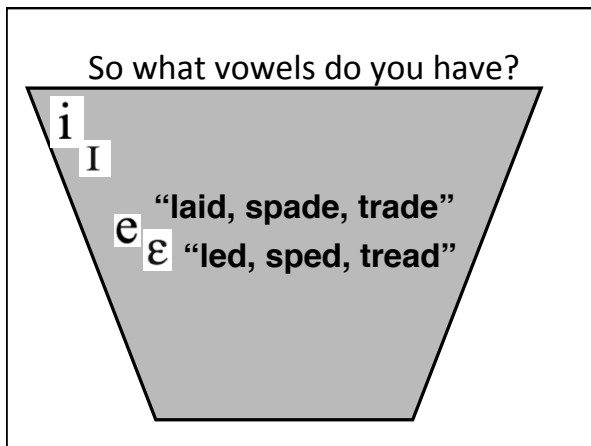
You can....

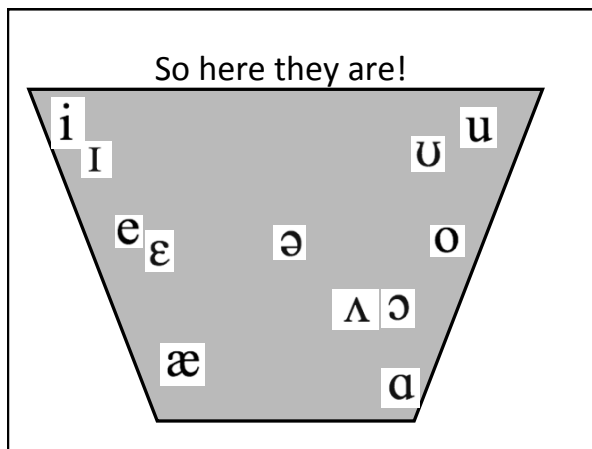
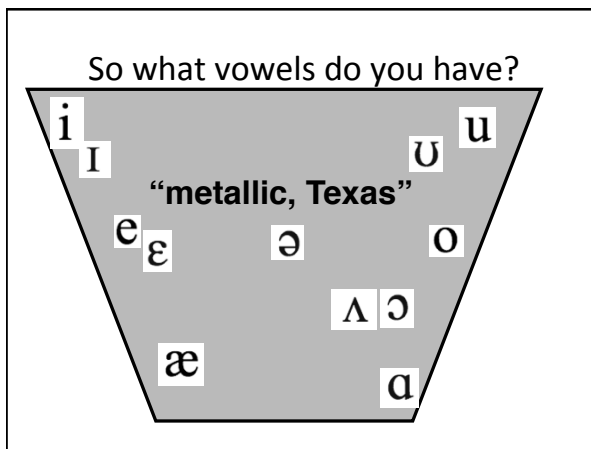
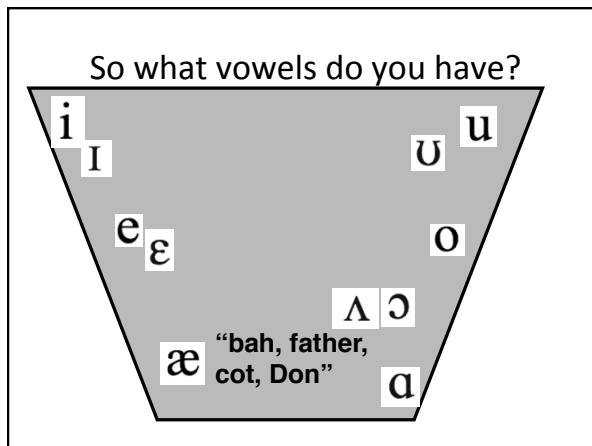
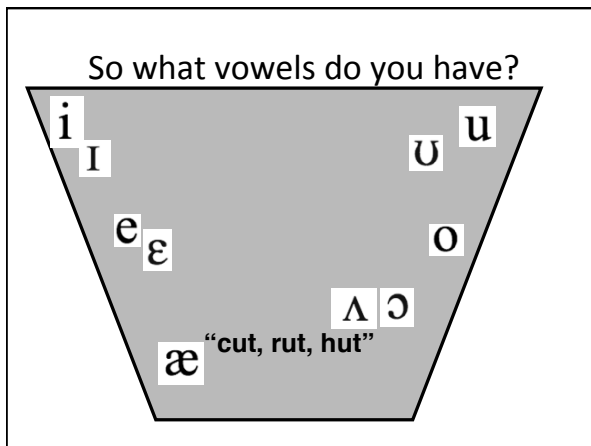
- (1) Raise or lower your tongue
- (2) Advance or retract your tongue
- (3) Round or spread your lips
- (4) Tense or not tense your mouth

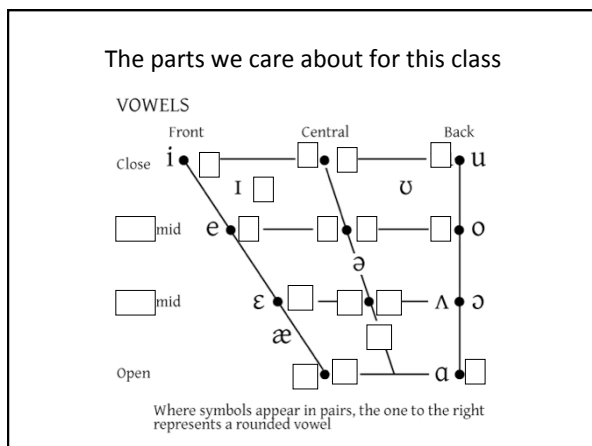
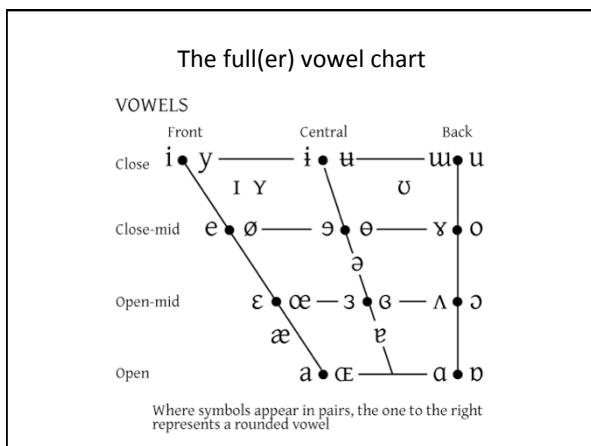
So what vowels do you have?

i "sheep, sleep"

I "ship, slip"







Cross-language Differences

Feature Combinations

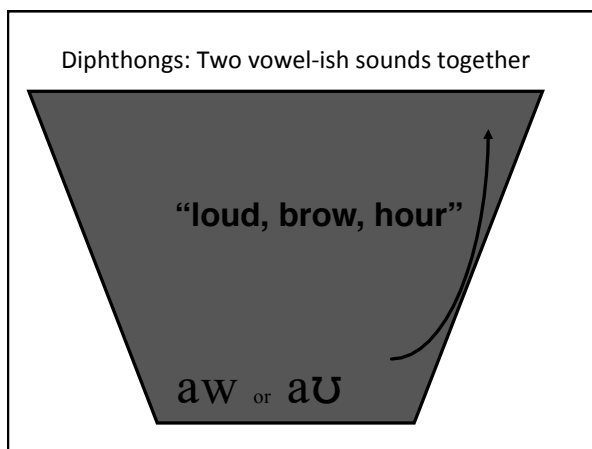
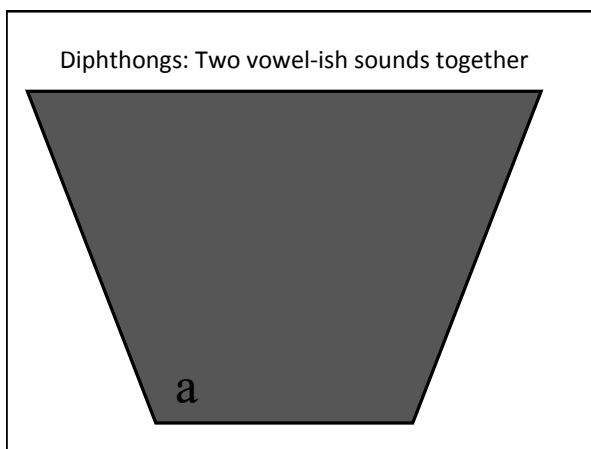
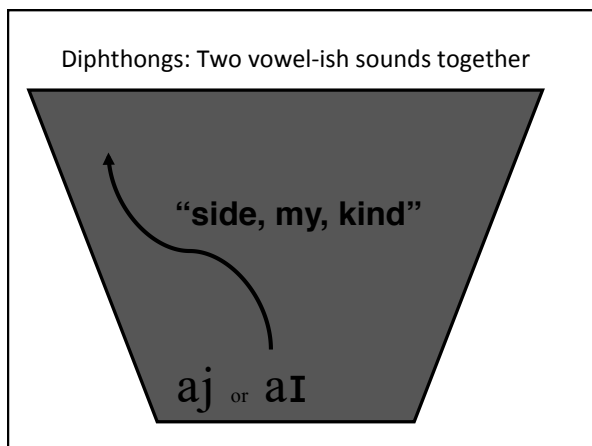
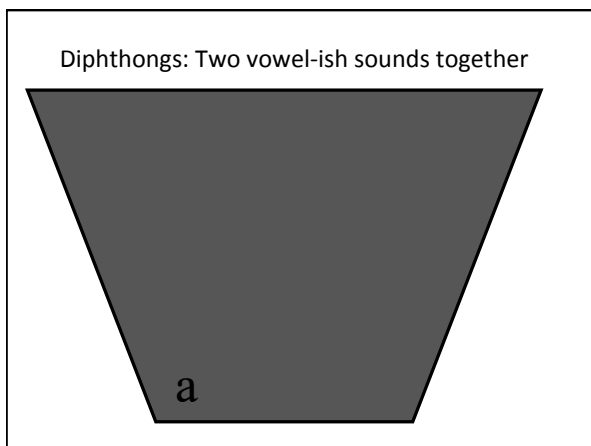
- English: back vowels are rounded, others are not
- German/French has high, front, rounded vowel [y]
- Russian has high back unrounded vowel [ɯ]

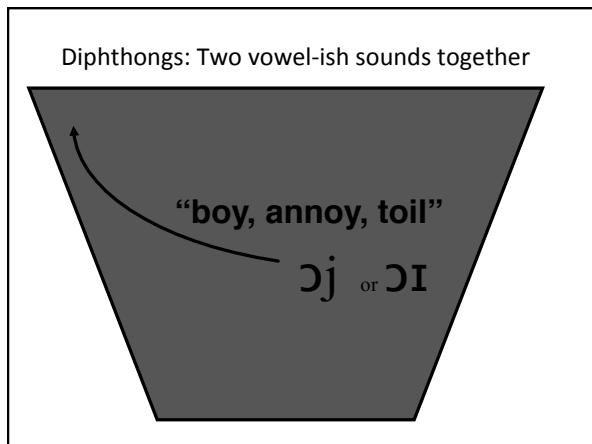
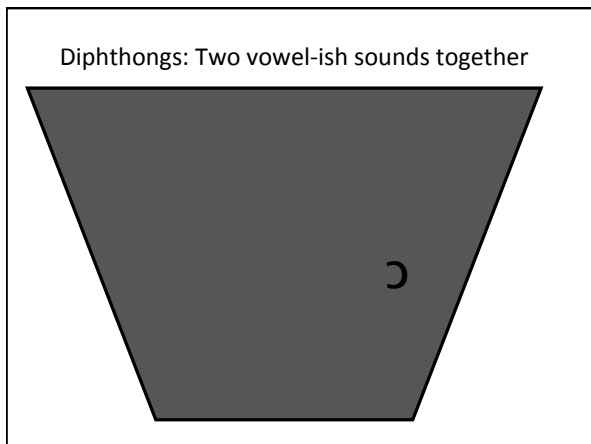
Many languages don't make the tense/lax distinction found in English (ex: Spanish [i], rather than [i] and [ɪ])

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).





More details of American English pronunciation

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

Monophthongs	Front	Central		Back
		plain	retracted	
Close	i			u
Near-close	ɪ			ɯ
Close-mid	e ^[ɪ]			ɤ ^[ɪ]
Mid		ə	ɚ	
Open-mid	ɛ		ɚ	ɛ + ɔ
Near Open	æ			ɑ

Depending on one's analysis, people who merge the vowels of cot and caught to /ɔ/ either have /ɔj/ and /ɔɪ/; but since all accents with cot and /ɔ/ merged to /ɔɪ/ have also merged in these cases, the [ɔ] before /j/ can be analyzed as an allophone of /ɔ/. [ɪ] and [ɛ] are other unstressed syllables. Since the occurrence of [ə] is mostly predictable, it need not be considered.

Among speakers who distinguish between /ɔ/ and /ɔɪ/, the vowel of cot (usually transcribed /ɔ/) is closer to [ɔ] than /ɔɪ/. Among cot-caught merged speakers, /ɔ/ usually remains a back vowel, [ɔ], so /ɔɪ/; their retracted allophones for /ɔ/ 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 ^[ɪ]	aʊ
Opener component is rounded	ɔɪ	oʊ ^[ɪ]

Speech Production - Summary

- Airflow set in vibration by vocal folds
- Airflow 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.