

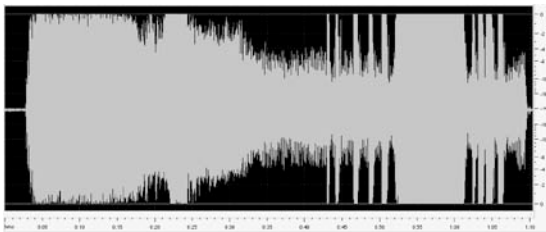
Psych 56L/ Ling 51:  
Acquisition of Language

Lecture 6  
Phonological Development I

Announcements

Homework 1 due Monday 10/20/08 in class

Sounds of Language



Forget Spelling!

Sounds  $\neq$  Spelling

One Sound - Many Characters

h <u>e</u>	e	se <u>as</u>	ea
beli <u>ev</u> e	ie	amo <u>eb</u> a	oe
Ca <u>es</u> ar	ae	ke <u>y</u>	ey
se <u>e</u>	ee	mach <u>in</u> e	i
pe <u>op</u> le	eo	se <u>iz</u> e	ei

International Phonetic Alphabet: [i]

One Sound - Many Characters

<u>to</u> o	oo	th <u>rew</u>	ew
<u>t</u> o	o	li <u>eu</u>	ieu
cl <u>ue</u>	ue	sh <u>oe</u>	oe
throu <u>gh</u>	ough		

IPA: [u]

One Character - Many Sounds

d <u>a</u> me	e
d <u>a</u> d	æ
f <u>a</u> ther	a
ca <u>l</u> l	ɔ
vi <u>ll</u> age	l, ə
ma <u>n</u> y	ɛ

One Sound - Multiple Letters

<u>sh</u> oot	ʃ
ei <u>th</u> er	ð
<u>ch</u> aracter	k
de <u>a</u> l	i
<u>Th</u> omas	t
<u>ph</u> ysics	f
rou <u>gh</u>	f

### One Letter - 0, 1, 2 Sounds

mnemonic		
psychology		
resign	= no sound!	
ghost		
island		
whole		
debt		
cute		[kjwʌt]
	= 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

THE INTERNATIONAL PHONETIC ALPHABET (revised in 1993)

Phonetic	Symbol	Symbol	Symbol	Symbol	Symbol	Symbol	Symbol	Symbol	Symbol
Stop	p	b	t	d	ʈ	ɖ	k	g	ŋ
Sound	ph	bi	ti	di	chi	ji	ki	gi	ng
Stop	m	n							
Sound	mi	ni							
Stop	f	v	s	z	ʃ	ʒ	x	χ	ħ
Sound	fi	vi	si	zi	ʃi	ʒi	xi	chi	hi
Stop			l						
Sound			li						
Stop	r								
Sound	ri								
Stop			h						
Sound			hi						
Stop				ɰ					
Sound				hi					

OTHER SYMBOLS

◌̄ = stressed vowel ◌̌ = unstressed vowel

◌̂ = nasalized vowel ◌̥ = voiceless ◌̜ = voiced

◌̩ = syllabic consonant ◌̨ = short vowel

◌̠ = long vowel ◌̡ = short vowel

◌̣ = short vowel ◌̤ = short vowel

◌̥ = voiceless ◌̦ = voiceless

◌̧ = voiceless ◌̨ = short vowel

◌̩ = syllabic consonant ◌̪ = short vowel

◌̫ = short vowel ◌̬ = short vowel

◌̭ = short vowel ◌̮ = short vowel

◌̯ = short vowel ◌̰ = short vowel

◌̱ = short vowel ◌̲ = short vowel

◌̳ = short vowel ◌̴ = short vowel

◌̵ = short vowel ◌̶ = short vowel

◌̷ = short vowel ◌̸ = short vowel

◌̹ = short vowel ◌̺ = short vowel

◌̻ = short vowel ◌̼ = short vowel

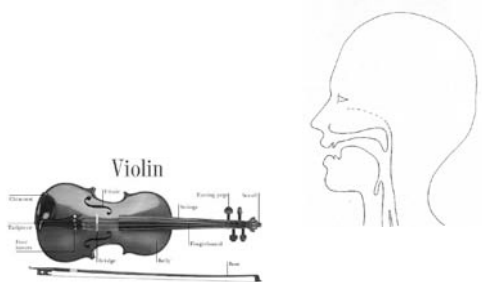
◌̽ = short vowel ◌̾ = short vowel

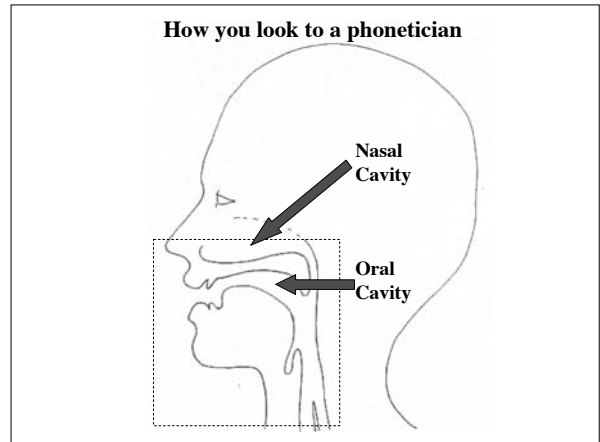
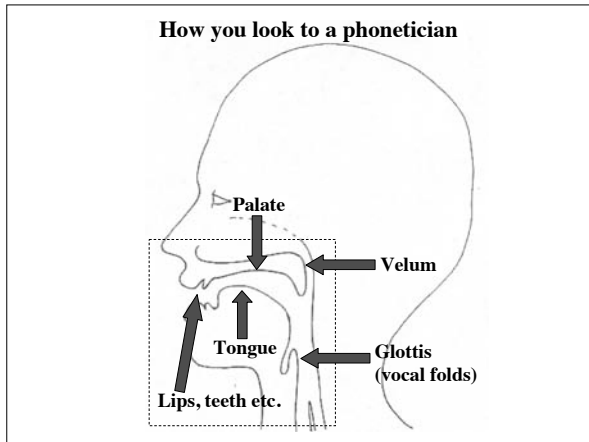
◌̿ = short vowel ◌̀ = short vowel

◌̿ = short vowel ◌̀ = short vowel

◌̿ = short vowel ◌̀ = short vowel

### Sounds: Speech Production





**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).

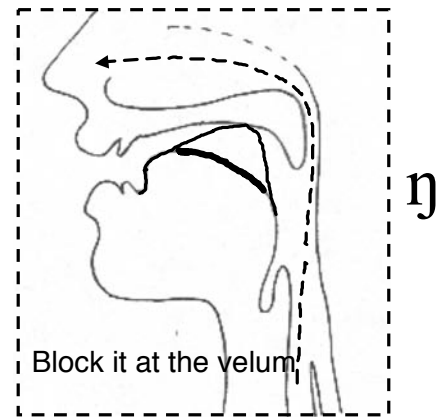
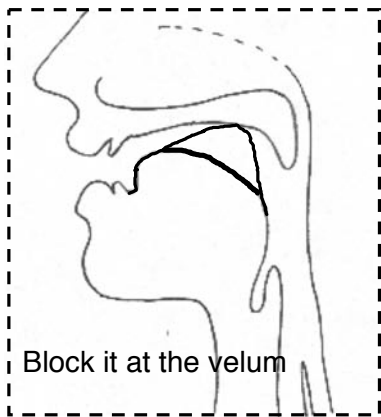
**Describing Speech Sounds**

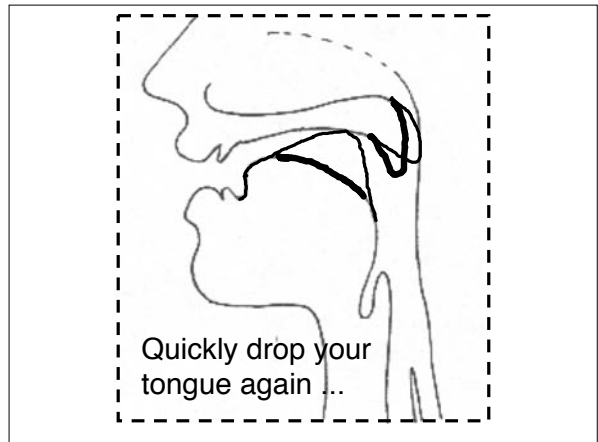
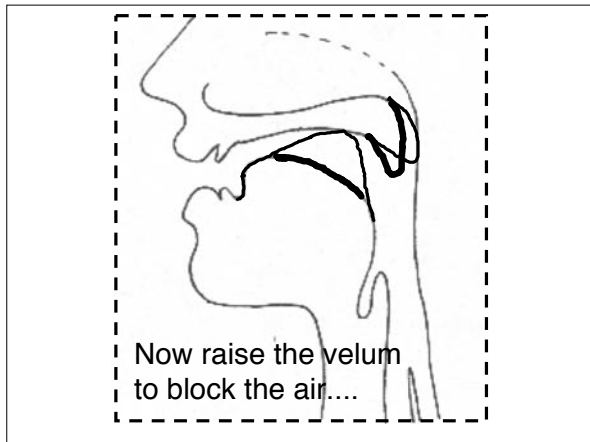
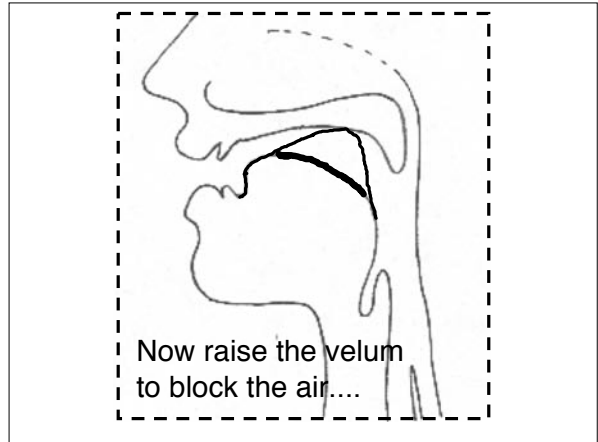
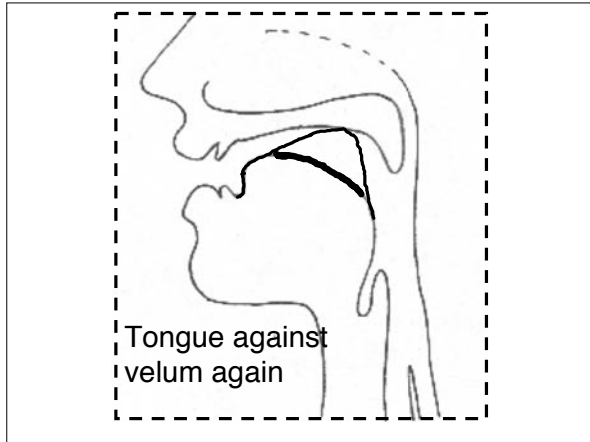
Where/how is the air flowing?  
*nasal/oral, stop, fricative, liquid etc.*

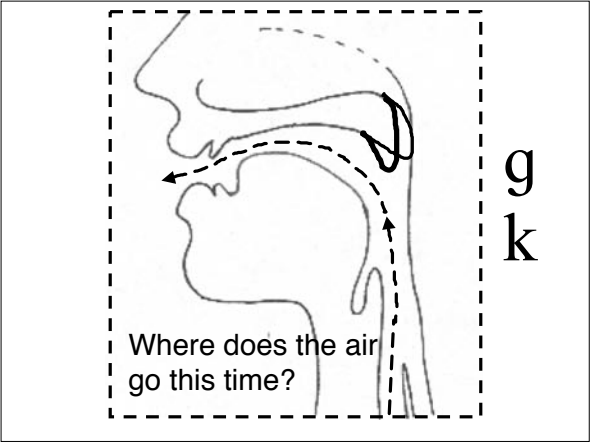
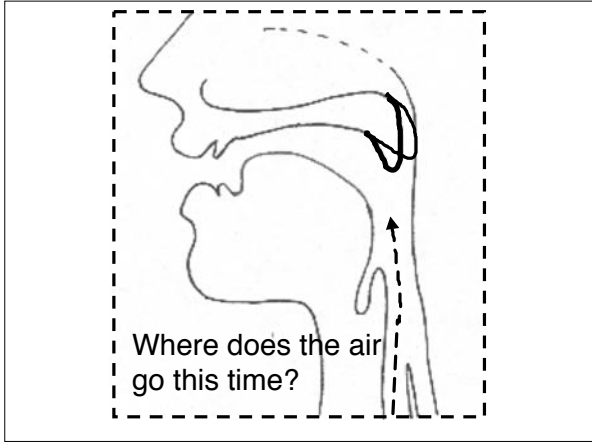
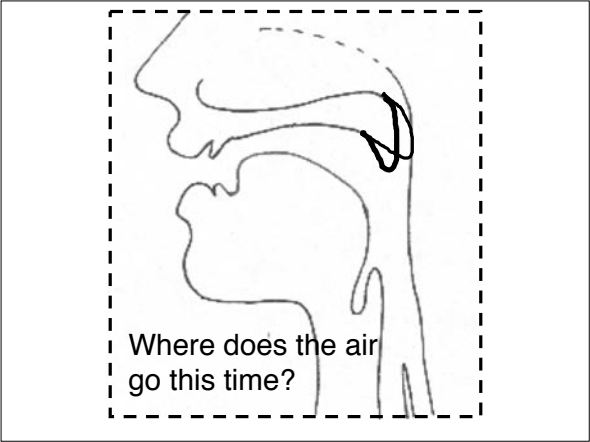
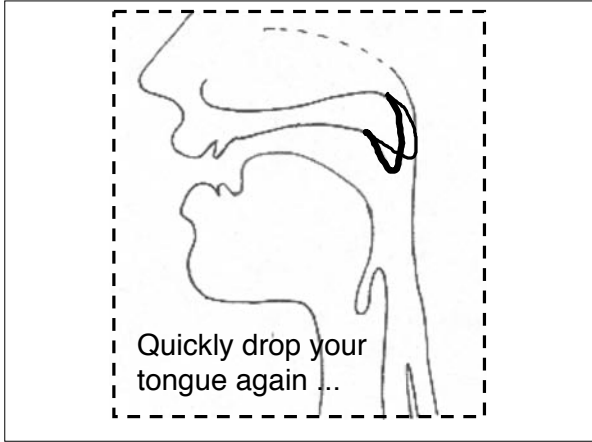
Where is the air-flow blocked?  
*labial, alveolar, palatal, velar etc.*

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

Where does the air flow?







So far we have:

Nasal stop:

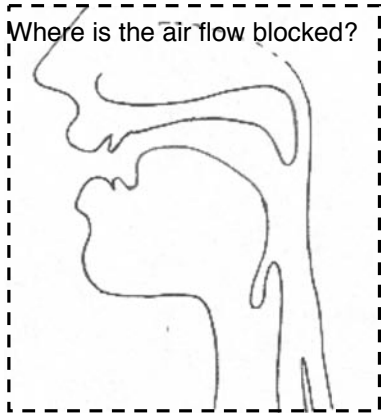
[ŋ]

Non-nasal (oral) stops:

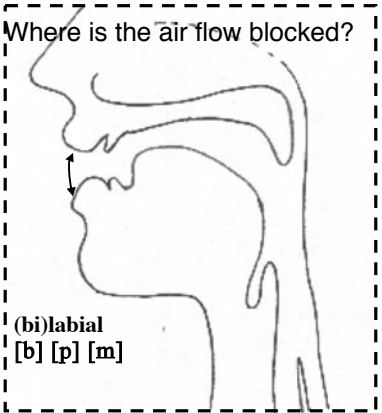
[g] [k]

Where is the air flow blocked?

Where is the air flow blocked?

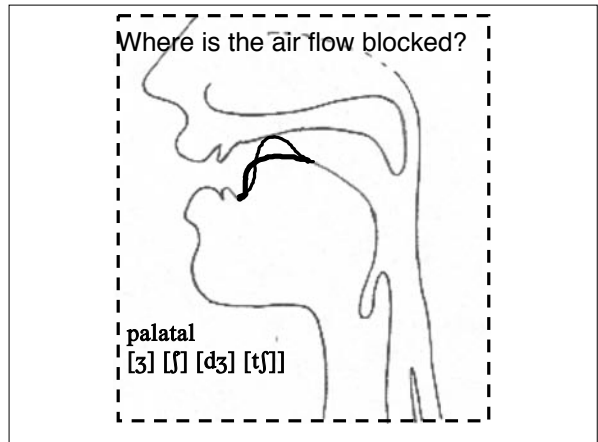
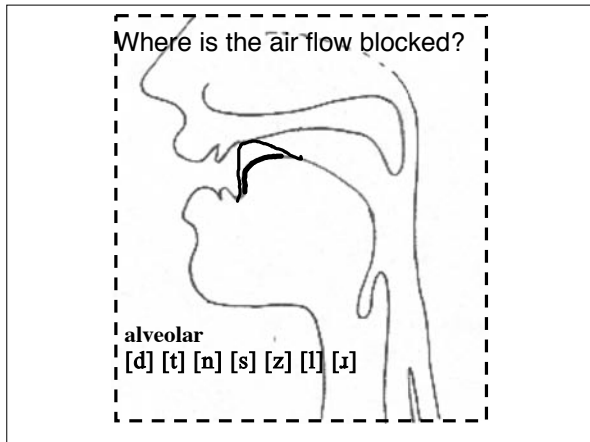
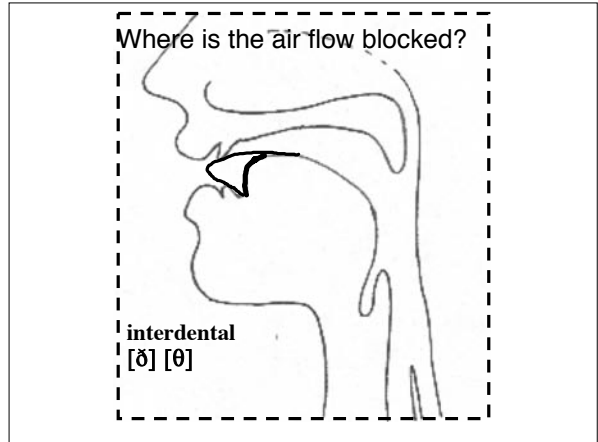
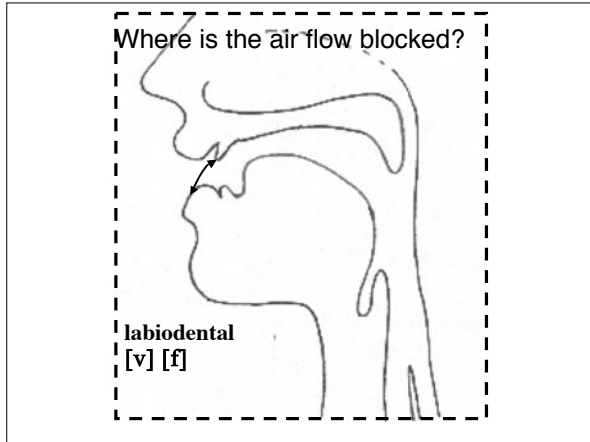


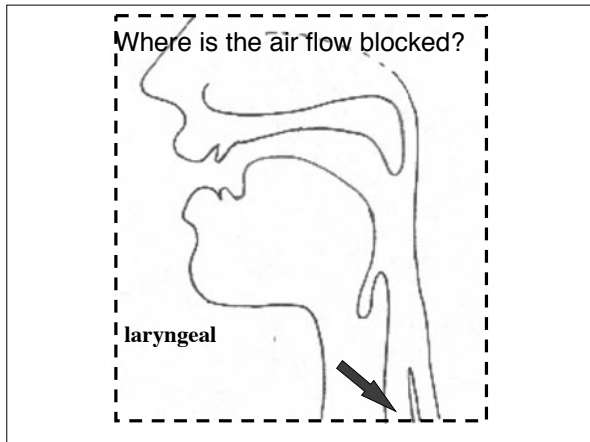
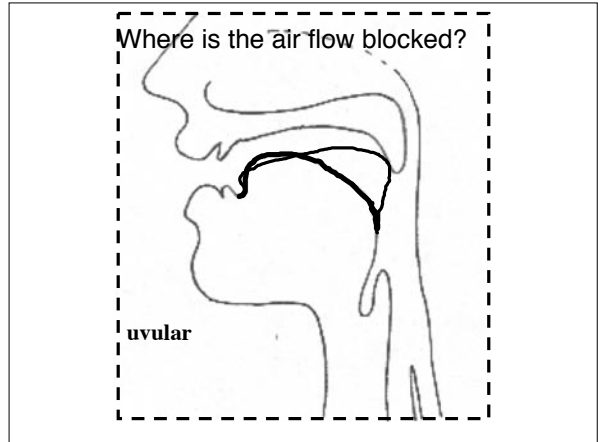
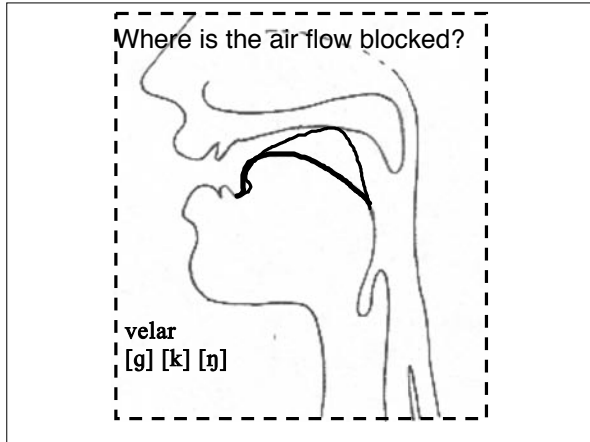
Where is the air flow blocked?



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







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]

**Liquids**  
[l] [ɹ]

## Fricatives & Affricates

Palatal sounds [ç] [ʃ] [dʒ] [tʃ]

Palatal Fricatives - [ç] [ʃ]

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

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

What are the vocal folds doing?

## Voiced & Voiceless Consonants

Consonants either voiced or voiceless.

English pairs:

<b>b p</b>	<b>v f</b>	<b>d t</b>	
<b>z s</b>	<b>ð θ</b>	<b>ʃ ʒ</b>	<b>tʃ dʒ</b>

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

	bilabial	labiodental	labial-velar	alveolar	palatal	velar	glottal
voiceless	■			■		■	■
voiced	■			■		■	
nasal		■	■	■	■		■
nasal		■	■	■	■		
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	

	bilabial	labiodental	labial-velar	alveolar	palatal	velar	glottal
voiceless	■			■		■	■
voiced	■			■		■	
nasal		■	■	■	■		■
nasal		■	■	■	■		
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	
nasal				■	■	■	

“Fuji”  
“Cuba”

	ll-llllll	lllll-llllll	llllll-llllll	ll-llllll	llllllll	llllll	llllll
llllll llly	■			■		■	■
llllll llly	■			■	■	■	
llllllllll	■	■					■
llllllllll					■	■	
llllllll				■	■	■	
llllllll				■		■	

“año”

?

?

	ll-llllll	lllll-llllll	llllll-llllll	ll-llllll	llllllll	llllll	llllll
llllll llly	■						■
llllll llly	■						
llllllllll	■	■	■	■	■	■	■
llllllllll					■	■	
llllllll				■	■	■	
llllllll				■		■	

“Bach”

“agua”

?

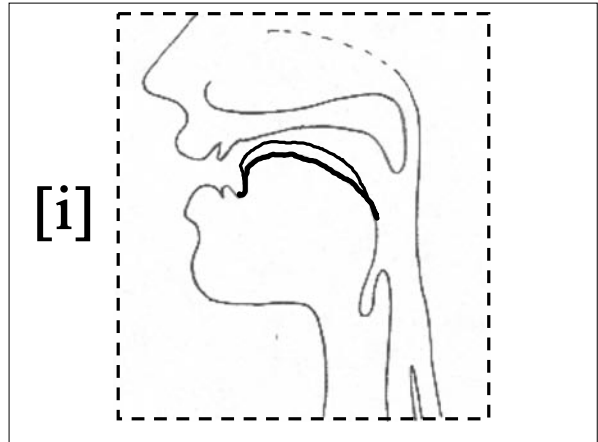
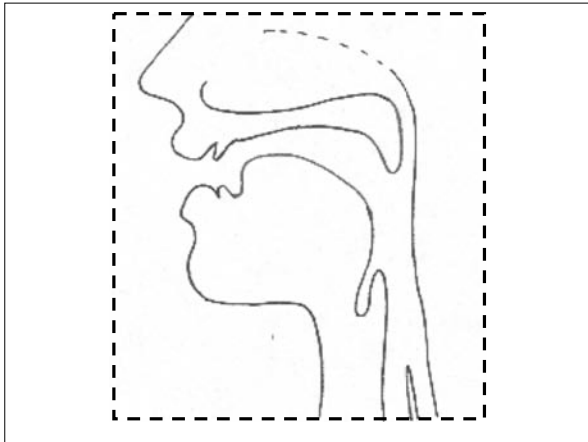
	ll-llllll	lllll-llllll	llllll-llllll	ll-llllll	llllllll	llllll	llllll
llllll llly	■			■		■	■
llllll llly	■			■	■	■	
llllllllll	■	■	■	■	■	■	■
llllllllll					■	■	
llllllll				■	■	■	
llllllll				■		■	

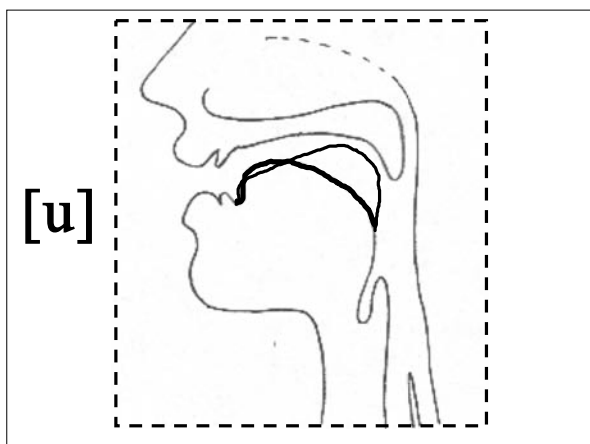
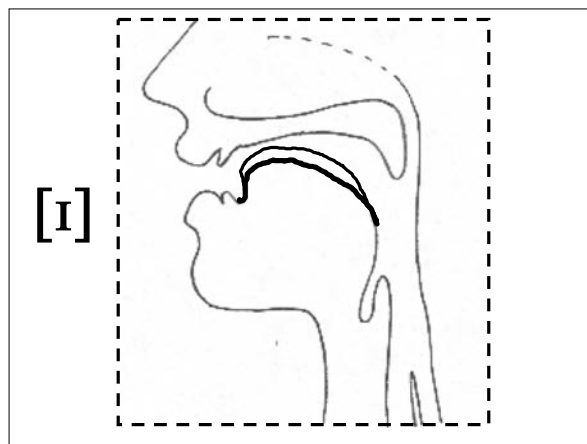
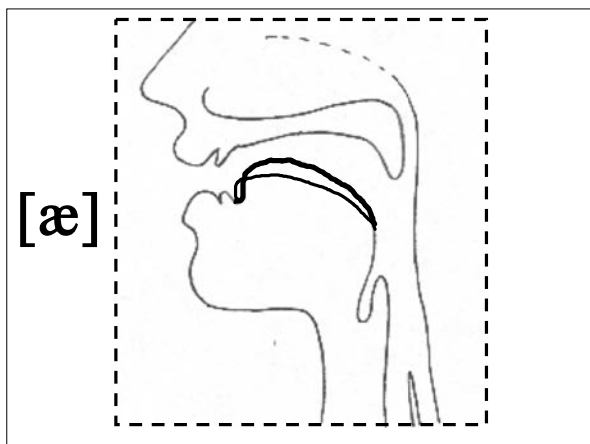
“caballo”

	ll-llllll	lllll-llllll	llllll-llllll	ll-llllll	llllllll	llllll	llllll
llllll llly	■			■		■	■
llllll llly	■			■	■	■	
llllllllll	■	■	■	■	■	■	■
llllllllll					■	■	
llllllll				■	■	■	
llllllll				■		■	

# 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"

So what vowels do you have?

**i**  
**I**  
**e** "laid, spade, trade"  
**ɛ** "led, sped, tread"

So what vowels do you have?

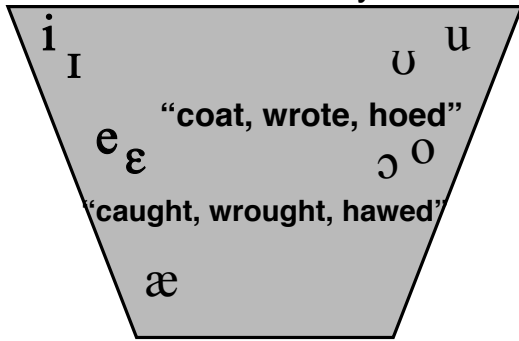
**i**  
**I**  
**e** **ɛ**  
**æ** "bat, lad"

So what vowels do you have?

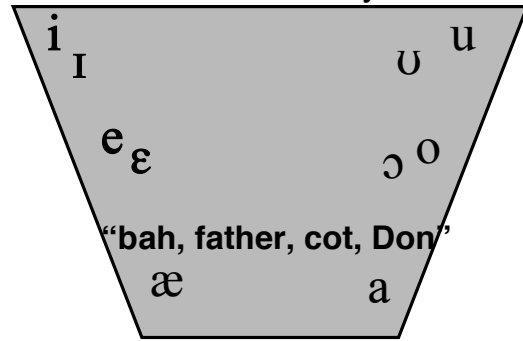
**i** "Luke, who'd, suit" **u**  
**I** "look, hood, soot" **ʊ**  
**e** **ɛ**  
**æ**



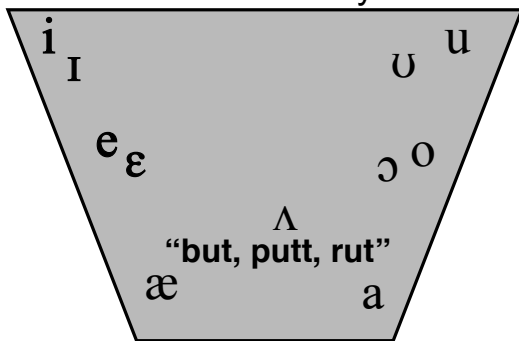
So what vowels do you have?



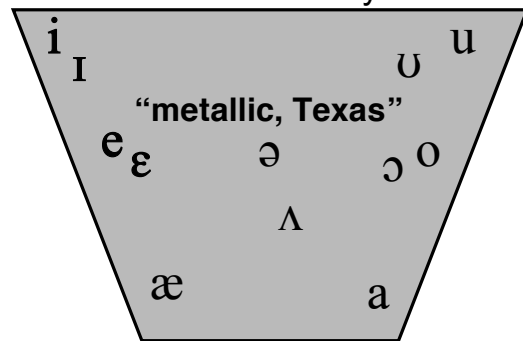
So what vowels do you have?

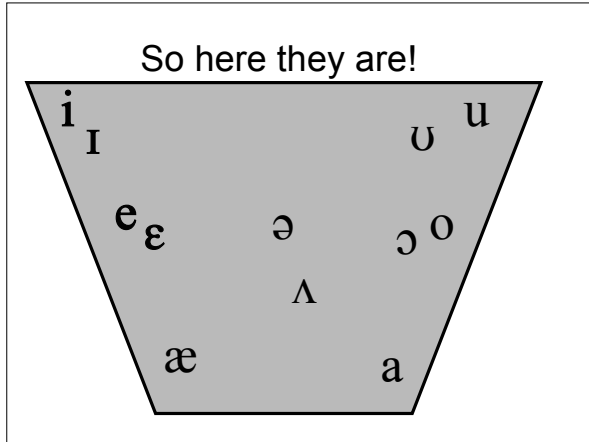


So what vowels do you have?



So what vowels do you have?





Some dialectal differences

caught/cot [Mid back lax vowel and mid back tense vowel]: many American speakers do not have both of these.

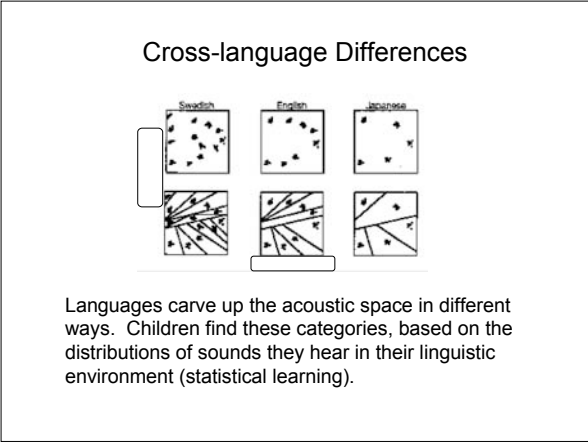
pot/father: some British and (fewer) American dialects have different vowels in these words ("pot" has a low back rounded vowel [ɒ]).

Cross-language Differences

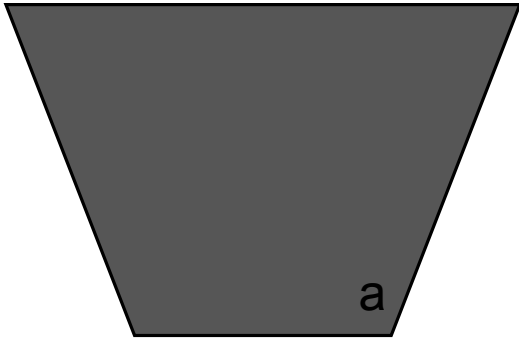
**Feature Combinations**

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

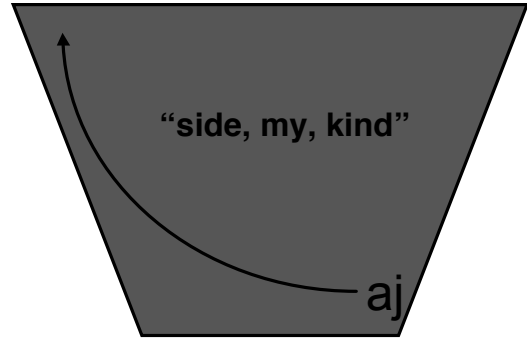
Many languages don't make the tense/lax distinction found in English (ex: Spanish [i])  
 Many languages distinguish short and long vowels (unlike English), ex: Japanese [i] vs. [i:]



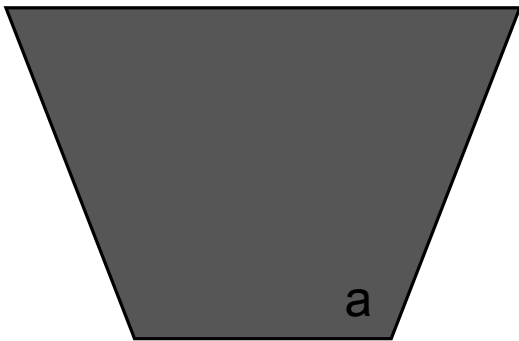
Diphthongs: Two vowel-ish sounds together



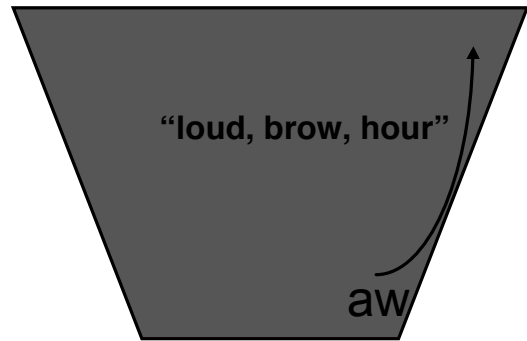
Diphthongs: Two vowel-ish sounds together



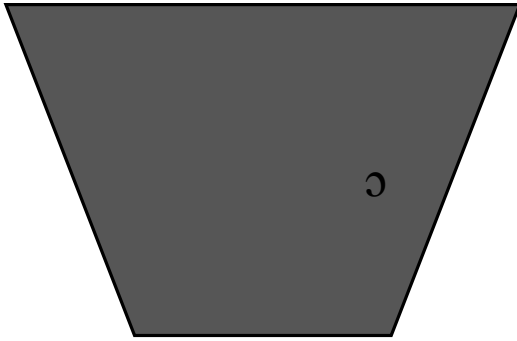
Diphthongs: Two vowel-ish sounds together



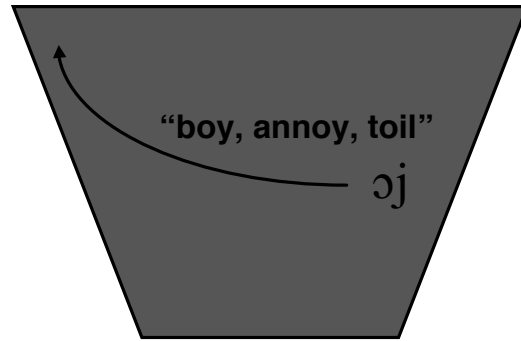
Diphthongs: Two vowel-ish sounds together



Diphthongs: Two vowel-ish sounds together



Diphthongs: Two vowel-ish sounds together



### Speech Production - Summary

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

Vowels: shaping of oral cavity

Consonants: narrowing or blocking of oral/nasal cavity

Different languages choose different selections of articulatory gestures

### 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?

