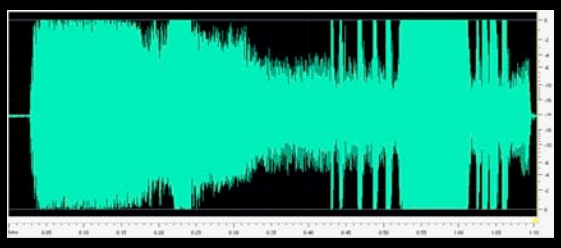
Psych 56L/ Ling 51: Acquisition of Language

Lecture 6
Phonological Development I

Announcements

Homework 1 due Monday 10/20/08 in class

Sounds of Language



Forget Spelling!

Sounds ≠ Spelling

One Sound - Many Characters

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 **P**honetic **A**lphabet: **[i]**

One Sound - Many Characters

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

IPA: **[u]**

One Character - Many Sounds

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

One Sound - Multiple Letters

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

One Letter - 0, 1, 2 Sounds

mnemonic
psychology
resi**g**n
g**h**ost = **no sound!**
i**s**land
whole
de**b**t

cute [**kj**uwt]

= 2 sounds!

Differences across Languages

English: j**u**dge, j**u**venile, J**e**sus [ʤ]

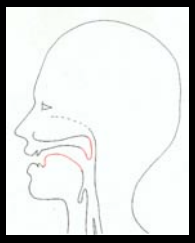
Spanish: j**u**gar, J**e**sus [h]

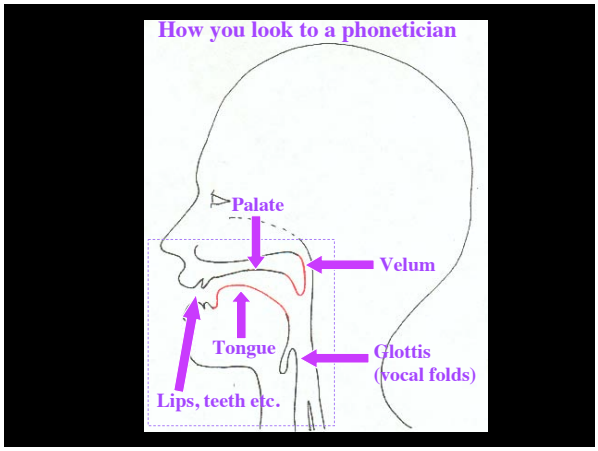
German: J**u**gend, j**u**beln, J**e**sus [j]

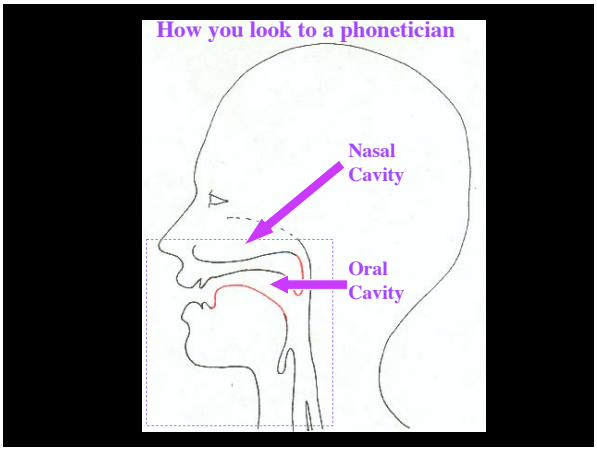
French: J**e**an, j'accuse, j**a**mbon [ʒ]

International Phonetic Alphabet

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).

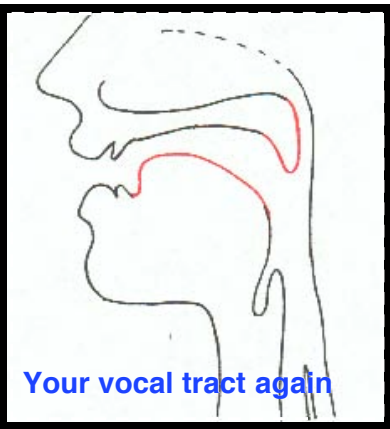
Describing Speech Sounds

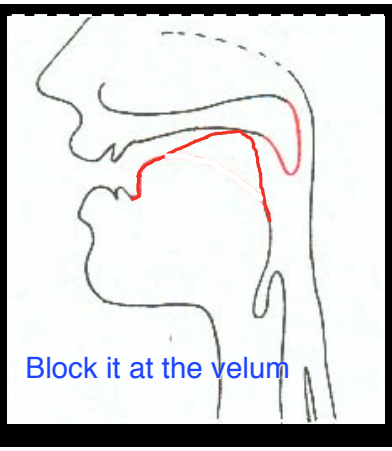
Where/how is the air flowing?
nasal/oral, *stop*, *fricative*, *liquid* etc.

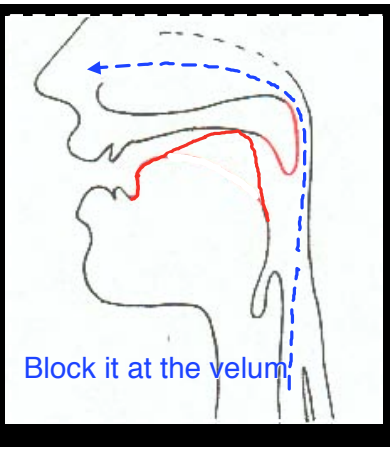
Where is the air-flow blocked?
labial, alveolar, palatal, velar etc.

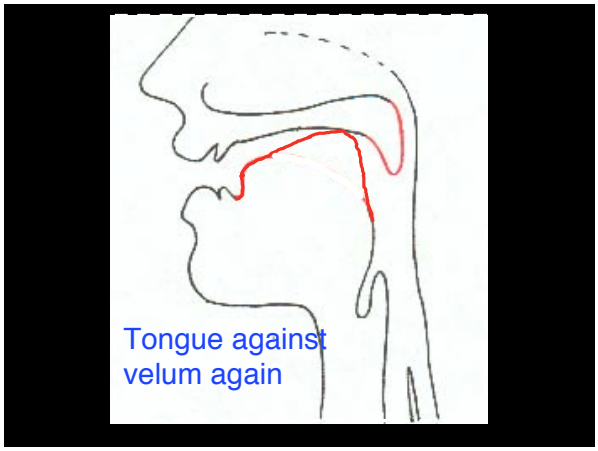
What are the vocal folds doing?
voiced vs. *voiceless*

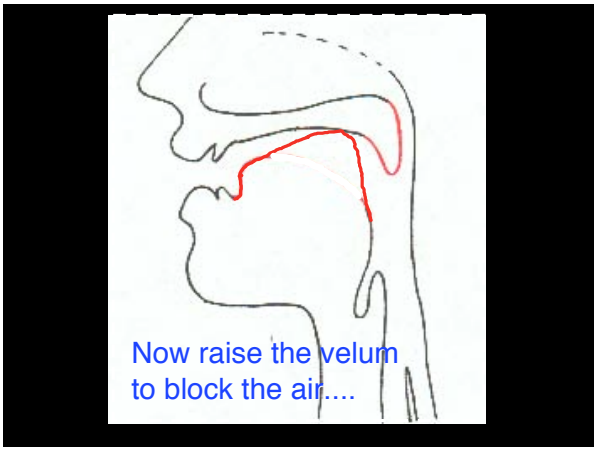
Where does the air flow?

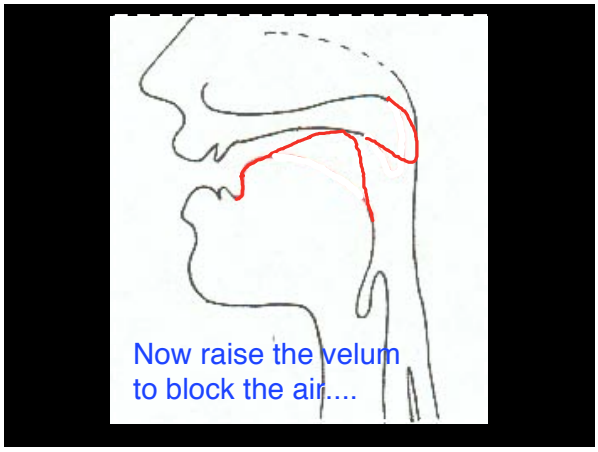


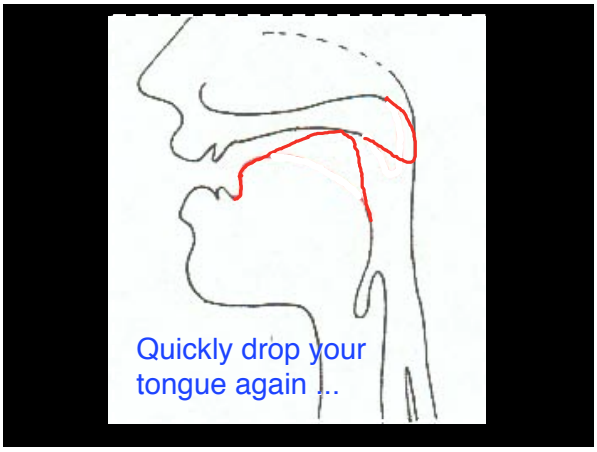


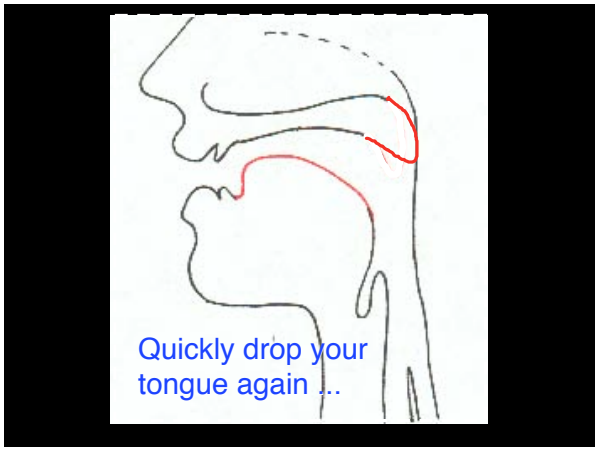


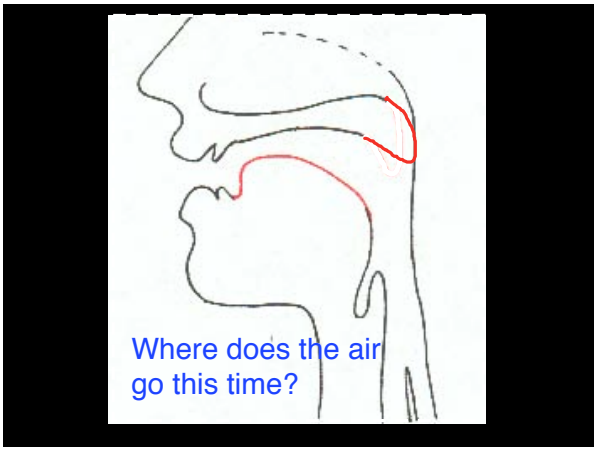

Tongue against
velum again

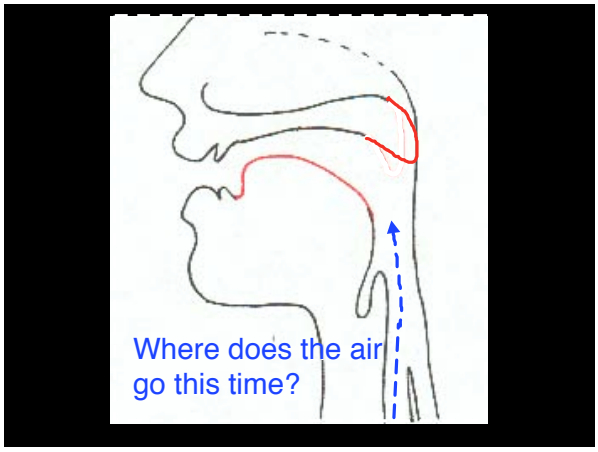

Now raise the velum
to block the air....

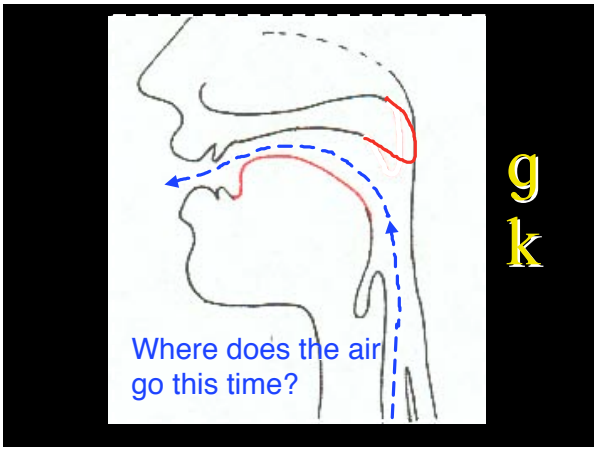

Now raise the velum
to block the air....


Quickly drop your
tongue again ...


Quickly drop your
tongue again ...


Where does the air
go this time?


Where does the air
go this time?


Where does the air
go this time?
g
k

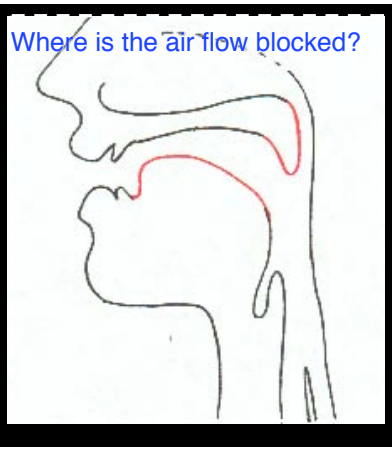
So far we have:

Nasal stop:
[ŋ]

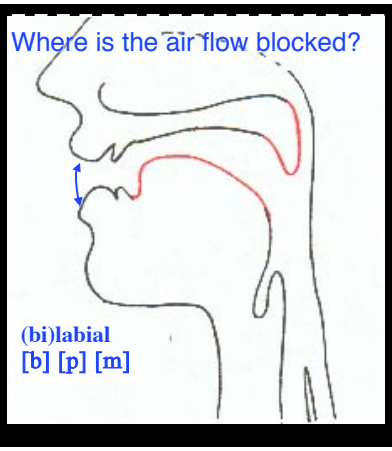
Non-nasal (oral) stops:
[g] [k]

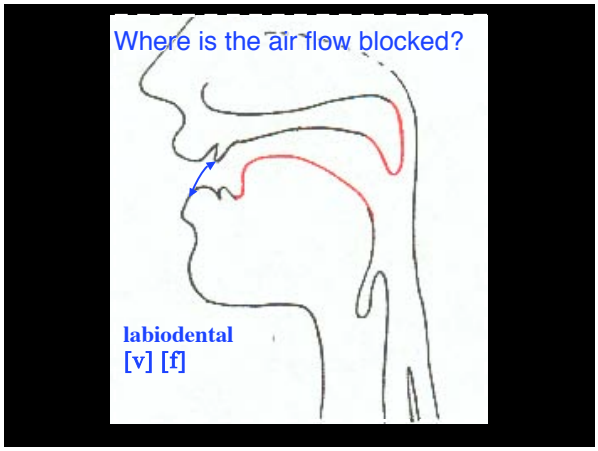
Where is the air flow blocked?

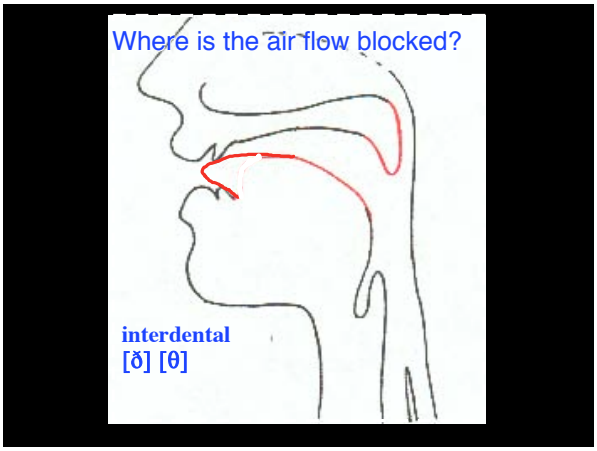
Where is the air flow blocked?

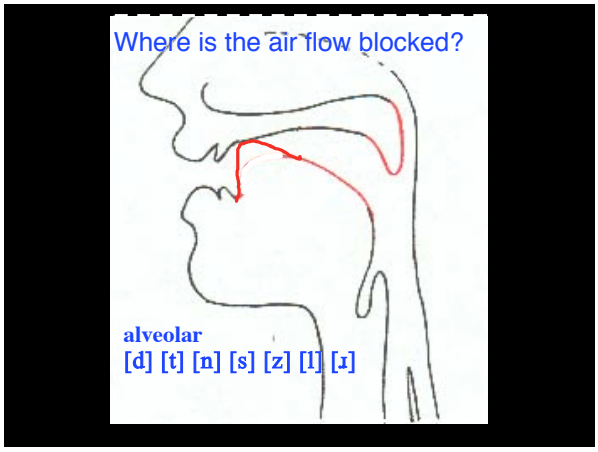


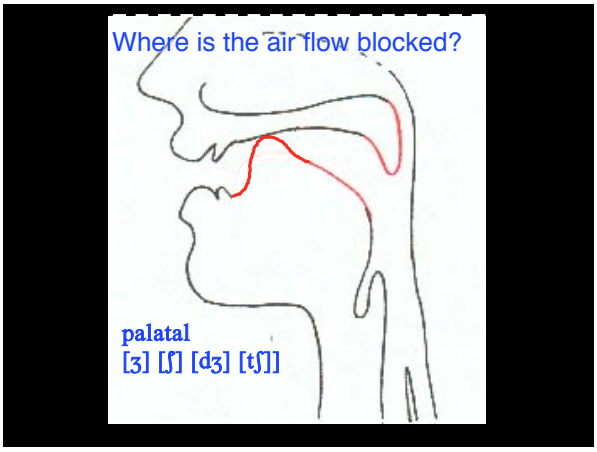
Where is the air flow blocked?

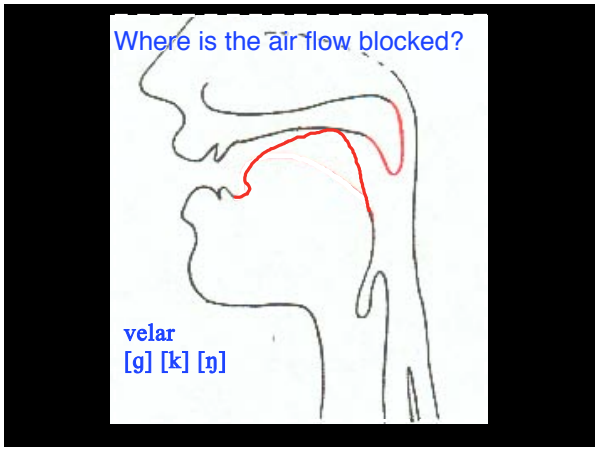


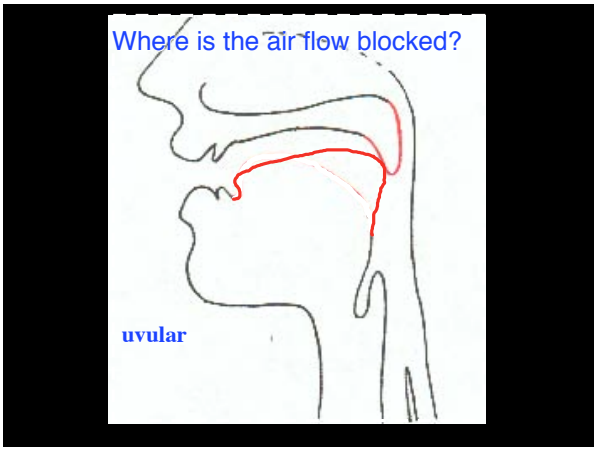

Where is the air flow blocked?
labiodental
[v] [f]

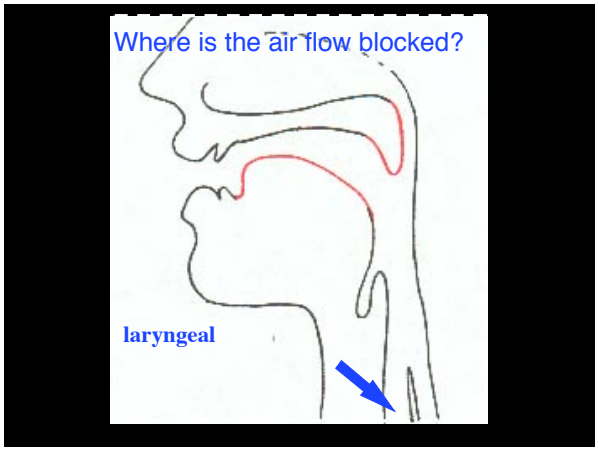

Where is the air flow blocked?
interdental
[ð] [θ]


Where is the air flow blocked?
alveolar
[d] [t] [n] [s] [z] [l] [ɹ]


Where is the air flow blocked?
palatal
[ʒ] [ʃ] [dʒ] [tʃ]]







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
[ɹ] [l]

Fricatives & Affricates

Palatal sounds [ʒ] [ʃ] [dʒ] [tʃ]

Palatal Fricatives - [ʒ] [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 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

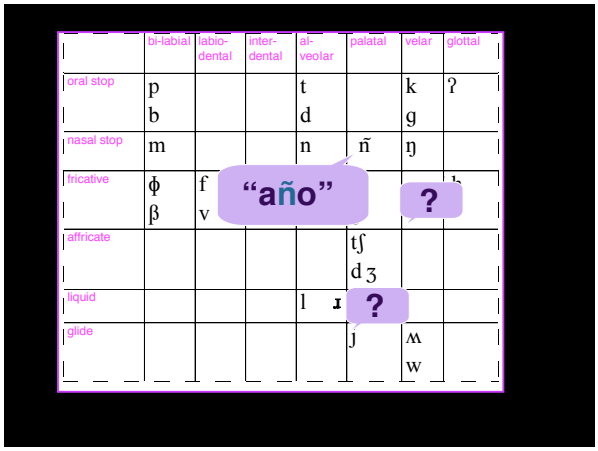
Goal: a set of universal features should make it possible to describe the speech sounds of all of the languages of the world

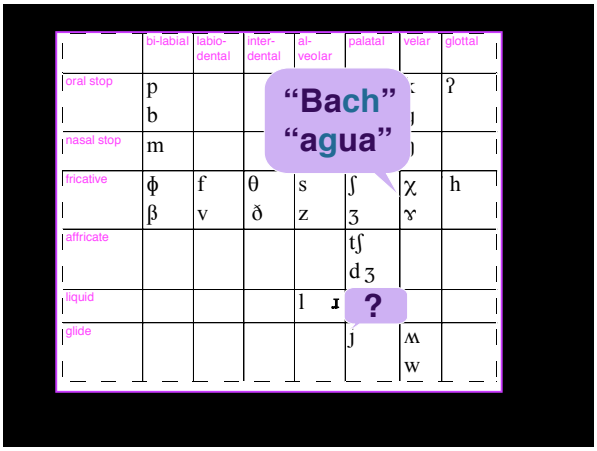
Different languages choose different feature combinations

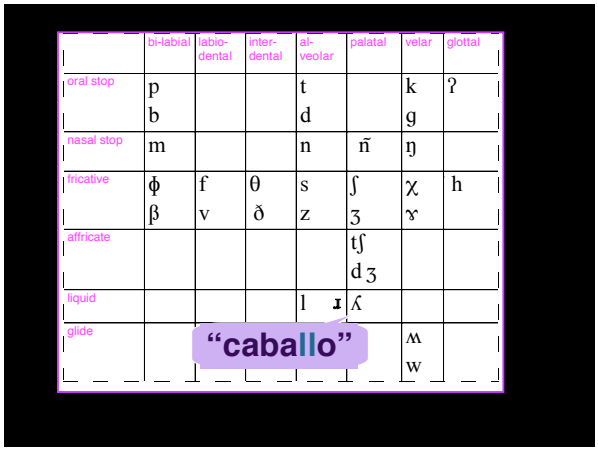
	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	ʔ
nasal stop	m			n		ŋ	
fricative		f v	θ ð	s z	ʃ ʒ		h
affricate					tʃ dʒ		
liquid				l ɹ			
glide					j	ʍ w	

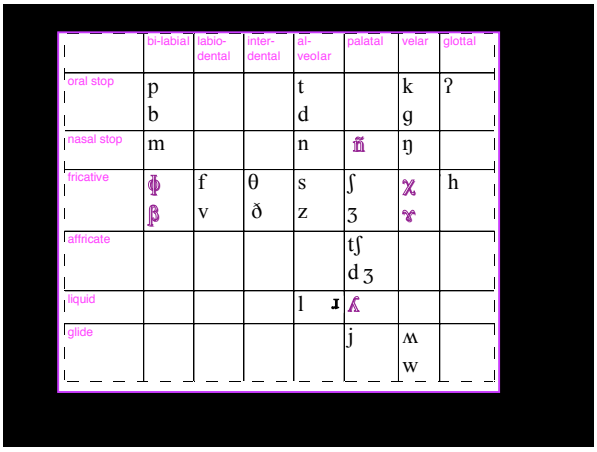
	bi-labial	labio-dental	inter-dental	al-veolar	palatal	velar	glottal
oral stop	p b			t d		k g	ʔ
nasal stop	m			n	?		
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	?	h
affricate					tʃ dʒ		
liquid				l ɹ	?		
glide					j	ʍ w	

"Fuji"
"Cuba"


bi-labial
labio-dental
inter-dental
al-veolar
palatal
velar
glottal
oral stop
p b
t d
k g
ʔ
nasal stop
m
n
ɲ
fricative
ɸ β
f v
ʃ ʒ
ɣ
h
affricate
tʃ dʒ
liquid
l ɹ
glide
j
ʍ w
“año”
?
?


bi-labial
labio-dental
inter-dental
al-veolar
palatal
velar
glottal
oral stop
p b
ʔ
nasal stop
m
fricative
ɸ β
f v
θ ð
s z
ʃ ʒ
χ ɣ
h
affricate
tʃ dʒ
liquid
l ɹ
?
glide
j
ʍ w
“Bach”
“agua”


bi-labial
labio-dental
inter-dental
al-veolar
palatal
velar
glottal
oral stop
p b
t d
k g
ʔ
nasal stop
m
n
ɲ
fricative
ɸ β
f v
θ ð
s z
ʃ ʒ
χ ɣ
h
affricate
tʃ dʒ
liquid
l ɹ
ʎ
glide
ʍ w
“caballo”


bi-labial
labio-dental
inter-dental
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glottal
oral stop
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nasal stop
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ɲ
fricative
ɸ β
f v
θ ð
s z
ʃ ʒ
χ ɣ
h
affricate
tʃ dʒ
liquid
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glide
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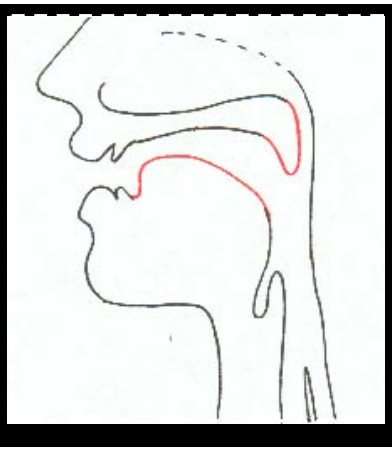
ʍ w

VOWELS

What can you do to alter the shape of your vocal tract?



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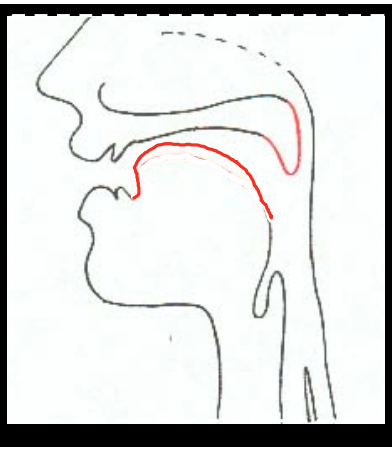
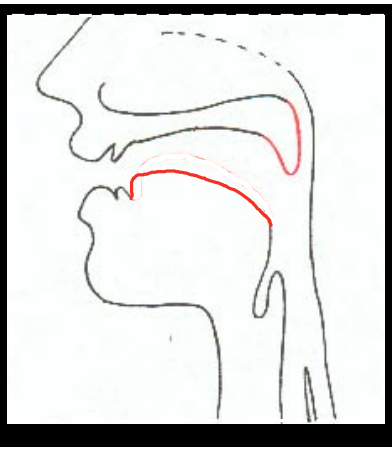
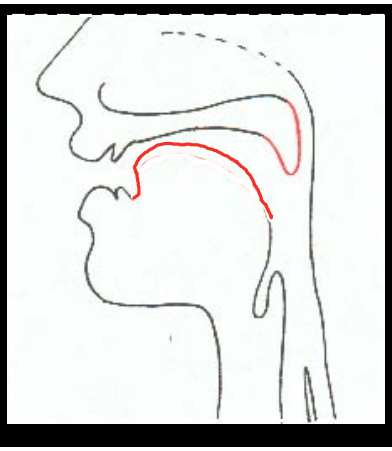


[æ]



[ɪ]



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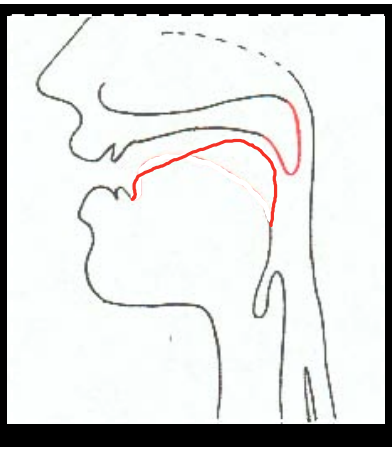
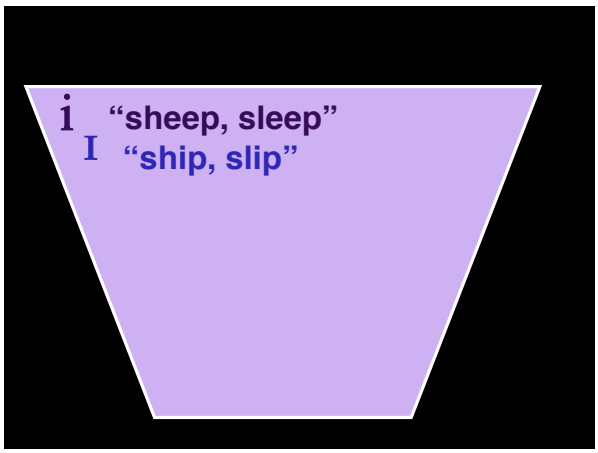
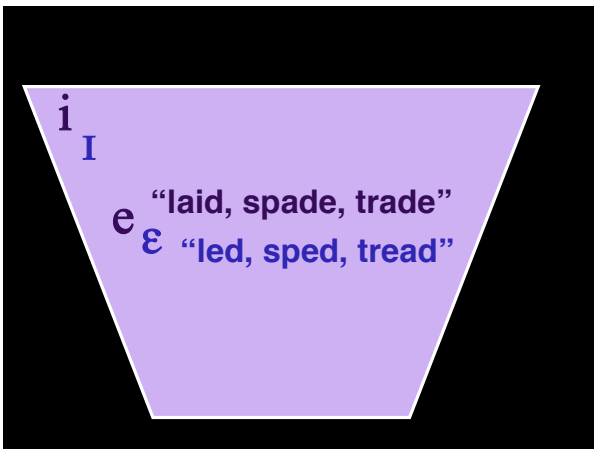
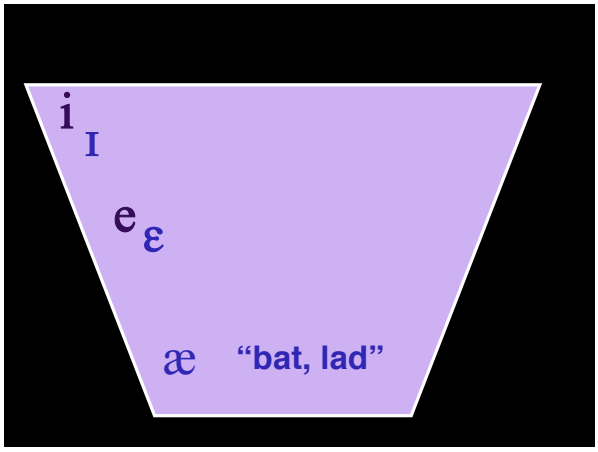


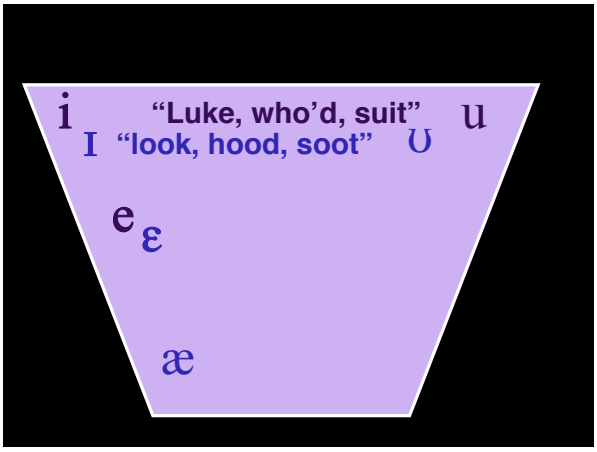
You can....

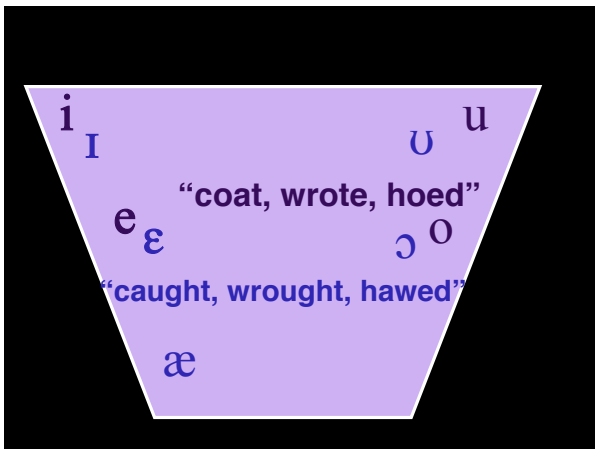
(1) Raise or lower your tongue
(2) Advance or retract your tongue
(3) Round or spread your lips
(4) Tense or not tense your mouth

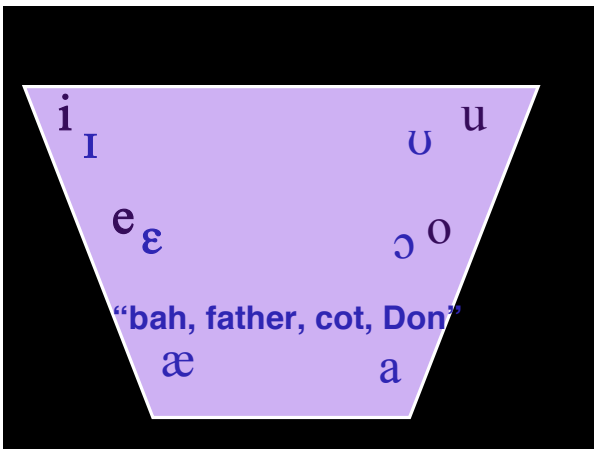

i "sheep, sleep"
I "ship, slip"


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


i
I
e
ɛ
æ "bat, lad"


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


i
ɪ
ʊ
u
"coat, wrote, hoed"
e
ɛ
ɔ
o
"caught, wrought, hawed"
æ


i
ɪ
ʊ
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e
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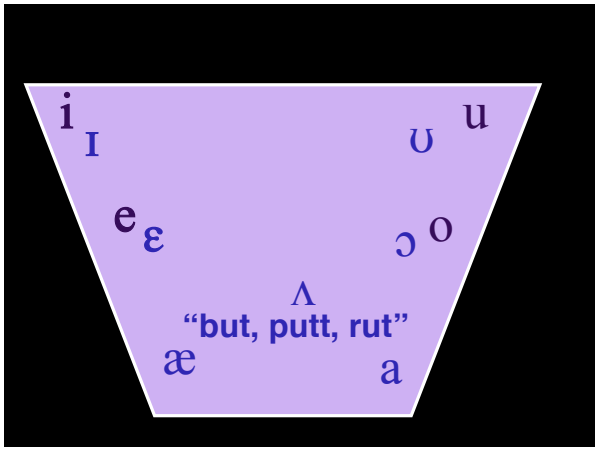
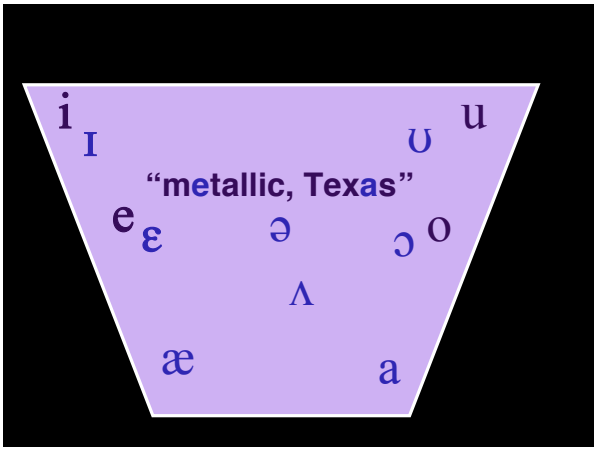
o
"bah, father, cot, Don"
æ
a


i
ɪ
ʊ
u
e
ɛ
ɔ
o
ʌ
"but, putt, rut"
æ
a


i
ɪ
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u
"metallic, Texas"
e
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ə
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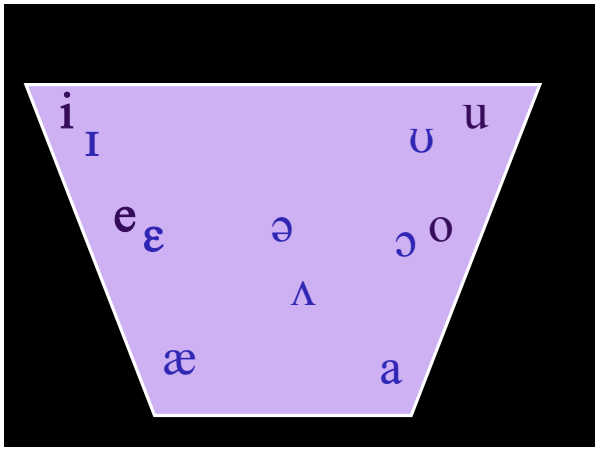
o
ʌ
æ
a



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]).

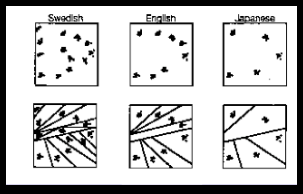
Cross-language Differences

Feature Combinations

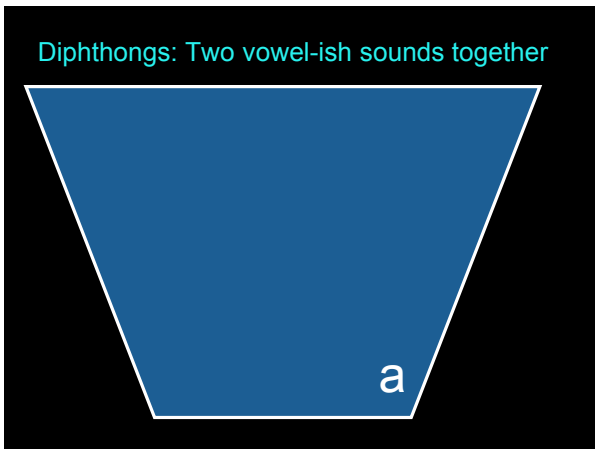
- English: back vowels are rounded, others are not
- German/French has high, front, rounded vowel [y]
- Russian has high back unrounded vowel [ɯ]

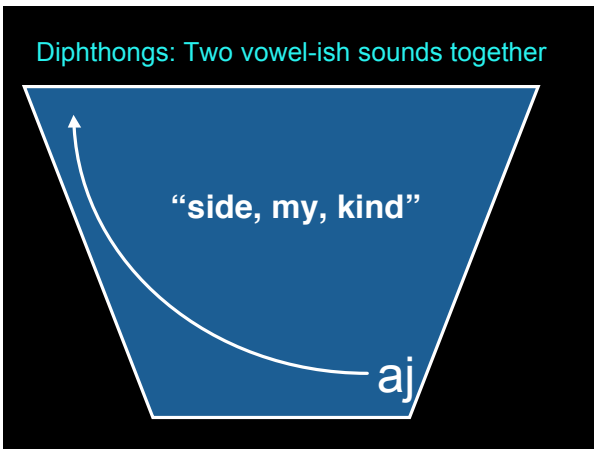
- Many languages don't make the tense/lax distinction found in English (ex: Spanish [i])
- Many languages distinguish short and long vowels (unlike English), ex: Japanese [i] vs. [i:]

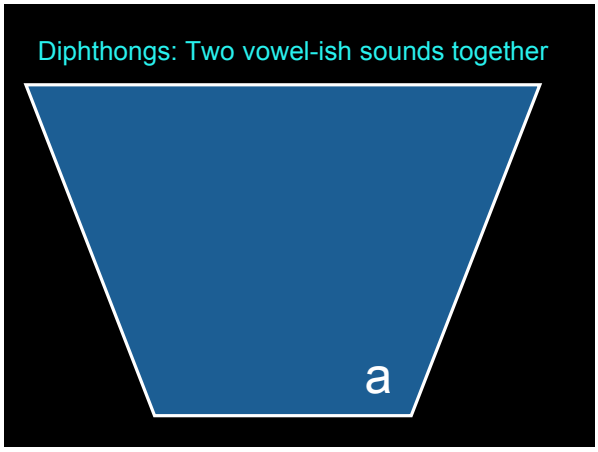
Cross-language Differences

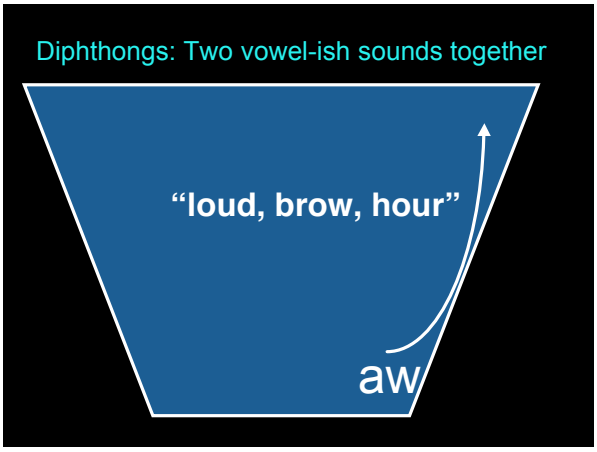


Languages carve up the acoustic space in different ways. Children find these categories, based on the distributions of sounds they hear in their linguistic environment (statistical learning).

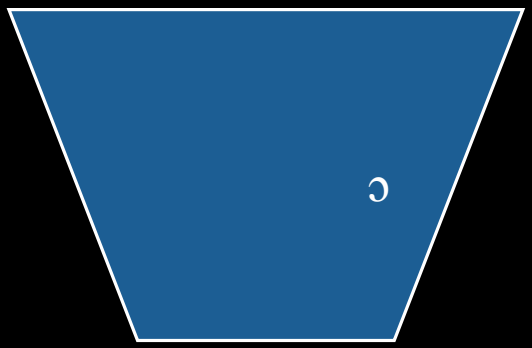

Diphthongs: Two vowel-ish sounds together
a


Diphthongs: Two vowel-ish sounds together
“side, my, kind”
aj

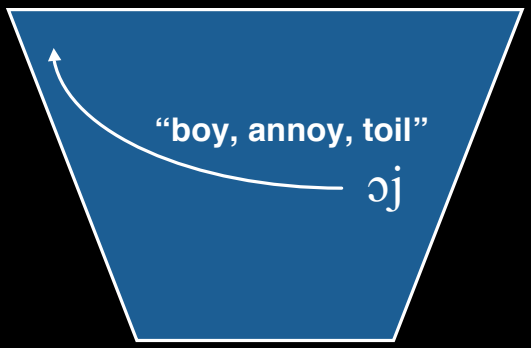

Diphthongs: Two vowel-ish sounds together
a


Diphthongs: Two vowel-ish sounds together
“loud, brow, hour”
aw

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?