Lecture 1
Introduction

SPAU 3343
Phonetics and Phonology

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University of Texas at Dallas

(A very brief) history of phonetics

"The history of phonetics—going back some 2.5 millennia—makes it perhaps the oldest of the behavioral sciences and, given the longevity and applicability of some of the early findings from these times, one of the most successful"

-- Prof. John Ohala, UC Berkeley, 1991

Early roots

- India
- Korea

Panini

- India ~ 7th - 4th centuries B.C.E.
- His work on Sanskrit was surprisingly modern and systematic
- Phonology/phonetics was explicitly dealt with
- Discovery of Panini's grammar helped develop today's linguistic science

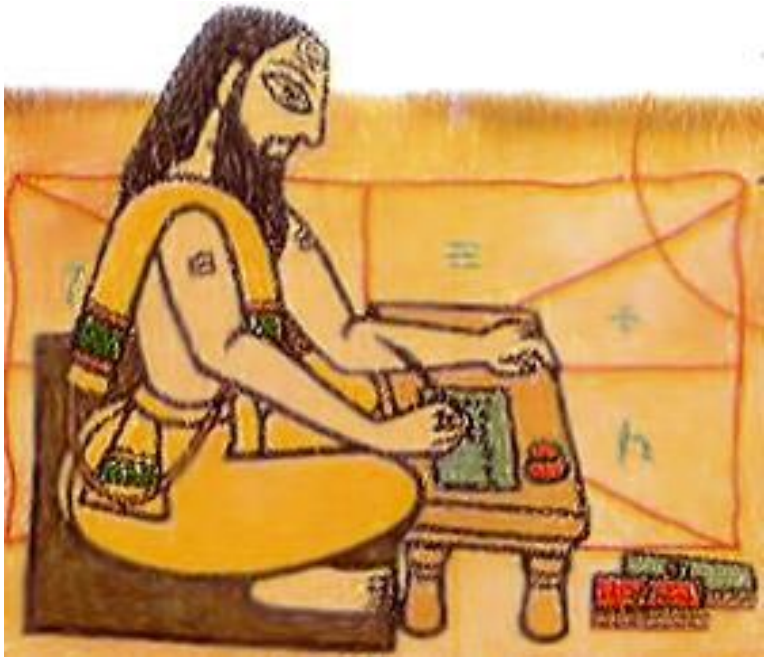
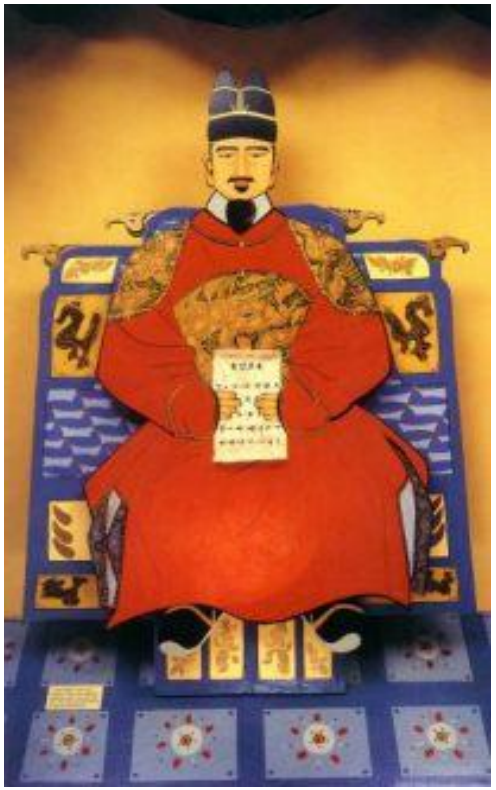


Image from *IndiaNetzone*. "Panini, Sanskrit Grammarian." 09/23/2009. Accessed 5/20/2016. http://www.indianetzone.com/31/panini_sanskrit_grammarian.htm

King Sejong of Korea



1397-1450

- Wanted his people to be literate, but knew that the existing (Chinese-based) system was too difficult
- Created (*by himself*!) an entirely new, scientific alphabet based on phonetics *(see next slide →)*
- Named this alphabet *Hun Min Jong Um*, "Accurate Sounds to Educate the People"
- His alphabet was largely neglected, almost until the 20th century
- Now in general use in both South and North Korea

Image from *JAARS Museum of the Alphabet.* "Alphabet Makers: King Sejong of Korea." 1999-2011. https://www.jaars.org/museum/alphabet/people/sejong.htm

Han'gul

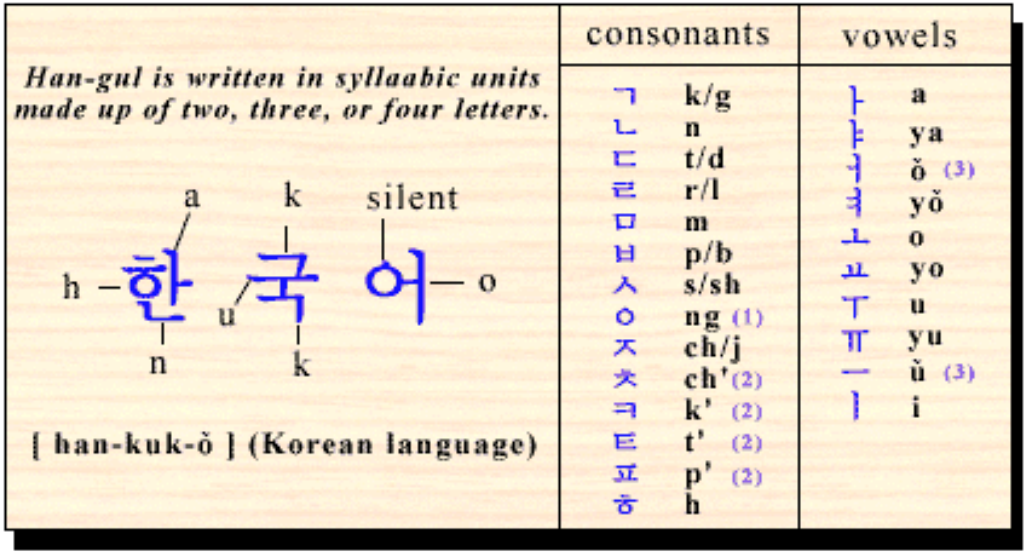
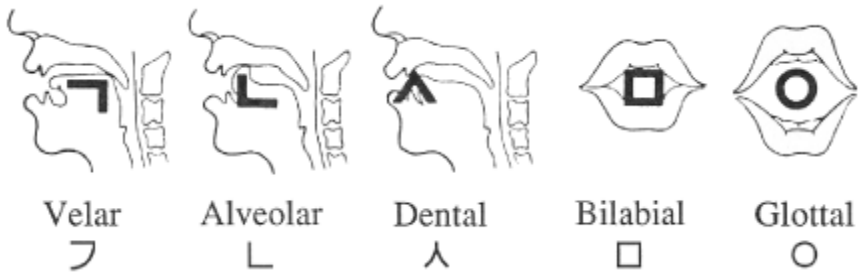


Image from *Everyday Korea.* "Bringing Back the Hangul." 2014. Accessed 5/20/16. http://www.everydaykorea.com/2013/10/bringing-back-the-hangul/



Images from *Wright-House.* "Linguistic and Philosophical Origins of the Korean Alphabet (Hangul)." 7/13/07. Accessed 5/20/16. http://www.wright-house.com/korean/korean-linguistics-origins.html

Sir William Jones

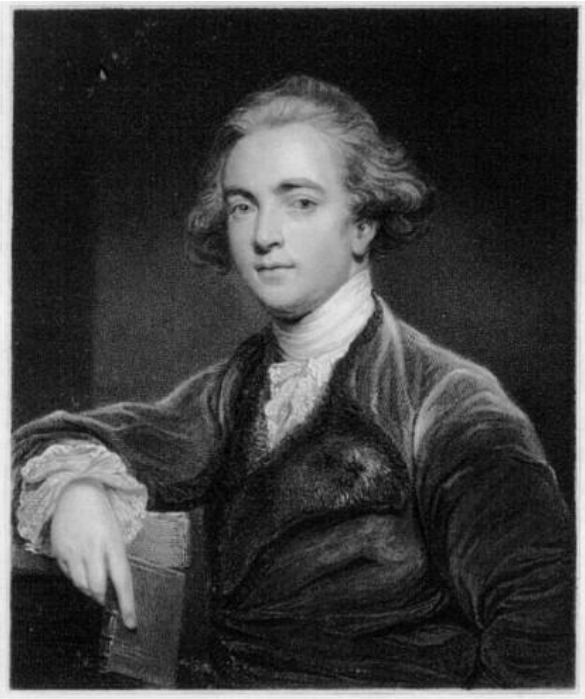


Image from *Lidahibu*. "William Jones." 2016. Accessed 5/20/16. http://lidahibu.com/edisi/11/

1746-1794

- British scholar, linguist, and lawyer
- Fluent in 7 languages by age 20
- Came to India as Supreme Court Judge
- In 1786, announced:

  …*Sanskrit and the European languages "have sprung from some common source which, perhaps, no longer exists"*
- Set a trend for studying Sanskrit as basis for the "Indo-European language family"
- Roots of historical linguistics

Henry Sweet

1845–1912

- English philologist and phonetician
- Authority on Anglo-Saxon and the history of the English language (Oxford, England)
- Pioneer in modern scientific phonetics
- His *History of English Sounds* (1874) was a landmark study.
- Thought to be the model for "Professor Higgins" in G. B. Shaw's play *Pygmalion*

  (although it was actually Daniel Jones…)

Image from "Figures from the history of English." Accessed 5/20/16. https://www.uni-due.de/SHE/SHE_Portrait_Gallery.htm

“Henry Higgins”

- Phonetician character in the play “*Pygmalion*” by George Bernard Shaw

→

← “Eliza Doolittle”

Daniel Jones

1881 - 1967

- Professor at University College London
- Used the term “phoneme” in the modern sense
- Promoted the term “cardinal vowel”
- A father of the IPA
- Suggested a two-parameter diagram to visualize how vowels are produced
- Popularized experimental phonetics
- Developed new alphabets for African and Indian languages

Image from “Figures from the history of English.” Accessed 5/20/16. https://www.uni-due.de/SHE/SHE_Portrait_Gallery.htm

Lionel Logue (1880-1953)

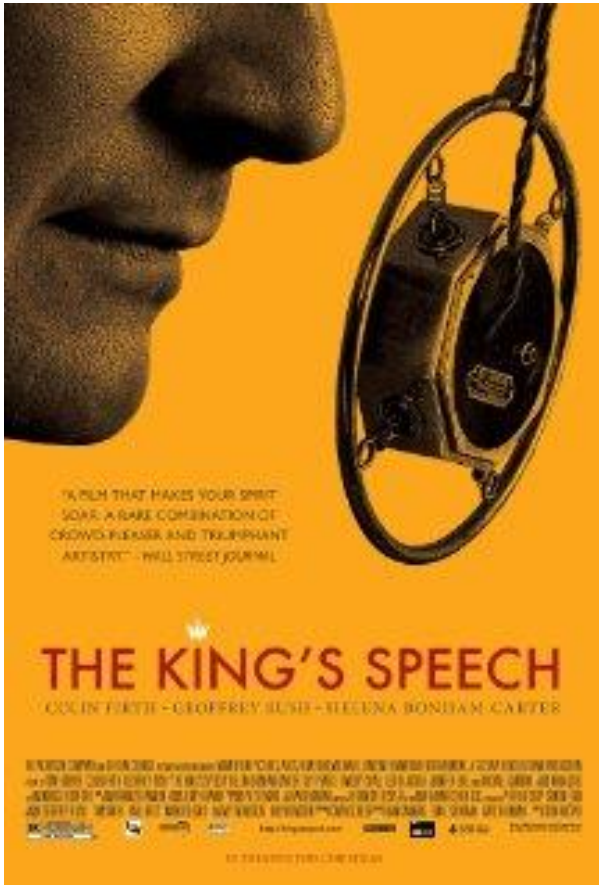


Image from *IMDB.* "The King's Speech (2010)." 2016. Accessed 5/20/16.
http://www.imdb.com/title/tt1504320/

- Australian "elocutionist" who worked with speech defects
- Consultant to King George VI
- Featured in 2010 movie

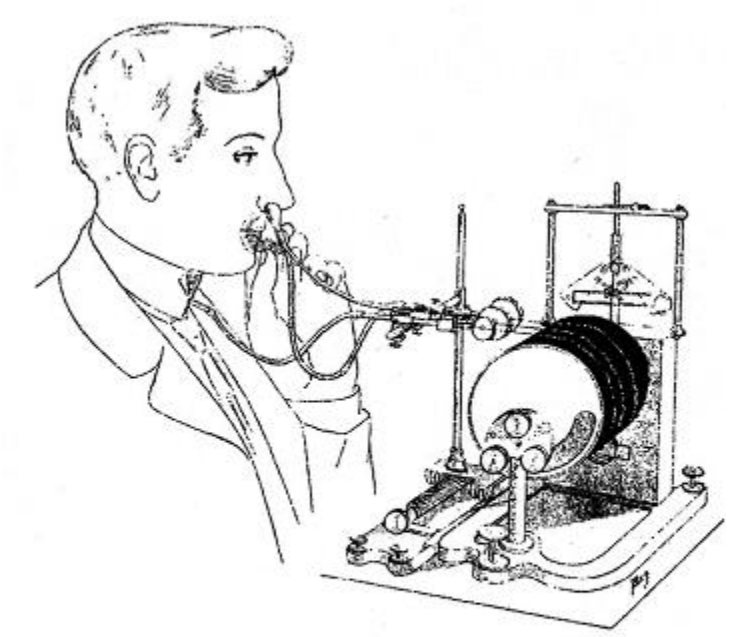
Image from *AceShowbiz.* "The King's Speech Picture 6." 2016. Accessed 5/20/16.
http://www.aceshowbiz.com/still/00005854/the_king_s_speech05.html

Abbé Rousselot

Image accessed 5/20/16.
http://charente.confolens.free.fr/confolens/saint_claud/saint_claud/saintclaud0650e.html

- 1843 – 1924
- An early innovator in experimental phonetics
- Professor with the College of France

Rousselot cylinders



Inscription de la parole.

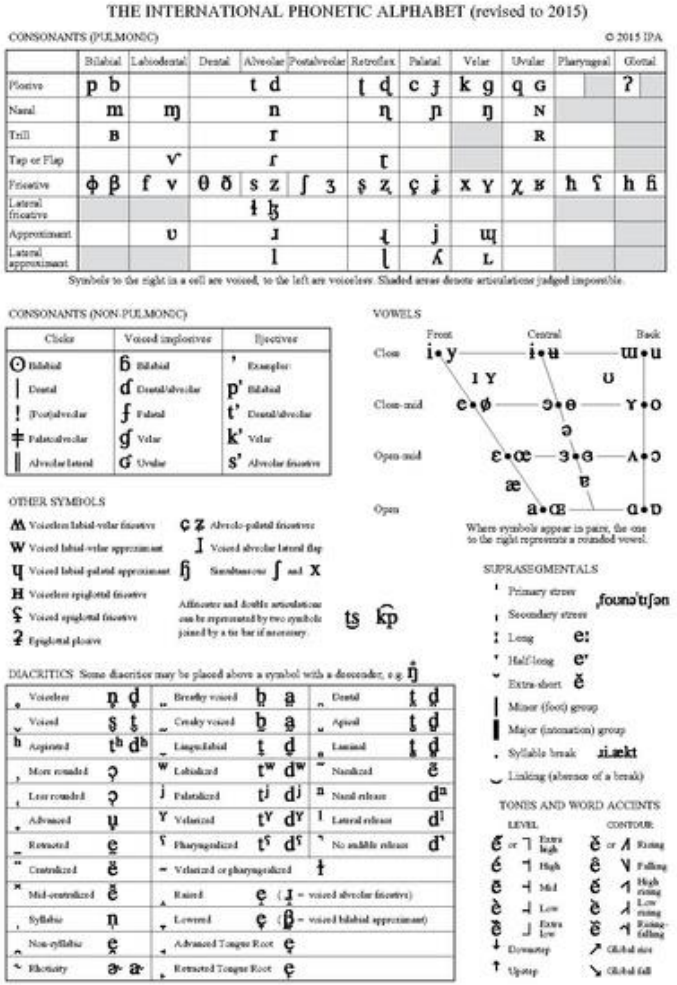
FIGURE 2. Recording speech, circa 1897. From Abbé Pierre-Jean Rousselot and Fauste Laclotte, *Précis de prononciation* (Paris, 1902), 14.

- Speech sounds and articulatory information were recorded for analysis
- *"It will be possible hereafter to note the pronunciation of any language, dialect, or idiom whatever, without relying upon the testimony of the ear, which distinguishes but slight differences between the modes of speaking of several individuals"*

Image from *Language Log.* Mark Liberman. "God's own englishman with a tube up his nose". April 23, 2007. Accessed July 5, 2016. http://itre.cis.upenn.edu/~myl/languagelog/archives/004436.html

International Phonetic Alphabet (IPA)

- (1888) First published by the *Association Phonétique Internationale*, a group of French language teachers
- Modeled on an 1847 phonetic script for English
- <u>Goal:</u> To devise a system for transcribing speech sounds <u>independent</u> of any particular language and applicable to all languages



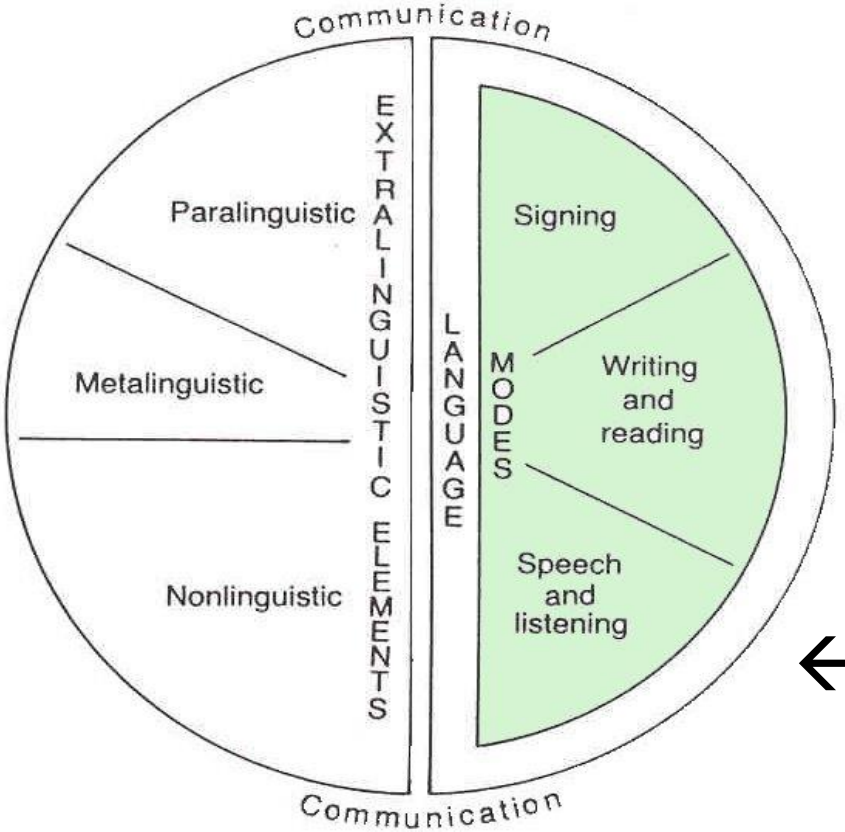
IPA - Uses

- Dictionaries, textbooks, phrase books
- Creating new writing systems for previously unwritten languages
- Non-native speakers learning English
- Clinicians in speech language pathology and related disciplines

Modern Phonetics

- Phonetics – Scientific study of speech sounds
- Phonology – Study of sound systems, patterns, and rules
- Phonetics and phonology are highly related… Both are within the field of …
- Linguistics – Scientific study of Language

Important terms: Communication, human language, speech



← Phonetics is HERE!

Q: How do linguists study language?

- By describing a **<u>grammar</u>**

  (*mental representation of language knowledge*)

<u>GOAL:</u>

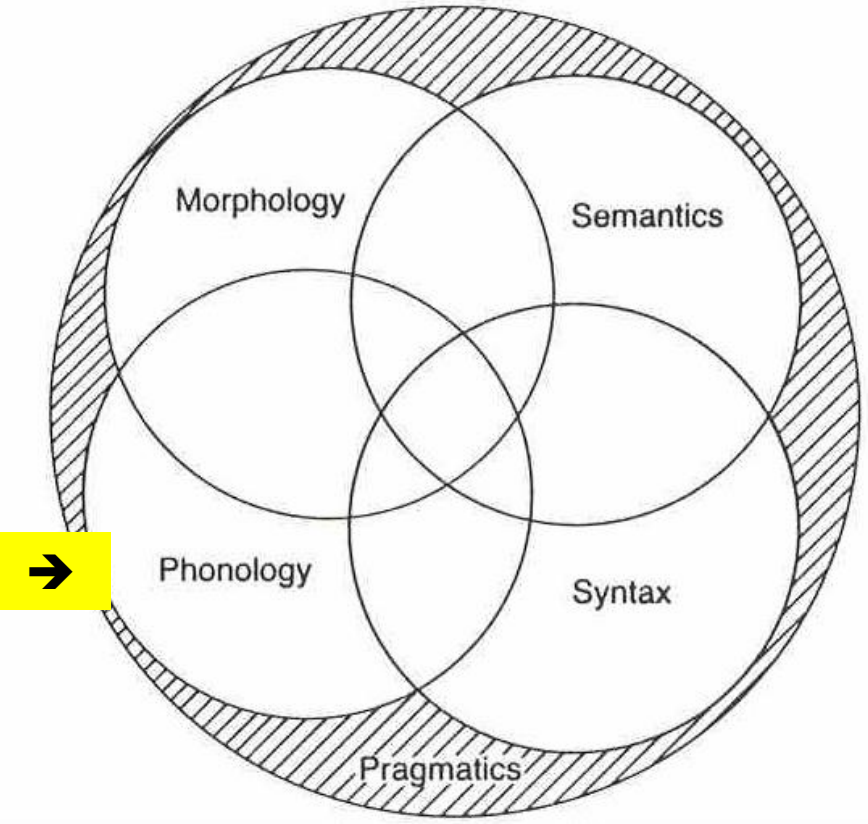
Language-particular → Universal

Q: What are the components of grammar?

(next slide)

Levels of the grammar

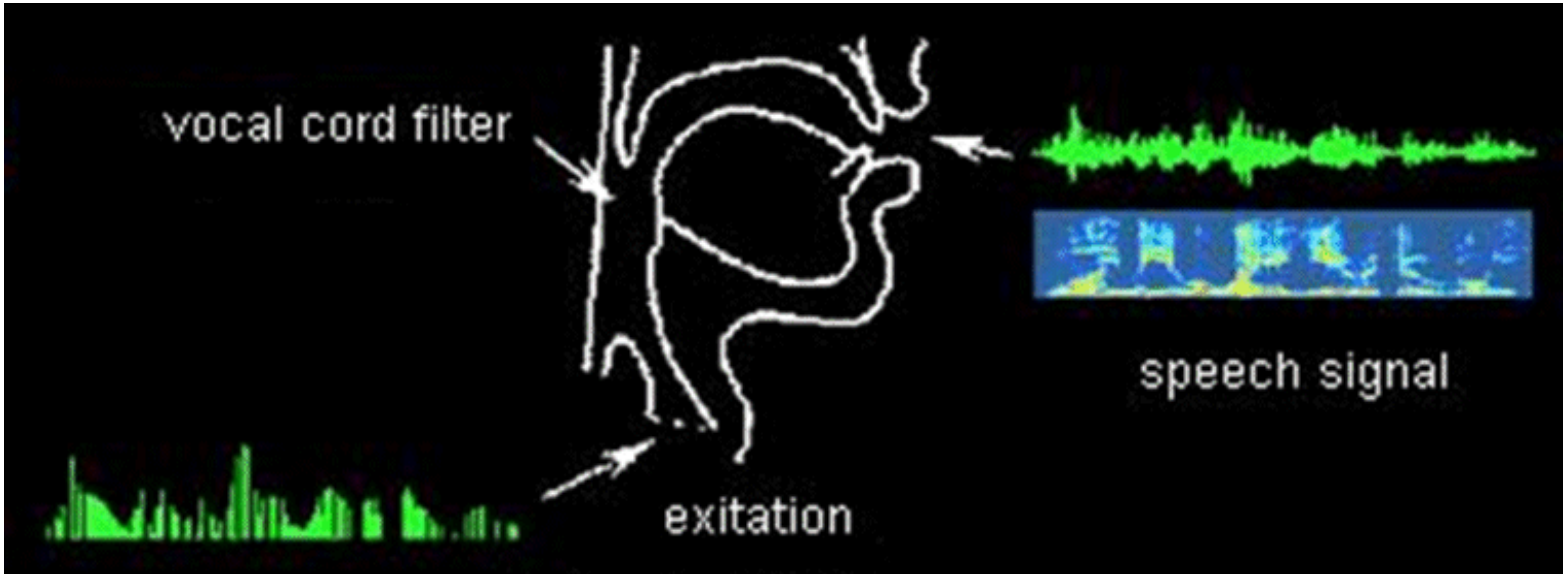
We are HERE! ➔



Types of phonetics

1. Articulatory – *How speech sounds are produced in the human vocal tract*
2. Acoustic
3. Linguistic/Perceptual

Source-filter theory



Redrawn by UKT from
www.columbia.edu/itc/psychology/rmk/T2/sf_theory.html

Vocal source **vocal tract filter** **speech**

Source-filter system – cont'd

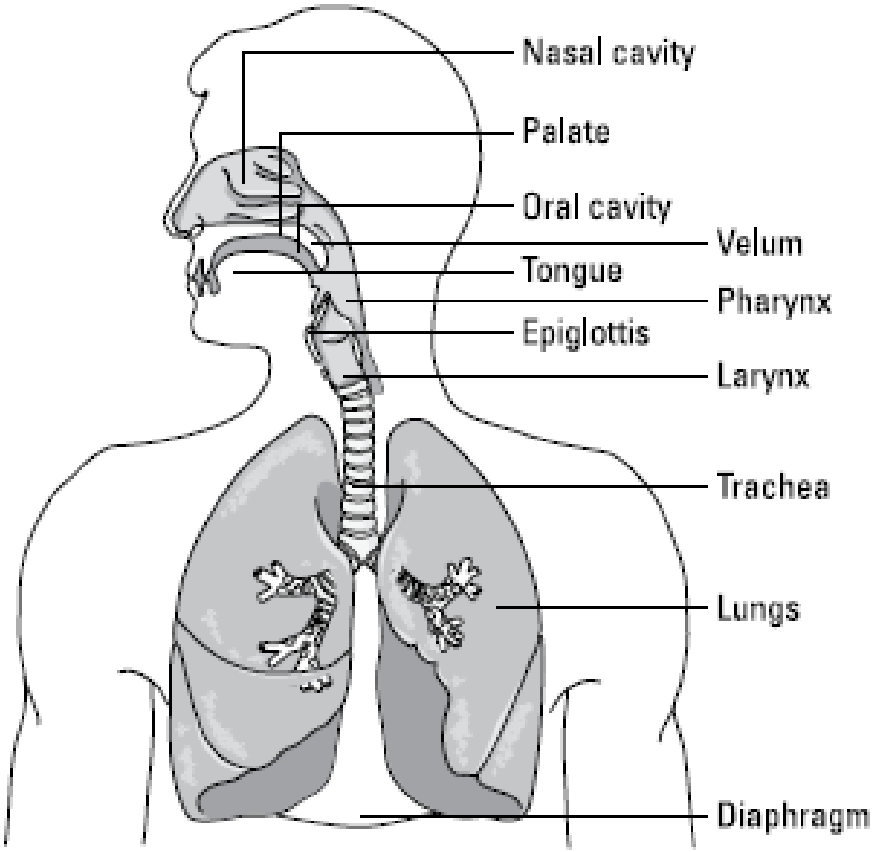


Illustration by Wiley, Composition Services Graphics

Image from *Phonetics for Dummies.* "The Lowdown on the Science of Speech Sounds." 2013.

Features

- Feature – A component of a sound with a discrete phonetic property – "smallest systematic part" of a speech sound
- Binary (+ or -)
- Graded

Information from *Phonetics for Dummies.* William Katz. "Classifying Speech Sounds: Your Gateway to Phonology". 2013.

Articulatory features

THE BIG THREE!

- **V**oicing
- **P**lace
- **M**anner

Information from *Phonetics for Dummies.* William Katz. "Classifying Speech Sounds: Your Gateway to Phonology". 2013.

Voicing - anatomy

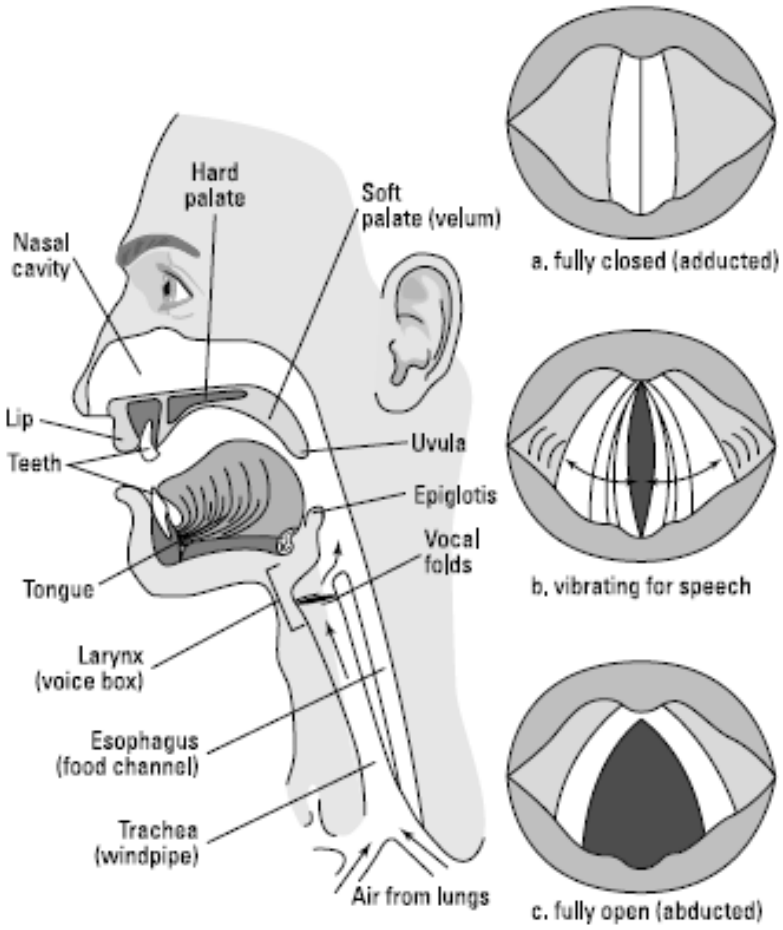


Illustration by Wiley, Composition Services Graphics

Image from *Phonetics for Dummies.* "Producing Speech: The How-To." 2013.

Voicing

- Property of vibrating <u>vocal folds</u>
- Occurs at the <u>glottis</u>

(literally, a hole or aperture)

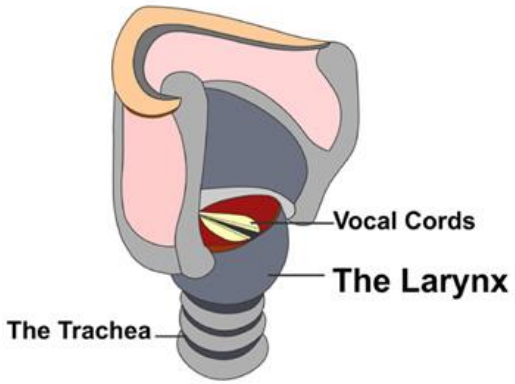


Image from *Cedars-Sinai*. "Laryngeal Surgury." 2016. Accessed 5/20/16. http://www.cedars-sinai.edu/Patients/Programs-and-Services/Head-and-Neck-Cancer-Center/Treatment/Laryngeal-Surgery.aspx

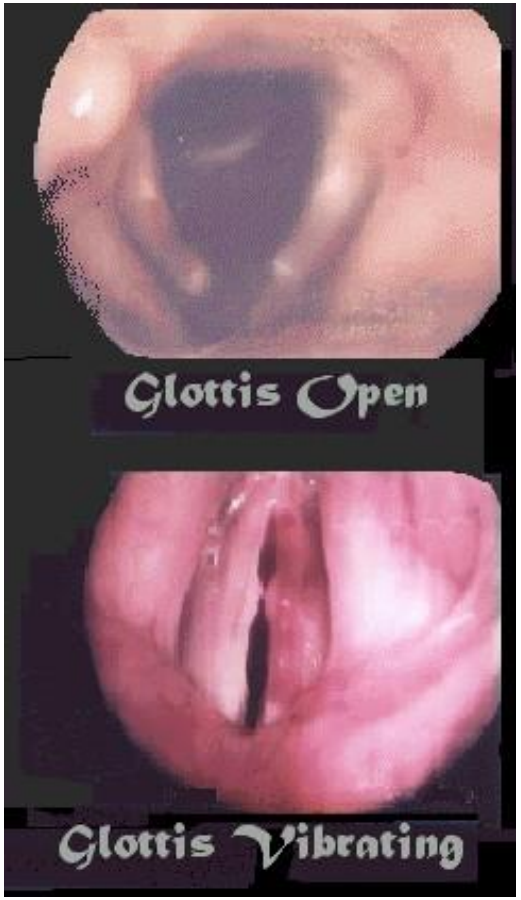


Image from *plaza.ufl.edu*. "Voicing and Phonation". Accessed 6/27/16. https://www.google.com/search?q=open+glottis+vs+closed+glottis&espv=2&biw=1280&bih=923&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj1gJX10MjNAhVL4iYKHdQRDFUQ_AUIBigB#imgrc=9SqboxeZmczh3M%3A

Information from *Phonetics for Dummies.* William Katz. "The Lowdown on the Science of Speech Sounds". 2013.

Laryngoscopy - video

Video from *Auditory Neuroscience.* "Human vocal folds in action." Accessed 5/23/16.

https://auditoryneuroscience.com/vocfld

The speech articulators

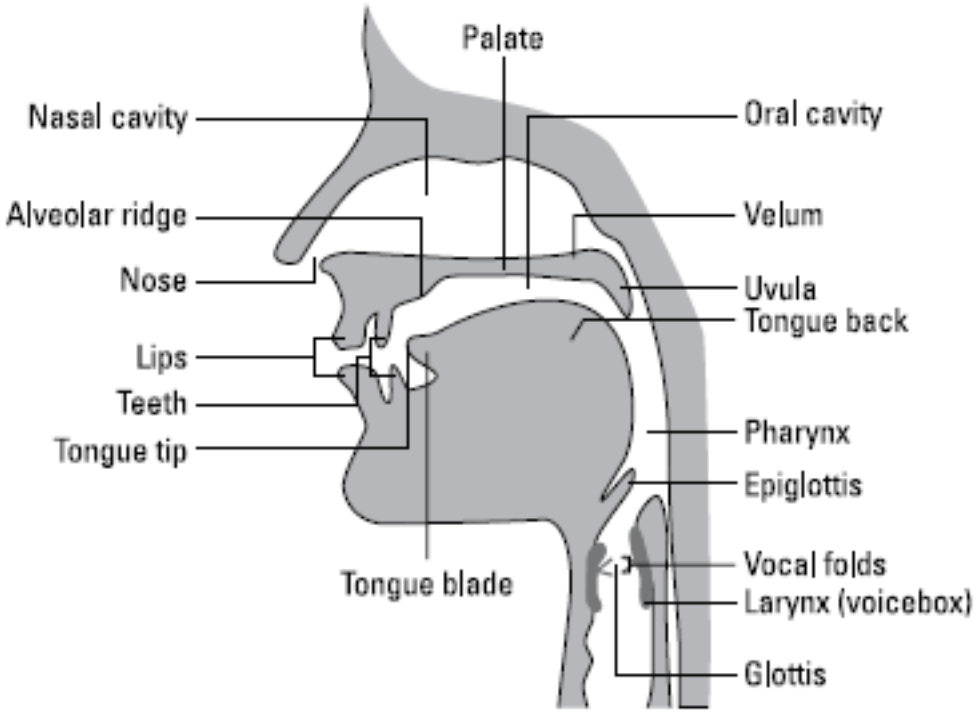
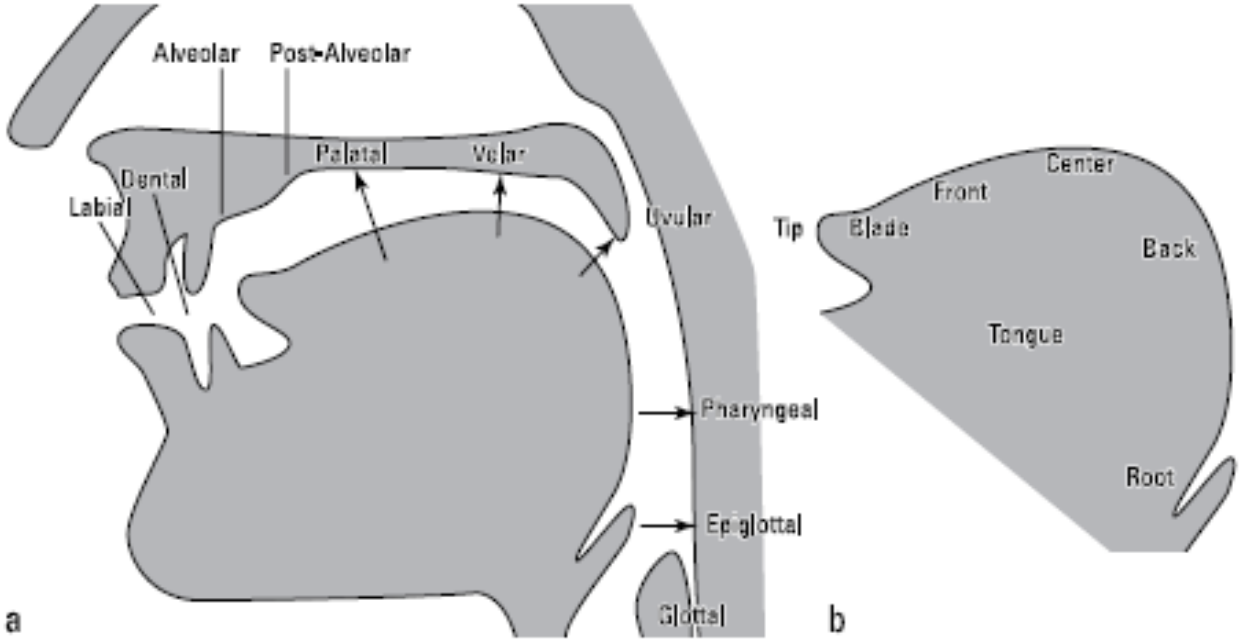


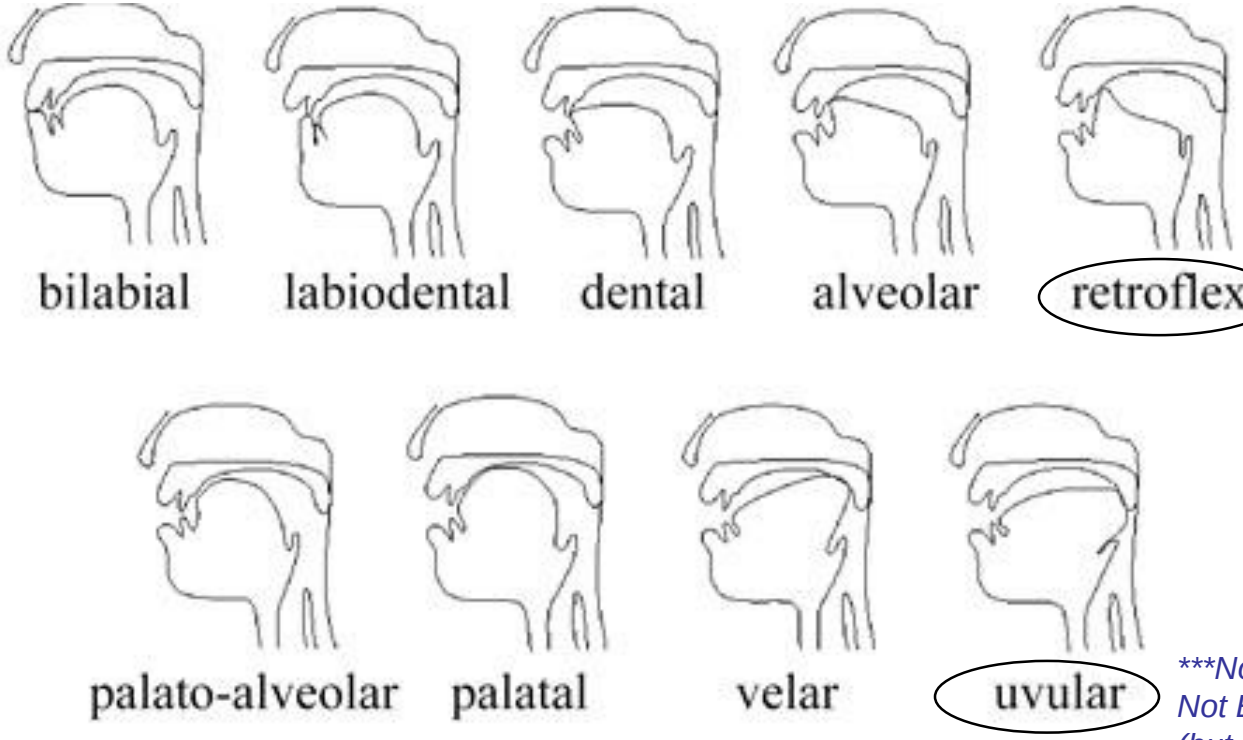
Image from *Phonetics for Dummies.* "The Lowdown on the Science of Speech Sounds." 2013.

Places of articulation, parts of tongue



Images from *Phonetics for Dummies.* "The Lowdown on the Science of Speech Sounds." 2013.

Place – where sounds are produced



*** Note-
Not GAE

***Note-
Not English
(but e.g., in French
and Arabic)

Image from Dr. Christian DiCanio. University at Buffalo. "Places of Articulation." Accessed 5/23/16.
http://www.acsu.buffalo.edu/~cdicanio/pdfs/Lect_Place_9-15_9-17.pdf

Manner* – How sounds are produced

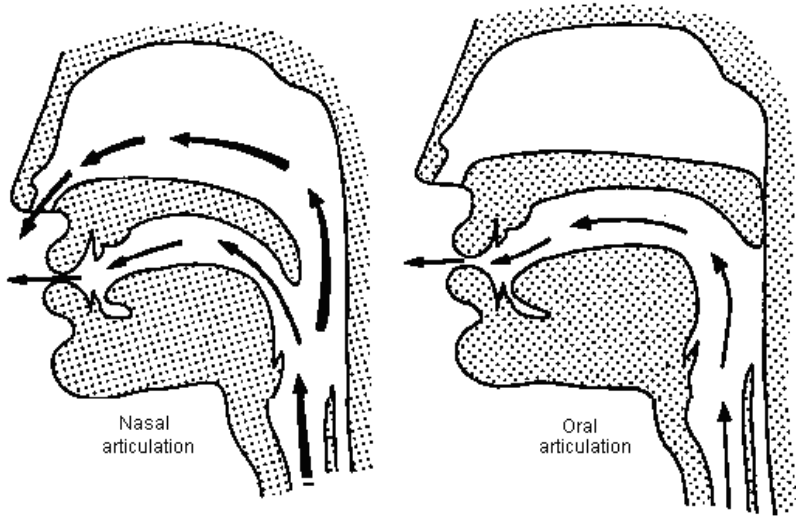


Image from *UNIL.* "Introduction: Nasality." Accessed 5/23/16.
https://www.unil.ch/sli/fr/home/menuguid/ressources/cours-et-livres-en-ligne/introduction-to-phonetics/introduction.html

*NOTE: generally refers to **consonants** because they involve airflow obstruction

- Stop: Nasal vs. oral
- Also – fricative, affricate, approximant, tap/flap

Information from *Phonetics for Dummies.* William Katz. "The Lowdown on the Science of Speech Sounds". 2013.

Consonants of GAE

Manner	Voicing		Place of articulation							
	Voiced (+)	Voice-less (–)	Bilabial	Labio-Dental	Dental	Alveolar	Palato-Alveolar	Palatal	Velar	Glottal
Stop (nasal)	+		m			n			ŋ	
Stop (oral)		–	p			t			k	
Stop (oral)	+		b			d			g	
Fricative		–		f	θ	s	ʃ			h
Fricative	+			v	ð	z	ʒ			
Affricate		–					tʃ			
Affricate	+						dʒ			
Approximant		–	ʍ						ʍ	
Approximant	+		w			ɹ		j	w	
(lateral)	+					l			ɬ	

Also /ʔ/ and /ɾ/

Image from *Phonetics for Dummies.* "Meeting the IPA: Your New Secret Code." 2013.

How to draw ‘em!

ɪ			
ɛ			
æ			
ə		ŋ	
ɚ		ʃ	
ʌ		ʒ	
ɝ		θ	
ʊ		ð	
ɔ		ɾ	
ɑ		ʔ	

Figure 3-5: How to draw some of the common made-up IPA symbols.

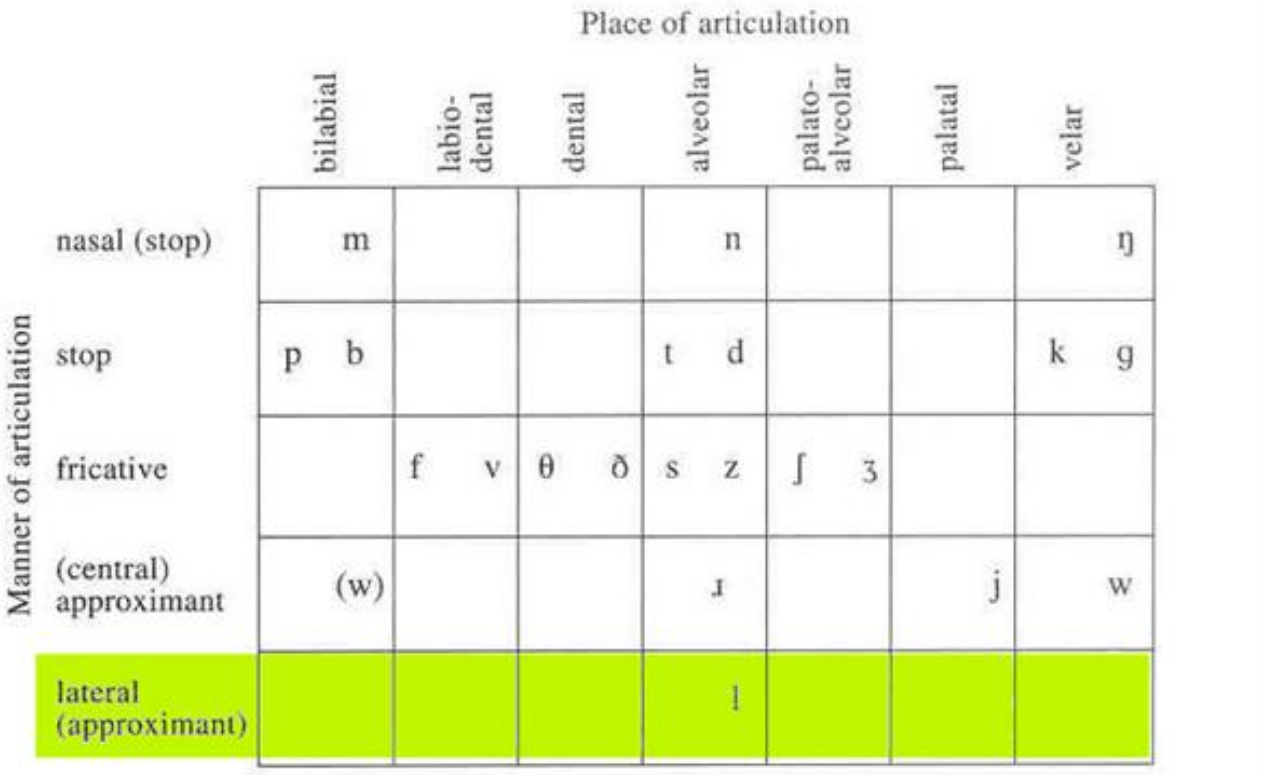
Image from *Phonetics for Dummies.* “Meeting the IPA: Your New Secret Code.” 2013.

The voiceless “w” (/ʍ/)

https://www.youtube.com/watch?v=xzBQlWBDJMM

Image from *FBCOVERSTREET*. “Cool Hhhwhip Stewie Griffin.” Accessed 5/23/16. http://fbcoverstreet.com/facebook-cover/cool-hhhwhip-stewie-griffin

Other features: Central vs. lateral



Manner of articulation \ Place of articulation	bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar
nasal (stop)	m			n			ŋ
stop	p b			t d			k g
fricative		f v	θ ð	s z	ʃ ʒ		
(central) approximant	(w)			ɹ		j	w
lateral (approximant)				l			

From *A Course in Phonetics.* P. Ladefoged and K. Johnson. "*Phonology and Phonetic Transcription*," 2011.

Markedness

- We do not mark the more usual case
- Thus, the less frequent a feature, the more "marked"

Image from *Reddit*. "My brother just found out who drinks his milk." Jbee14. Accessed 5/25/16. https://www.reddit.com/comments/11y784

Example:

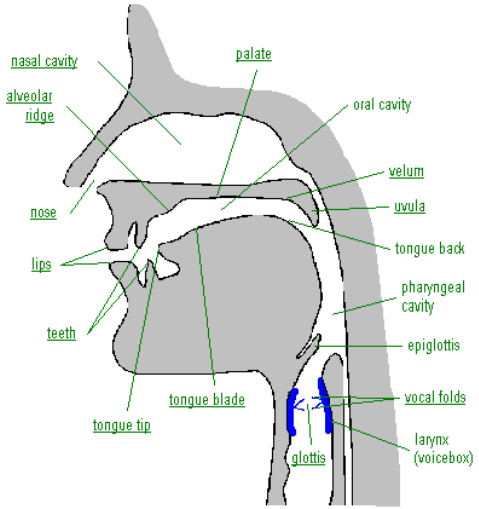
I'm going to the store to get ~~cow~~ milk

I'm going to the store to get soy milk

Information from *Phonetics for Dummies.* William Katz. "Classifying Speech Sounds: Your Gateway to Phonology". 2013.

Let's relate the features to the anatomy

Manner	Voicing		Place of articulation							
	Voiced (+)	Voice-less (–)	Bilabial	Labio-Dental	Dental	Alveolar	Palato-Alveolar	Palatal	Velar	Glottal
Stop (nasal)	+		m			n			ŋ	
Stop (oral)		–	p			t			k	
Stop (oral)	+		b			d			g	
Fricative		–		f	θ	s	ʃ			h
Fricative	+			v	ð	z	ʒ			
Affricate		–					tʃ			
Affricate	+						dʒ			
Approximant		–	ʍ						ʍ	
Approximant	+		w			ɹ		j	w	
(lateral)	+					l			ɬ	



Great! Now on to vowels

The setting

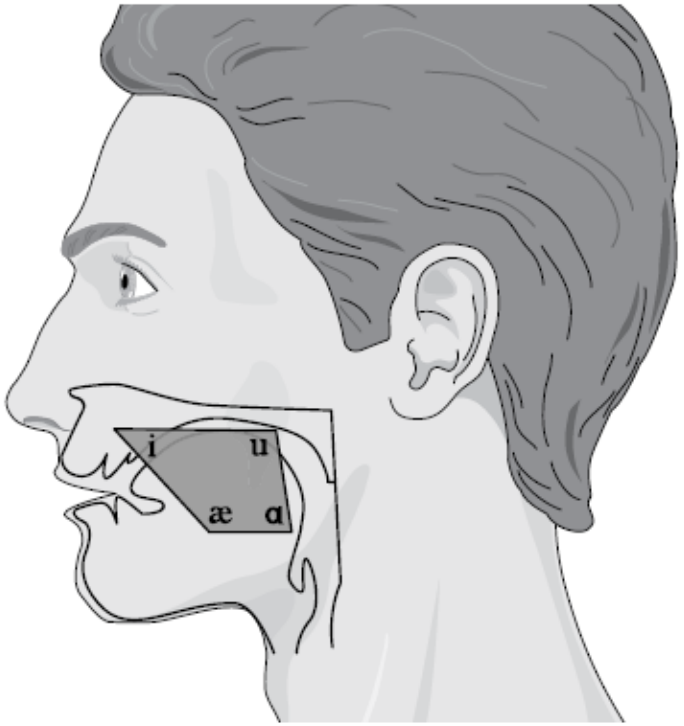


Figure 3-2: Vowel quadrilateral superimposed on a person's vocal tract.

Image from *Phonetics for Dummies.* William Katz. "Meeting the IPA: Your New Secret Code". 2013.

GAE vowel quadrilateral

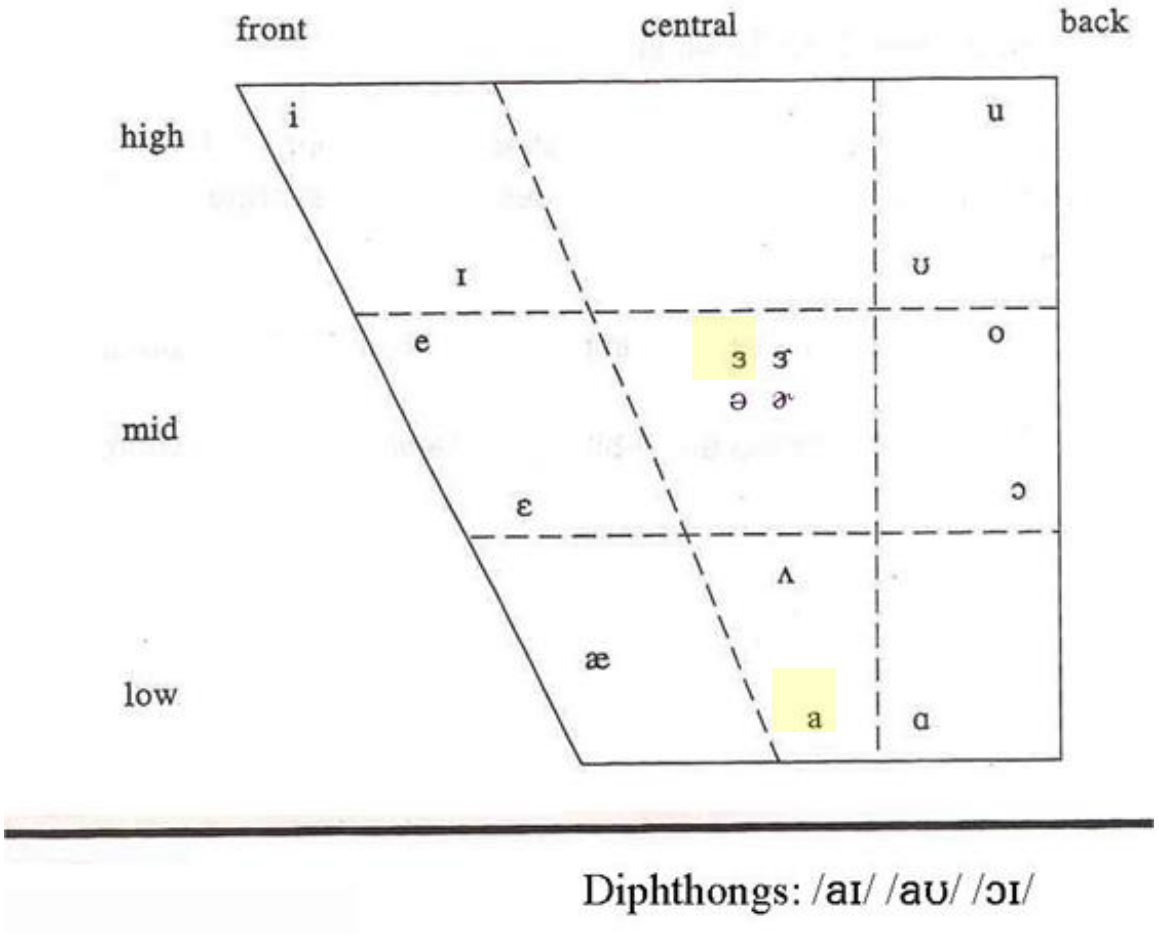
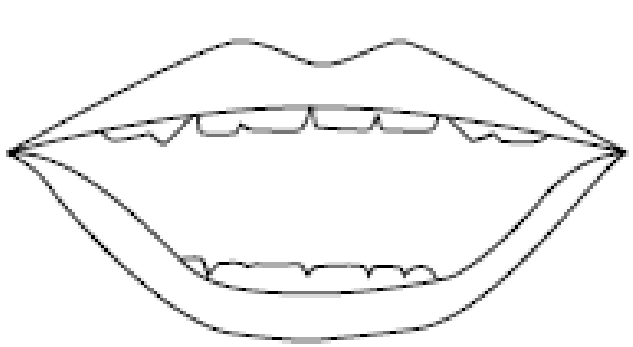
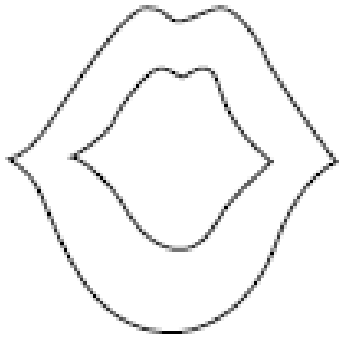


Image from *StudyBlue.* "Phonetics Final: Communication Sciences and Disorders 3313 with Baldwin at Oklahoma State University – Stillwater *". 2016. Accessed 6/27/2016. https://www.studyblue.com/notes/note/n/phonetics-final/deck/6489748

This should help?



/ɑ/



/ɔ/

Image from *Phonetics for Dummies.* William Katz. “Meeting the IPA: Your New Secret Code”. 2013.

Homework/ Reading

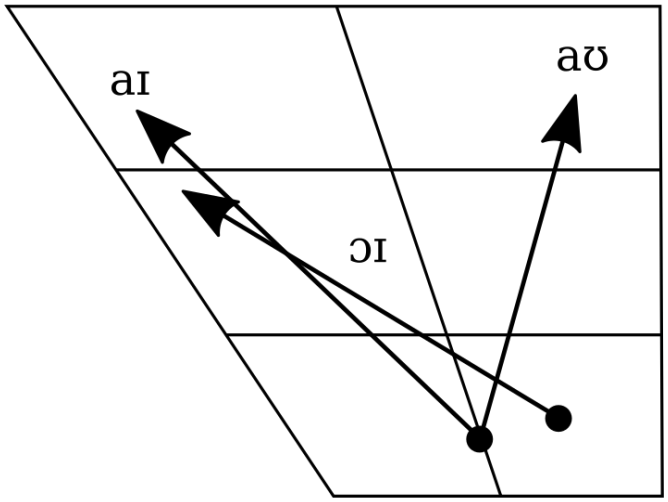
- First e-learning homework set!

Lecture 2

- More issues on broad transcription of GAE consonants and vowels
- Finishing up concepts from text, chapters 1-3

Mono – vs. Diphthongs

- Monophthongs – constant vowel quality
- Diphthongs – sweep across the vowel space



GAE

Image from *Wikimedia Commons.* "File:California English disphthong chart.svg". 29 February 2016. Accessed 27 June 2016. https://commons.wikimedia.org/wiki/File:California_English_diphthong_chart.svg
*based on the vowel chart in Peter Ladefoged, "American English", *Handbook of the International Phonetic Association* (Cambridge Univ. Press 1999), p. 42.

Q: Could there be a …(shudder).. Triphthong?

A: Yes!

- Bernese German (a Swiss German dialect):
- [iə̯w] as in *Gieu* 'boy'
- [yə̯w] as in *Gfüeu* 'feeling'
- [uə̯w] as in *Schueu* 'school'
- [yə̯j] as in *Müej* 'trouble'

- Spanish:
- [wej] as in *buey* 'ox'
- [waj] as in *Uruguay*

Tense vs. lax vowels in English

- English lax vowels: /ɪ/,/ɛ/,/æ/,/ʊ/,/ʌ/
- Originally thought to be physiologically distinct
- Now considered a phonological property
- (Lax vowels cannot occur in stressed, open syllables)
- Thus: “You are really *veh!*” (is not English)

Tense/lax - examples

- "*beat*" versus "*bit*"
- "*bait*" versus "*bet*"
- "*Luke*" versus "*look*"

Table 7-3	Distribution of English Tense and Lax Vowels		
	Vowel	***Stressed Open Syllable***	***Closed Syllable***
Tense	/i/	bee /bi/	beat /bit/
Lax	/ɪ/	bih /bɪ/ (not a real word)	bit /bɪt/

Table from *Phonetics for Dummies"*. W. F. Katz. "Sounding Out English Vowels". 2013.

Tense

- Some tense vowels show offglide qualities:

/e/ = /eɪ/ ✓
/u/ = /uw/
/i/ = /ij/
/o/ = /oʊ/ ✓

- For beginners, I prefer the simpler set on the left

- Our AV materials also include examples from checked set on the right

GAE vowel “r-coloring”(blending)

IPA	*Example*	*American English*
/i/	seer	/siɹ/ or /siɚ/
/ɪ/	fear	/fɪɹ/
/e/	payer	/peɹ/ or /peɚ/
/ɛ/	fair	/fɛɹ/
/ɝ/	fur	/fɝ/
/ʊ/	poor	/pʊɹ/
/ɔ/	sore	/sɔɹ/
/ɑ/	far	/fɑɹ/
/aɪ/	fire	/faɪɹ/
/aʊ/	flower	/flaʊɹ/
/ɔɪ/	foyer	/fɔɪɚ/

Table from *Phonetics for Dummies”*. W. F. Katz. “Sounding Out English Vowels”. 2013.

Some vowel “adjustments”

/o/-/ɔ/ and /i/-/ɪ/

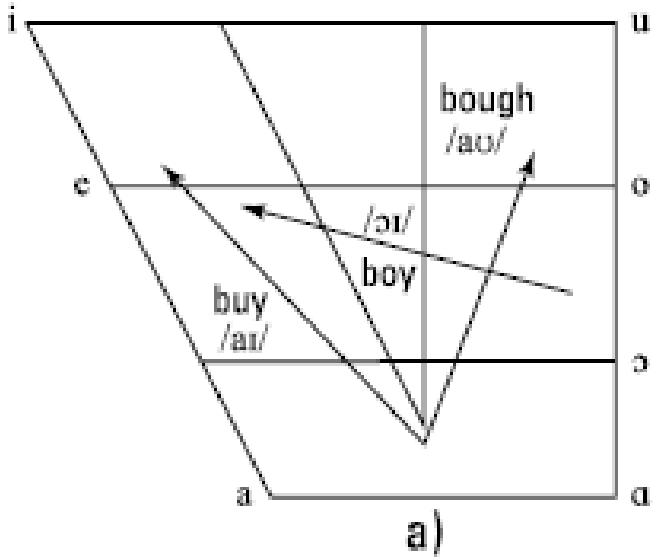
→ before /ɹ/,/l/ and nasals

Some examples:

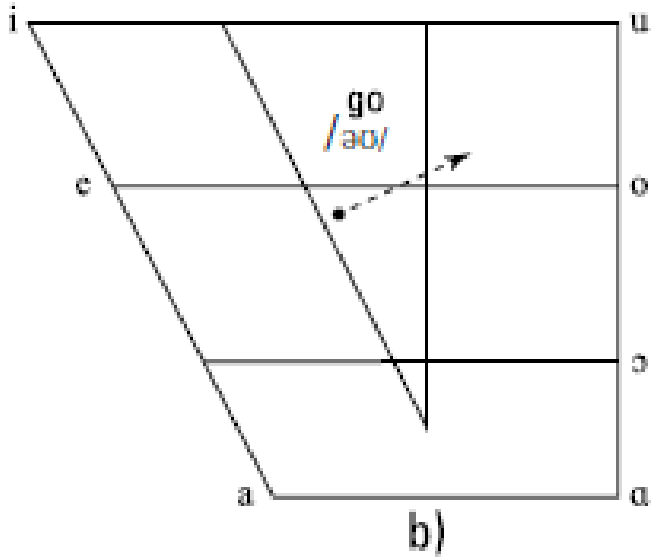
“*sore*” /sɔɹ/

“*selling*” /ˈsɛlɪŋ/

English diphthongs



American English



British English

(contains one more diphthong)

Figures from *Phonetics for Dummies"*. W. F. Katz. "Sounding Out English Vowels". 2013.

Segmental vs. supra-segmental

Segmental: consonants, vowels

Supra-segmental:

- features larger than the individual segment
- includes stress, intonation (“prosody”)

Homework set #2

- e-learning, second set
- Keep practicing with audiovisual and lab materials

Lecture 3

- What is a phoneme?
- What are allophones?
- Why should we care?

Phoneme

- *“Smallest systematic unit of sound that changes meaning in a language”*
- Abstract
- Psychological
- Can be illustrated in a minimal pair:

/bæt/ - /bit/

/bit/ - /biz/

Allophone

- Systematic variant of a phoneme
- Show *<u>complementary distribution</u>* (context-dependent variation)

(…like these guys…)

Image from *iwantedwings.* "Superman Returns & Man of Steel: Man vs. Myth". June 1, 2014. Accessed July 5, 2016. https://iwantedwings.com/2014/06/01/superman-returns-man-of-steel-man-vs-myth/

Allophone example

- In GAE, the phoneme /t/ can be…

[t]	[bɪt]
[tʰ]	[tʰɪp]
[ɾ]	[ˈlɪɾɬ]
[ʔ]	[ˈbʌʔn]

Complementary distribution

[t]	[bɪt]	syllable <u>final</u>
[tʰ]	[tʰɪp]	syllable <u>initial</u>
[ɾ]	[ˈlɪɾɬ]	<u>btwn</u> stressed & unstressed syllable

* <u>NOTE</u>: As opposed to “free distribution”

Phoneme/allophone

Language 1		Language 2	
/ˈdəsiɬ/	*V. "to catch"*	/θʊʃ/	*N. "female cat"*
/ʃəˈɹati/	*Adj. "clever"*	/saʊˈnɛmɪt/	*N. "muscle"*
/ˈsɔɹlok/	*N. "debate"*	/ˈklɔɪjɛʃ/	*Adv. "rapidly"*
/dəˈʃiɬ/	*V. "uncover"*	/sæfimˈi/	*V. "speaking"*

- In one language there are two separate phonemes, /s/ and /ʃ/.
- In the other, /s/ and /ʃ/ seem to be allophones of one underlying phoneme.

Q: WHICH IS WHICH, AND WHY?

Real language example – Find the phonemes vs. the allophones

Example 2: **Papago (Focus: [t, t͡ʃ, d, d͡ʒ)**

1.	[ˈbid͡ʒim]	‘turn around’	12.	[ˈhiwgid]	‘smell’
2.	[ˈtaːpan]	‘split’	13.	[ˈt͡ʃihaŋ]	‘hire’
3.	[ˈhidoɖ]	‘cook’	14.	[ˈtoɲi]	‘become hot’
4.	[ˈt͡ʃikid]	‘vaccinate’	15.	[ˈwiɖut]	‘swing’
5.	[ˈgatwid]	‘shoot’	16.	[ˈtaːtaɖ]	‘feet’
6.	[ˈt͡ʃuku]	‘become black’	17.	[ˈkiːt͡ʃud]	‘build a house for’
7.	[ˈdagʂp]	‘press with hand’	18.	[ˈdoːdom]	‘copulate’
8.	[ˈtoha]	‘become white’	19.	[ˈtaːtam]	‘touch’
9.	[ˈd͡ʒuːki]	‘rain (noun)’	20.	[ˈd͡ʒiwid]	‘soil, earth’
10.	[ˈwiːmt]	‘help, marry’	21.	[ˈt͡ʃigig]	‘name, reputation’
11.	[ˈd͡ʒiːk]	‘taste’	22.	[ˈt͡ʃiːwia]	‘settle, establish residence’

[1] Data and analysis assembled by Bruce Hayes, based on Saxton, Dean, Lucille Saxton, and Susie En (1983) *Dictionary: Papago/Pima-English, English-Papago/Pima*, University of Arizona Press, Tucson.

Look at vowel context….

Left Contexts Only: No Pattern

	t		t͡ʃ		d		d͡ʒ
2,8,14,16,20	[word ___	4,6,13,21,22	[word ___	3,4,5,12	i___	1	i___
15	u___	17	i:___	15	u___	9	[word ___
5	a___			7,11,18	[word ___	20	[word ___
16,19	a:___			18	o:___		
10	m___			20	i___		

Right Contexts Only

✓

	t		t͡ʃ		d		d͡ʒ
2,16,19	___a:	13	___i	3,18	___ o	1	___i
8,14	___o	4	___i	4,5,12, 15, 20	___]word	9	___u:
10,15	___]word	6,17	___u	7	___ a	20	___i
5	___w	u	___i:	18	___ o:	11	___i:
16,19	___a	v	___i:				

[1] Data and analysis assembled by Bruce Hayes, based on Saxton, Dean, Lucille Saxton, and Susie En (1983) *Dictionary: Papago/Pima-English, English-Papago/Pima*, University of Arizona Press, Tucson.

Answer

- “The palato-alveolar affricates occur before high vowels, and the alveolar stops occur elsewhere”

(or, as formalized….)

Alveolar Palatalization

$$\begin{bmatrix}\text{stop}\\ \text{alveolar}\end{bmatrix} \rightarrow \begin{bmatrix}\text{affricate}\\ \text{palato-alveolar}\end{bmatrix} / \_\_ \begin{bmatrix}\text{vowel}\\ \text{high}\end{bmatrix}$$

English / Thai / Spanish

Language		*IPA Symbols*	*Examples*	
English	One phoneme, two allophones	/p/ --> [p^h] or [p]	[p^het] "pet"	[næp] "nap"
Thai	Two phonemes	/p/, /p^h/	[p^ha:] "forest"	[pa:] "split"
Spanish	One phoneme	/p/		['pɛro] "but"

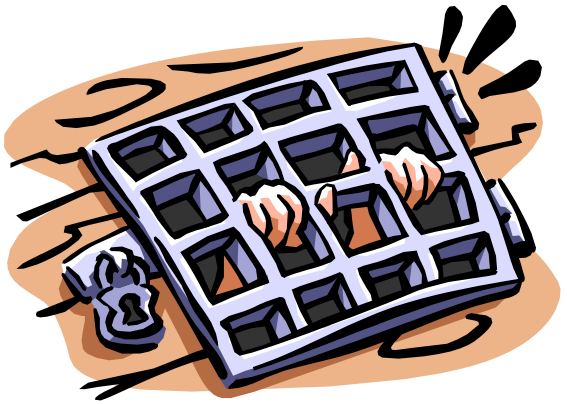
Table from *Phonetics for Dummies"*. W. F. Katz. "Classifying Speech Sounds: Your Gateway to Phonology". 2013.

How are phonemes acquired?

- Infants are born capable of learning any sounds of any language
- They learn the phonemes of their language by ~ 9 - 12 months
  - (by learning to ignore distinctions that are not phonemic)

Q: What about adults?

Are we each a prisoner of our phonemic inventory (?)



- ✓ Second language issues
- ✓ *"Phonemic misperception"* for disordered speech