Ling 230/503: Articulatory Phonetics and Transcription

Broad vs. narrow transcription. A narrow transcription is one in which the transcriber records much phonetic detail without attention to the way in which the sounds of the language form a system. A broad transcription omits those details of a narrow transcription which the transcriber feels are not worth recording.

Normally these details will be aspects of the speech event which are:
(1) predictable *or*
(2) would not differentiate two token utterances of the same type in the judgment of speakers *or*
(3) are presumed not to figure in the systematic phonology of the language.

IPA vs. American transcription
There are two commonly used systems of phonetic transcription, the *International Phonetics Association* or IPA system and the *American* system. In many cases these systems overlap, but in certain cases there are important distinctions. Students need to learn both systems and have to be flexible about the use of symbols.

English Vowels

Short vowels /ɪ ɛ æ ʊ ʌ ɝ/

'pit'	pɪt	'put'	pʊt
'pet'	pɛt	'putt'	pʌt
'pat'	pæt	'pert'	pɝt (*or* pɹ̩t)

Long vowels /i(ː), u(ː), ɑ(ː), ɔ(ː)/

'beat'	biːt (*or* bit)	'boot'	buːt (*or* but)
'(ro)bot'	bɑːt (*or* bɑt)	'bought'	bɔːt (*or* bɔt)

Diphthongs /eɪ, aɪ, aʊ, oʊ, ɔɪ, ju(ː)/

'bait'	beɪt	'boat'	boʊt
'bite'	bɑɪt (*or* baɪt)	'bout'	bɑʊt (*or* baʊt)
'Boyd'	bɔɪd (*or* boɪd)	'cute'	kjuːt (*or* kjut)

The property of *length*, denoted by [ː], can be predicted based on the quality of the vowel. For this reason it is quite common to omit the length mark [ː].

Vowel Chart

		front	back	
			central	back
high	tense	i(ː)		u(ː)
	lax	ɪ		ʊ
mid	tense	e	ɝ	o
	lax	ɛ	ʌ	ɔ(ː)
low	lax	æ		ɑ(ː)

Round(ed) vowels*:* u ʊ o ɔ In English the round vowels are all back and non-low.

Tense vs. lax

Conventionally a distinction is made between 'tense' and 'lax' vowels in English, at least for high and mid vowels. The tense vowels, when not part of a diphthong, are phonetically long.

Tense vs. lax distinctions are sometimes held to be inoperative for low vowels. On the other hand, some authors use this property to distinguish a tense form of [æ], often written [ǣ], which appears in Philadelphia English in words such as *mad, bad, glad.*

Central vs. back. The term 'central' vowel is normally used only in phonetic descriptions. From a phonological point of view, central vowels pattern with back vowels. In other words, languages will usually treat central vowels as though they were back vowels, making distinctions between the back vowels by other means, such as tenseness or rounding.

Rhotacized (or rhotic) vowel

American English has in addition an r-colored or 'rhotacized' mid central vowel, usually transcribed /ɝ/ but also sometimes written as a 'syllabic' *r* as /r̩/.

Reduced vowels

In addition to the 'full' vowels above, English also has at least one 'reduced' vowel /ə/ 'schwa'. The symbol /ə/ denotes a vowel whose precise phonetic qualities vary considerably depending on its context: a /ə/ may ultimately be pronounced close to [ɪ] or [ʌ] or [ʊ]. Effectively, it is a vowel which is 'neutral', articulated in a position in which the tongue body is neither raised nor lowered, nor advanced or retracted, except as the requirements of neighboring sounds' articulation may independently require. It is therefore not tremendously important for the purposes of this class to concern yourself with the precise quality of /ə/ when doing transcriptions.

Nevertheless, many speakers do distinguish two varieties of reduced or neutral vowel, a 'lower' /ə/, approximating /ʌ/, and a 'higher' schwa, approximating /ɨ/, and so often transcribed /ɨ/, but also sometimes /ɪ/ instead.

Rose's /roʊzɨz/ Rosa's /roʊzəz/

usually reveals the contrast if a speaker has it. /ɨ/ is a high central non-round vowel.

Some speakers recognize a third type of reduced vowel, a rounded version of /ɨ/ which we can transcribe /ʊ/:

/ˌæbɻəkəˈdæbɻə/	Abracadabra
/ˈbʌtɝˌfɪŋgɝz/	butterfingers
/ˌgɻædʒʊˈeɪʃən/	graduation

Reduced vowels do not have any contrast for tense vs. lax. If necessary they can be considered lax, since they certainly do not behave as tense vowels in any event.

Schwa vs. wedge

Wedge /ʌ/ and schwa /ə/ both denote mid central/back vowels, and for many speakers of American English they are often the same in quality. The normal convention is to use /ə/ for *unstressed* neutral 'uh'-like sounds, and to use /ʌ/ for stressed vowels.

/ˈsoʊfə/	sofa
/ˈkʌntɻi/	country
/kənˈdɪʃən/	condition
/ˈhʌmpti ˈdʌmpti/	Humpty Dumpty

Final vowels

In most dialects of American English the only lax vowels which are permitted at the ends of words are neither high nor front, i.e. /ɔ ɑ ə/.

Final stressless vowels at the end of the word, therefore, also include, aside from the ordinary /ə ɝ/, the tense versions of /ʊ ɪ/, which are /u i/:

/ˈævənu/	*avenue*
/ˈɹɪli/	*really*

Some British English speakers have lax /ɪ/ in this environment, however.

Names of the symbols

ɪ	'small-cap I'	ʊ	'small-cap U'
ɛ	'epsilon'	ɔ	'open O'
æ	'ash'	ɑ	'script A'
ʌ	'wedge'	ɒ	'turned script A' (not used in Amer. English)
ə	'schwa'	ɨ	'barred I'

Stress

The syllable with the greatest amount of stress in a word is said to have (or 'carry') *primary stress.* In English and some other languages words may contain more than one stressed syllable, in which case the syllables which are stressed but do not have primary stress are said to have *secondary stress.* A syllable which has no stress at all is said to be *stressless.*

Stress is sometimes recorded in phonetic transcriptions, but is often omitted if not specifically under discussion. Primary stress is shown by [ˈ] before the stressed syllable and secondary stress by [ˌ].

[ˌtæləˈhæsi]	Tallahassee
[ˌæpəˌlæʧəˈkoʊlə]	Apilachicola
[ˌwɪnəpəˈsɔki]	Winnipesaukee

Vowel terminology

high:	tongue body is raised above its neutral position to or near the maximal extent possible
mid:	highest point of the tongue is at its neutral position
low:	tongue body is lowered below its neutral position to or near the maximal extent possible
front:	highest point of the tongue is in the front region of the mouth
central:	tongue position is neither in the front third nor the back third of the oral cavity, i.e. roughly below the junction of the hard and soft palates.
back:	highest point of the tongue is at the back of the mouth (below the soft palate)
tense:	characterized by relatively more forceful and extreme motion of the articulators
lax:	opposite of tense
rounded:	articulated in a manner involving rounding of the lips
diphthong:	sequence of two perceptibly different vowel sounds within the same syllable

Diphthongs and long vowels

The mid tense vowels [e o] appear as diphthongs [eɪ oʊ] in American English. The full set of long vowels and diphthongs is:

IPA	*American*	*example*
[i] or [iː]	[iy]	beat
[eɪ]	[ey]	bait
[oʊ]	[ow]	boat
[u] or [uː]	[uw]	boot
[aɪ]	[ay]	high
[aʊ]	[aw]	how
[ɔɪ]	[oy]	boy
[ɔ] or [ɔː]	[ɔ]	bought
[ɑ] or [ɑː]	[a]	spa
[ju] or [juː]	[yuw]	beauty

Diphthongs particular to some North American dialects

[æː]	long ash	*can, bad*
[ɔɑ]	diphthongized [ɔ]	*long, talk*
[ʌʊ]	Canadian Raising	*about, mouse*

Length

The property of length is denoted by means of a colon [ː] or by means of a special type of colon with diamond shaped points [ˑ].

Since length of a syllable is not contrastive in English it is permissible to leave length untranscribed. However, if length is transcribed, [iː uː ɑː ɔː] are considered long vowels in English.

Length can also be written by doubling the long segment [aa] or by a length mark (called a 'macron') written above the long segment: [ā].

Half-length is typically not recorded in English broad transcriptions. However, short vowels are typically half-long (a little longer than short) when followed by voiced segments in the same syllable.

broad	*narrow*	
kæp	kʰæp	cap
kæb	kʰæːb	cab

Rhotics.
R-like sounds are called *rhotics* (cf. Greek letter *rho*).

Approximant rhotic. American English rhotics are relatively unusual in that they are not the normal alveolar tap or trilled /r/ found in most languages, rather they are *approximant* (the active articulator *approaches* but does not *touch* a site in the mouth). An approximant rhotic is transcribed with the 'turned r' = / ɹ /.

Retroflection. In addition, many Americans pronounce the approximant rhotic with some degree of *retroflection,* that is, by pulling the tip of the tongue back so it approaches a site behind the alveolar ridge. To indicate retroflection a 'hook' is attached to the symbol. For the retroflex approximant rhotic the symbol is [ɻ].

R-colored (rhotacized) vowels. American English vowels acquire some retroflection before [ɻ]. When a vowel and [ɻ] occur in the same syllable, American English displays 'r-colored' or 'rhotacized' vowels.

/ɝ/ The 'reversed hook epsilon' denotes the 'urr' of American English

/ɪɻ/ → [ɝ]	/ɛɻ/ → [ɝ]	/ʊɻ/ → [ɝ]
fir	*per*	*fur*

British English does not have rhotacized [ɝ] but has a tense mid central [ɜ].

Intervocalic [ɻ]
When [ɻ] occurs between two vowels some speakers of American English distinguish /e æ ɛ/ before the [ɻ] while others pronounce all such sequences as /er/ or /ɛr/ or with a vowel a little higher than /ɛ/ but lower than /e/.

Cary, Mary, fairy
Carrie, Harry, marry
Kerry, merry, ferry

Similar variations are exhited for the back vowels before / ʌ /:

courage
horrible
poor

Practice with vowel transcription (do for next class)

Which words contain high vowels?
bask love groove board hut put pick try women rate Myrtle hound purse carcass

Which words contain mid vowels?
desk ink sunk hot deep doll first plane pack language tort part wart purple

Which words contain low vowels?
tusk space leather raft cough lady enough Asia Otto Paris speak anxious

Which words contain round vowels?
horse dusk quack desk frog pot bounce twilight turtle touch ouch book witness

Which words contain diphthongs?
tortoise down pale tough Mona Donna haul power drought heifer iris

English consonants and glides
voiced segments are in boldface

	1	2	3	4	5	6	7
LABIAL							
bilabial	p **b**	**m**					
labiodental			f **v**				
labial-velar							**w**
CORONAL							
apical dental			θ **ð**				
apical alveolar	t **d**	**n**	s **z**		**ɾ**	**l**	**ɹ**
retroflex							**ɻ**
laminal alveopalatal			**ʃ ʒ**	**ʧ ʤ**			
palatal							**y**
DORSAL							
velar	k **g**	**ŋ**					
LARYNGEAL							h

1 stop (= oral non-continuant = plosive)
2 nasal non-continuant
3 fricative
4 affricate
5 flap
6 lateral approximant
7 central approximant

Note that there is *no difference* between /g/ and /g/! They are typographic variants.

Remarks.

1. **Labial-velars.** The English /w/ is a complex segment, that is, a segment formed by simultaneous articulatory gestures, in this case an approximation of the lips and of the tongue body to the velar region. Some speakers also have a voiceless /ʍ/ counterpart.

2. A **continuant** is any sound produced without complete **oral** tract closure. **Nasals are non-continuants** because air escapes only through the nasal cavity, and is completely prevented from escaping from the mouth by a total oral tract closure. Thus, some consider nasals to be a stype of 'stop', and some use the term *oral stop* or *plosive* is used to denote a non-continuant which is not nasal.

3. A **consonantal segment** is a segment which is produced with a certain degree of oral cavity constriction. *Glide* segments such as /w y/ are technically *not consonantal* because the constriction is 'vocalic', i.e. insufficient to be considered consonantal. Similarly laryngeal segments such as /h ʔ/ are not consonantal either, since they involve no constriction in the oral cavity. To avoid confusion, it is a good idea to say 'consonantal segment' rather than 'consonant' when using this definition. (It is hard not to think of *w y h ʔ*/ as consonants, but they are non-consonantal.)

4. **Alveopalatal** sounds are produced with a constriction behind the alveolar ridge but in front of the hard palate. Thus, *alveopalatals* are *neither alveolars* nor *palatals*. They are called *alveopalatal* only because their articulation is at a site in between these two other sites.

5. **Affricates vs. fricatives.** Affricates are segments produced with two phases of articulation: a *stop* phase and a *release* phase. The *release* phase has something in common with a fricative pronounced at the same place of articulation.

Thus [ʧ] has a release phase somewhat like [ʃ]. Nevertheless *affricates* are *not fricatives*. Be careful to distinguish these two classes in your mind.

Alternative notations

There are two major schools of transcription, American and IPA (Internation Phonetics Association). The IPA has also recently revised its system. One consequence is that you will see a great variety of variation in the symbols used. When in doubt, look to see if any symbols are especially explained (in special notes attached to the source, for example). Or ask me.

American	*IPA*	*older IPA*	*name*
š	ʃ		'esh'
ž	ʒ		
č	ʧ		
ǰ	ʤ		
y	j		'yod'
D	ɾ		'flap'
ɚ	ɝ	ɚ	
ᴜ	ʊ	ɷ	

Use of common symbols to designate less common symbols. In American English /r/ does not occur, but instead /ɹ/ or /ɻ/. But many authors will simply write /r/ for /ɹ/ or /ɻ/ in broad transcription, with the tacit understanding that the symbol /r/ is being used in that context to denote a 'more special' variety of /r/. It is often the case that a more common symbol will be substituted for a less common symbol where, in a certain language, a sound denoted by the less common symbol is the normal 'substitution' for the sound denoted by the more common symbol.

It is also quite common to see /a/ substituting for /ɑ/.

Aspiration and VOT

Aspiration results from a brief interval of time after the release of oral closure before vocal cord vibration begins. Aspiration is a phenomenon of Voice Onset Time (VOT) and is denoted by a superscript /^{h}/ after the segment, i.e. /p^{h} t^{h} k^{h}/

Stops in English are typically aspirated provided that they are (1) word-initial or (2) begin a syllable which has some stress and (3) are not flapped or glottalized. The degree of aspiration (length of VOT) usually corresponds to the stress promenince of the syllable.

/ˈkʰɑp/	cop
/tʰuˈpʰeɪ/	toupée
/tʰɝˌɹænəˈsɔɹəs/	tyrranosaurus

No aspiration occurs when the stop is not at the beginning a syllable (syllable breaks are sometimes denoted by periods):

/ˈstɑp/	stop
/ˈmæ.stɝ.ɹi/	mastery
/ˈspɛ.lɪŋ/	spelling

Flapping

The flap rhotic /ɾ/ appears as a variant of /t d/ between vowels where the following syllable is not stressed. Flapping is an optional process occuring more often in casual speech registers in American English.

/ˈkʰeɪɾi/	Katy
/ˈbɛɾi/	Betty
/ɹiˈæliɾi/	reality

Stress.
Stress, the most abstract of phonological properties, refers to the **relative prominence** of a syllable or segment. For most languages each syllable has a degree of prominence either greater or stronger than its neighbors.

The **phonetic correlates** of stress vary from language to language and also depend on such factors as speech rate and intonation, but usually prominence is expressed through modulation of (1) duration (2) loudness and (3) pitch in some combination.

Relative prominences of syllables are also sometimes modelled by means of a *grid*, a set of columns of marks where the height of each column indicates the prominence of the syllable beneath the column.

```
        x                       x
x       x               x       x
x  x    x               x   x   x
x  x  x x xx            x x x x  x x
ambassadorial           onomotapoeia
```

The syllable with the greatest prominence in a word is said to bear **primary stress**, and syllables of the next lower level of prominence are said to have **secondary stress.**

Stress is transcribed in the IPA by small vertical lines placed directly before the beginning of the stressed syllable (not before the vowel).

Primary stress is a mark above the line; secondary stress is a mark that crosses the line of writing. It is also quite common to mark primary stresses with an acute accent [´] and secondary accents with a grave accent [`].

using spelling when just showing stress

àmbàssadórial *ònomàtopoéia*

transcription with accent marks to show stress

/æmbæ̀sədɔ́ɹiəl/ /ɑ́nəmɑ́ɹəpíə/

transcription with IPA symbols for stress

/ˌæmˌbæsəˈdɔriəl/ /ˌɑnəˌmɑɹəˈpiə/

Labial-velar fricatives

Some speakers of English distinguish a 'wh' sound from a 'w'. The former sound is a voiceless labial-velar fricative /ʍ/, which is distinct from the voiced labial-velar approximant /w/ in that it is not voiced and has more air turbulence.

/weɪɹ/	ware	/weɪl/	wail
/ʍeɪɹ/	where	/ʍeɪl/	whale

Syllabic sonorants

Every syllable has a 'nucleus' or 'head': that part of the syllable where the vocal tract creates the least impedance to air flow. In many languages the nucleus of a syllable must be a vowel, but some languages admit other segments as syllable nuclei.

If necessary (where there is no adjacent vowel), sonorants /l n m r/ can function as the 'head' or 'nucleus' of a syllable in English. When 'syllabic' in this sense, they are transcribed with a small vertical mark underneath called the 'syllabicity mark.'

bubble	/ˈbʌbl̩/
redden	/ˈɹɛdn̩/

Syllabic /ɹ̩/

Syllabic **/ɹ̩/** is identical to the r-colored (rhotacized) schwa **/ɝ/**:

ɹ̩ = ɝ

banner	/ˈbænr̩/ = /ˈbænɝ/

Velarization of [l]

Lateral /l/ in English is **velarized** when in the **rhyme** part of a syllable.

The 'rhyme' is the part of the syllable that two syllables share if they rhyme.

Velarization is a species of **secondary articulation**, that is, a type of secondary gesture by an articulator that accompanies the primary gesture used to form a segment. Velarization involves a **retraction of the tongue body** (i.e. towards the velum). Velarized /l/ is often called the 'dark' /ɬ/ (as opposed to the non-velarized or 'light' /l/.

/mʌɬ/	'mull'
/lʌk/	'luck'
/lʌɬ/	'lull'

Glides vs. High Vowels

Glides /j w/ (= American /y w/) are phonologically the same as the corresponding high vowels /i u/ *except for their syllabic position*.

Specifically, /i u/ are the symbols used when these segments form the nucleus of a syllable. /j w/ are the symbols used when these segments are not the nucleus of the syllable.

Glottalization.

For many speakers of English, vowels are glottalized to varying degrees when preceding a voiceless stop or affricate which ends a syllable.

Glottalization is a constriction of the vocal cords, giving a 'creakiness' to the voice quality, followed in this case, by a glottal closure that precedes the oral closure. This is often symbolized by writing a superscript glottal stop before the triggering obstruent:

/mæˀt/	mat	/noʊˀp/	nope
/bʌˀk/	buck	/glɪˀʧ/	glitch

In some cases, since the glottal closure precedes the oral closure, the effect of the oral closure will be hardly audible. In more extreme cases, the oral closure is not made at all, so that glottal stop may replace an oral stop completely. This is especially common for /t /.

/bʌˀt, bʌʔ/	but	/kʰæˀt, kʰæʔ/	cat
/hɪˀt, hɪt/	hit		

Release

After air is stopped from flowing out of the mouth and nose, the articulators move to again allow the passage of air: this is known as *release*. Release can be *oral* or *nasal* depending on whether air flow resumes out of the mouth or out of the nose. *Oral* release is the normal kind of release. Nasal release occurs in English immediately after a stop before a syllabic nasal and is denoted by a superscript [n]:

button	/bʌˀtⁿn̩/

Practice Transcription.
Transcribe the following words or phrases as you pronounce them in English. Come to class prepared to explain and discuss any unusual issues relating to these words.

mango
maple syrup
ostrich feathers
spinach salad
water fountain
orange and cherry punch
Latin America and the European Union

Identifying segments
In each of the following sets, name the segments which do *not* have the property listed at left:

palatal	ʃ v l j k ŋ ɻ ʧ
labial	f l j m θ p
consonantal	s w u l ɹ ɛ ɝ ð
stop	ð g r l ɑ b z ʤ
voiced	m t ʊ l v θ f ʒ

Further Practice Exercises

1. Fun with the tongue.

a. Stand in front of a mirror at home. Watch your lips as you pronounce the vowels /i ɪ e ɛ æ a ɑ/. Now look as you pronounce /ʊ oʊ ɔ ɪ eɪ ɑ/ as in *soot, low, law, sit, lay, spa*. What do your lips do? Do they move during the pronunciation of any of these vowels/diphthongs? Do they move more or less in any of the words? Try each diphthong in English, stopping in the middle of each. Listen to the sound:

Example: *tray* [tɹeɪ] stop before moving to [ɪ]
Is this the same sound as in *trek?*

try [tɹɑɪ] stop before moving to [ɪ]
Is this the same sound as in *father?*

boy [bɔɪ] stop before moving to [ɪ]
Is this really the same sound as in *caught?*

b. Practice moving gradually through the vowel space:

[i → e → æ → e → i] [u → o → ɔ → o → u]
[æ → a̠ → ɐ → e̠ → a → a̱ → ɑ → ɑ̟ → a → a̟ → ɐ → ɐ̟ → æ]

Note: underline means ‘retracted’ or ‘more back’,
subscript + means ‘advanced’ or ‘more fronted’

Try stopping at different points, listening to the subtle differences.

c. Hold your tongue still and round and unround your lips

[i → y → i] [ɪ → ʏ → ʏ] [u → ɯ → u]
[e → ø → e] [ɛ → œ → ɛ] [o → ɤ → o]
[æ → ɶ → æ] [ɑ → ɒ → ɑ]

d. Pronounce *her, cur, fur*

American accent: /hɜˑ kɜˑ fɜˑ/
British accent: /hɜ kɜ fɜ/

e. Now practice keeping lips in same position, moving only tongue:

[i → ɨ → ɯ → ɨ → i]
[u → ʉ → y → ʉ → u]
[ʊ → ʏ → ʊ] [œ → ɔ → œ]
[o → ɵ → ø → ɵ → o]