

English Phonetics

English Sonorants

- we can divide English consonants into two subgroups, *obstruents* and *sonorants*
- *obstruents* are consonants that are formed by obstructing the airflow, causing increased air pressure in the vocal tract
- *sonorants* involve no turbulent airflow in the vocal tract
- the English sonorant consonants include the nasals, liquids, and approximants

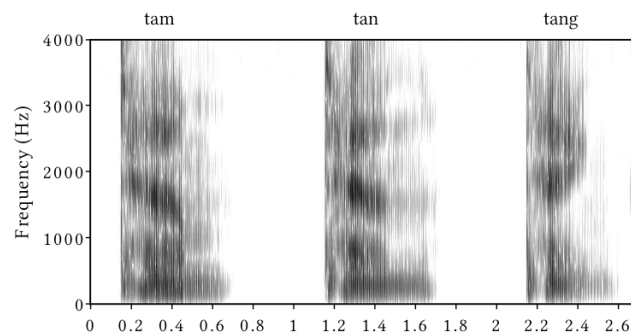
Nasals	m	n	ŋ
Liquids	rhotics	r	ɹ
	laterals	l	ɫ
Semivowels	w		j
	ʌ		

Nasal Stops

- nasals involve a closure in the oral cavity
- lowering of the velum to allow air to pass through the nasal cavity
- since they interrupt the flow of air in the oral cavity, they are often referred to as 'nasal stops'
- not considered plosives
- there are three main English nasal stops: the bilabial nasal [m], alveolar nasal [n], and velar nasal [ŋ]
- other nasal consonants may arise due to assimilation to adjacent consonants
- the nasal in the words *emphasis* or *invite* is often closer to a labiodental nasal [ɱ], since it anticipates the following labiodental fricative [f] or [v]

Acoustic Correlates of Nasals

- nasals involve a heavy voicing bar demonstrating their voicing
- in addition, they have formants like vowels, although they are somewhat lighter
- the nasal is also less prominent on the waveform, although still more than an obstruent
- these properties appear in either onset or coda position
- the individual place of articulation of the nasal is indicated by the adjacent vowel formants
- [m] shows a fairly level F1 with a downward sloping F2
- [n] shows a downward slope for both F1 and F2
- [ŋ] shows an upward direction for F2 and a downward direction for F3 (=velar pinch)

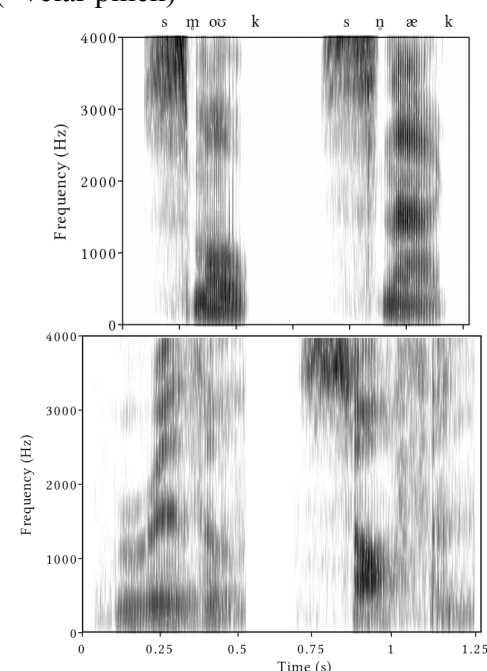


Partial Devoicing

- nasals may be devoiced when following [s]
- this appears in the spectrogram as a reduction in the intensity of the formants for the nasal
- they are short and show only a faint trace of a voicing bar
- virtually no indication of higher formants
- this indicates that they are devoiced

Syllabic Nasals

- nasals may also appear as the head of the syllable, like a vowel
- they show similar properties to vowels, including movement in their formants to reflect adjacent consonants
- note the downward trend of the F2 formant at the end of *rhythm*



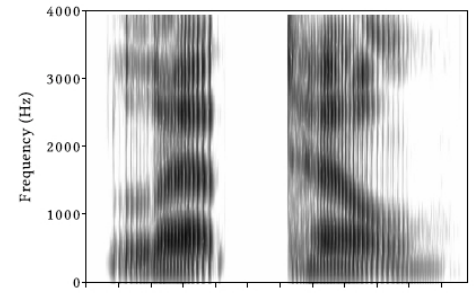
Laterals

- Laterals are sonorant consonants that involve an airflow around one or both sides of the tongue
- in English, there are two main lateral consonants phonetically: one occurs in the onset of the syllable, [l]
- the other occurs in the end of the syllable, [ɫ], sometimes referred to as 'dark l' or 'velarized l'
- /l/ is a difficult sound to make as attested by its relatively late acquisition by children, the average age for complete mastery being around 6 years of age

Acoustic Correlates of Laterals

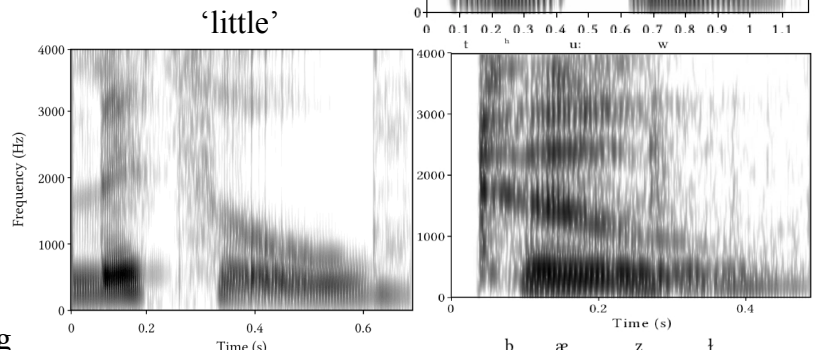
- The basic alveolar lateral approximant [l] has the average formant frequencies provided in the table taken from Dalston (1975)
- [l] has a formant frequency for F1 of around 350 Hz
- F2 is around 1100 Hz
- the effects of velarization are clear in the [ɫ] in 'tell'
- the transition from the vowel [ɛ] to [ɫ] resembles that of a diphthong

	F ₁	F ₂	F ₃
Men	344	1179	2523
Women	365	1340	2935
Children	412	1384	3541



Strong Velarization

- in certain dialects, the velarized [ɫ] can be realized as strong velarization, i.e., [w]
- compare the last syllable in the spectrogram for *little* with the analysis of the word *two*
- the [ɫ] appears to lose all of its lateral qualities and becomes a [w] in such dialects

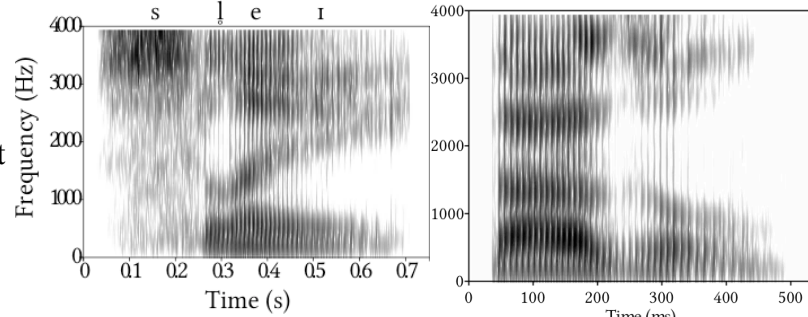


Devoicing

- the alveolar lateral approximant is subject to devoicing just like the nasals
- it appears as a short segment with less voicing

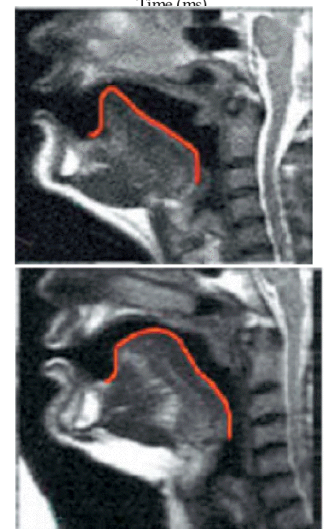
Syllabic Laterals

- laterals may also appear as the syllabic head
- they show similar properties to vowels, including movement in their formants to reflect adjacent consonants
- note the downward trend of the F2 formant at the end of the word *basil*



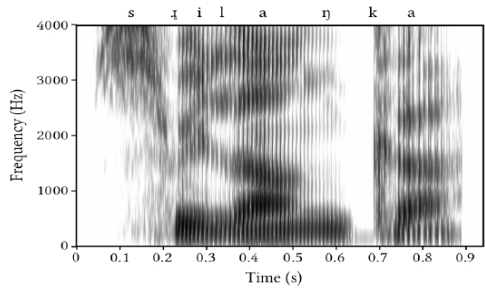
Rhotics

- there is only one /r/ phoneme in English, but there are several different r-sounds
- the first rhotic is the basic form, [ɹ], found in onsets and codas
- it is a rather complex sound, made in several possible ways
- it is one of the last sounds to be acquired by children due to its complexity
- the age of full acquisition is considered to be around six years
- the English /r/ has been studied by a number of phoneticians
- Zhou et al (2007) examine the two principal means of producing the English [ɹ]: with a retroflex or a bunched tongue position
- MRI scans of speakers producing the different r's can be used to study these
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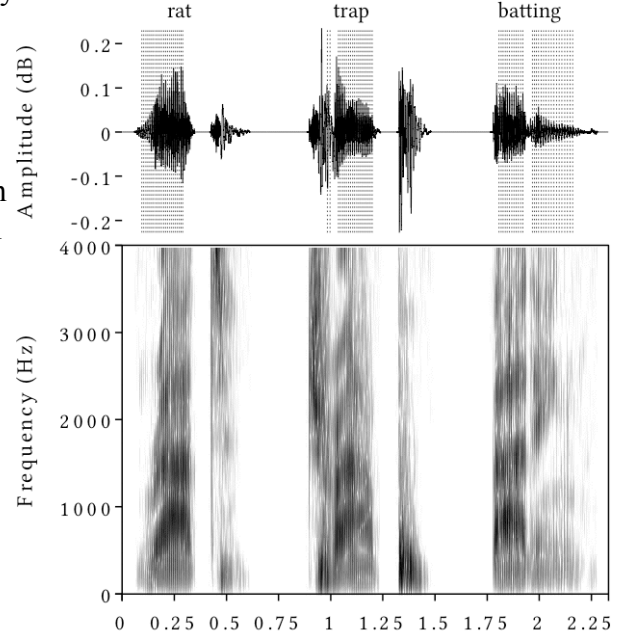


Acoustic Correlates of Rhotics

- The basic alveolar rhotic approximant [ɹ] has the average formant frequencies provided in Dalston (1975)
- Note in particular the rather low F3, as compared with that of the alveolar lateral approximant
- the most obvious acoustic characteristic of this [ɹ] is the very low F2 and F3: F3 is around 1600 Hz
- the second English rhotic variant is a voiceless [ɹ̥]
- this is found following voiceless aspirated plosives, such as in the words *tray* or *pry*
- the third variant is the alveolar flap [ɾ], found in NA English when /t/ or /d/ occurs between a stressed vowel and a vowel
- English /r/ is also subject to devoicing when following [s]
- it is particularly rare for /r/ to follow [s] or any other sound besides the plosives.
- nevertheless, it is clear from this spectrogram (from about 180-245ms) that the [ɹ] is both short and has very weak voicing and formants

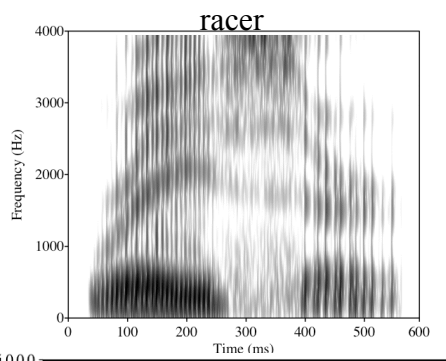


	F ₁	F ₂	F ₃
Men	348	1061	1546
Women	350	1065	2078
Children	431	1503	2491



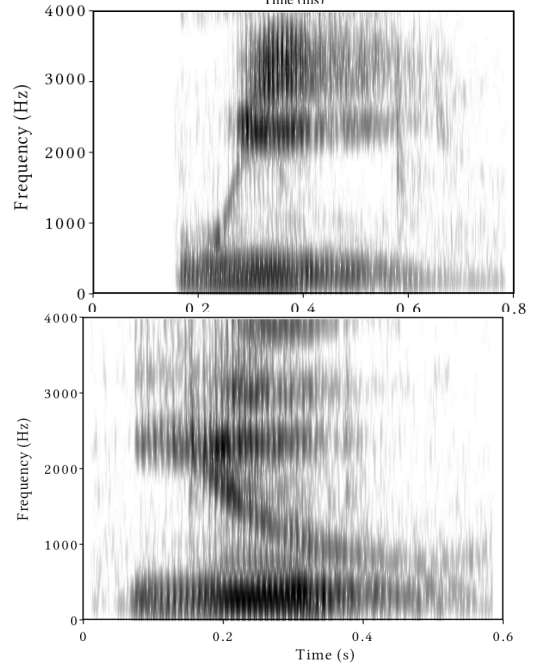
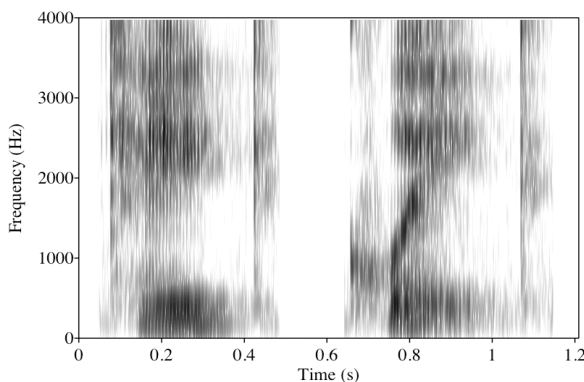
Syllabic Rhotics

- it is also possible to have syllabic rhotics in English
- for instance, the final [ɹ̩] in *racer* or *laser* is syllabic
- one can see the formants at the end of the word
- F1 at 440 Hz and F2 at 1500Hz

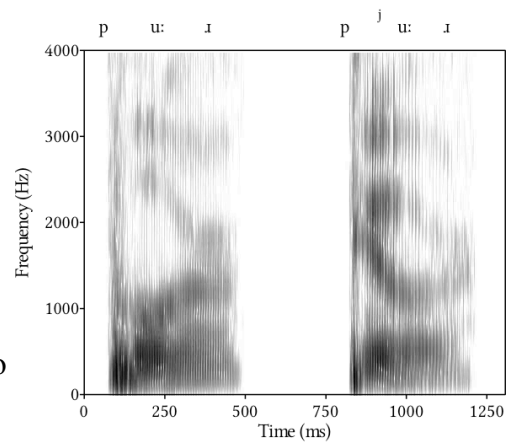


Semivowels

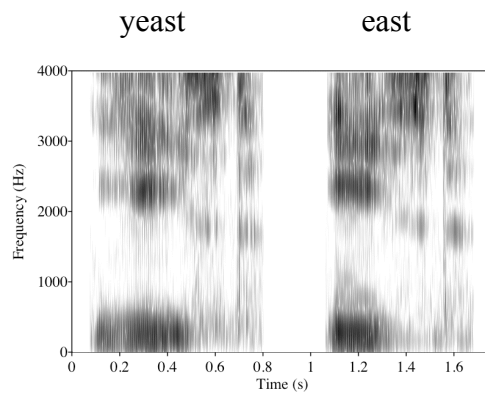
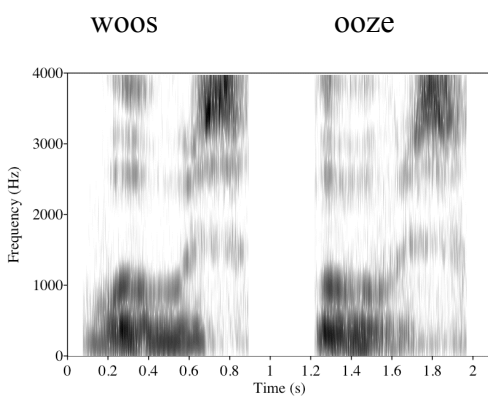
- [w] and [j] are semivowels, also known as 'glides'
- they are approximant consonants sharing many of the qualities of the vowels [u] and [i], respectively
- they may occur alone, as in the words *we* or *you* or together with certain consonants
- compare *cake* and *quake*: the latter has a [w] modifying the [k]:



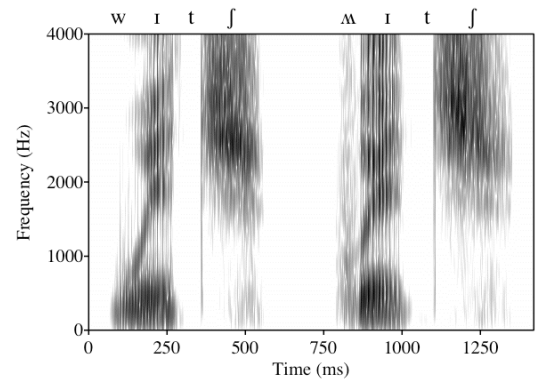
- OR *poor* and *pure*, where [p] is supplemented by [j] in *pure*



- Semivowels are acquired early by children and typically pose no problems for second language learners, except perhaps in one special context
- semivowels may co-occur with their corresponding vowels in English, but not in Korean
- compare English *woos* and *ooze* or *yeast* and *east*



- this poses a distinct problem for Korean learners of English, since this contrast does not exist in Korean
- the voiceless labiovelar fricative [ɱ] is not an approximant
- it share many features with [w] and is lexically contrastive for some speakers
- this sound, represented in the IPA by [ɱ], is found in only a handful of forms, even in those dialects that have it
- it is not widely attested but does distinguish certain minimal pairs such as *witch* and *which* in those dialects that have it
- there is some disagreement about the status of [ɱ], given that it appears to be more a fricative with rounding than a labiovelar approximant without voicing



Acoustic Correlates of Semivowels

- the acoustic correlates of the semivowels share many properties with the corresponding vowels
- compare the average formants for [w], from Dalston (1975), and those for the English vowel [u] from Peterson and Barney (1952)
- the averages for [j] and [i] would be similar

	[w]			[u]		
	F ₁	F ₂	F ₃	F ₁	F ₂	F ₃
Men	336	732	2290	300	870	2240
Women	337	799	2768	370	950	2670
Children	402	1020	3547	430	1170	3260