Syllables and Phonotactics

Ling 110 Guest Lecture

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Syllables, Phonotactics, and your course project

- Being able to describe the syllable structure and phonotactics of a language may be relevant to sections 4 and 5 of your course project.

- Section 4, Prosody. Syllables are often relevant for understanding systems of stress placement and tone restrictions (Do certain types of syllables attract stress, or disallow certain tones?)

- Section 5, Phonology. Often phonological rules (which we'll see more examples of later in the week) are sensitive to syllable structure, for example, a rule may apply only in syllable codas but not onsets, etc.

What is a syllable?

- Let's consult the textbook first which provides us with a satisfactory definition of the syllable:

- "A unit of speech for which there is no satisfactory definition. Syllables seem to be necessary units in the mental organization and production of utterances." (Ladefoged & Johnson pg. 318).

- Syllables are something that most people seem to agree exist but are hard to define.

- If there is no easy way to define syllables then will this prove to be a useful concept to talk about?

Phonetic Definitions of the Syllable

▶ Now that that is clear (not really), we can start with a purely phonetic description of the syllable: "One possible theory is that peaks of syllabicity coincide with peaks of sonority" (pg. 214).

▶ What are peaks of sonority? Recall the sonority hierarchy from last week's lecture. More sonorant sounds will be higher in amplitude.

▶ Phonetically speaking (not necessarily in terms of phonological features):

▶ low vowels > high vowels > approximants > liquids > nasals > voiced fricatives > voiceless fricatives > voiced stops > voiceless stops

- This chart from ACIP show the relative sonorities of different English sounds. Notice how much acoustic energy voicing and sonority adds.

Figure 10.1 The relative sonority of a number of the sounds of English.

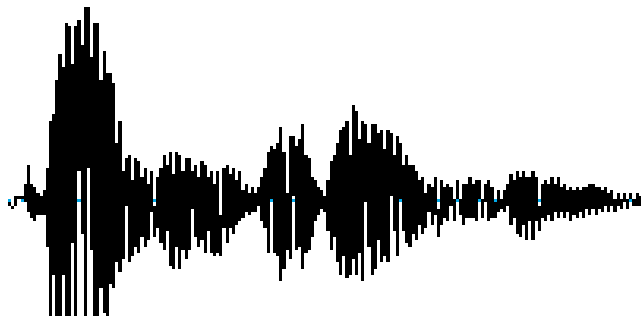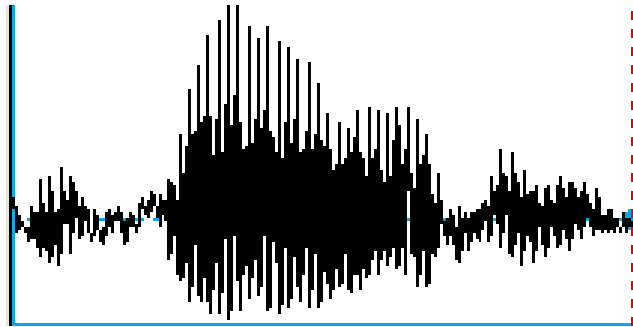sonority

ɑ æ ɛ ɪ u i l n m z v s ʃ d t k
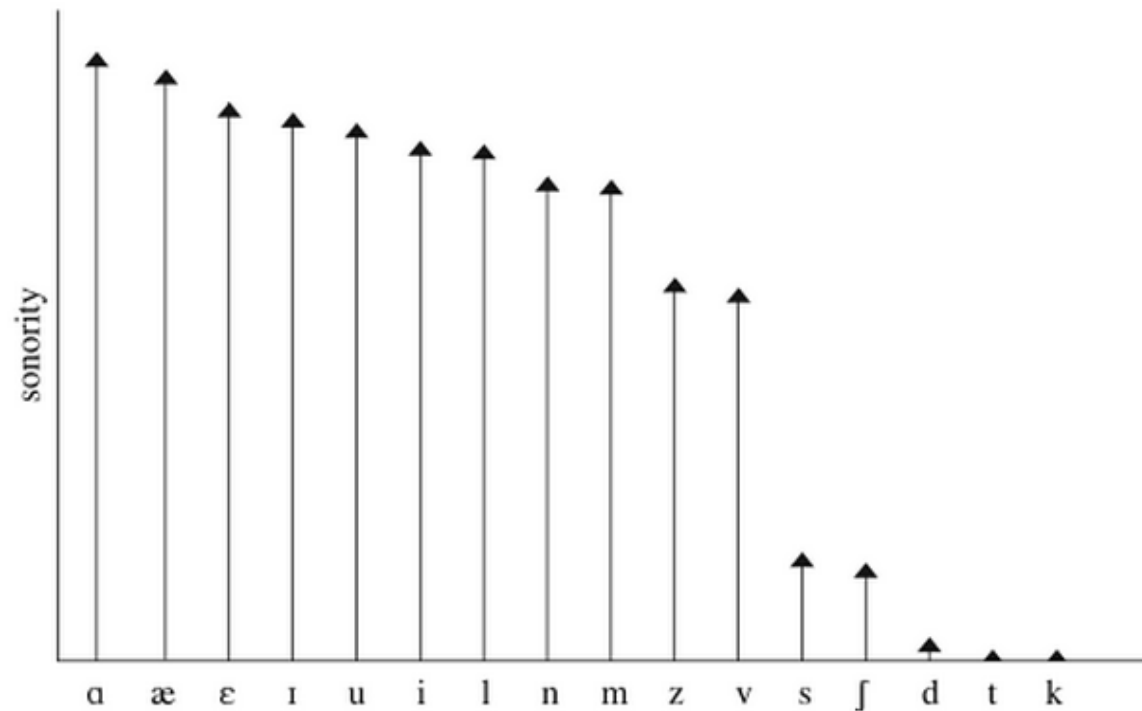
Syllables as Peaks in Sonority

▶ Let's test out our phonetic definition of syllables, that they coincide with peaks in sonority. This will essentially mean that at the point when the amplitude switches from decreasing to increasing, that we are at a syllable boundary.

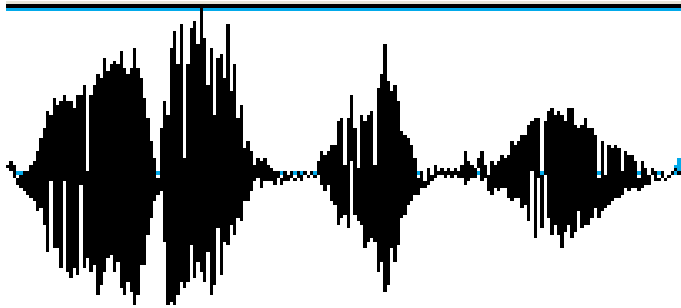▶ Amplitude can be seen in the waveform. Thus we might expect something like this:
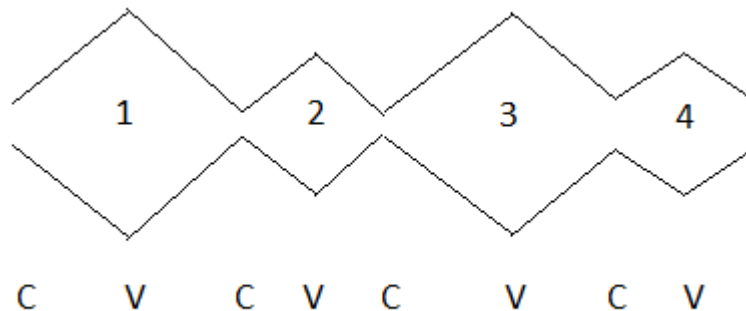
Syllables as seen in waveforms

Sometimes less clear---how many syllables does this word have?

Syllables in waveforms

What about this one?

- Sonority or prominence peaks seem to play a role but this theory of syllables doesn't always work.

- "Ideal" syllables follow the *sonority sequencing principle* where syllables begin with low sonority sounds, become more sonorous, such as usually having a vowel nucleus, and then may only end in less sonorous sounds. For example: 'plant,' or 'trust.'
- What about 'sixths' then? Some have also suggested that syllables may be stored units in motor planning.

Syllables in Phonology

▶ Let's consider now syllables from a phonological point of view where they are most abstract units of organization. Do we need to include syllables in this discussion?

▶ Chomsky & Halle's *Sound Pattern of English* (1968) didn't define the syllable. Words were considered to be strings of segments, and one may manage to describe phonological patterns without them.

Syllables in Phonology

- Without referring to syllables, how might we describe why we can't say 'knee' as [kni] but 'acne' as [ækni] is fine?

- What about the patterning of clear [l] vs. dark [ɫ] l?

- Consider how /l/ patterns in the following words:

- 'bowl'   'ebola'   'love'   'polka'

- [bɔ(ɫ)]   [ibɔlə]   [lʌv]   [pɔ(ɫ)kə]

- Without referring to syllables we would have to give a complex environment:

    /l/ > [ɫ] (or Ø) / _C   OR   _#

- (/l/ surfaces as [ɫ] (or Ø) at the end of a word or before a consonant)

Syllables in Phonology

▶ This complex environment--- before a word boundary (#) or a consonant (C) is very common cross-linguistically. But how do we capture the unity of these environments?

▶ This can be done by referring to syllables. Both "before a C" and "before a #" are both the *coda* position (final consonant) within syllables.

▶ Thus: /bɔl/   CVC

              /pɔl.kə/   CVC.CV

  vs.   /i.bɔ.lə/   V.CV.CV

              /lʌv/   CVC

Syllable Structure

▶ Syllables may begin with an *onset* (ω) which is an initial consonant. All languages optionally allow onsets, some require them.

▶ Syllables are usually required to have a nucleus (v) which is usually what grants a string of sounds syllablehood. This is most commonly a vowel or sonorant segment.

Syllable Structure

▶ Final consonants within a syllable but occurring after the nucleus are in the *coda* (κ). Some languages may not allow any coda segments, and only CV syllables are allowed.

▶ The nucleus and coda together are referred to as the *rhyme*.

σ

O

R

N

C

C

V

C

k

.æ

t
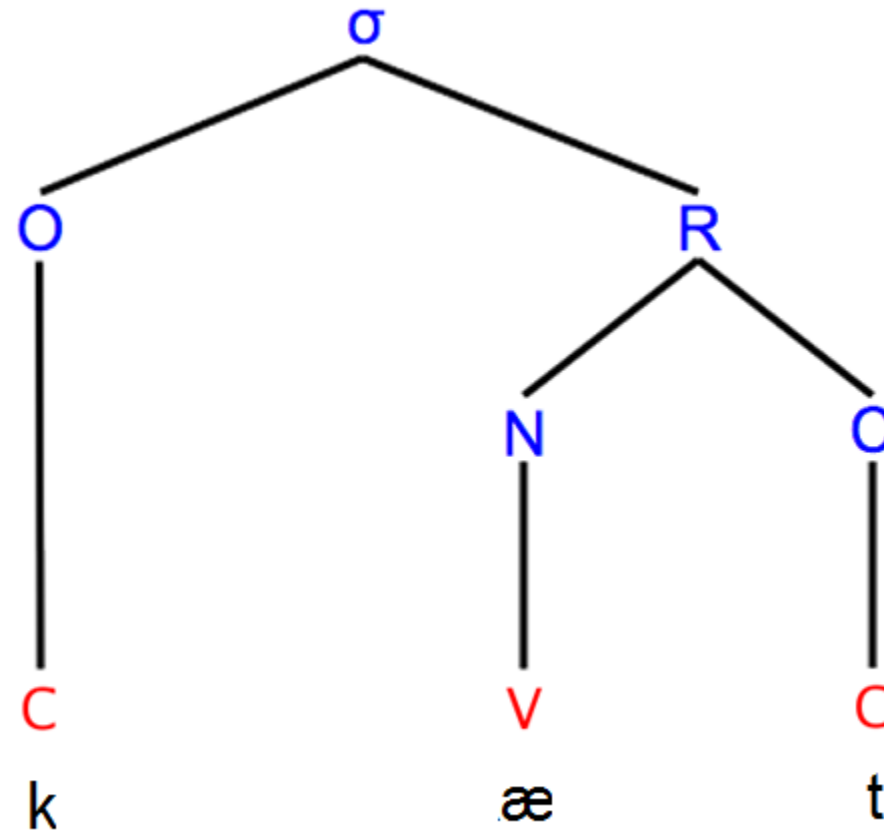
Syllabification and the Maximum Onset Principle

- How do we decide how to analyze certain segments that might be ambiguous with respect to their syllable position? For example, the /l/'s in 'ebola' or 'polka' or the /pl/ in 'diploma'?

- The *Maximum Onset Principle* states that intervocalic consonants should be considered onsets first if possible as long there is no violation of the sonority hierarchy. That is, there is a preference for consonants to be onsets rather than codas.

- Thus: /e.bo.la/ not /e.bol.a/ (or /eb.ol.a/); /pol.ka/ not /po.lka/ (because this would violate the sonority hierarchy) or /polk.a/; /di.plo.ma/ not /dip.lo.ma/ or /dipl.om.a/

Application - Koryak

▶ Now let's apply our knowledge of syllables to understand an example from the Koryak language of Siberia.

▶ Koryak allows only V, VC, CV, and CVC syllables (no consonant clusters).

▶ Underlying word forms may consist of strings of syllables with no vowels. But schwa segments must be inserted to adhere to the allowable syllable types.

Application - Koryak

▶ The underlying form then of 'I ask him' is said to be /t-pŋlo-n/.

▶ To break up the consonants here, schwa [ə] is inserted. So the output then is: [təp.ŋə.lon]. MOP rules out [ət.pəŋ.lon], and Koryak's syllable structure rules out possibilities like [tpəŋ.lon] or [təp.ŋlon].

▶ /mt-pŋlo-n/ -> [mət.pəŋ.lon]

▶ /na-pŋlo-n] -> [nap.ŋə.lon]

▶ Again, being able to refer to syllable structure makes for a more elegant description as to why two consonants can occur next to each other word internally, but not at the beginning or end of a word.

Syllable Types and Phonotactics

- Phonotactics deals with the rules and restrictions languages have for what strings of segments are permissible.

- Crosslinguistically, different languages have different requirements for what types of syllables are allowed.

- CV is considered the most basic syllable type and is allowed in every language.

Syllable Types

- Syllables with no coda are referred to as *open syllables*. (so V, CV, CCV, CCCV, etc.)

- Syllables *with* a coda are referred to as *closed* syllables. (so VC, CVC, VCC, CCVC, etc.)

- For processes like stress and tone, these might be sensitive to syllables of different "weights." Having a coda or a long vowel usually makes a syllables heavier.

- Weight implicational hierarchy: CV < CVC < CVV

Syllable Types Crosslinguistically

▶ Most languages have constraints on what syllable types are allowed.

▶ Some languages may only allow V and CV syllables, such as Hawai'ian:
   u.ke.le.le   pa.ho.e.ho.e
   hu.mu.hu.mu.nu.ku.nu.ku.a:.pu.a.ʔa

▶ Some languages can have long consonants clusters in onsets or codas. Itel'men (Siberia):
   tksxqzukitʧen 'I wanted to eat'   ktwelʲknen 'he brought it'
   ktimplʲx 'bring it'   k'anjʧpx 'teach him'

▶   Maximum syllable in English: CCCVCC[+ coronals]

Onset and Coda Restrictions

▶ In addition to restricting the syllable types, languages may restrict what segments are permitted in different parts of the syllable.

▶ Typically only non-syllabic consonants occur in onsets and codas.

▶ Languages tend to allow most of their consonant segments in onsets while codas may be quite restricted.

▶ This may occur because phonetic cues are harder to hear in cues, especially if the sounds are unreleased.

▶ So for example, ancient Greek onset consonants could include:

/p t k b d g p^h t^h k^h m n l r s z h/….

but in codas, only /s n/ are allowed

Phonotactics in Han Athabascan

	labial		dental		lateral	alveolar	retroflex	palatal	velar	glottal
voiced	<b> /b/[2]		<d> /d/[3]					<j> /dʒ/[3]		
plain			<d> /d/	<ddh> /dð/	<dl> /dɬ/	<dz> /dᶻ/	<dr> /dʳ/	<j> /ǰ/	<g> /g/	<'> /ʔ/
aspirated			<t> /t/	<tth> /tθ/	<tl> /tɬ/	<ts> /tˢ/	<tr> /tʳ/	<ch> /č/	<k> /k/	
ejectives			<t'> /t'/	<tth'> /tθ'/	<tl'> /tɬ'/	<ts'> /tˢ'/	<tr'> /tʳ'/	<ch'> /č'/	<k'> /k'/	
voiceless fric.			<th> /θ/		<ł> /ɬ/	<s> /s/	<sr> /sʳ/	<sh> /š/	<kh> /x/	<h> /h/
voiced fric.			<dh> /ð/		<l> /l/[4]	<z> /z/	<zr> /zʳ/	<zh> /ž/	<gh> /ɣ/	
voiced sonorants[1]	<w, -ww> /w/[2]	<m> /m/[2]	<n, -nn (-n)> /n/[3]		<l, -ll (-l)[4]> /l/		<r, -rr (-r)> /r/	<y, -yy (-y)> /j/	<ng> /ŋ/	
voiceless sonorants[1]	<hw, -wh> /w̥/		<-n (-nh)> /n̥/		<-l (-lh)> /l̥/		<-r (-rh)> /ɬ̥/	<-y (-yh)> /j̥/		

- Only the brown sounds occur both in onsets and codas; the green ones occur only in codas and the blue/gray ones occur only in onsets (34 to 16)

Nucleus Restrictions

▶ Vowels can be nuclei in all languages. Typically most vowels are allowed in open syllables while mergers may occur in close syllables or before certain consonants (somewhat the reverse in English).

▶ Some languages allow other sonorants (liquids, glides, nasals) to be syllable nuclei.

▶ In a few languages, obstruents such as fricatives and even stops can be syllable nuclei (or are nuclei not required in syllables?)

▶ The division of what is allowed as a syllable nucleus typically occurs somewhere on the syllable hierarchy.

▶ vowels > (approximants) > liquids > nasals > voiced fricatives > voiceless fricatives > voiced stops > voiceless stops

Rare Nucleus Segments

▶ Some languages allow nuclei with less sonorant or more constricted nuclei

▶ Mambila language (Nigeria, Bantoid). "Fricative vowels," something Matt Faytak studies

▶ /bz̩˥/ 'ask'

▶ /kɣʉ̃˥/ 'cut'

▶ True fricatives and stops may even be acceptable nuclei, yielding complex consonant clusters

Nucleus Restrictions

- Wakashan Languages – Bella Coola (British Columbia)

- [xɬp'xʷɬtɬpɬɬs] 'he had in his possession a bunchberry plant'

- Berber (North Africa)

- tftχtstt "you rolled it (fem)

- More Berber examples on right

Sequences of two voiceless obstruents :

ks	"feed on"
fk	"give"

Sequences of three voiceless obstruents :

kst	"feed it on"
kt	"give it"
kks	"take off"
sχf	"fade away"
ftħ	"operate"

Sequences of four voiceless obstruents :

tftħ	"she operated"
tkʃf	"it is dirty"
tfss	"she is quiet"
fqqs	"irritate"

Sequences of five voiceless obstruents :

tʃtft	"you crushed"
tkkst	"you took off"
!tχtft[3]	"you stole"
kkstt	"take it off (fem)"
tfsχt	"you cancelled"
tqssf	"it shrunk (fem)"

Sequences of six voiceless obstruents and more :

sfqqst	"irritate him"
tfktstt	"you gave it"
tsskʃft	"you made it dirty"
tkkststt	"you took it off (fem)"
tftktstt	"you sprained it (fem)"
tftχtstt	"you rolled it (fem)"

Salish Consonant Clusters

- Long strings of fricatives are permitted. Syllabification not always clear.

- Looking again at Bella Coola, [xɬp'χʷɬtɬpɬɬs]--- is this one syllable, lots of syllables with fricative nuclei, or are syllables totally irrelevant for examples like these?

A few other things --- syllables or strings?

▶ Some have argued (Blevins 2003) that the syllable may not be a universal unit of segmental organization, and that some languages only consider the segmental string.

▶ Recall (such as in Koryak) that it is frequent that languages may only allow consonant clusters intervocalically, but not finally--- CV**CC**V vs. CV**CC**. This is because we can analyze the first one as being split into two syllables, CVC.CV where there is only one consonant in each onset and coda, but two in the coda in CVCC.

▶ However, some languages like Lenakel allow CC onsets and clusters, but medial CCC clusters are not allowed, even though they might be if syllabified as CVC.CCV. Thus the constraint here might be *CCC (no sequences of three consonants allowed).

A few other things--- ambisyllabicity

- Recall the Maximum Onset Principle, stating that intervocalic consonants should be analyzed as onsets of the following syllable.

- Recall also the patterning of /l/ in English which seems to support this.

- At the same time, the patterning of tense vs. lax vowels may suggest otherwise.

- Now recall that while tense vowels can occur about anywhere, lax vowels can only occur in closed syllables, thus /pɛt/ or /pɪt/ are fine but not /pɛ/ or /pɪ/.

A few other things--- ambisyllabicity

▶ However, medial consonants in English can act like codas in that they license lax vowels:

▶ 'penny' 'pity' 'packing,' etc.   /pɛni/ /pɪri/ /pækɪŋ/

▶ These intervocalic consonants are thus often analyzed as being "ambisyllabic" where there is a single consonant that is both the coda of the preceding syllable but the onset of the following syllable.
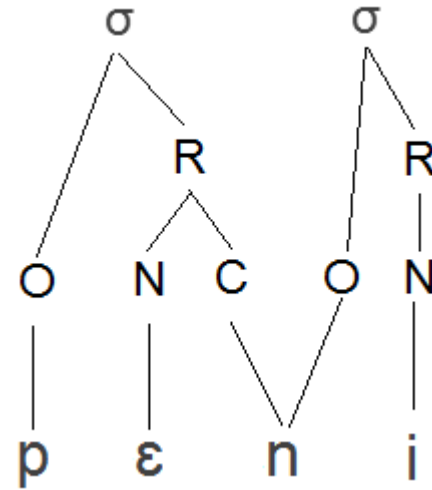
Conclusion

- Syllables may be rooted in phonetics, in that they generally follow patterns of sonority peaks. But they are more complex that than, and are abstract organizational units.

- Nevertheless, the phonotactics and other phonological rules of languages are often sensitive to aspects of syllable structure.

- Thus, syllables are often a useful concept for describing languages despite the unanswered questions we still have about them.