Intermediate Phonology

Part 4: Moras, weight and time slots

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2. Segmental allophonies
3. Syllables
4. **Moras, weight and time slots**

5. Feet and lexical stress
6. Prosodic words
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8. Tones and intonation

Tense and lax vowels in English

English distinguishes tense and lax vowels:

	tense	lax	
bee, beat	/i/	/ɪ/	*bit*
bay, bait	/e/	/ɛ/	bet
Shah, father	/ɑ/	/a,æ/	Sam, bat
show, boat	/o/	/ɔ/	bought
shoe, pool	/u/	/ʊ/	foot

Tense vowels occupy more place in the syllable than lax ones: they are long when stressed. Diphthongs pattern with tense vowels: they all occupy two positions in the rime, while lax vowels occupy only one position. Lax vowels are always short.

Tense and lax vowels in English

The rime (nucleus + coda) has maximally three positions: VVC or VCC

The distinction among the vowels plays a crucial role for the number of segments that the rime can have:

if the vowel is tense or if it is a diphthong (VV), only one consonant is allowed in the coda.

If the vowel is lax (V), two consonants are fine:

VVC	VCC	*VVCC
lean [li:n]	film [fɪlm]	*[film]
hide [haɪ̯d]	clamp [klamp]	*[klaɪ̯mp]

The appendical segments do not count: *claims* is okay because [z] is an appendix and does not count for the number of segments in the core syllable. It does not add any weight to the syllable. The same applies to [t] in *winced* or [z] in *hides*.

Giegerich, Heinz J. 1992. *English Phonology.* Cambridge. Cambridge University Press.

CV positions

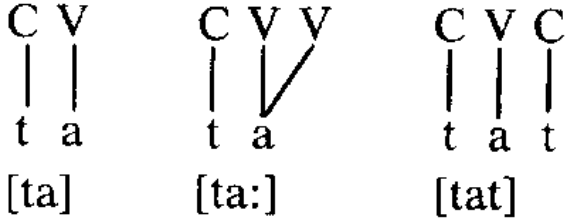
It is often assumed that the constituents of syllables are not represented directly on the segments, but that there is a level of representation between segments an syllable node.

Several proposals in the literature account for the length or weight of segments and syllables:

CV positions, X-positions, moras.

Clements & Keyser (1983): CV positions, where C is [–syllabic] and V is [+syllabic]. CV positions are realized when they are associated with a segment or with any phonetic content. Only [+syllabic] segments can be nucleus, which implies that syllabic sonorants in *rhythm* and *meter* are [+syllabic] . A short vowel takes on position and a long vowel takes two V positions.

a. *CV Theory*



Clements, George N. & Samuel J. Keyser. 1983. *CV Phonology. A Generative Theory of the Syllable*. Cambridge, Massachusetts: MIT Press.

CV positions

CV positions are excellent for the representation of ghost segments (also called “floating segments”): these segments are sometimes realized and sometimes not, depending on the context.

Liaison in French: word-final ghost segments are realized when they function as onsets of following vowel-initial words.

/pəti<t> gaʁsõ/ → [pəti gaʁsõ]

```
   σ  σ        σ     σ
  /|  /|       /|\    /|
 C V C V  C   C V C  C V
 | | | |  |   | | |  | |
[p ə t i <t>g a ʁ  s õ]
```

petit garçon ‘little boy’

ghost [t] is not realized, even though it is associated with C

/pəti<t> ami/ → [pəti.ta.mi]

```
  σ    σ    σ   σ
 /|   /|   /|  /|
C V C V C V C V
| | | | | | | |
p ə t i t a m i
```

petit ami ‘boyfriend’, literally ‘little friend’

ghost [t] is realized as an onset of the following word-initial vowel

CV positions

Greek also has *liaison:*

την [tin] ‘the’, μην [min] ‘neg.’ and δεν [ðen] ‘neg.’ have a ghost [n], not pronounced in the following words:

τη λέξη	/ti 'leksi/	→ [tiléksi]	‘the word’
μη με λυπάσαι	/mi me lipáse/	→[mimelipáse]	‘don’t pity me’

(See Presentation 2 for more examples)

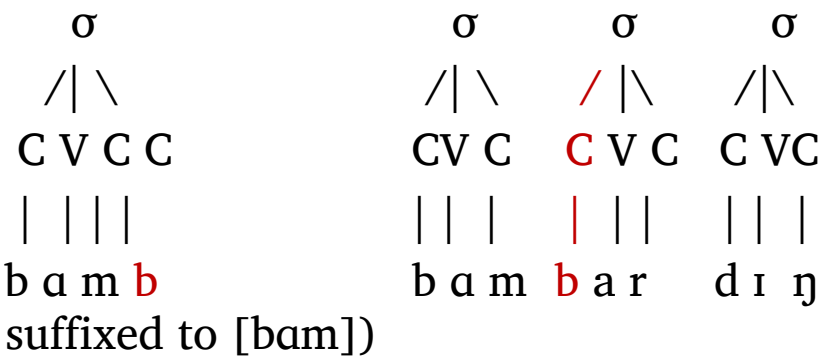
Ghost /n/ is pronounced in the following contexts: when it is followed by a vowel, and optionally when it is followed by a voiced stop:

την τιμησαν /tin tímisan/	→[ti(n)dímisan]	‘they honoured her’	
δεν πειράζει /ðen pirázi[	→ [ðe(m)birázi]	‘it doesn't matter’	*[ðen piˈrazi]
μην πατε /min páte/	→ [mi(m)báte]	‘don’t go’	

CV positions

In English, compare *bomb* where the final [b] is not realized with *bombarding* where it is. The final [b] of *bomb* is part of the underlying representation of this word, but it does not always emerge. In word-final position, when it is a coda, it is deleted because of a constraint against such consonant cluster *[mb]$_{\sigma}$, also *[ŋg]$_{\sigma}$

When [b] is an onset, as in *bombarding*, nothing blocks its pronunciation: it is faithful to its input.



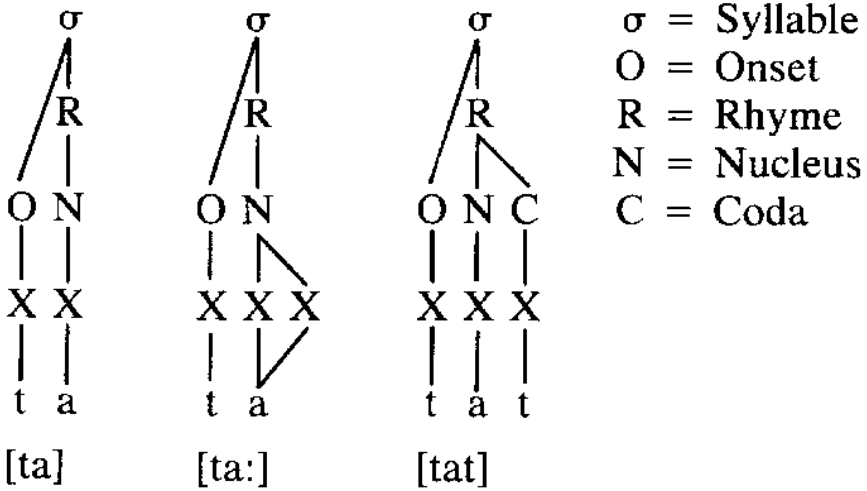
(but *bombing* [bɑmɪŋ] where *-ing* is suffixed to [bɑm])

Ghost or floating segments (or features) exist in many languages. They are realized when needed by the phonotactic principles of the language under consideration.

Skeletal tiers (X positions)

Levin (1985): X positions make no difference between vowels and consonants, each segment is a X position in a syllable structure. The syllable structure is represented above the X positions. Branching at different levels matters.

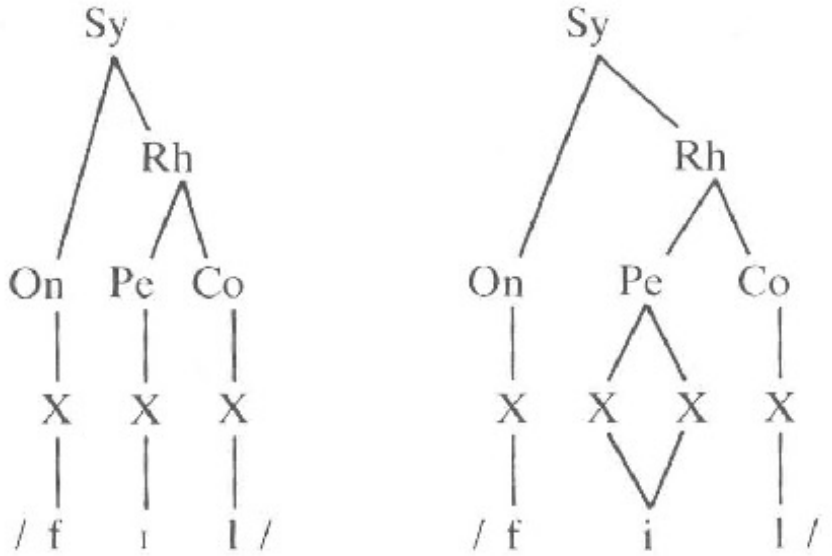
b. *X Theory*



Levin, Juliette 1985. *A metrical theory of syllabicity*. Doctoral dissertation. Cambridge Massachusetts: MIT.

X-positions in English

Short and lax vowels are associated with one X-position in the syllable
Long and tense vowels are associated with two X-positions in the syllable.
In *fill* the peak does not branch, but it does in *feel.*

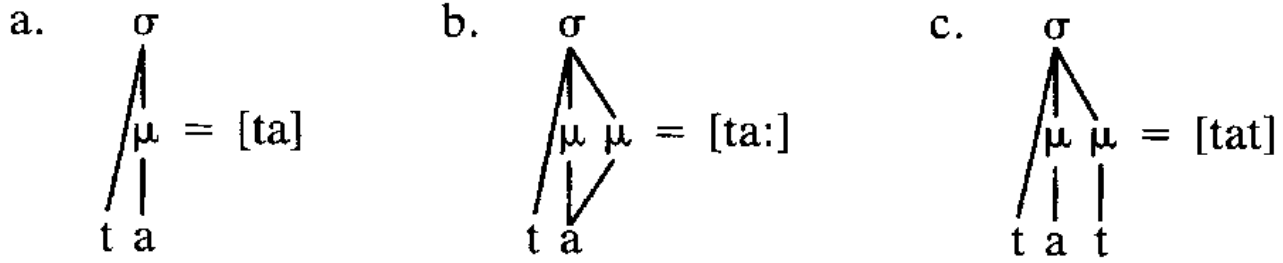


X positions, as CV positions, assign position to the onset, nucleus and coda, and are unable to account for the weight difference between onsets and rime: an onset can also branch.

Giegerich, Heinz J. 1992. *English Phonology.* Cambridge. Cambridge University Press.

Moras

Hyman (1985), Hayes (1989) a.o.: Moras are weight or length units, they are constituents of the syllable rime, but not of the onset. Only elements of the rime can be moraic. Depending on the number of moras in the rime, syllables have different weights. The moras come from both vowels and consonants.



- This is a more radical proposal than CV or X positions: no segmental difference between [+/–syllabic], or C/V, only the mora that can come from a vowel or a consonant.
- A light syllable has one mora, a heavy syllable two, a superheavy syllable three.
- The mora counts as a phonological position: a heavy or long segment is represented as being doubly linked, It occupies two moras.

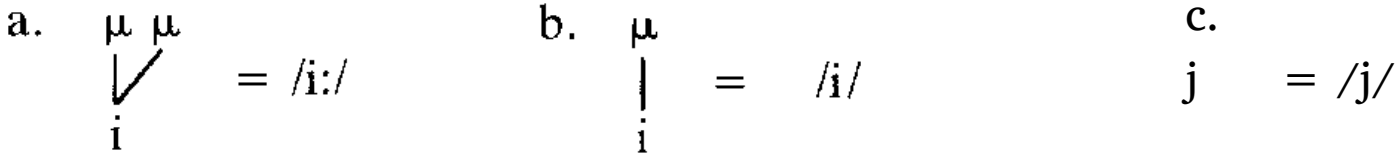
Hyman, Larry M. 1985. *A Theory of phonological weight.* Dordrecht: Foris Publications.

Hayes, Bruce. 1989. Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20. 253-306.

Moras

Languages with a syllable weight distinction typically also have a vowel length distinction. In some languages (such as Latin and English) CVV and CVC syllables count as heavy and CV as light.

The three-way contrast in the vocoid series [i] – [i:] - [j] corresponds to one, two and zero moras.



In other language (such as Lardil) only CVV is heavy and both closed CVC and CV are light.

CVC is assigned two moras in Latin and one mora in Lardil.

In still other languages (such as Greek), there is no difference is vowel length, thus no underlying mora, although moras could be inserted by rule.

Hayes, Bruce. 1989. Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20. 253-306.

Moras in English

In English the consonants are moraic. Consonantal moras are assigned by Weight-by-position: If a consonant is in the coda, it becomes moraic by rule.

In other words, vowels come with underlying moras: a lax vowel is monomoraic, a tense vowel is bimoraic. Only bimoraic (tense) vowels or diphthongs can be long. A lax vowel is always short. Length is triggered by stress. A stressed vowel is longer than an unstressed one, and also longer than a lax one.

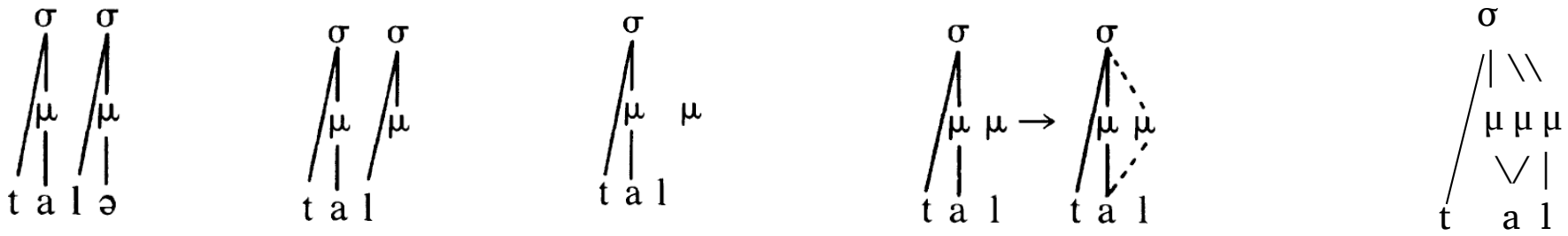
Consonants have no underlying moras, they acquire one if they are part of the coda.

Moras

Besides the difference between light and heavy syllables, moras can account for compensatory lengthening (CL). An example from Middle English with the rule expressed by Minkova (1982 cited by Hayes): “A stressed penult in an open syllable lengthened just in case a word-final schwa was dropped.”

[talə] → [ta:l], Modern English *tale*, by later diphthongization of long vowels (also *time, brave* etc.). In this case, CL is caused by deletion of a segment that is not adjacent to the vowel that lengthens

Input Schwa drop Parasitic delinking CL Weight-by-position



Since Schwa Drop induces the deletion of the second syllable, the only remaining moraic segment [a] occupies the empty adjacent mora, and [l] has no other choice than become the coda of the sole syllable. Weight-by-position creates a third mora.

Adapted from Hayes, Bruce. 1989. Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20, 253-306.

No moras in Greek

In Greek, vowels have no underlying moras.
And Weight-by-position does not exist either.

Nonetheless, all Greek vowels become longer, louder and have a higher or lower f0 when stressed (as a phonetic effect), there is no such difference as among lax and tense vowels.
Difference in duration:

Vowel	Stress	Arvaniti (1991a, 2000)	Fourakis et al. (1999)	Nicolaidis (2003b)
[i]	stressed	106	76	69
	unstressed	77	44	
[e]	stressed	113	94	81
	unstressed	85	57	
[a]	stressed	126	105	85
	unstressed	89	78	
[o]	stressed	123	94	78
	unstressed	96	67	
[u]	stressed	120	88	60
	unstressed	89	54	

Arvaniti, Amalia. 2007. Greek Phonetics: The State of the Art. *Journal of Greek Linguistics:* 97-208.

Conclusion

We saw three representations of a layer between segments and syllable nodes: CV positions, X positions and moras:

Moras are better for English:

• Both vowels and consonants contribute to weight.

• Moras in English are necessary to account for the quantity sensitive trochaic foot: lexical stress is largely phonological in this language

• Compensatory lengthening is also better taken care of by moras.

CV positions are better for Greek:

• Stress is morphological in Greek: no need for feet and moras.

• Liaison finds a natural representation if ghost consonants are associated with a segment that is realized in some contexts, and not in others.