The Skeleton

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Background

- In the previous two weeks, we have been introduced to the basics of autosegmental phonology, and applied it to tonal and non-tonal phenomena in a variety of languages.
- Occasionally, I have informally drawn a central tier in my representation, one consisting of x's. This tier is called the *timing tier* since it organizes phonological timing.
- It is also called the *skeleton*, since it is the central line of phonological representation.
- The skeleton behaves like any other autosegmental tier, as we will see today.

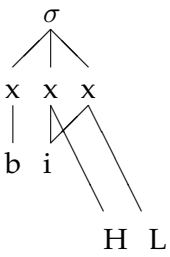
1 The core of the phonological structure

Until now, we have been quite informal as to the precise structure of autosegmental representations. We know that tones and features such as [voice] and [velar] can behave like autosegments on independent tiers which are somehow linked to the 'segment', but we have not yet developed a clear notion of how all of these tiers are then organized into a larger structure. This is what we will set out to do today and in the next week.

Today we discuss the central tier of autosegmental representations, the **timing tier** or **skeleton**. Different from other autosegments, the elements on this tier do not correspond to their own independent (articulatory) instruction. Rather, each of them is represented as a neutral 'x'; these are called **timing slots**, because their most important function is to organize all autosegments into temporal units. (Notice that this means that the OCP should not be able to apply to this tier, otherwise we would only be allowed to have 1 segment per word.)

Syllable structure is built on top of these x's, and all autosegmental features are linked to them. An autosegmental representation for the Limburg Dutch word *bie* 'bee' — remember that Limburg Dutch has lexical tones; this word has a falling tone — would thus be approximately as follows:

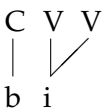
(1)



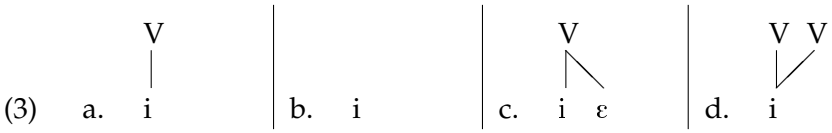
Several remarks are in order here. In the first place, it may seem as if some of the association lines are crossing in this representation, even though we have argued in the first class that this is absolutely disallowed in the phonology of natural language. The reason for this line crossing is equally trivial, however: we are drawing a three-dimensional structure in two-dimensional space. The line with tones is in a different dimension from the line with segmental information; therefore the lines do not really cross. The logical problem connected with line crossing which we discussed in the first class therefore does not arise — this structure is perfectly legitimate.

Another thing we should note is that this representation is still overly simple. We have conflated many autosegmental tiers by just writing /b/ and /i/. Also the syllable structure is much too simple; we have marked it here by one σ which is associated to three segments, but that will need to be turned into something more sophisticated later on. In this class, however, we will stick to these two simplifications, and we will also no longer consider the tonal tier. Furthermore, we will in most cases stick to a further notational simplification, which is sometimes used in the literature. We assume that syllable positions will mark an x as being a consonant (C) or a vowel (V). In the pictures below, we will leave out the syllable structure altogether, and note x's as C's and V's instead. All of this means that the word *bie* gets the following representation in our current discussion:

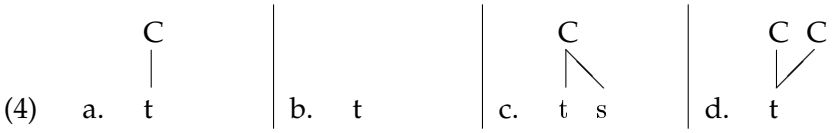
(2)



If this is an autosegmental representation, we now know that we can expect the following variants, for instance for the vowel /i/:



Indeed, all of this structures are attested: (3a) gives a regular (short) vowel; (3b) gives a floating vowel; (3c) gives a diphthong; and (3d) gives a long vowel. We should also expect that (3a) (with a one-to-one association) is the regular case, which every language has. This is indeed what we find – as the label 'regular' vowel already suggests, obviously. For consonants we can set up the same structures:



(4a) gives a regular (short) consonant; (4b) gives a floating consonant; (4c) gives a doubly articulated consonant; and (4d) gives a long consonant.

In what follows, we will see examples of the most important (and most surprising) structures from a variety of different languages.

2 Long vowels in Finnish and in Germanic

The superlative suffix for nominative singular adjectives in Finnis is *-in*.[1] If we add this suffix to a vowel final stem, the stem vowel gets lost:

(5)	*vanha* 'old' [vanha]	*vanhin* [vanhin]
	köyhä 'poor' [køyhæ]	*köyhin* [køyhin]
	tärkeä 'important' [tærkeæ]	*tärkeä* [tærkein]

The last example shows that it is only the final vowel that gets deleted – not any vowel preceding it. Now at first sight, long vowels are exceptional: they do not get deleted, they get shortened instead:

(6)	*tervee-* 'healthy' [terveː]	*tervein* [tervein]
	rakkaa- 'beloved' [rakːaː]	*rakkain* [rakːain]

The behaviour of long vowels is hard to explain under the assumption that they would be carrying for instance a feature [long]; what these vowels suggest that long vowels consist of two short vowels in a row. The behaviour of *tervee* then becomes completely parallel to the behaviour of *tärkeä*. This however would still leave us with two options:

[1] The discussion of Finnish follows Keyser & Kiparsky (1984); Gussman (2002).

(7)


It is hard to decide on independent grounds, within Finnish, which one of these two representations is the correct one. The language has vowel harmony, but this affects long and short vowels, and diphtongs or vowel sequences all alike.

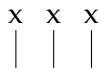
In some other languages, we may find evidence that the representation on the righthand side is the correct one. One piece evidence comes from a phenomenon called **compensatory lengthening**. An instance from this comes from the history of English (Ewen & van der Hulst, 2001; Gussman, 2002). Compare the following Old English words with their Dutch or German cognates:

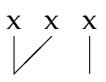
(8)

Old English	*Dutch/German*
gōs	*gans* (Dutch)
ōþer	*ander* (Dutch)
sōfte	*sanft* (German)
fīf	*fünf* (German)
ūs	*ons* (Dutch)

The Old English words all have a long vowel, where the Dutch/German forms have a short vowel followed by a nasal. There is reason to assume that the latter is more faithful to the state of affairs in Proto-Germanic, predating all of the Germanic languages, and that English is the language that has changed. (Notice that German is then more conservative than Dutch in this respect; it would be possible to give VN cognates for all words in the former language, but not in the latter.)

How can we described what has happened? Autosegmental phonology gives us a nice tool to provide this description: first, the nasal got lost, i.e. it was delinked from its position on the skeletal (for some reason which we cannot describe at this point yet). After this, the empty position was filled by the preceding vowel. The lengthening is compensatory in the sense that the vowel length compensates for the lost consonant:

(9) a. Input:


b. Output:


A few things have been noted again. In the first place, the change we are witnessing here is *a priori* nothing like a phonological rule in the sense we have seen them before. We are dealing here with a diachronic change, the 'input' in (20) represents some stage in the history of English and the 'output' some other stage; and there is as yet no specific reason to assume that any speaker ever had both of them in his head. Still, also diachronic changes like this may give us some insight in the mental representations of speakers.

Under this assumption, then, we actually see autosegmental phonology at work. If a long *ū* would be nothing but a sequence of two short *u*'s, we would not really understand what was going on: we would have to say that the nasal would have turned into a full copy of the preceding vowel, which would make the representation of this change rather complex.

Note also that in order to describe this change, we cannot use the C/V notation and we had to go back for a while to the 'real', more abstract, use of x's. The reason for this is that we would have to draw a C in the input and a V in the output.

Compensatory lengthening is found in many of the world's languages. A very well-known case can be found in Turkish (Sezer, 1986; Goldsmith, 1990; Kenstowicz, 1994; Gussman, 2002). In this language, there is actually a reason to assume that it is synchronic, because, depending on sociolinguistic and pragmatic factors, speakers can choose to delete or not delete a consonant (to be more precise, one of /v, j, h/. When they do delete, compensatory lengthening follows suit automatically:

(10) a. *kahya* 'steward' [kahja]-[ka:ja]
b. *eylül* 'September' [ejlyl]-[e:lyl]
c. *sevmek* 'love' [sevmek]-[se:mek]

3 Long consonants in Italian

Next to long vowels, we also expect to see long consonants. And indeed, there is at least as much evidence for their autosegmental representation as there is in the case of long vowels.

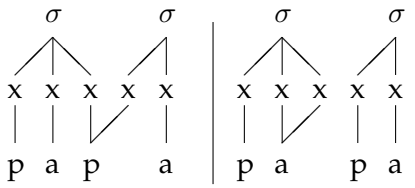
A famous case comes from Italian dialects in which we find a phenomenon of *Raddoppiamento sintattico* (Syntactic doubling) (Nespor & Vogel, 1986). In the first place, we have to know that most Italian dialects have long consonants (or **geminates** as they are usually called). For instance, there is a contrast between *papa* 'father' [papa] and *pappa* 'pope' [pap:a], which can presumably only be described in these terms. Yet it should be noted that on the surface, the first vowel in the word for father lengthens, whereas the second vowel does not.

The reason for this presumably is that the following is true for Italian (as well as for many other languages):

(11) An x-slot has to follow the stressed vowel within the syllable.

In order to understand why (11) would need to be the case, we would need to delve deeper into the theories of syllable structure and stress; the idea is that stress needs some space within the syllable to be expressed. This space is already available in *páppa*, but it needs to be filled by the vowel in *pápa* (the accents denote that stress is on the first syllable in both words):

(12)



There are thus two ways of satisfying (11): either by a long consonant or by a long vowel. For some reason, the latter option is not open in the last syllable of the word in Italian: the language does not allow words to end in a long vowel. Therefore, what we find is a doubling of the consonant (which is dependent on certain syntactic factors as well, hence the name):

(13) a. Cittá [sː]anta
Holy city

b. La sciammia aveva appena mangiato metá [bː]anana.
The monkey had just eaten half a banana.

c. La sciammia aveva appena mangiato quáttro [b]anane.
The monkey had just eaten four bananas.

At a sufficiently high level of abstraction, the phenomenon looks a little bit like compensatory lengthening, except that the position to be filled is not caused by deletion of a segment, but by stress. Again, it is hard to understand this if we cannot dispose of autosegmental representations: why would otherwise the empty position be filled by an exact copy of the following consonant or the preceding vowel?

4 Floating consonants in French

We now turn from the doubly linked structures (long vowels and long consonants) to the unlinked structures: the representation of floating segments. In particular, we will have a brief look at floating consonants in the phenomenon of French liason.

In this language, final consonants of certain words are subject to a phonologically motivated alternation: they surface before a word starting with a vowel (# V), but not before a word starting with a consonant (# C) or at the end of a phrase (##):

(14)

# V	# C	##
petit ami	*peti~~t~~ camerade*	*il est peti~~t~~*
gros enfant	*gro~~s~~ camion*	*il est gro~~s~~*
un enfant	*u~~n~~ gros enfant*	*il y en a u~~n~~*
premier etage	*premie~~r~~ cas*	*il est le premie~~r~~*

First, we have to observe that the nature of the consonant that surfaces before a vowel is determined by the preceding word: *petit* always has [t], *premier* always has [r], etc. Thus, these consonants somehow have to be present in the underlying representations of these words.

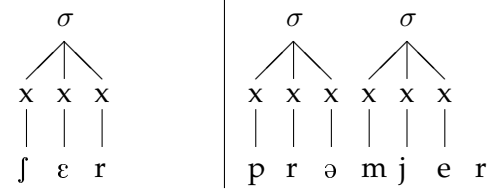
Further, we have to distinguish the /r/ from *premier* from that of *cher*, since the latter does not alternate, but always surfaces:

(15)

# V	# C	##
cher ami	*cher camerade*	*ça coûte cher*

The autosegmental solution is to assume that the /r/ in *cher* is underlyingly linked, whereas the one in *premier* is floating:

(16)

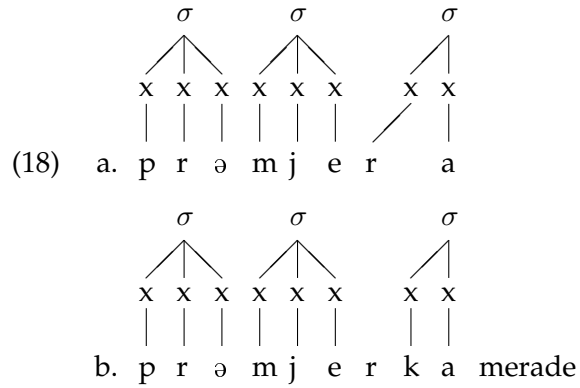


In French, like in many other languages of the world, syllables prefer to start with a consonant rather than with a vowel: syllables are optimally CV. In parallel to (11) we thus have (17):

(17) An x-slot has to precede the vowel in a syllable.

Because words which start with a consonant underlyingly, already satisfy (17), nothing will happen in *premier camerade*: the /r/ will not find an x-slot to be linked to, hence it will not be timed and not pronounced. Yet in *premier ami*, the extra consonant projected because of this requirement, comes to the rescue of the floating consonant.

(18)



5 Contour segments in Luganda

To round off our discussion of the various autosegmental possibilities of the skeleton, we need of course also to provide evidence for the existence of structures where more than one segment is linked to one timing slot. One piece of such evidence we can find in Luganda, a Bantu language from Uganda (Goldsmith, 1990). Like many Bantu languages, Luganda has so-called prenasalized consonants such as [ᵐp, ᵐb, ⁿd, ⁿt, ᵑg, ᵑk] and a few others. One might think of them as two segments (a nasal and a plosive) but at the same time they behave like one segment, for instance with respect to syllable structure (which we will not discuss). Furthermore, they are always preceded by a long vowel:

(19) a. *ku siinza* 'to worship'
b. *ku toonda* 'to create'
c. *mu leenzi* 'boy'
d. *ku laba* 'to see'
e. *ku*: *n daba* 'to see me'

The last example shows that the lengthening is not just another instance of a diachronic process, but it corresponds to a productive rule of Luganda phonology. It also shows that if we put a segment /n/ together with a stop, we create a prenasalized consonant.

The autosegmental analysis of this is not too complicated. Apparently a nasal will dock unto the x slot of the following consonant, for whatever reason (maybe because the language does not like to have two consonants linked to independent x-slots in a row, due to some sort of OCP effect). Because of this, the original x-slot of the nasal becomes available, and the vowel spreads, just as in compensatory lengthening (I only draw the three relevant segments of *ku n daba*:

(20) a. Input: 

b. Output: 

Other candidates for representations with two segments being linked to one timing slot are affricates (e.g. [c] = /t/+/s/ linked to one slot) and doubly articulated consonants (e.g [k͡p]).

Bibliography

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Exercise 3

Beschouw de volgende vormen uit het (bijbels) Hebreeuws.

(21) a. *seefer* 'boek'
b. *geʃem* 'regen'
c. ʔiːʃ 'man'
d. *haːr* 'berg'

Bekijk nu de volgende vormen, waarin we aan bovenstaande nomina het bepaald lidwoord *ha* hebben toegevoegd:

(22) a. *hasːeefer* 'boek'
b. *hagːeʃem* 'regen'
c. *haː*ʔiːʃ 'man'
d. *haːhaːr* 'berg'

Beschrijf zo nauwkeurig mogelijk wat hier gebeurt. Je mag aannemen dat laryngalen en faryngalen niet gemineren in het Hebreeuws.