

# Mora Theory

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## Background

- Our previous discussions of syllabic theory and the interaction between syllable theory and stress, have been based on one conception of syllable structure — so-called onset-rhyme theory.
- In this class, we discuss an alternative conception of the structure of the syllable, called mora theory.

## 1 The moraic theory of syllable structure

In this class, we will discuss a popular alternative to the representations of syllable structure that we have seen so far. Under this conception, the syllable does not consist of an onset and a rhyme, but of two **morae** (from the Latin word meaning ‘a short period of time’ or ‘delay’). The main generalisation is the following:

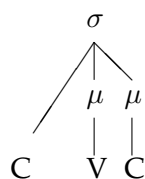
- (1) a. Heavy syllables consist of two morae  
b. Light syllables consist of one mora

Suppose we are dealing with a language in which closed syllables and syllables with a long vowel are heavy, whereas other syllables are light. We can represent syllable structure in this language in the following way:

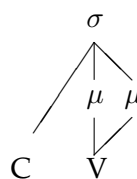
- (2) a. light



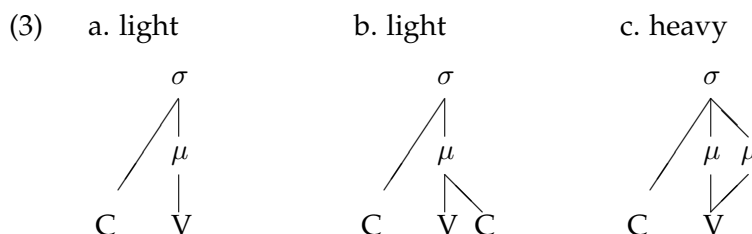
- b. heavy



- c. heavy



In a language in which only long vowels count as heavy, we get the following structures:



It is usually assumed that the morae take the position of skeletal points; the C's and V's in this figure represent root nodes. This means that the phonological timing in this model is slightly different from that in x-slot theory: onset consonants do not count for timing, for instance.

One language to which moraic analysis has been applied quite successfully, is Japanese. As a matter of fact, the mora (or *haku*) plays an important role in traditional Japanese linguistics. For instance, in the 'phonetic' part of Japanese spelling, heavy syllables are represented by two symbols, whereas light syllables are represented by one. Traditional Japanese poetry (like *haiku*) is also based on counting 5+7+5=17 moras (rather than syllables, as in Western renditions of haiku).

It is generally considered true that moraic theory solves two problems of traditional syllable structure/stress analysis:

- In the first place, weight usually refers to coda consonants and not to onset consonants (remember our discussion of Tübatulabal stress).
- In the second place, compensatory lengthening of vowels is always the result of the deletion of *coda* consonants, and never of *onset* consonants (remember our discussion of the history of Germanic).

It is not really the case that these two observations are 'explained' in moraic theory, but we find a formal language which can link them together and express them in some way:

- As to weight, we could posit, for instance, that some languages build stress feet on syllables, whereas others build them on morae (more on this below).
- Compensatory lengthening can now be described in terms of mora preservation: if a coda consonant is lost, it may leave a mora behind, which will then be filled by the vowel. However, if an onset consonant is lost, there is no resulting mora, and hence no possibility for onset loss.

It should be noted, that there is some discussion in the literature on the validity of both of these claims (Topintzi, in preparation). For instance, there are

a few languages for which it seems to be true that onsets count for weight. One famous instance of this is Pirahã, which has the following stress rule:

- (4) Stress the rightmost heaviest syllable of the last three syllables of the word.

Like Dutch and many other weight-sensitive languages, Pirahã thus displays a three-syllable window at the end of the word. Within, this window we choose the heaviest syllable, where the notion of 'heaviness' is defined according to the following hierarchy:

- (5)  $PVV > BVV > VV > PV > BV (> V)$   
 (P = a voiceless plosive, B = a voiced plosive;  $a > b$  means  $a$  is heavier than  $b$ )

The notion of weight is thus fairly complex in Pirahã, but it can be decomposed into the following:

- (6) a. long vowels are heavier than short vowels  
 b. syllables with an onset are heavier than syllables without an onset  
 c. syllables with a voiceless onset are heavier than syllables with a voiced onset

Here are a few examples illustrating these effects (I leave out tone markings and note stress with an acute accent):

- (7) a. *káo.ba.bai* 'almost fell'  
 b. *káa.gai* 'word'  
 c. *bíi.ao.ii* 'tired'  
 d. *pia.hao.gi.so.ái.pi* ''  
 e. *ʔá.ba.gi* 'toucan'  
 f. *ʔa.ba.pá* 'Amapá'  
 g. *ho.áo.ii* 'shotgun'  
 h. *pao.hoa.hái* 'anaconda'  
 i. *ti.pó.gi* 'species of bird'

is relevant to our present discussion in particular; it shows that at least in some languages onsets do seem to be relevant to the calculation of syllable weight — there is a handful of languages for which a similar claim has been made.

Compensatory lengthening may also be attested, albeit again in marginal cases. A rather well-known example is the Samothraki dialect of Greek,

where deletion of an onset /r/ may result in lengthening of the preceding vowel:

- (8) /roʝa/ → [o:ʝa], /riz/ → [iz], /rema/ → [e:ma], /roʝa/ → [o:ʝa],  
/ruxa/ → [u:xa], /rafts/ → [a:fts]

(In spite of the phonological notation, it may not be clear that we are dealing with a synchronic process in this case; the underlying representations here as a matter of fact represent Standard Greek and other dialects, but we have no a priori evidence that these are also the underlying representations for Samothraki.)

What are we going to do with this type of evidence? A reasonable first approach might be to be very sceptical about it: if our theory forbids it, and the data are so rare, maybe there is something wrong with the sources we have.

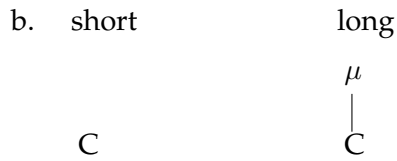
However, in this case, this line of attack will not work. In the first place, especially the Pirahã data stem from a well-respected field worker, who has spent a large amount of time on his work on this particular language (the Greek dialectological data might be a bit more shaky, but they have been confirmed by some other speaker). In the second place, it is not really true that our theory ‘forbids’ these facts; there is nothing very deep inherent to any of the theories presented thus far which would disallow onsets to carry morae.

But if this is the case, we are dealing with a typological puzzle: why are data of the Pirahã/Samothraki Greek type so rare as compared to similar effects with coda’s? The answer to this might fall outside of the domain of formal linguistics proper: it might have something to do with the phonetic perceptability of codas vs. onsets, for instance.

But given all this, it becomes less clear that mora theory is really superior to the more traditional theories we have seen. If the two reasons why it is introduced in the first place do not really seem to fall within the realm of formal phonological analysis proper, mora theory mainly becomes a convenient notation to talk about the interaction between syllable structure and stress.

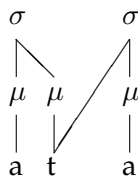
As an example of such a notational property, consider the following. The representation of short vs. long vowels will be as in (9a) within mora theory; the representation of short vs. long consonants will be as in (9b):

- (9) a. short                      long
- |       |             |
|-------|-------------|
| $\mu$ | $\mu$ $\mu$ |
| ↓     | ↓ ↘         |
| V     | V           |



One observation which is nicely represented by these pictures is that geminate (long) consonants do not occur in onsets — although, again, there seem to be a few exceptions. Typically, a long consonant will be attached to the coda of one syllable, and the onset of the next one:

(10) [at:a]



Most languages allow for only **monomoraic or bimoraic syllables**; syllables with one or two morae. This means that long vowels could not be followed by long consonants. The following example is from Koya:

(11) /ke: t: o:ŋɖa/ [ket:o:ŋɖa] 'he told'  
 /ot:o:ŋɖu/ [ot:o:ŋɖu] 'he brought'

These facts can be understood under assumption of the representations in (10), plus a requirement that Koya syllables have at most two morae, and the idea that nongeminate consonants are never moraic in Koya — this explains why the vowel before the cluster [ŋɖ] does not have to be shortened. Note that especially the latter fact is more difficult to express in a nonmoraic framework.

## 2 Morae and stress

In the previous class, we introduced a simple parametric model of stress typology. The core of the foot typology were two parameters (next to this there was also a typology of foot placement inside the word):

- Feet are left-headed (trochaic) or right-headed (iambic)
- Feet are quantity sensitive (the head is heavy and/or the dependent is light) or quantity insensitive (both heavy and light syllables can occur both in the head position and in the dependent position)

Hayes (1987, 1995) claims that one of the four types of feet which we would expect to exist is typologically inexistent: there are no quantity-insensitive

iamb. On the other hand, most trochaic languages seem to be also quantity-sensitive.

Hayes connects this to a psycholinguistic finding (in particular Woodrow, 1909). If we expose informants to a signal *ta-ta-ta-ta-ta-ta...*, and we alternate the intensity of the *ta*'s, listeners will tend to group them in a trochaic fashion; that is to say, they will tend to hear ...(*táta*)(*táta*)(*táta*)... On the other hand, if we keep the intensity constant, but alternate the length of the vowels, the listeners will tend to group the sounds as ...(*tata:*)(*tata:*)(*tata:*)... The conclusion of this is that the difference between foot types is partly determined by the **Iambic/trochaic law** (Bolton, 1894):

- (12) *Iambic/trochaic law*:
- a. Elements contrasting in intensity naturally form groupings with initial prominence (trochees).
  - b. Elements contrasting in duration naturally form groupings with final prominence (iamb).

Trochees now should be constituents which consist of two elements with roughly the same duration. There are two types of these, according to Hayes: we can build feet on the basis of morae, or on the basis of syllables. In the former case, we have a type of quantity sensitive system:

- (13) *Moraic trochees*



In a system with moraic trochees, heavy syllables will form a foot of their own, whereas light syllables will be grouped together. An example of this is so-called 'Egyptian Radio Arabic'. In bisyllabic words, stress is on the last syllable if it is (super)heavy, and otherwise it is on the first syllable:

- (14) a. *Last syllable (super)heavy*: *salám* 'peace' *dimášq* 'Damascus'  
 b. *Last syllable light*: *málik* 'king' *húna* 'here'

Another possibility is to build trochees on syllables, disregarding the internal structure. We then get a quantity-insensitive trochaic structure:

- (15) *Syllabic trochees*



An example of this is Icelandic, where primary stress is on the first syllable of the word, and secondary stress alternates (since Icelandic orthography uses accents to denote vowel quality, we use underlining to denote accent):

- (16) *höfðingja* 'chieftain (gen.pl)', *akvarella* 'aquarelle', *bíógrafa* 'biography'

Yet in iambs, the requirement is that the two parts of the foot are uneven in length, and we have only one canonical foot type:

- (17) *Iambs*



An example of this is Tübatulabal, the language we have discussed in some detail last week. It can furthermore be observed that many languages which use iambic feet have some rule of lengthening vowels and/or consonants to satisfy requirements on foot structure. An example of this is provided by Menomini, A Central Algonquian language. In this language, when a word begins with two light vowels underlyingly, the vowel of the second syllable is lengthened; this can be understood if we assume that these first two syllables are grouped into an iamb:

- (18) a. /ahsama:w/ → [ahsa:ma:w] 'he is fed'  
 b. /netahsama:w/ → [neta:hsama:w] 'I feed him'

Of course, we have seen earlier in this course, that Italian also has lengthening under conditions of stress, but Italian, like most (if not all) European languages uncontroversially has trochaic feet. It thus seems that we would have to relax our typology of feet some more to also include a preference for uneven trochees (although it could also be argued that the Italian case is not a foot effect, but only found in the main stress of the word).

More in general, it seems that the typology is more lenient for trochees than for iambs. We could also observe that the number of attested (and well-understood) trochaic systems is much larger than the number of attested iambic systems; the latter mainly consist of native languages of (North) America. We could, once again, wonder which conclusions we can draw from these typological considerations. On the one hand, some might wish to argue that the relative paucity of iambic systems is just some accident of history, and that, given this arbitrary historical fact, it is no wonder that there is

less diversity in iambic systems: even syllabic or moraic iambs might be possible in principle, but we simply have a much smaller opportunity of finding them actually attested.

Alternatively, some have argued that there is a more principled reason why iambic systems are so few. We could claim, for instance, that iambic feet are not part of our inventory of possible structures. Iambic languages would then need an alternative analysis.

## Bibliography

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