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Some ways to count morae: Prokosch's Law, Streitberg's Law, Pfalz's Law and other rhythmic regularities

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Abstract

This paper focuses on a number of mora-related phenomena, mainly in various German dialects (OHG, Bavarian, Alemannic). It is argued that the rhythmic makeup of these varieties can be described in a satisfactory way only if a mora tier is added to multilayered phonological representations. It is shown that the CV tier of CV phonology is not suited for this purpose. Differences in the way in which the languages and varieties in question compensate on the mora level are analyzed with reference to the traditional principles known as Prokosch's Law and Streitberg's Law.

1. A working definition for 'mora'

Despite its importance for nineteenth-century linguistics (*Indogermanistik*), for Prague School functionalism, and for recent developments in multitiered approaches to phonology, it remains unfortunately true that the mora can hardly be described any better than 'imprecisely as "something of which a long syllable consists of two and a short syllable consists of one"', as one writer remarked about 20 years ago.[1] There is little doubt, though, that the mora is an extremely useful concept for prosodic phonology; in fact its relevance comes close to or equals that of the syllable. Some of the issues where the mora plays a central role are the following:

1. The mora is needed to establish the weight of syllables in many languages, where syllable weight is relevant for stress assignment. It allows grouping together as heavy open syllables that end in a long vowel and closed syllables ending in a consonant following a short vowel, and opposing to them light syllables the rime of which consists of only one short vowel. In the case of heavy syllables, the equivalence of VV and VC_1 is based on counting rhythmic units within the syllable

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nucleus, and on equating V and C positions as bearing (or representing) one mora each. Only the mora makes it possible to generalize about C and V positions.

A well-known example is Classical Latin. Here, the stress is either on the penultimate syllable if it is heavy, or on the antepenultimate if otherwise. Thus, we get *acā́tus*, *acáptus*, *acā́ptus* with penultimate stress, but *ácatus* with prepenultimate stress. The rule for stress assignment in Classical Latin becomes quite straightforward if the mora is used: we may then simply say that the accent in Classical Latin falls upon the syllable which contains the second mora counted from the final syllable.[2] As *cā*, *cap*, and *cāp* all contain this mora (= the first part of the *ā* and the *a* or the second part of *ā*), but not the *ca* in *ácatus*, the different behavior of words of this phonological makeup is easily explained.

2. In languages with a so-called musical accent,[3] such as Classical Greek,[4] Japanese,[5] or Lithuanian,[6] a two-mora syllable may be accented on the first or the second mora (or on both). In some of the languages with musical accent (but not, for example, in Classical Greek), this second mora may be part of a long vowel, or a consonant. Long vowels must be split into two parts (= morae) so that stress can be placed on either one of them (falling or rising), and vowels and consonants must be treated alike so that the proper generalizations can be made. The location of other prosodic features may also be best stated with reference to morae. As an example, take the *stød* in Danish, which, although segmentally realized as a glottal stricture on a vowel or sonorant, is a prosodic phenomenon and obeys the same mora-implicative location rules as the musical accent (in fact, it is historically related to the distinction between monosyllabic and disyllabic tone or accent in Swedish or Norwegian).[7] The *stød* may occur on any Danish syllable that is stressed and contains either a long vowel or a short vowel followed by a sonorant consonant. It is placed on the second part of the vowel in the first case, or on the sonorant in the second case, as in [man'] or [mo:'ðən] (*mand*, *moden* [Adj.]).[8] In terms of morae, we may simply say that the *stød* requires a two-moric (heavy) syllable and is located on its second mora.

3. The mora represents that prosodic level on which the basic rhythmic pulse ('isochrony') is established in so-called mora-timed (or mora-counting) languages,[9] for example in Japanese. These mora-timed languages are opposed to stress-timed and syllable-timed languages. The idea is that whereas stress-timed languages tend to keep distances between the perceived onset of stressed syllables constant, having to lengthen or shorten individual syllables to fit in between these isochronous feet or cadences,[10] and whereas syllable-timed languages tend to keep the duration of individual syllables constant, having in consequence to adapt

the duration of the feet or cadences, mora-timed languages make an even smaller unit the basis of their rhythmic system.

Japanese takes as this basis the duration of a simple (short) segment — consonant or vowel — in the rime of a syllable. These segments constitute one mora each, whereas long vowels or consonants count as two morae. Consequently, neither the syllable nor the foot have constant duration; on the contrary, the duration of the syllable varies with the number of morae it contains, and the duration of the foot of course with the number and duration of the syllables it contains.

(Almost) all Japanese syllables obey the syllable formula

$$(C)(y)V(\left\{\begin{matrix}V\\N\\Q\end{matrix}\right\})$$

According to this formula, the rime of a Japanese syllable may consist of a short or long vowel, or a vowel plus the generalized nasal, or a vowel plus the first part of a following geminate consonant ('Q'). In a strict sense of mora timing, a VV rime takes double the time of a V rime, but the same as a VN or VQ rime. (Onsets are said to be timing-irrelevant.)[11] Thus, the syllables in /keQ$koN/ 'marriage' and in /šoo$kai/ 'introduction' should all be of equal length, and the two words should be twice as long as /há$ši/ 'chopsticks'.

4. There are numerous cases of compensation between C and V positions (see the mora-based treatment of compensatory lengthening in Hock 1986a; Hayes i.p.). The point is that although a segment is deleted, the rhythmic value of the unit in question (mostly the syllable, sometimes the word or the foot) remains unchanged. For instance, Clements (1982) gives examples from colloquial, relaxed English speech styles, where [ð] is deleted but the preceding coronal fricative or resonant is lengthened — as in *have you see*[n] [nə̃] *paper*? As the present paper deals with processes of compensation and similar cases where morae are 'counted' as a cause or a consequence of segmental changes, we need not go into details here.

As the above examples show, the mora may be a weight or a timing unit, a unit on which prosodic events are spread, or a unit of compensation. Given this variety, it must be concluded that we are dealing with an elementary rhythmic structure which has to be located at a relatively abstract level of phonology but can be involved in a number of more superficial processes. Thus, the mora may surface as a phonetic timing regularity in Japanese but as a weight regularity in Classical Latin, etc. It is therefore difficult or even impossible to give a phonetic definition of the mora (which is possible in the case of other prosodic units

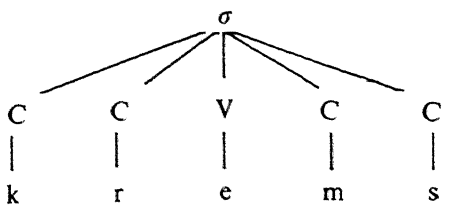
such as the syllable or the foot). A phonemic working definition, however, is possible: THE MORA IS THE SMALLEST PROSODIC UNIT OF LANGUAGE. It constitutes the lowest level of prosody in a hierarchy that contains on top of it, in ascending order, the syllable, the phonological word, the foot, the rhythmic group, the intonational phrase, and even larger textual units. (Not all of these units will be relevant for the prosodic system of any language, however.) As a consequence, the relevance of the mora is not restricted to mora-timed languages (see [3] above); the kind of mora counting that takes place in these languages is but one surface relation of phonemic mora structuring. Languages that use morae as timing units are just a small subgroup of those that can be fruitfully analyzed with reference to morae. In the following, data from German, English, and other languages and dialects will be used that show that mora 'counting' is relevant in these languages or varieties, although the dominant type is that of stress timing (German, English) and syllable timing (for example, OHG).

The above working definition aims at a notion of 'mora' which is able to work as a pivot between segmental structures and rhythmical regularities. The mora both separates and conjoins segmental and rhythmical information. From this point of view, the phonetic makeup of a segment is related to its prosodic status (via morae) but does not include it. Now, this separation of segmental and prosodic information is the central feature of nonlinear, hierarchical phonological models as they have been developed over the last ten years, and it is in the framework of these theories that the mora has had its renaissance. One of the most influential of these multilayered theories is Clements and Keyser's 'CV phonology' (1982). Here, the mora structure of phonological entities is represented in a so-called CV tier which is extracted from the linear, segmental representation of traditional (generative) phonology and therefore assumes outstanding importance. Before turning to the empirical issues that form the main part of this paper, some remarks are necessary on the type of representation for morae and of the adequacy of Clements and Keyser's approach.

2. What is on the CV tier? Some preliminary notes on notation and theory

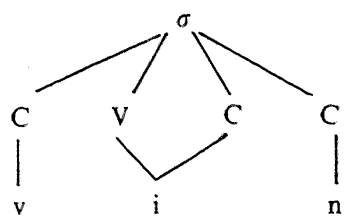
Let us look at some examples for Clements and Keyser's way of representing morae on a CV tier. According to their notation, a word such as the German city name *Krems* would look like

(1)



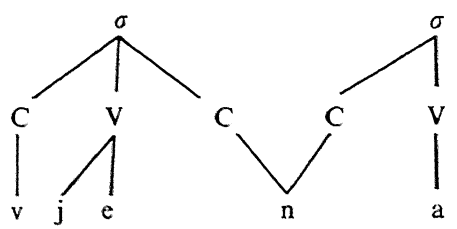
The highest tier is that of the syllable and the lowest tier is that of segmental feature matrices, summarized by letters. The status of the critical middle tier becomes clear if one looks at examples on which feature matrices and CV positions do not correspond in a one-to-one fashion. For one, a segment may be dominated by a V and its adjacent C together, in which case the whole complex would have to be 'read' as a long vowel, such as in German *Wien*:

(2)



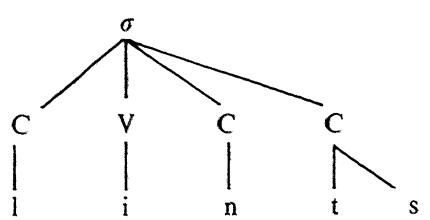
A segment may also be dominated by two adjacent Cs, in which case it is interpreted as a long or geminate consonant; for example, Italian *Vienna*:

(3)



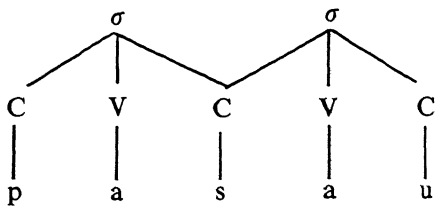
As the *je* in (3) illustrates, a single position in the CV tier can also dominate two segments, for instance those of an ascending diphthong or those of the German affricates, which behave just like simple consonants in many ways. Thus, Clements and Keyser would analyze German *Linz* as follows:

(4)



The relationship between the syllabic and the CV tier also allows downward- and upward-branching association lines. Thus, positions on the CV tier may be dominated themselves either by one σ or by two. The latter case of upward branching represents ambisyllabicity, as in German *Passau*:

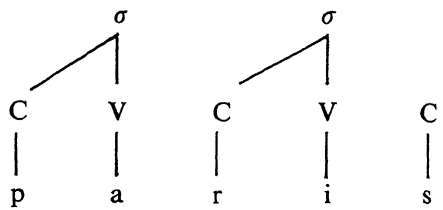
(5)



Note that the difference between geminates and ambisyllabicity boils down in this approach to a difference between upward branching on the segmental and on the CV tier. The two types of syllable contact may cooccur in a language — as in German, where ambisyllabicity is obligatory after short vowels inside the phonological word, but geminates arise between phonological words (compare colloquial German *hamɐ* 'have we' — clitic pronoun, one phonological word — vs. *ham maistn̩s* 'have mostly' — two phonological words); however, although the difference is important for the rhythmic surface gestalt of a language, it seems hardly ever to be phonemically distinctive.

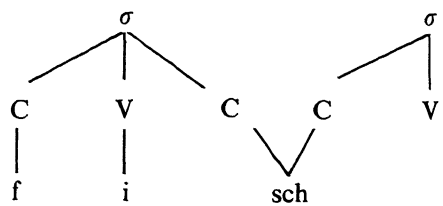
Finally, a CV position may fail to be associated with a σ in the case of extrasyllabicity, as is the case with French liaison consonants, as in French *Paris*:

(6)



and a CV position may be without segmental content (empty), as in Bavarian *fisch* (pl.) (see the discussion below, section 6), where the stem behaves 'as if' it were followed by a syllable-bearing (V) element:

(7)



The formalism is quite straightforward. But what exactly is represented in the CV tier? Clements and Keyser (1983: 10f) answer the question as follows:

> ... the CV-tier is not only, or even primarily, a constituent of morphological analysis, but serves in phonological representation to distinguish functional positions within the syllable. ... In this respect the CV-tier can be seen as subsuming the function of the earlier feature category [syllabic]. However, the elements of the CV-tier are not merely ANALOGUES OF THE FEATURES [+SYLLABIC] AND [-SYLLABIC], but serve the additional and equally important function of defining the PRIMITIVE UNITS OF TIMING at the sub-syllabic level of phonological representation. In particular, it appears as if the useful but ill-defined notion of 'phonological segment' can best be reconstructed at this level (emphasis added).

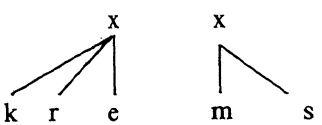
Clements and Keyser, it seems, had two things in mind; on the one hand, they wanted to define the extension and structure of the syllable by drawing association lines between σ and those elements on the CV tier that belong to the same syllable, and by letting a V dominate the syllabic peak (its most sonorous segment); on the other hand, they thought of the C and V positions as rhythmic units corresponding to the traditional mora. In the first case, they define positions in the syllable with respect to its 'energy center' and the distance from it; in the second case, they define rhythmic positions.

However, this double duty is problematic. At closer inspection it turns out that the CV tier is not capable of fulfilling either of its functions in a satisfactory way, although it has to do with both. If the CV tier were only to replace the traditional feature [syllabic], it would be enough to use one symbol, such as V, dominating the peak position of the syllable, and the other positions could automatically be filled by Cs (which would be entirely redundant). Understood in this way, the CV tier is overspecified. For the representation of the extension and the peak of the syllable, we do not need the possibility of branching C or V segments. Indeed, the segments on the segmental tier could be immediately dominated by σ, and one of the association lines could be labeled 'V' (for marking the syllabic peak). On the other hand, if the CV tier is to be a mora tier, it is redundant again, for it is not necessary to distinguish C and V in rhythmic terms: C and V are both morae, and processes of compensation may take place exchanging C for V positions which are difficult to state as long as there is no uniform formalism covering both of them (see Hock 1986a). And there is another reason why the CV tier is not a mora tier: it may be almost universally true[12] that some C positions in the onset must not be counted as morae.[13] This means that the initial prevocalic CV elements

do not correspond to rhythmic positions at all, and that a C in the onset means something different from a C in the nucleus.

These inconsistencies have been seen by a number of authors.[14] For instance, Hyman's theory of phonological weight (1985) recognizes this theoretical ambiguity; he develops an alternative approach in which the tier extracted from the traditional linear segmental level is exactly that of the mora, that is, it is exclusively a rhythmic tier independent of the feature [syllabic] (or, in his theory, [cons]). Morae are symbolized by an x dominating segments that count as such; for example, *Krems* would probably look like (8):[15]

(8)

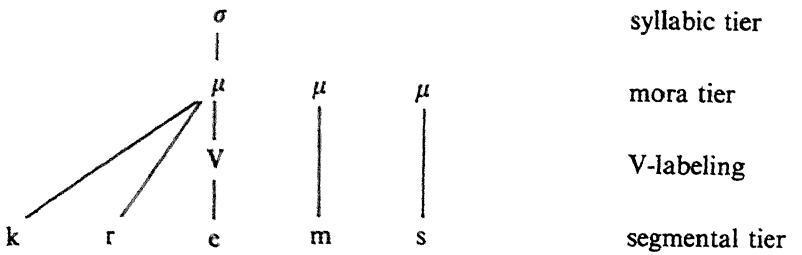


A very similar representation is used by Van der Hulst (1984). Both authors construct the syllable out of this mora level by certain language-specific rules. The disadvantage of Hyman's notation is that the syllabic peak is entirely mora-derived. However, a separate nonrhythmic marking of the peak is advisable as deletion of vowels does not necessarily entail the deletion of a syllabic nucleus which may be transferred to neighboring sonorant consonants, for example to nasals.[16] Some German schwa deletions (or insertions, for that matter) are typical processes that separate segmental and prosodic information and call for an independent level where the syllabic peak is marked (see below, [10]). Some provision to mark syllable peaks may also be necessary or at least useful in order to distinguish falling from ascending diphthongs. Finally, it is not at all sure that a mora tier is necessary (or even adequate) in all languages.

Another solution is suggested by Hock (1986a: 451) in an important critique of CV phonology. He proposes to add a separate mora level to the CV tier, comparable to a suprasegmental tonal tier.[17] Note, however, that this does not avoid the ambiguities inherent in Clements and Keyser's approach; in fact, the additional mora tier only doubles some of the information contained in the CV tier.

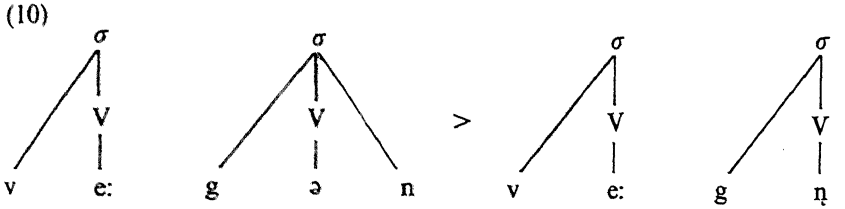
The point is that the conflation and confusion of rhythmic aspects and aspects of syllable structure on one tier must be avoided. In this paper, the symbol 'V' will therefore be used to mark the syllable peak, that is, a nonrhythmic distinction. In this representation, the Cs are redundant. The 'V' is best regarded as a label for one of the association lines between σ and the segments (mediated by the mora level); it labels that association line that links the syllabic peak to σ. In addition, a mora tier will be used and marked by μ.

(9)



For some phonological rules only the structure of the syllable as represented by the σ and its association lines — one of them marked by V — is relevant, and we can do without the mora tier. (This is why the labeling of an association line as 'V' is preferable to the marking of a μ as the syllabic peak, that is, marking on the mora level, which would then be indispensable.) German schwa deletion in ə + sonorant syllables is such a rule; it would result in the following structural change:

(10)



We need a two-dimensional representation, for schwa deletion leaves the syllabic peaks intact. But all that happens is that a segment is deleted, and the vacant prosodic position associated to σ by a V line is taken over by its most sonorous neighbor. The whole process has nothing to do with mora structure.[18]

The information stored in the lexicon will consist of the segmental tier together with a V-labeling for the syllabic peak, at least in some languages and/or for some lexical entries. This information and language-specific rules as to what segments 'count' as morae (see below) are enough to construe the mora tier; together with language-specific syllabification rules, they are also enough to construe the σ tier, which, in fact, does no more than fix syllable boundaries. It should be emphasized at this point that in the notation used here (as well as in that of CV phonology), syllable peaks and syllable boundaries have a very different status. The status of syllable boundaries is clearly less central than is that of syllable peaks. This corresponds to the fact that peaks are universal, but boundaries may be of little importance in the phonology of some languages, and of great importance in others.

One may go one step further and question the tenet of much research in prosodic phonology, that morae are always and necessarily counted in the

domain of the syllable. The following discussion of cases of mora counting and mora compensation in various languages and varieties will show that the prosodic structure in which morae are counted is the syllable in some languages, but a higher prosodic unit in others. The most natural candidate for such a higher prosodic unit above the syllable is the phonological word or the foot.[19] It will be argued below that the domain of mora counting has to be decided on empirically from case to case. In languages which count morae in a unit larger than the syllable, the extension of the syllable (not the fact that there are syllable peaks, of course) is reduced in phonological importance.

More generally, we can say that for any given language, the following parameters have to be fixed: (1) the domain of morae counting, and (2) the nature of segments that can count as a mora. Here, languages seem to diverge massively; for instance, Ancient Greek only recognizes vowels as morae for stress assignment (although coda consonants do play a role in poetic meter), Bavarian does not accept sonorant consonants, Lithuanian and Danish, on the contrary, accept only sonorants (vowels and consonants), etc.

The basic idea of mora counting is that there are general preferences ('preference laws') in language which aim at keeping the number of morae in a given domain at a small variance, and if possible constant. Given the nature of such preferences, and the fact that they will be counteracted by other preferences in phonology or in other parts of the language, we cannot expect them to be fulfilled everywhere and in any language. However, they should be able to describe a trend or 'drift' in the best way possible.

In sections 3–5, the following ways to count morae will be discussed: (1) mora compensation in the syllable ('Prokosch's Law'); (2) mora compensation in the phonological word/foot (see note 19) (Streitberg's Law); (3) mora addition in the phonological word in order to augment the number of morae per each additional syllable.

Finally, in section 6, I will turn to mora compensation in the phonological word in Bavarian according to Pfalz's Law, a regularity little known to phonologists, which presents some particularly interesting details of mora structuring.

3. Mora compensation in the syllable: 'Prokosch's Law'

In this well-known case, a correlation between syllabic peak and syllable coda is established which necessitates compensatory processes. These keep the number of morae in the syllable constant by lengthening/shortening of the vocalic part and/or the consonants in the coda, where the

aim is usually a two-moraic syllable structure. The correlation is formulated by Vennemann (1988: 30) like this:

> In stress accent languages an accented syllable is the more preferred, the closer its syllable weight is to two moras, and an unaccented syllable is the more preferred the closer its weight is to one mora. (The optimal stressed syllable is bimoric, the optimal unstressed syllable is unimoric.)[20]

In order to establish the equivalence in stressed syllables, long vowels (including the diphthongs, unless the language differentiates between long and short diphthongs)[21] and long consonants are each given the value of two morae; short vowels and consonants have the value of one mora. The canonical stressed syllable of a language obeying Prokosch's Law therefore consists of a long vowel or a short vowel plus a single consonant.

As an example of a natural change towards this correlation, the loss of length as a distinctive vocalic feature as it occurred in the development of the Romance languages out of Latin may be mentioned.[22] Latin had distinctive vowel quantity, and in addition, distinctive consonant quantity (geminates), as shown by the following minimals pairs ($=syllable boundary, syllabification according to maximal onset principle):

(11)	*pa:$lus* 'pole, stake'	:	*pa$lu:s* 'swamp'
	le$go 'I read'	:	*le:$go* 'I bequeath'
	a$lia 'another' (fem.)	:	*a:$lia* 'garlic' (pl.)
	ca$rus 'dear'	:	*car$rus* 'carriage'

In addition to the syllable rimes VV, V, and VC, which we find in the ictus syllables of these words, Classical Latin also permitted the rime VVC, at least before sonorant consonants (as in *ste:lla* 'star', in Old Latin also before stops; compare reconstructed *me:ccum* > *me:cum*). This very 'liberal' system was reshaped in Proto-Romance. By shortening of the geminate, or of the ictus vowel in the words containing VVC rimes, and (mainly) by lengthening of the vowel in the V rimes, a canonical syllable developed that required an ictus syllable to have exactly two morae, that is to be heavy. (The phonological status of vowel quantity was thereby lost and is still absent in the Romance languages, where it was partly replaced by vowel-quality features.)

Mora constancy in the ictus syllable, with two morae establishing its canonical shape, is well documented for mono- or polysyllabic words in other languages as well.[23] (Compare the additional cases from Indogermanic and Semitic languages mentioned in Weinrich 1958: 33; the '2-Moren-Gesetz' of Pāli in Mayrhofer 1951: 42f; and the case of compensatory lengthening in Tiberian Hebrew discussed in Lowenstamm and Kaye 1986.)[24]

Note that Prokosch's Law (in Vennemann's formulation) has a second component, predicting the mora value 'one' for a nonictus syllable. Prokosch's Law therefore implies a prediction about the number of morae in a foot as well: it should increase with the number of syllables it contains. We will come back to this aspect in section 4.

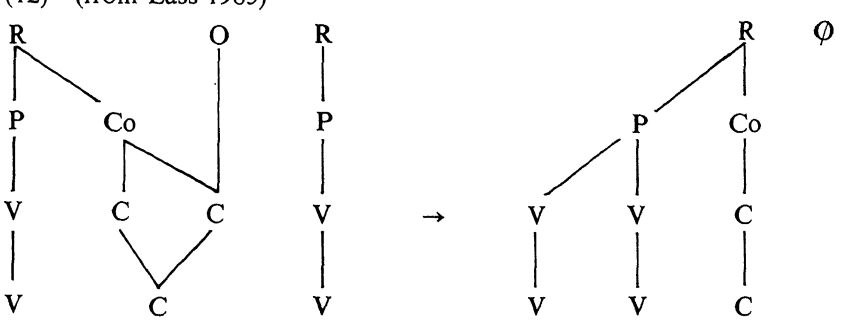
4. Mora compensation in the phonological word [25]

Obviously, for monosyllabic words, mora compensation in the word obeys the same principle as mora compensation in the syllable. The interesting cases are therefore mora-counting phenomena in bi- or multisyllabic words. Again, it is not difficult to find examples:

a. *Middle English open-syllable lengthening*

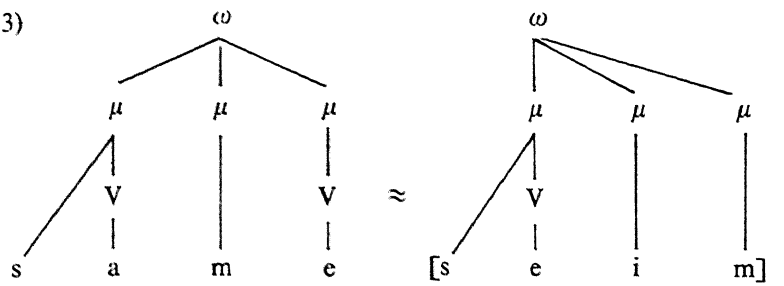
According to a new interpretation of the facts by Minkova (1982), the lengthening of ME /e, o, a/ in the ictus syllable of bisyllabics as in OE *etan, sama, nosu*→eME *eten, same, nose* (Modern English 'eat', 'same', 'nose') overwhelmingly took place concomitant with the loss of the final schwa of these words, and only when the two syllables were conjoined by an ambisyllabic consonant. Both processes collaborate to keep the overall mora value of the word constant: whereas the final syllable loses one mora (and with it, its syllabic peak), the first, tonic syllable counterbalances this loss by lengthening of its vowel. Lass (1985: 249f) tries to capture this regularity with reference to the syllable; in particular, he argues that both before and after the change, the first syllable of the OE disyllabics is heavy. However, in order to arrive at this conclusion, he is forced to analyze the intervocalic, ambisyllic consonant as a 'pseudogeminate', which provides a CC coda for the first and a C onset for the second syllable:[26]

(12) (from Lass 1985)



This phonetically unmotivated duplication of CV tiers is unnecessary if instead of the syllable, the phonological word is taken as the domain of mora counting. (That the phonological word — or, in her terms, the foot — is the basic domain of the compensation process is also suggested in Minkova 1985, who uses a theory of foot metrics which does not, however, include morae.) If we want to count morae, the mora-relevant part of the relevant ME words can be identified as the part from the first V-labelled segment on, or, more precise, excluding the onset, as in

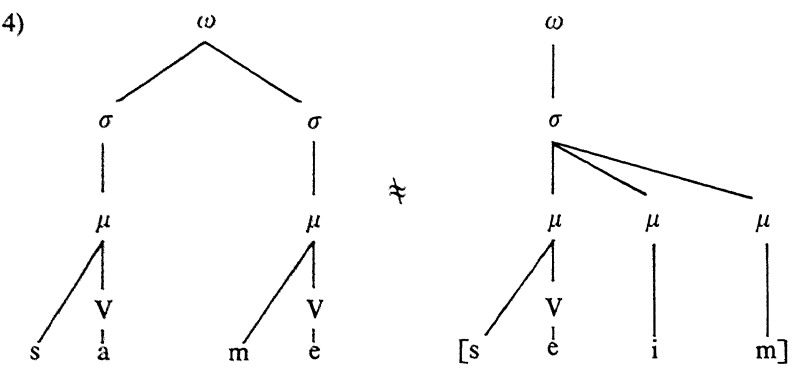
(13)



We can simply state that the mora structure of the words in question remains unaffected because they retain the mora value '3' as a consequence of MEOSL.

Note that the regularity could NOT be captured in a formalism that postulates an intervening syllabic tier and counts morae in the two syllables in the phonological word individually. As syllable onsets would have to be excluded from the count, the two-syllabic pre-MEOSL form would have two morae, but the post-MEOSL form three:

(14)



The ambisyllabic consonant has to take part in the count.

MEOSL did not take place in three-syllable words, even if they underwent final-schwa loss. This means that the teleology of MEOSL was not so much constancy but the avoidance of two-mora words, that is, a trend towards a canonical three-mora word.

Mora compensation in the phonological word is attested in many other languages as well. A number of additional examples are summarized in Hock (1986a: 435ff). On the other hand, it is clear that not each and every case of schwa deletion must lead to this kind of compensation (compare, for example, the German case, where MHD schwa loss, as in i:sə 'ice', had no such consequence).[27]

b. *OE noun structure (see Luick 1964; Lass 1983: 143ff)*

The OE neuter a-stem nouns (acc. and nom.pl.), ō-stem nouns (nom.sg.), and masculine u-stem nouns (nom.sg.) appear in two phonological shapes: as bisyllabics if their structure is (C)(C)VCV, and as monosyllabics if their structure is (C)(C)VVC or (C)(C)VCC:

(15) (from Lass 1983: 153)

a.	*fætu* 'vessels'	:	*wīf* 'woman'
	hofu 'dwellings'	:	*dēor* 'animals'
	limu 'limbs'	:	*word* 'words'
b.	*wine* 'friend'	:	*glǣ:m* 'gleam'
c.	*sunu* 'son'	:	*gār* 'spear'
	lagu 'sea'	:	*feld* 'field'

The regularity is the same as in the above case: the OE words of these morphological classes obey a mora principle applicable over the whole of the word, with the exception of the first onset: their mora value is '3'. This value is achieved in both mono- and bisyllabic words.[28]

c. *Vowel lengthening in Alemannic*

In the Alemannic vernacular spoken in the city of Konstanz, as well as in other Alemannic dialects (see Auer 1989), a trend toward mora compensation very similar to MEOSL is quantitatively well attested, although obscured by standard-dialect variation (NHG does not exhibit this regularity). Again, the relationship between monosyllabics and disyllabics with an ambisyllabic consonant and schwa with the ictus in the first syllable is at stake:

(16)

i gi:b 'I give'	: *gebə* 'to give, etc'	: *du gipsch* 'you give'
i le:b 'I live'	: *lebə* 'to live etc.'	: *du lepsch* 'you live'
i sa:g 'I say'	: *sagə* 'to say etc.'	: *du saksch* 'you say',

etc.[29]

In the monosyllabic words, we observe mora counting in the syllable (compare the long vowel in the 1.ps.sg. ending in a single lenis with the short vowel in the 2. ps. sg. ending in two obstruents); but as a comparison with bisyllabics shows, the count disregards syllable boundaries: that there is a short vowel in the infinitive (and other bisyllabic forms), although the syllable is monomoric, can only be explained if the whole word is taken as the domain of the mora count. Counted in the phonological word, the number of morae remains constant throughout the paradigm.[30]

It should be noted that mora compensation in the phonological word of the kind discussed here, that is, between vowel deletion and vowel length, only takes place in bisyllabics with a single intervocalic consonant. No cases with an intervocalic consonant cluster are reported. These single intervocalic consonants seem to be ambisyllabic in all cases discussed, which amounts to saying that in the two-syllable words in question, the division between the two syllables is particularly ill-defined (or ambiguous). This, in turn, ties in nicely with an analysis which gives up syllable-internal mora counting for the sake of the larger domain of the phonological word.[31]

The first elaborate treatment of mora counting across syllable boundaries, that is, in whole words, was given by Wilhelm Streitberg in his analysis of the lengthening of Indogermanic short vowels (1894). (He refers to some earlier explanations along the same line by H. Möller and A. Fick.) This is his formulation of what was later known as *Streitbergs Gesetz* (1894: 313):

> Findet in einem Wort ein Morenverlust statt, so wird eine der Verluststelle unmittelbar vorausgehnde betonte kurze Silbe gedehnt, dagegen eine unmittelbar vorausgehnde betonte lange Silbe mit gestossnem Akzent geschleift.[32]

Streitberg's Law was explicitly applied to MEOSL by Sarrazin (1898), who, in turn, seems to have inspired Minkova's reanalysis.

5. Mora adddition in the phonological word

In this third type of mora compensation, Prokosch's Law expands over syllable boundaries and covers the rhythmic structure of whole words. It can be exemplified from the rhythmic structure of Old High German (major class) words. In addition to the universal mora-counting rules, the following mora regulations hold for OHG:

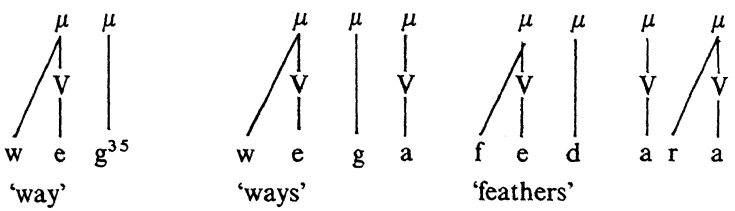
- segments specified as [+son] and not dominated by V do not count as morae;

–phonetic fortes correspond to two phonemic mora positions.[33]

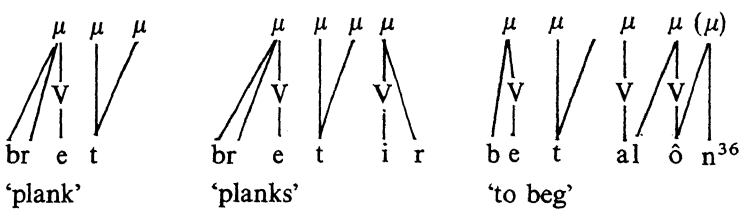
Wiesinger (1983) has reconstructed the rhythmic scheme for OHG simplicia. According to his reconstruction, all OHG simplicia were of one of the following rhythmic types (only obstruents following the tonic vowel are taken into account here):[34]

(17) Monosyllabics Bisyllabics Trisyllabics

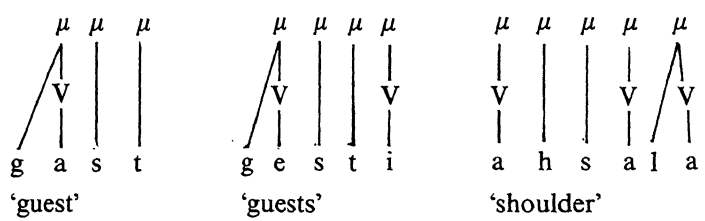
Type 1



Type 2:



Type 3:



It is easy to see that there is a certain regularity in this ninefold scheme. Types 1 and 2/3 differ in the number of morae present in the monosyllabics, that is, two or three, respectively. But for all types, the number of morae increases by one in the bisyllabic and by two in the trisyllabic words. Thus, we get the following mora counts:

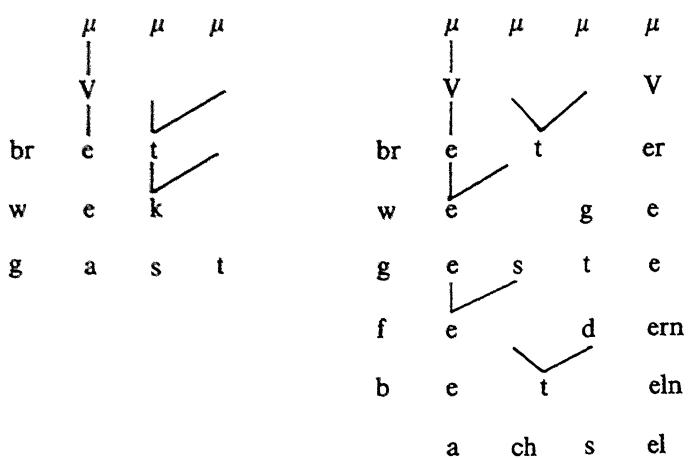
(18)

	Monosyllabics	Bisyllabics	Trisyllabics
Type 1:	2	3	4
Type 2:	3	4	5
Type 3:	3	4	5

Again, the regularity presupposes counting morae regardless of syllable boundaries (for if we counted in the syllable, the first type would have two morae in the monosyllabics, but one in the ictus syllable of the bisyllabics).

Seen against the background of Prokosch's Law, the mora scheme of (18) is clearly not optimal, for contrary to what is to be expected according to Prokosch and Vennemann, type I simplicia have only one mora in the ictus syllable. As Prokosch's Law is said to hold only for accent-timed languages, and as OHG was still predominantly syllable-timed, this may have been all right. However, as German moved more toward the accent-timed rhythm type, changes were bound to occur. In particular, a new phonological rule was introduced and had consequences for the whole system. When, still in Old High German times, syllable-final lenis obstruents started to become fortes (a change underlying NHG 'final devoicing'), this changed the mora count for the monosyllabics of the first type; for whereas *weg* had two morae, the new *wek* had three and therefore the same rhythmic structure the monosyllabics of the second type had. The rhythmic balance was disturbed. And in fact, a rhythmic compensation took place that added one mora to the bisyllabics and trisyllabics, thereby conflating the first type totally with the second one. This was done by lengthening the vowel in the open syllable; that is, *wega* became *we:ga*. At the same time, the final syllables of the old trisyllabic words were reduced so that the new scheme for German simplicia looked like this:

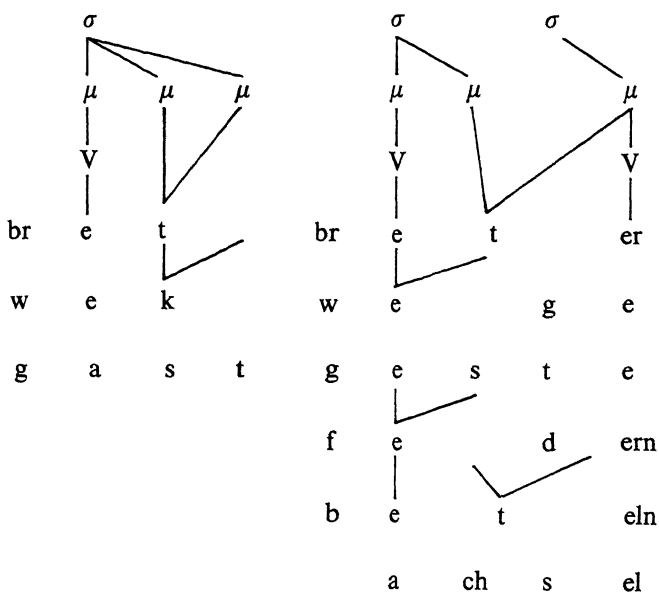
(19) Monosyllabics Bisyllabics



Still, the mora count remained regular, for the bisyllabics had one mora more than the monosyllabics; but now it also conformed to Prokosch's Law. Soon afterwards (or possibly even parallel to this change), morphological criteria began to play a role and led to new developments, which, however, are of no interest here.[37]

Note that the representation in (19), as a regular instance of Prokosch's Law, can be restated as a regularity of mora CONSTANCY in the foot (instead of mora ADDITION), if we return to the syllable-based way of counting morae implied by this law:

(19′) Monosyllabics Bisyllabics



Stated in these terms, the regularity is that each eMHG simplicium has three morae. Whereas this regularity has been lost in modern German as a consequence of morphological leveling and borrowing, some dialects of German still present a fairly regular rhythmic patterning. Among them is Bavarian, for which the above-stated regularity — every phonological word has three morae — is still largely correct.

6. Pfalz's Law in Bavarian

In many Bavarian dialects — in this case, the city dialect of Freising as described by Zehetner (1970) and Hinderling (1980) is the empirical basis

— the quantity of a vowel and the feature [±fortis] in the following consonant are correlated in a rather strict way: short vowels are followed by fortis, long vowels by lenis.[38] See the following minimal pairs:[39]

(20) *fe:da* 'feather' vs. *feta* 'cousin'
vi:sn 'meadow' vs. *vissn̩* 'to know'
la:id 'people' vs. *lait* 'suffers' or 'rings'

Loan words from standard German not corresponding to this correlation are adapted. For instance, std. /puding/ becomes either *bu:ding* or *buting*. In German dialectology, this correlation is known as *Pfalz's Law*:

Nach kurzem, scharfgeschnittenem Akzent tragendem Vokal oder Diphthongen kennt die Ma. nur Fortiskonsonanz, nach langem, schwachgeschnittenen Akzent tragendem Vokal oder Diphthongen nur Leniskonsonanz (Pfalz 1913: 9).[40]

According to Pfalz's Law, the suffixaton of consonants for inflection can result in a shortening of the stem vowel. That is, the consonants in the coda determine the length of the vowel in the peak of the syllable and not vice versa[41] ('+' marks the morphological boundary):

(21) a. *i re:d* 'I talk' vs. *du ret+sst* 'you talk'
b. *i mO:ch* 'I like' vs. *du mOk+sst* 'you like'
c. *du ha:u+sd* 'you hit' (sg.) vs. *ia hau+tss* 'you hit' (pl.).

The third example in (21) involves a stem consisting of an open syllable, which is always long. These 'neutral stems' (Hinderling) can be used to determine the mora value of the affixes. It shows that a syllable-closing *sd* has no shortening effect on its preceding vowel: *i re:d* and *du ha:usd* both consist of a long vowel (or diphthong) and a consonantal coda. From this and similar examples it follows that sequences of fricatives and plosives or plosives and fricatives represent one mora only. They consequently do not lose their lenis character and are exceptions to the above generalization. The plural suffix of the second person, however, results in a fortis coda and therefore has to be phonemized as /dds/, as again the neutral stems prove: *ia hautss*. The examples also show that two consonants in the coda have the effect of a single fortis consonant. This proves that to analyze fortes as underlying lenis geminates is correct.[42] (For empirical details and further examples of Pfalz's Law, the reader is referred to Hinderling 1980.)

In order to state Pfalz's Law in terms of morae, we have to define what counts as a mora in Bavarian. In addition to the language-independent mora rules mentioned above (but note that Bavarian distinguishes long and short diphthongs), the following language-specific mora rules apply:

–*sd, ds, fb* represents only one mora, and
–sonorant consonants do not count as morae (as for example in /vo:nd/ 'er wohnt', */vont/).

As we shall shortly see, Pfalz's Law has as its domain the phonological word, which does not include compounds that have to be analyzed into two phonological words but does include clitics. Taking into account the mora structure of phonological words, Pfalz's Law can now be formulated in very simple terms:

(22) Pfalz's Law for mono- and bisyllabics:
In a canonical Bavarian (phonological) word, the number of morae is three.

The law operates on the phonemic level. It means that the peak vowel is lengthened if there is no or only one obstruent to its right, so that the ideal number of morae is reached (or at least approximated, in the case of no consonant in the coda).

Words conforming to this rhythmic regularity on the phonemic level later on undergo the following phonological rules, which convert phonemic into phonetic representations by introducing the feature [±tense] on the basis of consonant cluster constellations:

(23) Phonetic conversions rule for tenseness:

a.

$$\begin{array}{c} \mu \qquad\qquad\qquad \mu \\ | \qquad\qquad\qquad\quad | \\ ([-\text{son}])[-\text{son}]([-\text{son}])[-\text{son}]([-\text{son}]) \rightarrow \end{array}$$

$$\begin{array}{c} \mu \qquad\qquad\qquad \mu \\ | \qquad\qquad\qquad\quad | \\ ([-\text{son}])[-\text{son}]([-\text{son}])[-\text{son}]([-\text{son}]) \\ \underbrace{\qquad\qquad\qquad\qquad\qquad\qquad}_{[+\text{tense}]} \end{array}$$

b.

$$\begin{array}{c} C_iC_i \rightarrow C_i \\ | \\ [+\text{tense}]. \end{array}$$

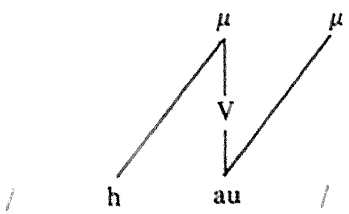
Rule (23a) makes a sequence of fortes out of a sequence of obstruents (including fricatives) provided two of the obstruents are mora-relevant; rule (23b) reduces fortis geminates produced by rule (23a). (Thus, we get/dsd/>*tsst*, /dds/>*tss*, /dd/>*t*, etc.) A rhythmic constellation is

mapped onto a fortis/lenis distinction on the way from the hierarchical phonemic to the linear phonetic level of representation.

Let us first have a look at monosyllabic words. As predicted by Prokosch's Law, the number of morae in the syllable remains constant. However, contrary to Prokosch's Law, the canonical number is three, not two:

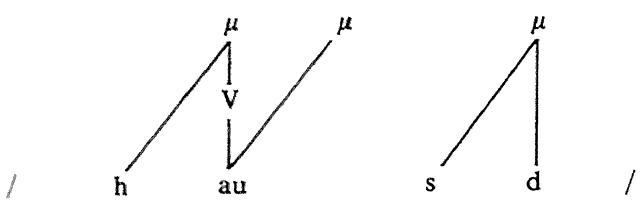
a. an example for neutral stems (that is, those ending in a vowel)

(24) *i ha:u* 'I beat':



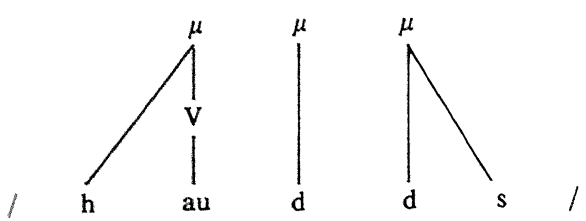
The word does not reach the canonical number of morae, although the diphthong is lengthened. However, the suffix /sd/ for the 2.ps.sg. adds one mora (for /s/ before /d/ is not a mora of its own) and yields

(24') *du ha:usd* 'you hit'



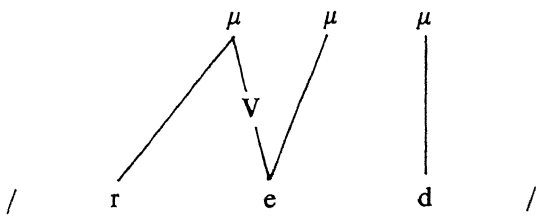
Affixing a stronger, two-morae ending, the /dds/ of the 2.ps.pl., leaves only one mora to be added by the syllable peak in order to reach the canonical number three:

(24") *ia hautss* 'you hit' (pl.)

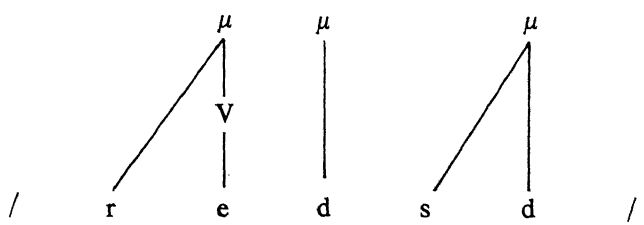


b. examples for lenis stems (ending in a lenis obstruent)

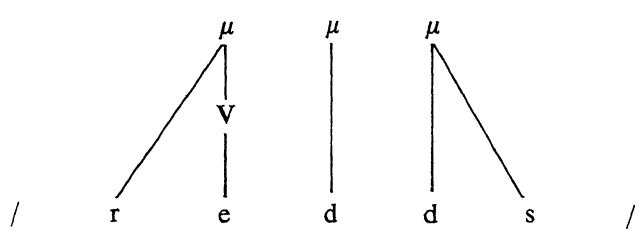
(25) *i re:d* 'I talk'



(25′) *du retsst* 'you talk' (pl.)

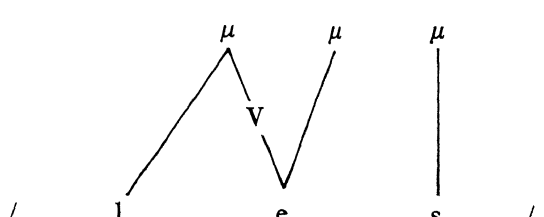


(25″) *ia retss* 'you talk' (pl.)

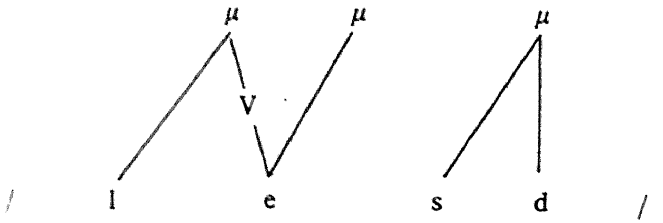


The suffix /dds/ added to the stem /red/ would result in a sequence of four instead of three morae. However, geminate reduction reestablishes the canonical word.

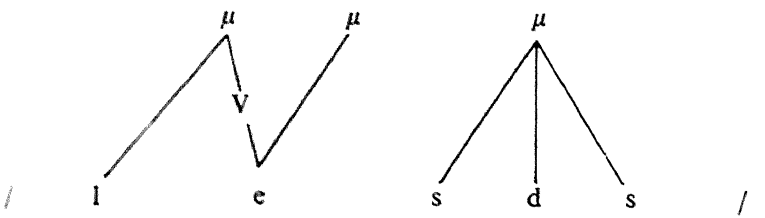
(26) *i le:s* 'I read'



(26′) *du le:sd* 'you read' (sg.)



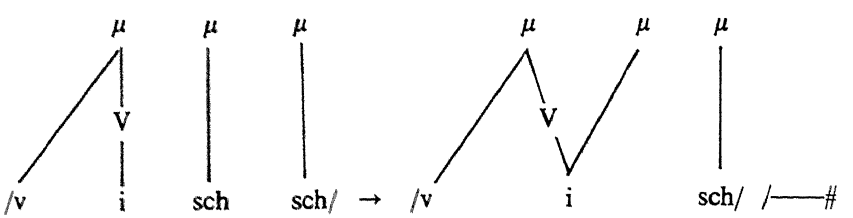
(26″) *ia le:sds* 'you read' (pl.)



The peak vowel is lengthened as neither of the /s/ surrounding the /d/ counts as a mora.

c. examples for fortis stems (that is, those ending in a fortis obstruent). Only a few stems with a fortis coda can be observed, spoken in isolation. One might deduce from this observation that Bavarian has only a handful of underlying fortis stems. But this is clearly wrong, as can be seen in morphologically more complex forms, where many more words reveal their underlying fortis coda. Pairs such as *i wi:sch* (full pronoun) vs. *wischsche* (postclitic pronoun) (both: 'I wipe') show that the underlying stem-final fortes only surface when in nonfinal word position. A word-final geminate is reduced:

(27)



This is done by a rule of geminate reduction[43] operating in word-final environment:

(28) Geminate reduction:
CC→C/____#.

Now, the problem is that, as already mentioned, this rule fails to apply in

some words or morphological variants of words; in this case, word-final fortis is possible. See the following examples:

(29)	a.	*fi:sch* 'fish', sg.	: *fischsch* 'fish', pl.
	b.	*kho:bf* 'head'	: *khepff* 'heads'
	c.	*i vi:sch* 'I wipe'	: *i fischsch* 'I fish'
	d.		*bett* 'bed', *aff* 'monkey', etc.

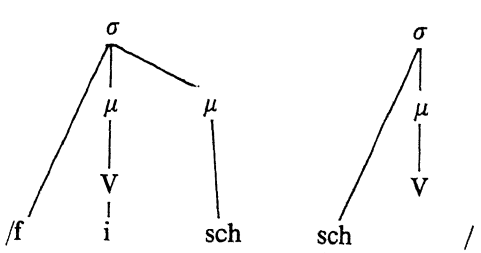
Although the alternation between word-final fortes and lenes, that is, the application of geminate reduction, clearly serves morphological functions, as shown by the first three examples in (29), these morphological contexts do not govern the application of rule (28) alone, as shown by the examples in (29d).[44] The application of (28) is therefore lexicalized, that is, whether it applies or not has to be stored in the lexicon. But how should this be marked?

Hinderling (1980), who argues in a traditional generative framework, proposes a suffix /-a/ that later has to be deleted in all cases (absolute neutralization). This suffix would have to function as an allomorph of the plural morpheme and an allomorph of the first-person singular morpheme; verbs and nouns would have to be marked in the lexicon for the allomorph they take. In addition, the same /-a/ would have to be attached to the stem of words such as *bett*, *aff*, again in order to be deleted as soon as (28) cannot apply any longer.

Although Hinderling's solution is historically motivated and intuitively appealing, it is unsatisfactory for postulating an arbitrary underlying segment for the purpose of diacritically marking words, one which has to be deleted in all contexts at a later stage of the derivation. It captures our intuition that words such as *fischsch* somehow behave 'as if' there were a vowel in the end; however, it remains artificial to specify this vowel as /a/.

In the framework of linear phonology, no other solution was possible. A nonlinear approach, however, makes it easy to except certain words from geminate reduction without using absolute neutralization: instead of a segment /a/, we assume an empty mora position in the lexical representation of these words, as follows:

(30) *fischsch* 'fish' (pl.)

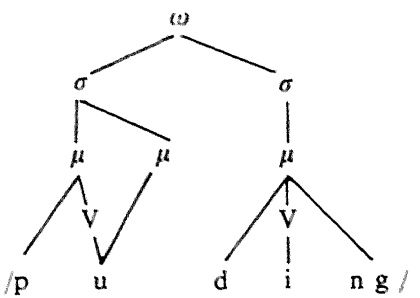


(This extra mora position is one of a syllabic peak, for otherwise the phonological word would not conform to Pfalz's Law.)

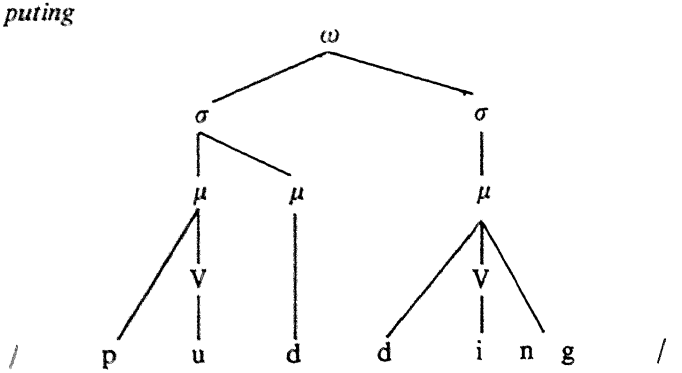
The empty mora position does the job of removing the CC sequence from the end of the word. Its advantage over a segmental solution is that our analysis states the opposition between *fi:sch* and *fischsch* as a rhythmic one and therefore remains at a much more concrete level.[45]

In (30) we have touched on the analysis of bisyllabic Bavarian words. Another example would be the above-mentioned Bavarian adaptions of std. German *Pudding*; they have the following phonemic representations (as before, the geminate is later transformed into a phonetic fortis):

(31) *pu:ding*



(31′) *puting*



In this representation,[46] the domain of mora counting is the phonological word; however, no mora is assigned to syllable-initial consonants, that is, what counts as a mora is decided within the syllable (excluding syllable onsets).

It is useful to compare the case of Pfalz's Law — which is in fact largely deducible from Prokosch's Law — with the case of Alemannic (see [16] above), which was analyzed as an instance of Streitberg's Law. In both cases, the rhythmic teleology in question aims at keeping the number of

morae in the phonological word constant. In this sense, the domain of mora counting is the phonological word in both varieties of German. The decisive difference lies in the way in which intervocalic consonants are treated. Whereas in Bavarian, what counts as a mora is decided with reference to syllable structure (syllable onsets are excluded), the rhythmic regularity typical for Alemannic can only be established when intervocalic consonants are given a mora value of their own, which means that what counts as a mora is decided with reference to the phonological word (excluding its onset). Thus, we are dealing with two notions of 'domain': with the domain of mora compensation (the phonological word in both cases), and with the domain of mora constitution (the syllable in one case, but the phonological word in the other). The different ways of counting morae, which make bisyllabics of the type *hebə* equivalent to monosyllabics like *he:b* in Alemannic, but bisyllabics of the type *fischschn̩* equivalent to monosyllabics like *fi:sch* in Bavarian, IMPLY a different treatment of intervocalic consonants, that is, one in terms of phonemic ambisyllabics (Alemannic) and in terms of geminates (phonetically realized as fortes) (Bavarian), respectively.

7. Conclusion

It was the intention of this paper to show that a number of very different phonological phenomena, from open-syllable lengthening and schwa loss to gemination and final devoicing, can be shown to be related when the notion of mora is integrated into multitiered phonology. It has also attempted to show that languages differ in the way they make use of mora counting. In particular, differences seem to be closely related to the role of the syllable in the phonology of the respective variety.

The main findings can be summarized as follows. There is a general 'preference law' or teleological principle with the effect of keeping the number of morae in the phonological word or foot constant. This principle can be shown to operate in various languages or varieties of language. In the varieties investigated in this paper, phonological words which are also full-fledged feet when spoken in isolation obey the following 'preference law' : the number of morae they contain tends to be as close as possible to three. This means that monosyllabics tend to be three-moraic. In bisyllabics, two different mora counts can be established depending on how intervocalic consonants are treated. If morae are counted in the constitution domain of the syllable, intrafoot compensation according to Prokosch's Law takes place; on the other hand, if mora counting is done in the constitution domain of the phonological word,

intrafoot compensation according to Streitberg's Law may occur. Prokosch's Law compensates between the ictus vowel and the following consonantal material in the syllable, whereas Streitberg's Law compensates between the ictus vowel and the following vowel. In the first case, mora counting keeps the prosodic value ('weight') of the ictus syllable — and thereby, by extension, also that of the whole foot — constant, that is, loss of a segment on the syllable is compensated for by adding another (as in Proto-Romance, Bavarian). In the second case, mora counting is used in order to keep the prosodic value of the phonological word constant, by compensating for the loss of a mora to the right of the ictus vowel by adding a mora to it, and vice versa (as in ME, Alemannic). Whereas the syllable plays a central role in phonologies of the first type, the extension of the syllable is of comparatively less importance in phonologies of the second type.

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Notes

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1. McCawley (1968: 58, note 39)
2. This formulation goes back to Jakobson 1937; comments may be found, for example, in Pulgram (1975: 88ff), McCawley (1968: 59ff), Leben (1980 [1973]: 180ff).
3. Jakobson (1931: 167f).
4. Jakobson (1962 [1937]), Pulgram (1975: 77ff).
5. McCawley (1968: 131ff).
6. Darden (1970).
7. See Basbøll (1985) or Staun (1987) for a recent treatment.
8. A superscript ' after the segment marks the location of the stød.
9. Unfortunately, the term is ambiguous, for Trubetzkoy (1958) [1939]: 174) and scholars in his tradition use it to refer to syllable-timed languages. (The definitions are not exactly identical, though.)
10. See the discussion in Auer and Uhmann (1988).
11. On Japanese as a mora-timed language, see Vance (1987: 56ff) for a critical summary. Among the phoneticians, Hoequist (1983) and Han (1962) come to positive conclusions regarding the phonetic reality of this type of isochrony, although in a somewhat less strict sense, whereas Beckman (1982) is rather skeptical. Note, however, Port et al. (1987) for a critique of her experimental design. The counting of morae (*onsetsu*) is also the basis of traditional Japanese poetry.
12. With reference to Parahã, an Amazonian language, Everett and Everett (1984) argue

against this universal. In this language, onset structure seems to be important for stress assignment.

13. This formulation is not very precise, for, as I will argue later on, mora counting is done on the level of the phonological word in some languages. For these languages, consonants preceding the first syllabic peak in the word are excluded as morae. Also, there is the issue of which rime consonants count as mora, although basically each of them would be dominated by C in CV phonology. Languages differ in this respect as well.
14. See Hyman (1985), Lowenstamm and Kaye (1986), Van der Hulst (1984: 60ff). A thorough critique of CV phonology from the point of view of mora phonology is developed in a paper by Hayes (i.p.) which has been made available to me by one of the anonymous reviewers of this article. It is not possible to deal with Hayes's very detailed proposals for mora phonology here; there are many similarities with the approach chosen in the present paper, but also a number of differences.
15. The option is left open here for the nasal to count as a mora or not (but see below for Bavarian).
16. See Auer (i.p.: 23 f, 421ff).
17. Elsewhere (Auer 1989) I have relied on a very similar extension of CV phonology.
18. I assume that there are languages which do not make use of the parameter 'mora structure' for their phonology at all; and that there are rules in languages which do use the mora level in principle which fail to refer to this tier, which can therefore be omitted in a shorthand notation.
19. In many cases, it is difficult to decide between the two. The foot is certainly the phonetically more salient category. On the other hand, the phonological word is closer to the morphological word and therefore to a salient semantic unit. In the following discussion, reference is usually made to the phonological word, and not to the foot, as it was often impossible to obtain reliable information about mora structure in contiguous discourse. This restriction to the phonological word is under the proviso that phonological words always contain one and only one primary accent. In the varieties discussed below, this holds generally true, as the phonological word is always a permissible foot of its own. (However, phonological words made up of non-major-class words may be unstressed and then included in the neighboring foot. The mora regularities stated in this paper may not hold in such a case.) Feet that are larger than phonological words occur frequently, of course. In their case, the issue is whether foot-internal morphological boundaries can impede the regularities on the mora level. This question definitely needs further exploration, but there are good reasons to believe that they can.
20. Vennemann attributes the discovery of this correlation to Prokosch (1939: 140). However, Prokosch, far from formulating a Lautgesetz or something similar, only refers to the tendency of NHG accented syllables to have two morae in a minor side-remark. He does not seem to have seen the generality of the regularity he alludes to and was far from working out a theory of syllabic weight based on the mora. So Prokosch's Law may be a misnomer. On the other hand, Prokosch certainly was a great linguist, and even if it should turn out that he didn't discover Prokosch's Law, we may well continue calling it after him.
21. In this case, the long diphthong has the value of two morae, the short diphthong that of one, which branches into two segments. See below for Bavarian,where this distinction is necessary.
22. Weinrich (1958: 12ff).
23. Several researchers in an older generative tradition saw the regularities mentioned here

but refused to apply the concept of the mora, because no appropriate formalism was available (for example, Leben 1980 [1973]: 190]). This kind of objection, if it was a valid one, certainly no longer holds in the light of recent hierarchical models in phonology.

24. As there are often two possibilities to reach the canonical syllable — one focusing on the vowel, the other on the consonant — the empirical correlates of Prokosch's Law are heterogenous. Usually, however, the consonants seem to take the lead, if possible. In Tiberian Hebrew, the choice between consonant gemination and vowel lengthening is governed by the consonantal onset of the following syllable.
25. Here and in the following, the phonological word excludes compounds. Compounds are made of two phonological words. The prosodic status of prefixes can be left open here as the data given in this and the following sections are restricted to stem-initial words. The definition of the phonological word is language-specific; for further considerations, see Nespor and Vogel (1986).
26. R = rime, O = onset, P = peak, Co = coda.
27. Whether it leads to diphthongization, as Wrede thought, is highly questionable.
28. For the difficulties any syllable-based mora counts are faced with in this case, see Lass (1985: note 7).
29. Before sonorant consonants, the regularity has almost disappeared and is restricted to individual lexemes. Lexicalization also plays a role before stops but still allows us to see the underlying former regularity.
30. But note that for this kind of mora counting, the consonants in the coda of the right, nonictus syllable are irrelevant; that is, the word may exceed the optimal number of three morae if there are additional consonants attached, such as in *gebət* 'you give', pl.
31. Hock (1986a: 438f) mentions some cases in which word-internal mora compensation occurs in two-syllable words with an intervocalic consonant cluster. Compensation is due in these cases to the loss of a consonantal element in the unstressed syllable, that is, to simplification of the cluster (compare Cret. [Gort.]**werdonti* > *we:ronti*, PIran. **šarda* 'year' > Farsi *sa:l*, etc.). But as he notes himself, these cases may be due to an intermediate assimilation of /rd/ into /rr/ or into /ll/ and subsequent mora compensation between degemination and vowel lengthening, that is, an intrasyllable process. This leaves us with some words in several Ancient Greek dialects, such as (*)*wiswos* 'alike' > *(w)i:sos*, where, according to Hock, an intermediate geminate stage (/ss/) is highly unlikely. But here, lengthening is due to the resyllabification triggered by *w* deletion in the second syllable, and not merely and directly a mora compensation for the loss of a moraic *w*.
32. Translation: 'If a mora is lost in a word, the short stressed syllable preceding the loss is lengthened, but a long stressed syllable preceding the loss, which has acute accent, is circumflexed.'

    Note that according to Streitberg, the compensatory process is not restricted to bisyllabics with a short ictus vowel; and indeed, examples for overlength such as the one discussed by Ternes (1981) for Nordniedersächsisch show that schwa loss may add a mora to long ictus vowels as well.
33. That is, lenes and fortes are not distinguished in the underlying representation but equated with simple and geminate consonants. This is justified by the behavior of pregeminate and prefortis vowels in MHG lengthening; the latter often show no lengthening although the preceding syllable is 'open' (compare NHD *sitte* < MHG *site*). Following Russ (1982: 131ff) I would take this behavior as the rule, and the very few cases of lengthening before /t/, such as in *vater*, as the exception.

    The kind of tradeoff between moraic value and segmental fortition/lenition postu-

lated for OHG (fortis = geminate lenes) also holds for Bavarian (see section 6) and has parallels in a number of other varieties (see Hock 1986b: 138f).

34. My representation differs from the one given by Wiesinger (1983: 1095), who gives one mora value for a posttonic syllable regardless of its internal structure. Such a strong separation of tonic and posttonic syllables presupposes a strictly accent-timed rhythm for OHG, a presupposition that cannot be made easily. Given the structure of OHG suffixes, the mora counts remain the same in Wiesinger's and my own analysis in almost all cases.
35. OHG words are given in orthographic transcription.
36. This word lost one mora as soon as the long vowel in the last syllable was reduced to a short one; the reduction was a consequence of the increasing phonological influence of the main accent on the rest of the word and took place in OHG.
37. In particular, the NHG development is characterized by a morphological principle to preserve the rhythmic structure of the stem regardless of its affixes. This led to lengthening by analogy of the peak vowel in the monosyllabics whose corresponding bisyllabics had undergone lengthening — for totally different reasons — already, that is, *wek* became *we:ge*. See for example Comrie (1980).
38. See also Kranzmayer (1956), Rennison (1981).
39. The transcription in this section follows Hinderling (1980) for ease of comparison. Final <a> has to be read as a low schwa. Fortis fricatives are marked by double consonants, such as <schsch> (lenis vs. <sch>). Surface representations of fortis plosives are <p,t,k>, surface representations of lenis plosives are <b,d,g>. Open variants of /e/ and /o/ are written as /E/ and /O/.
40. 'After a short, cut vowel or a short diphthong the dialect only allows fortis consonants, after a long, non-cut vowel or a long diphthong only lenis consonants.' See also Pfalz (1936: 15).
41. The dominance of the consonantal over the vocalic part of the nucleus in mora counting may in fact be universal and would then not have to be stated in the description of Bavarian. This, at least, is hypothesized by Lowenstamm and Kaye (1986: 114).
42. In fact, the analysis receives further support from utterance pairs such as the following:

    da'ge:da = std. *da geht er*
    'there he goes'
    vs.
    da'geta'baua = std. *da geht der Bauer*
    'there goes the farmer' (from Hinderling 1980).

    Again, the juxtaposition of two lexical lenes (dial. *ge:d* and clitic *der* = *da*) results in a single fortis.
43. Not to be confounded with the geminate 'reduction' mentioned in (23b), which replaces pairs of lenis obstruents by a fortis. The degemination we are dealing with in the fortis stems works on the phonemic level and really deletes a mora position.
44. Rennison (1981) claims that the preserved word-final fortes can be predicted on the basis of their corresponding standard forms with final schwa (compare std. *Fisch* — *Fische*), whereas lenes correspond to standard forms without schwa. This claim is falsified by words such as Bavarian = std. *bett* and Bavarian *i vi:sch* = std. *ich vische*. This, of course, is not to deny that there is a strong correlation between the loss of a final schwa in these words and vowel lengthening. In fact, this correlation is predicted rather precisely by Streitberg's Law. As early as 1894, O. Brenner had seen the connection, and Streitberg gives it as support for his law.
45. More examples for the use of empty mora positions in phonology can be found in Clements and Keyser (1982).

46. In the phonemic representation, a syllable boundary separates the two geminate consonants of (31); in the phonetic representation, the corresponding fortis consonant is ambisyllabic.

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