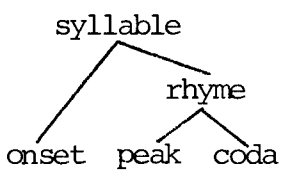
ON THE INTERNAL ORGANIZATION OF SYLLABLE CONSTITUENTS*

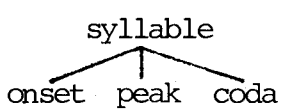
Stuart Davis
University of Arizona

0.1 INTRODUCTION

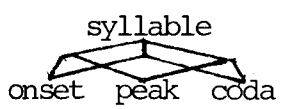
This paper challenges the notion that the rhyme (or "rime") is an obligatory constituent in a theory of syllable-structure.[1] According to this theory, the syllable is divided into an onset (the syllable-initial consonant or consonants), a peak (the peak of sonority in a syllable), and a coda (the syllable-final consonant or consonants). The peak and the coda are analyzed as forming a unique constituent, the rhyme. The proposed tree-diagram for this theory of syllable-structure, then, is the following:



Here, however, I will argue against the rhyme as a universal syllable-constituent, and I will propose that, in universal grammar, the syllable has the following "flat" structure:



The arguments previously adduced for the constituency of the rhyme seek to demonstrate that peak and coda have a privileged status; there are dependencies (e.g. cooccurrence restrictions) between them, as well as certain (language specific) rule-environmental conditions where both are mentioned. These arguments take such phenomena to be indicators of constituency. However, looking at a wider range of evidence (as will be done in the following sections) reveals that similar relationships hold between other parts of the syllable besides peak and coda. This would lead to a situation of "double-motherhood" where onset and peak, as well as onset and coda, comprise a constituent, since there can also be similar relationships between them. This would yield a syllable with the following structure:



The implausibility of this structure is a serious flaw in the arguments that the peak and the coda together form a constituent, but avoiding it entails rejecting the claim that dependencies and environmental mentionings indicate constituency. But this, in turn, further entails that peak and coda do not have a privileged status as a constituent. In fact, rejecting that claim eliminates all the evidence heretofore adduced in support of the rhyme.

Now, the level at which both Selkirk (1978) and Halle & Vergnaud (1980) argue for the obligatoriness of the rhyme is that it is a universal in the strong sense: it is a constituent in all languages. Selkirk argues for its universality by appealing to the existence of phonotactic constraints between peak and coda. This argument for the rhyme as a universal makes an implicit prediction that can be shown to be false (namely, that no phonotactic constraints occur between onset and peak or coda). Halle & Vergnaud's argument for the rhyme can likewise be invalidated. They argue that all languages have a syllable-constituent, and that the rhyme is a constituent within the syllable. Their justification for the rhyme's universality is that: "... in all languages known to us [them], stress assignment rules are sensitive to the structure of the syllable rime, but disregard completely the character of the onset" (1980:93). Thus, they essentially claim that the rhyme is an obligatory universal. I will show, however, that their argument for the rhyme is likewise invalid, because of the nature of additional evidence that they did not consider.

Although the arguments for the constituency of the rhyme as a universal in the strong sense fail, one still can make a weaker claim about the universality of the rhyme: that it is not an obligatory constituent but an available one, that a language can "choose" to use. I will look at some of the evidence from the recent literature that can be construed as supporting the constituency of the rhyme in the weak sense, and I will show that this evidence for the rhyme is not convincing. If the rhyme, then, is an available universal, the case for it still has to be made.

After showing the weaknesses of the various arguments for the rhyme (and for non-terminal subconstituents of the syllable in general) I will present the evidence for my claim that the syllable is flat - that no hierarchical relationships exist between onset, peak, and coda.

1.0 ARGUMENTS AGAINST THE OBLIGATORINESS OF THE RHYME

1.1 Phonotactics

Selkirk argues for the universality of the rhyme on the basis of the likelihood of phonotactic restrictions between peak and coda. She argues (1978:5) that:

> The grouping of peak and coda into a constituent is advocated as a universal of syllable composition... The claim made is that cooccurrence restrictions between peak and coda are always more likely to exist (and indeed are quite common) than are restrictions between either peak or coda and the onset. The explanation offered is that the former two comprise a constituent.

Halle & Vergnaud (1978:41) employ a similar argument for justifying the constituency of the rhyme in English: "Whereas practically any onset can be combined with any rhyme to form a proper English syllable, there are severe limitations on what peak can precede what coda." The reason for this, so their argument goes, is that the peak and the coda form a unique constituent.

It would be predicted, from the above arguments, that any phonotactic restrictions existing between the onset on the one hand, and peak or coda, on the other hand, must be highly irregular and infrequent; such constraints would not be considered to be systematic, but rather, only accidental gaps in the phonotactics. However, there is strong evidence that this prediction is incorrect, since there appear to be systematic phonotactic constraints between other position-slots than peak and coda. In the following subsections, I will present these constraints.

1.1.1 English

In English, there are many restrictions between onset and coda. The following are just some of the restrictions (These are based on dictionary work, and hold for one-syllable words only):

(1) If a word has a two-slot onset and a one-slot coda, then the second slot of the onset and the first slot of the coda cannot have the same consonant (thus, $C_iC_jVC_j$ forms like *flil are not possible: the clipping, stat, is a noteworthy exception).[2]

Along these lines are a number of other constraints:

(1) a. No word can occur with two slots in the onset and two slots in the coda such that the second slot of the onset is the same as the first slot of the coda (thus, $C_iC_jVC_jC$ forms like *flilt are not good, as well as mirror-image words with two consonants in the onset).

b. If a nasal occurs in the second slot of the onset, no nasal can occur in the coda (e.g., *snam).

c. If an onset has three slots, then the consonant in the third slot cannot occur in the coda (e.g., *splal, *strark).

The following two restrictions between onset and coda hold only within morphemes.

(2) The first slot of an onset of two or more consonants cannot be the same as the first slot of a coda of two or more consonants (thus, $C_iC_jVC_iC$ forms like *frift are impossible, but a word like 'stressed' [strɛst] is possible, because of the intervening morpheme-boundary).

(3) If /n/ occupies the only slot in an onset, then, a two or more slot coda cannot contain /n/; thus, *nant cannot occur, but, across the morpheme-boundary, a form like 'nuns' is good.

1.1.2 Mazteco

Pike & Pike (1947:87) cite the following phonotactic restriction between onset and peak in Mazteco: "The nasalized vowels may not be preceded by v, y, l, r or their clusters, nor by m, n, ñ." More simply put: the class of sonorant consonants cannot occur before nasalized vowels. That it is a natural class that cannot occur before nasalized vowels suggests that the restriction is systematic (It is possible that /v/ is a sonorant, in Mazteco; if not, its exclusion before nasalized vowels is most likely an accidental gap).

The preceding data from English and Mazteco show that there can be systematic dependencies between onset and coda, as well as between onset and peak. The limitation of constraints between syllable-constituents to members of the rhyme thus cannot be maintained, since this would sometimes respect rhymes and sometimes violate them. A universal theory of syllable-structure incorporating the rhyme cannot therefore be based on phonotactic constraints (as Selkirk and Halle & Vergnaud suggest) since such constraints falsely suggest that onset/peak and onset/coda constraints should not occur and that they should be viewed as accidental gaps, whereas the cases cited above do not appear to have this character.

1.2 Prosodic Phenomena

1.2.1 Stress

Halle & Vergnaud (1980:93) argue that the rhyme is obligatory; every syllable in every language has one. They state:

> Our proposal is that skeleta in all languages are subdivided into subsequences to which the term syllable has traditionally been attached. Furthermore, we wish to argue that the syllables themselves possess internal constituent structure.... The obligatory constituent, which we shall call rime, dominates at least one V slot in the skeleton.

They argue for the universality of the rhyme on the basis of the following claim (1980:93): "... in all languages known to us, stress assignment rules are sensitive to the structure of the syllable rime, but disregard completely the character of the onset."

In the following paragraphs, I will show that Halle & Vergnaud's claim is false, and thus fails to establish the universality of the rhyme - on two accounts. Firstly, stress assignment rules are not always sensitive to the structure of the syllable rhyme. And, secondly, there are languages where the character of the onset is not disregarded, in stress placement. Consequently, I would argue that the rhyme is not an obligatory (universal) syllable constituent, as Halle & Vergnaud claim.

Halle & Vergnaud's statement that "... in all languages known to us, stress assignment rules are sensitive to the structure of the syllable rime..." entails that there must be no languages where stress-placement is not sensitive to the make-up of the rhyme. However, the various surveys of stress rules in the literature do not support this claim. Only in a minority (albeit a sizeable one) of languages are stress rules sensitive to the structure of the rhyme; in most languages stress rules operate irrespective of its make-up. Ohsiek (1978:35), who surveyed stress-rules in 140 different languages, found that stress-rules were sensitive to the rhyme in only thirty of these languages. Hyman (1977:59-66) lists only twenty-four languages (out of more than 300) in which the rhyme plays a role in stress-placement. Many of these 300 languages have consistent initial, penultimate, or final stress. In these languages, where stress is always on the same syllable, in a word, the structure of the rhyme is irrelevant to stress placement. Thus, Halle & Vergnaud's argument for the obligatoriness of the rhyme – that stress rules are sensitive to its structure in all languages – is simply false, and hence constitutes no argument at all.

Moreover, Halle & Vergnaud's claim that "stress assignment rules ... disregard completely the character of the onset" is likewise false, and so also does not support the constituency of the rhyme. There are languages where stress rules are sensitive to the character of the onset. Aranda, Yidin^{y}, and Gadsup are three such languages.

In Aranda, a Central Australian language, the onset is crucial in determining stress placement, in words of more than two syllables. (Bisyllabic words are always stressed initially). Strehlow (1942:299-301) gives the following stress rule for Aranda:

> If a trisyllabic word begins with a consonant, the stress falls on the first syllable... If a trisyllabic word begins with a vowel, the stress falls on the second syllable... If a word of four syllables begins with a consonant, the main stress falls on the first syllable... If a word of four syllables begins with a vowel, the stress falls on the second syllable... If a word of five syllables begins with a consonant the main stress falls on the first syllable, and a weak secondary stress is usually placed on the third syllable or on the fourth... If a word of five syllables begins with a vowel, the main stress normally falls on the second syllable, and a weak secondary stress is placed on the fourth syllable.[3]

In Aranda, stress is on the first syllable containing an onset. Such a rule falsifies Halle & Vergnaud's claim about the onset-ignoring nature of stress assignment rules.

Yidin^{y}, another Australian language, also has a stress-rule that is sensitive to the onset. Dixon (1977:40) gives the following stress-rule: "Stress is assigned to the first syllable involving a long vowel. If there is no long vowel, it is assigned to the first syllable of the word." Dixon (p. 102) observes the following exception: "If the third syllable of a trisyllabic word is closed and begins with a stop or w, and if the second syllable is open and begins with a lateral or rhotic, then vowel length and stress are likely to shift from second to third

syllable."[4] And, thus, he claims that, "The main preference seems to be for the stressed syllable to begin with a stop or w and for it not to commence with a lateral or rhotic." So, in the YidinY stress rule, the onset is crucial; it interacts with both peak and coda. The whole syllable, therefore, is a factor in stress assignment, and not just the peak and the coda (the alleged rhyme).

A final example of a language in which stress rules do not disregard the character of the onset is Gadsup, a language of New Guinea. Frantz & Frantz (1973:413) report that among the many factors helping to determine stress-placement in Gadsup is the make-up of the onset (other factors include tone, and the character of the peak). They observe that "... syllables..., with a phonetic stop onset have more stress than those with nonstop onset."

The existence of stress assignment rules that are sensitive to the character of the onset, thus invalidates Halle & Vergnaud's argument for the universality of the rhyme. As McCarthy (1978:8) has noted, "... if the rhyme is a structural unit then no language can assign stress by reference to weight or any other property of C_oV sequences." Since there are such languages, the rhyme cannot be an obligatory (universal) structural unit within the syllable.

1.2.2 Tone

Another argument for the rhyme as an obligatory syllable constituent is related to tone-languages. This argument, based on Pike & Pike (1947:79) and McCarthy (1978:7), claims that tone will always fall on some element within the rhyme, and, therefore, that the rhyme must be mentioned in stating the domain of tone.[5] However, there are languages cited, in the literature, where tone also falls on the syllable onset, this thus showing that the rhyme is not the unique limiting domain of tone. One such language is Lalana Chinantec (spoken near Oaxaca, Mexico). Rensch & Rensch (1967:457-458) claim the following about it:

> ... contrastive pitch is actualized on all voiced segments of the syllable rather than on nuclear segments alone. The pitch of the voiced margins and the pitch of the nucleus compose the total pitch contour of the syllable.... For example in bi^{23} 'very' the pitch of the nucleus is frequently a low level pitch; the mid tone is heard only on the stop /b/.[6]

Thus, the members of a minimal pair such as ni^{2} 'face' and ni^{32} 'he knows' are distinguished only by the tones on the onset.[7]

A more widespread example of tone being realized on the onset is provided by tonal languages with prenasalized consonants. Feinstein (1979:246) has argued that "... prenasalized consonants are just those NC (Nasal-Consonant) sequences which are treated in particular languages as syllable onsets." Feinstein (p. 249) also cites Herbert (1976), who "... argues that in many African languages the nasal portion of a 'prenasalized consonant' in initial position can be tone bearing..." These, then, would be cases where part of the onset bears tone. Thus, the rhyme cannot be argued for universally (at least in all tone languages) as the unique limiting domain of tone.

2.0 ARGUMENTS AGAINST THE RHYME AS AN AVAILABLE UNIVERSAL

2.1 Phonological Processes

Halle & Vergnaud (1980:98) claim that certain phonological rules, "... clearly require for their description explicit reference to rime structure," and take such rules as evidence for the rhyme being a constituent. Furthermore, they devise a new formalism in order to refer to the rhyme, in phonological rules. However, a close examination of their data reveals that their new formalism (with explicit reference to the rhyme) does not have additional explanatory power over and above that of the standard formalism, which does not mention the rhyme. One can see this by comparing Halle & Vergnaud's (1980) description of a Lugandan phonological process using their new formalism, with a description of the same process not mentioning the rhyme.

In Luganda, when sequences of unlike vowels, come together (which happens only through morphophonemic combination), the second vowel becomes long, while the first one deletes (or, perhaps, the first vowel assimilates to the second). Also there is a separate desyllabification rule (Halle & Vergnaud 1980:97): "... after certain consonants, high vowels become glides if followed by nonhigh vowels." Consider the following data (+ here represents morpheme-boundary):

/Ba + e + Bak + a/ ⟶ [BeeBaka]

/li + ato/ ⟶ [lyaato]

My proposal for handling these facts would be a standard treatment containing the following transformational rule:[8]

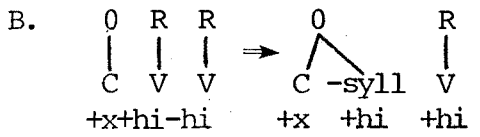
$$\begin{bmatrix} +\text{ cons} \\ \langle +\text{ x}\rangle \end{bmatrix}\ \begin{bmatrix} +\text{ syll} \\ \langle +\text{ hi}\rangle \end{bmatrix}\ \begin{bmatrix} +\text{ syll} \\ \langle -\text{ hi}\rangle \end{bmatrix} \Rightarrow 1 \left\langle \begin{matrix} 2 \\ [-\text{ syll}] \end{matrix} \right\rangle 3\ 3$$

1 2 3

Halle & Vergnaud (p. 96) propose the following (ordered) rules, which make reference to the rhyme.

A. 

("... a non-branching rime becomes branching if it follows directly another rime.")

B. 

(Desyllabification)[9]

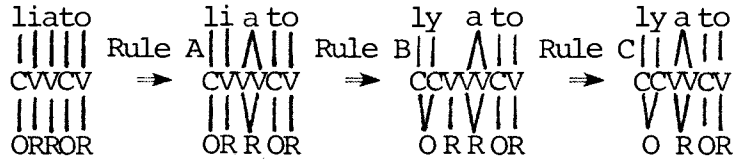
C. R ⟶ Ø/ _R

("... deletes all but the last [rime in a] sequence of consecutive rimes.")

The following two derivations can be ascertained (although Halle & Vergnaud only give the second one).

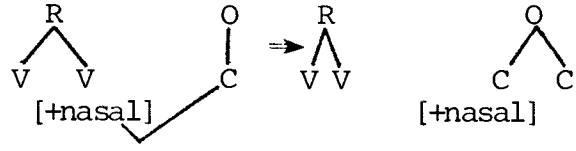
/Ba + e + Bak + a / ⟶ [BeeBaka]

/li + ato/ ⟶ [lyaato]

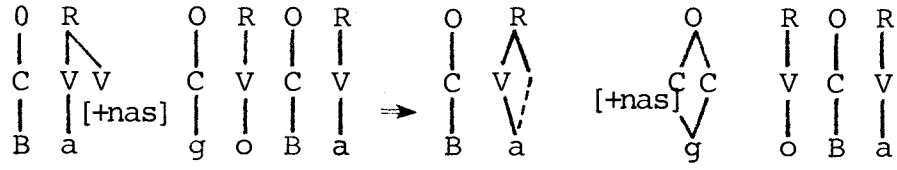


It is quite apparent that the standard treatment of this process is to be preferred, over Halle & Vergnaud's. The standard type treatment is simpler and more elegant. Moreover, it is better able to capture the generalization that it is but a single process that occurs when two vowels come together through morphophonemic combination.

Halle & Vergnaud (1980) claim that Luganda has also another phonological rule that refers to the rhyme, a rule lengthens vowels before a prenasalized consonant. In order to formulate this rule with reference to the rhyme, however, they have to posit underlying nasalized vowels which never occur on the surface. They give the following rule (p. 98):[10]



They provide the example below:



The only motivation that Halle & Vergnaud seem to have for positing an underlying nasalized vowel is that it allows them to mention the rhyme in their statement of the rule. However, we can eliminate this complication, by accepting Feinstein's view of prenasalization. As mentioned earlier, Feinstein (1979:246) has proposed that "... prenasalized consonants are just those NC (Nasal-Consonant) sequences

which are treated in a particular language as syllable onsets."[11] In other words, a prenasalized consonant is actually a nasal cluster that is syllabified \$NC.[12] Thus, the underlying form of the word [BaaŋgoBa] should have a nasalized consonant in it (/BaŋgoBa/), and not a nasalized vowel. Then, a rule that lengthens a vowel before a 'prenasalized' stop (V → [+ long]/ _\$NC) will derive the correct surface form. This characterization is preferrable to that of Halle & Vergnaud, because it avoids positing nonoccurring underlying elements without, thereby, sacrificing simplicity.

Halle & Vergnaud's characterization of Lugandan phonological processes in terms of the rhyme would perhaps be preferred if they had first established the rhyme as a universal syllable constituent (in the strong sense) on independent grounds. However, as has been shown, their arguments for this are noncompelling. Thus, there is no reason to choose their rhyme-based descriptions of the Lugandan data over ones that do not mention the rhyme, especially since their description complicates the phonology (positing nasalized vowels that do not occur on the surface) while seemingly lacking any additional explanatory power.[13]

2.2 Durational Relationships

Selkirk (1978:8) claim that peak and coda from a constituent because there can be a durational relationship (that is, a negative correlation or "trade-off") between them.[14] She argues that:

> Evidence such as that provided by Chen (1970), who claims that there is a constancy (approximate) in the length of the vowel plus stop combinations, could be taken as supporting the existence of the rhyme. According to Chen, a lengthening of the vowel (as before voiced stops) coincides with the shortening of the consonant. That is, one could say that within a constituent like the rhyme the duration of one element is adjusted in function of another.

For Selkirk's argument to be valid, it must be the case that a negative correlation exists only between a vowel and a following consonant in the same syllable (in a VC\$ sequence, where \$ is a syllable boundary), and not across syllables (in a V\$C sequence). The reason for this is that, if negative correlation is an argument for (rhyme) constituency, then such a correlation between V and C in a V\$C sequence would establish the absurd conclusion that members of separate syllables can form a constituent (rhyme). But obviously, a V\$C sequence cannot be a syllable constituent. However, I will demonstrate that a durational relationship does exist between a vowel and the following nontautosyllabic consonant. Hence, the relationship between peak and coda is an instance of a more general relationship between vowel and following consonant (regardless of syllabicity). Selkirk fails to look for the possible generalization because she focuses solely on the durational relationship in VC sequence within syllables, and trying to relate thus to constituency.

In the following subsections, I will show that in the languages that Chen (1970) investigated (which Selkirk cites as evidence for the rhyme), there is a negative correlation between a vowel and a following

nontautosyllabic consonant. This indicates that syllable division is not a factor in this durational relationship, which therefore, does not reflect syllable constituency.

2.2.1 French

A close look at Chen's (1970) data reveals that in French, a following consonant does not necessarily have to be tautosyllabic, to influence the length of the preceding vowel. Chen (1970:136) gives the following examples:

French Phonetic Forms	Length of First Vowel in Milliseconds
la poeR ('the fear')	117
la boeR ('the butter')	140
sa fwa ('her faith')	246
sa vwa ('her voice')	310

The first vowel in the above French forms is not tautosyllabic with the following consonant, according to the French syllabification rule (Price (1971:26-27)): "A single consonant between vowels forms part of the following syllable."

It would seem then, that the French data suggest that the durational relationship in question exists between vowel and any following consonant (regardless whether it is tautosyllabic or not, or even in the same word) and has nothing to do with peak and coda.

2.2.2 English

Lisker (1978:138) gives data from English nonsense forms which indicate that lengthening of the vowel occurs even if the following consonant is nontautosyllabic. He presents the following evidence:

English Nonsense Form	Length of First Vowel in Milliseconds
gabi	195
gapi	175
kabi	212
kapi	183

In the above data, the vowels are longer before (shorter) nontautosyllabic voiced consonants, and they are shorter before (longer) nontautosyllabic voiceless consonants.

Further evidence that the relationship between vowel and following consonant holds even across syllable boundaries is provided by spectrographic measurements made by the author for the real word minimal pair

mable-maple. The syllable boundary in these words also falls after the first vowel. The following values for vowel duration were recorded:

Lexical Item	Length of First Vowel in Milliseconds
Mable	185
maple	125

These results, of course, need further verification, but, preliminarily, at least, it seems that the durational relationship between peak and coda in English is not a reflection of the constituency of the rhyme, but rather, is just an instance of a more general relationship between vowel and following consonant.

2.2.3 Korean

K-O Kim (1975:262), using Korean nonsense-forms, shows that a similar durational relationship also exists in that language. He gives the following data:

	C_1	a_1	$	C_2	a_2	p'
Nonsense Form	n	a		k	a	p'
Milliseconds	66	102		67	97	
Nonsense Form	n	a	$	p	a	p'
Milliseconds	65	92		85	84	
Nonsense Form	n	a	$	p^h	a	p'
Milliseconds	65	71		154	61	

According to Kim (p. 263), the syllable is divided between a_1 and C_2: "In the test words, the syllable boundary occurs between the first vowel and the following consonant."

In the above data there is a negative correlation between a_1 and C_2. This suggests that syllable division is not a factor, in the durational relationship between a vowel and the following consonant. Thus, Kim's overall conclusion is the following (p. 263):

> If the syllable boundary plays any role in the temporal interaction between adjacent segments, we would expect the adjacent segments across the syllable boundary to show a less significant negative correlation. However, there is no such indication as the comparison of the coefficents of correlation in column a_1C ... shows.

Kim's conclusion is actually corraborated by Chen (1970:137), who gives the following data for real Korean words (although he does not give glosses):

Korean Words	Length of First Vowel in Milliseconds
kat^ha	81
kada	95

tsok^{h}ong	127
tsogog	160

If the syllable-division rule given by Kim also applies to Chen's Korean data, then the latter's data also support Kim's contention that syllable division is irrelevant to the durational relationship that exists between the vowel and the following consonant in Korean.

In sum, the Korean, English, and French data indicate that the durational relationship between peak and coda – cited by Selkirk in support of the constituency of the rhyme – is just an instance of a more general relationship between a vowel and the following consonant. Therefore, the existence of such a relationship cannot be used to argue for the rhyme as a syllable-constituent.

3.0 A LEVEL SYLLABLE STRUCTURE

In the first part of this paper I show the arguments most often cited in favor of the constituency of the rhyme actually fail to support such a constituent. Most of these arguments fail because the phenomena that occur between peak and coda can also occur between either peak or coda and the onset. This leads to a syllable structure possessing "double motherhood". The implausibility of such a structure moves one to conclude that dependencies (e.g., phonotactic constraints) and mention in rule environments (e.g., stress assignment and other language-specific processes) do not establish constituency in phonology any more than Subject-Verb Agreement (dependency) and Subject-Aux Inversion (environmental mention) establish the constituency for subject NP and Aux (or Verb) in syntax.

In this section, I argue that there are no hierarchical relationships between onset, peak, and coda; that is, the syllable has a flat structure.[15] One consequence of a flat structure is that one part of the syllable is not more privileged than another. Language-specific rules could refer to the peak and the coda just as they could refer to the onset and the peak. Before turning to the evidence that support a flat syllable structure, I will discuss various other possible syllable structures by reviewing proposals about syllable structure that have previously appeared in the linguistic literature.

3.1 Proposals Concerning Syllable Constituents

Pike & Pike (1947) made one of the earliest (if not the first) proposals for dividing the syllable into various constituents. They divided the Mazteco syllable into a margin (an onset) and a nucleus (a peak). Nothing corresponding to the coda was proposed, in this article, since Mazteco does not possess syllable final consonants. But, in Pike's later works, he divides the margin into pre-nuclear margin (onset) and post-nuclear margin (coda).

Hockett has been credited with inventing the terms onset, peak, and coda, to describe the syllable constituents (Haugen, 1956:217).

Moreover, he argued that the syllable could contain another element, the interlude, which he defined as follows (1955:52):

> An interlude is coda-like and onset-like at the same time, and structurally it belongs to the syllable that contains the preceding peak and to that which contains the following peak.

Further, when there is an interlude, there is no syllable division between coda and onset, because Hockett proposed the interlude in order to handle ambisyllabicity. He cited such examples as 'nitrate', where the first /t/ can go with either syllable, and, thus, claimed that (1955:64) "syllable division in an interlude is structurally irrelevant." Essentially, the interlude would be the name of the constituent where coda and onset are simultaneous – since, because of ambisyllabicity, the division between the onset and the coda cannot be pinpointed.

Haugen (1956) criticized Hockett's proposal regarding the interlude, for the following reason (p. 218):

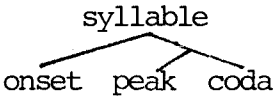
> If we are to make use of the syllable as an IC (immediate constituent) of the macrosegment it does not make good sense to leave the syllables all attached to each other by indivisible segments.

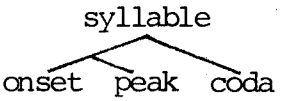
Haugen argued (p. 220) that non-overlapping syllable division was important, for he saw "the syllable as a unit of phonotactic structure." Thus, the coda and the onset had to be kept separate. He also argued that one could actually always separate coda and onset, because the syllable division usually does not permit the formation of a new coda or a new onset.[16]

> In 'nitrate' a division /naytr. eyt/ would introduce a nonexistent final cluster -tr; but the divisions /nay. treyt/ or /nayt. reyt/ would both fit with the existing positions and their members. (p. 218-219)

Essentially, then, Haugen maintained that the syllable constituents consisted of just onset, peak, and coda.

Now, one of the characteristics of the early works on syllable-constituents was that they did not make any claims about the existence of hierarchical relationships among these. It was not until McCarthy (1976) that the possibility of hierarchical structure within the syllable was dealt with. McCarthy viewed syllables as having either of the two following hierarchical structures (p. 8):

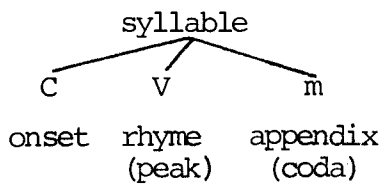




(Interestingly, he did not consider the possibility of level structure). McCarthy argues that both these syllable structures exist, in Estonian. There, if the coda is an obstruent, then the peak and the coda are grouped

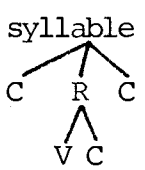
together, because they form a "tight phonetic unit". But, if the coda is a sonorant, then the onset and the peak are grouped together, since there would be no tight phonetic relationship between peak and coda. But there is no tight phonetic relationship between onset and peak either! That is, McCarthy apparently groups onset and peak together as a unit only because he envisions, at most, two possible structures, of which one is excluded. Thus, McCarthy's proposal to require hierarchical structure in all Estonian syllables forces him to group onset and peak together as a unit (when the coda is a sonorant) in the absence of any evidence for this.

McCarthy (1976) tried to deal with an issue that confronts those who advocate the rhyme as a syllable constituent: namely, how does one handle those syllables (and they are probably in the majority) in which peak and coda do not seem to act as a unit? This question arises because not all peaks and codas act together as a unit, and not all branching rhymes act as such. Especially this latter problem with the rhyme has lead Halle & Vergnaud (1980) to maintain that, when the coda does not interact with the peak, it is assigned not to the rhyme, but to the "appendix" (and, thus, the rhyme does not branch). For example, Malayalam syllables ending in /m/, have according to Halle & Vergnaud (1980:99), the following structure:



because such syllables behave as if they have nonbranching rhymes, with regard to stress placement.[17]

Prince (1980) employs a similar strategy. He suggests that a word-final CVC-syllable, in Estonian, is light, since the final consonant does not interact with prosodic phenomena. Further, he suggests that Estonian CVCC-syllables have the following structure:



And Prince also maintains (1980:531) that "... only the constituent R is accessible to the rules of prosody... and the last consonant of an Estonian word is adjoined outside the rhyme, where it will be prosodically inert."

Essentially, then, Halle & Vergnaud (1980) and Prince (1980) attempt to maintain the constituency of the rhyme by redefining the notion of a heavy syllable: they no longer apply that term to any syllable with a long vowel and/or coda, but only to one that interacts with prosodic phenomena (hence, the need for the appendix, as a place to put those coda-consonants that are "prosodically inert"). They need to redefine

heavy syllable in order to maintain the rhyme as a basis for capturing the distinction between light and heavy syllables. However, this makes their claim for the constituency of the rhyme circular: They claim that the rhyme is a constituent because it is needed to express or capture certain facts about prosodic phenomena (e.g., stress-placement on light vs. heavy syllables), but, in order to capture these facts, they redefine heavy syllables in terms of prosodic phenomena (so that they would be facts that the rhyme can capture). In other words, that is, they redefine heavy syllable so that it will fit their claims about the rhyme, and then they claim that one reason why the rhyme is a constituent is that it captures the distinction between light and heavy syllables. In sum, then, Halle & Vergnaud's argument for the appendix is ad hoc (it is needed to help redefine heavy syllables), and the fact that they even have to propose an appendix is a consequence of their attempting to maintain the rhyme as an obligatory syllable constituent. This certainly suggests that the rhyme is not only unmotivated, but more trouble than it is worth.

3.2 Evidence for Flat Syllable-Structure

In the previous section, I showed that the various proposals for hierarchical relationships among syllable constituents – such as the arguments of McCarthy 76 (in which the onset and peak are grouped together, if peak and coda do not act as a unit), Halle & Vergnaud's (1980) arguments for an appendix, and the various proposals that argue for the rhyme – are difficult to uphold. Thus, by default, the only remaining possibility is to have a flat syllable-structure. Furthermore, there is evidence that supports such a structure. Unlike a non-level syllable-structure, a level one would allow for onset, peak, and coda to interact in various ways (and would not entail a claim that peak and coda, or onset and peak, must act as a unit). Thus, the fact that there are phonotactic restrictions between onset and coda (as in English), between onset and peak (Mazteco), and between peak and coda (e.g., in English, long vowels cannot precede monomorphemic triconsonantal codas), could only be expected given a level syllable structure.

Moreover, the morphophonological process of reduplication can best be handled with a level syllable-structure. Often, reduplication picks out only some part of the syllable. It may pick out the onset and the peak (or certain members of the onset and the peak, as in Sanskrit), or it might pick out peak and coda and reduplicate it. However, if one postulates a constituent such as the rhyme, one would predict that a CV sequence could not be reduplicated (since such a sequence is not a unit), but this prediction is false, since CV reduplication is quite common. Thus, a general treatment of the different types of reduplication that can occur can best be provided by a theory with a flat syllable-structure.

Finally, evidence from speech-errors supports a flat syllable-structure. In speech errors, onset and peak can be transposed: stick in the mud → smuck in the tid (Fromkin, 1973:248); peak and coda can be transposed: Our backyard is full of toads → Our backyoad is

full of tards (p. 252); and onset and coda can be transposed: fish → shiff (p. 254). These different transpositional errors can only be predicted with a flat syllable-structure.

In short, the evidence just cited as well as the fact that hierarchical proposals for syllable-structure encounter many serious problems, indicates that the syllable has a flat structure.

4.0 SUMMARY

In this paper, I have first argued against the rhyme as a syllable constituent, and then proposed a level syllable structure. I have demonstrated that, for various reasons, the different arguments for the rhyme as a universal are invalid. Further, I have shown that other proposed hierarchical arrangements of syllable constituents also falter, because they lead one to predict that two of the three syllable constituents must always act as a unit, but this is usually not the case. Thus, a level syllable structure seems the most adequate one: not only because the proposals for the various hierarchical structures cannot be supported, but also, because the data from phonotactics, reduplication, and speech-errors support it.

One of the consequences of my proposal for flat syllable-structure is that metrical analyses of languages should not be based on rhyme structure. Halle & Vergnaud, though, have proposed a metrical analysis incorporating the rhyme for English. Recently, Selkirk (1980:575) has argued against their analysis, which is based on the branching of the rhyme, for the following reason: "... not all syllables that do have branching rhymes can be treated as such. Which is to say that branching becomes an ad-hoc diacritic device." Furthermore, Selkirk has proposed a metrical analysis for English that is not based on the branching of the rhyme. And this fact that metrical analyses do not have to be based on the rhyme is exactly what one would expect given a flat theory of syllable structure.

FOOTNOTES

*I would like to thank Dick Demers, Ann Farmer, Sue Steele, and Rich Janda for their suggestions, comments, and criticisms of earlier versions of this article. I must, however, accept full responsibility of any errors that appear.

[1]I am assuming that the syllable, as a constituent, does exist and that it is a universal (in the strong sense). For some language-specific arguments, see Kahn (1976) and Selkirk (1980).

[2]This restriction is indeed systematic. Given an English word of the pattern $C_1C_2VC_3$, C_3 can almost always be anything except C_2, regardless of what consonant C_2 is. Occasionally, when a certain consonant is in the C_2 slot, the consonant /v/ does not appear in C_3. However, this instance is likely to be accidental, given the infrequency of word-final /v/.

[3]Ken Hale (personal communication) has verified the Aranda stress rule for me, and also informs me that several languages related to Aranda have the same (or similar) stress rule.

[4]Nash (79/80:127) hears main stress on the first syllable in these words and not on the third syllable like Dixon. Also, unlike Dixon, Nash claims the syllable cannot begin with a lateral or rhotic.

[5]Others say that it is the entire syllable that is the domain of tone, while still others have argued that it is the segment that is the domain of tone.

[6]The numbers after the word 'bi', in the passage, indicate tone levels.

[7]The minimal pair is taken from Rensch (1978:85). Rensch & Rensch (1966) do not give any minimal pairs.

[8]There is no reason to separate desyllabification from 'vowel assimilation', since, according to Halle & Vergnaud's description, both occur when two vowels come together through morphophonemic combination.

[9]This rule is not formally represented, as such, in their paper. When they give this rule in words, they do not give it in terms of onset and rhyme; indeed the rule would be very awkward to state, in those terms. The rule I have given is based on their derivation of the word [lyaato].

[10]I have slightly changed their representation of this rule, in that I have the onset and the rhyme on top, with the consonant and vowel beneath. Halle & Vergnaud have it the other way around, which makes it a bit more complicated to read, graphically.

[11]Feinstein (1979:254) believes that syllable division is at some level deeper than phonetic representation.

[12]Apparently, in Luganda, an initial nasal before a consonant is syllabic (and, thus, the consonant is not prenasalized), but nasals are not syllabic, medially. Prenasalized consonants only appear medially in Luganda, then (See Snoxall 1967:XVI).

[13]There are other proposals, in the recent literature, that incorporate the rhyme into phonological rules. Ingria (1980) proposes a metrical analysis of compensatory lengthening in which the rhyme plays a crucial role. Essentially, he argues — using Latin and Greek data — that, when the coda deletes it leaves an empty node, which the peak then fills (i.e., VC$CV ⟶ VV$CV). However, a different analysis of

compensatory lengthening is proposed by de Chene and Anderson. They argue that when compensatory lengthening occurs, the first of two consecutive consonants (in a CVC$CVC sequence, for example) becomes a glide and then monophthongization occurs with the preceding vowel. (Ingria, though, does argue against this type of analysis for Greek.) If de Chene and Anderson's analysis is correct, then, compensatory lengthening can be seen as an assimilation rule.

Harris (1980) incorporates rhyme structure into an analysis of the e-epenthesis rule in Spanish. However, this involves assigning an initial s to the rhyme in an underlying representation like /skribir/ 'to write' or /skwela/ 'school', which does not seem to have any justification other than making his analysis work.

[14]This can be used to argue for the rhyme as a universal only in the weak sense, that is, as an available constituent.

[15]As far as I know, this has not been argued for, anywhere. However, both Kahn (1976) and Leben (1980) assume a flat syllable-structure, although they never argue for it.

[16]This mirrors Kahn (1976), who showed, for English, that medial clusters can be broken down into a joining of a possible word final coda with a possible word initial onset. Interestingly, Hockett (1955) further argued for the interlude because of languages like Finnish, in which medial clusters cannot be divided into permitted codas and permitted onsets.

[17]Halle & Vergnaud's argument for the appendix is quite similar to what Pike (1967:386) suggests: "... there may be postulated a dichotomous break between the nucleus on the one hand and the two margins on the other (if the nucleus is somehow independent of the two margins), or a dichotomous break between the pre-nuclear margin versus the nucleus and the post-nuclear margin in a language in which the domain of significant pitch extends over the post-nuclear margin as well as over the nucleus." Essentially, Halle & Vergnaud's claim is identical; if some prosodic phenomena affects the coda, then the coda is grouped with the rhyme, if it does not affect it, then the coda is grouped separately (in the appendix).

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