

ENGLISH WORD STRESS AND EMPTY VOWEL SLOTS¹

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One of most significant developments in the area of English stress must have been Hayes's metrical account (1982). Hayes simplifies stress assignment rules and reveals systematic distinctions between members of different lexical categories. He is able to do so by means of extrametricality, first introduced by Liberman and Prince (1977). In Hayes's paper the notion of extrametricality is developed and shown to account for apparently deviant stress contours of numerous English words.

Hayes assumes after Harris (1982) that languages may contain extrametricality rules which exclude some portions of words from the application of stress rules. According to him extrametricality may be assigned only at the right edge of stress domains. It appears, however, that the universal Peripherality Condition (Hayes 1982:270) should not be viewed as a constraint on rules assigning the feature in question, but as a "visibility" condition on that feature. That is to say, a nonperipheral syllable may also bear the feature [+extrametrical], but its extrametricality will not be noticeable to stress rules. This is the position argued for in Archangeli (1984) and Franks (1985).

Three distinct extrametricality rules are introduced in Hayes (1982) which apply to (a) nouns, (b) derived adjectives, and (c) other words. Under such an account, extrametricality explains differences in the stress behaviour of various lexical categories.

Once the right portions of various grammatical categories have been "crossed out" all words undergo foot construction rules — the English Stress Rule and Strong Retraction — and word tree construction rules. Then extrametrical syllables are attached by means of Stray Syllable Adjunction.

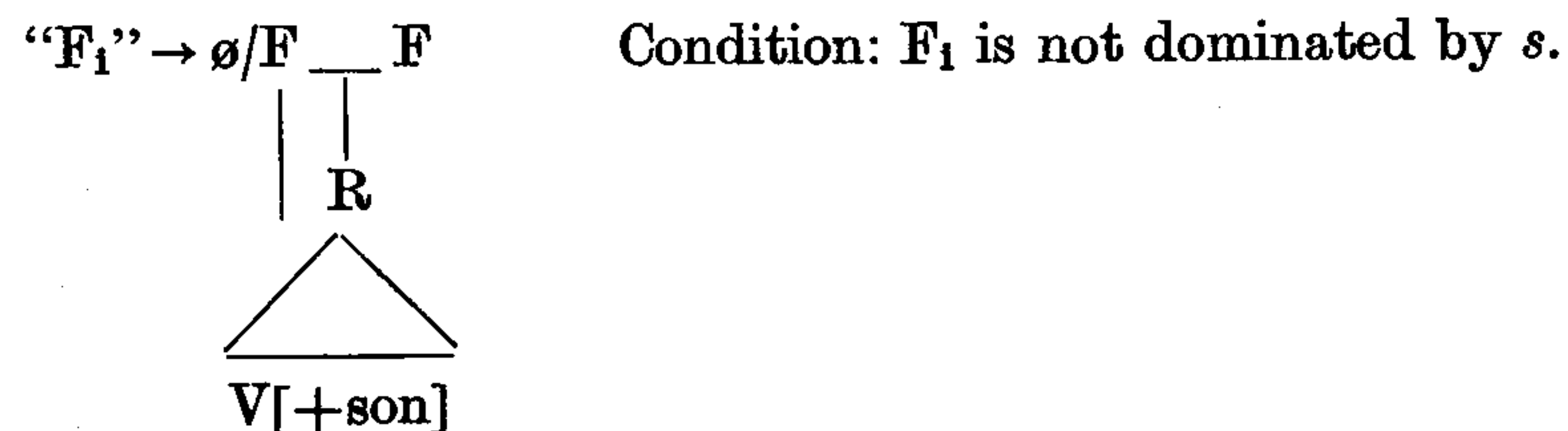
¹ I would like to express my gratitude to Prof. Gussmann for his valuable advice and comments on this paper.

Hayes's analysis of English stress phenomena is couched within the framework of Lexical Phonology which assumes that (most of) phonological rules, including stress assignment, apply cyclically in the lexicon after every word-formational operation. As far as English stress is concerned, its cyclicity is commonly accepted by both proponents and opponents of Lexical Phonology. The basic argument here is that derived words often exhibit subsidiary stresses on syllables which would have been primarily stressed in their sub-constituents if they had surfaced as full entities themselves. This fact cannot be straightforwardly accounted for in a noncyclic framework

The point in Hayes's model which we would like to consider more closely is destressing, or rather defooting. Hayes introduces three destressing rules each of which has the effect of removing the metrical structure of a foot in weak position. Its syllables are then adjoined to another foot by Stray Syllable Adjunction (SSA). The task of such rules is to produce trisyllabic feet on the surface, even though foot construction rules can create at most binary ones. At the same time they account for otherwise inexplicable vowel reduction in the defooted syllables. Note, however, that the presence of mechanisms like destressing enlarges the amount of redundancy in the grammar — it involves setting up the structure of a foot in order to reduce it afterwards. This is not to say that defooting rules should be done away with altogether. Our aim is to show that many of the apparently defooted syllables could have never become metrical feet. It follows that the application of foot deletion is much more restricted than it has been assumed by Hayes.

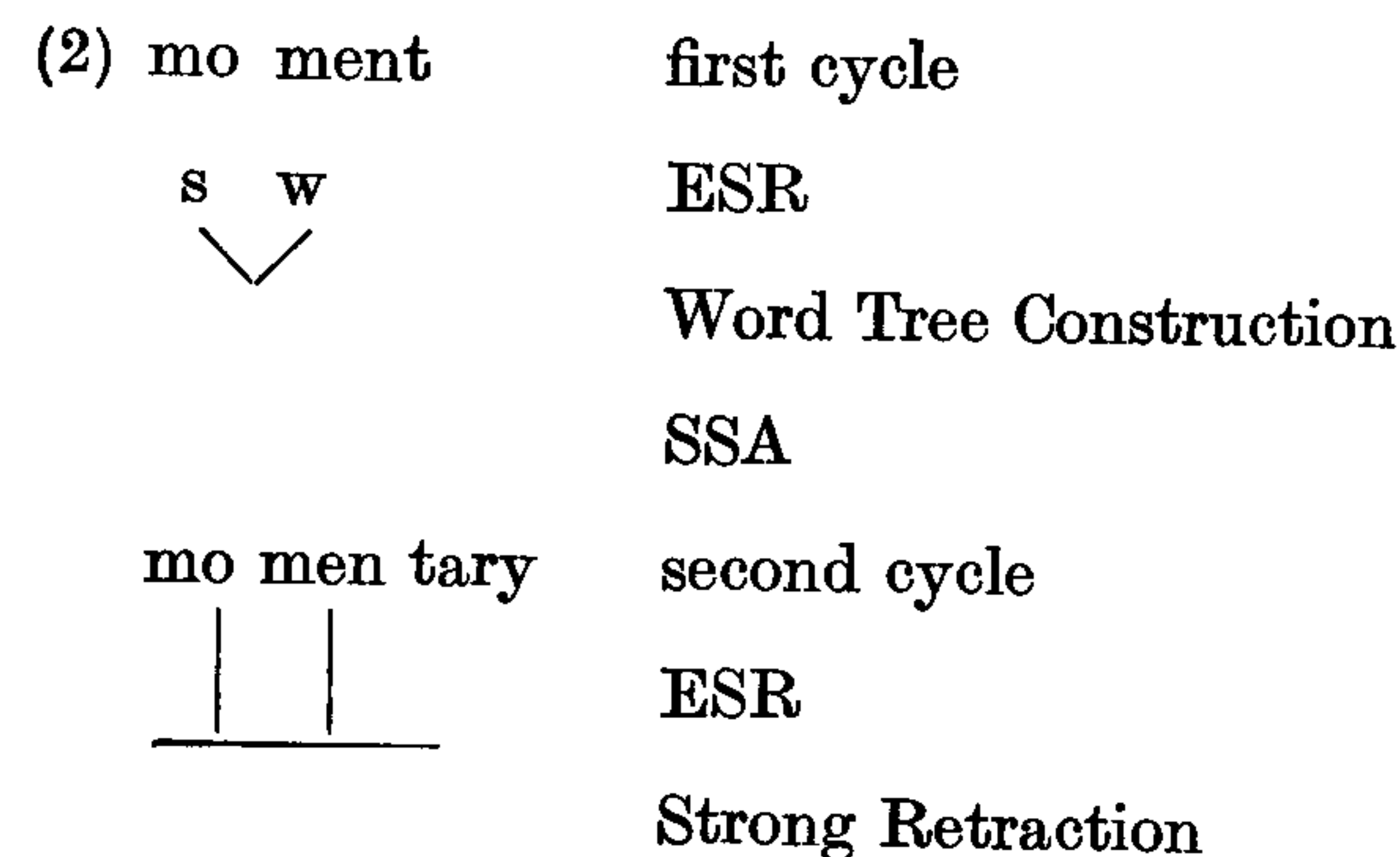
We would like to concentrate on the rule of Sonorant Destressing which has already been dealt with in Kiparsky (1979) and formulated in Hayes (1982:253) as follows:

(1) Sonorant Destressing



The condition imposed on (1) prevents the reduction of strong feet created on earlier cycles and implies that Sonorant Destressing must apply in the cycle after the English Stress Rule (henceforth: ESR) and Strong Retraction, but before Word Tree Construction. Otherwise the second syllables of *legendary*, *desultory*, etc., would have been marked as strong by the word tree.

Consider, however, the derivation of the adjective *momentary* [ˈmɒməntəri] which Hayes includes among the examples supporting Sonorant Destressing:



Now Sonorant Destressing should take place. Observe, however, that the metrical structure assigned so far lacks the foot following F₁ in (1). The foot must not be left out of the rule's formulation, because otherwise Sonorant Destressing would apply to the second syllables of verbs such as *record* and *present* (their final consonants being excluded by Consonant Extrametricality). Instead of making any ad hoc amendments to (1) let me put forward a radically different explanation for vowel reduction in the syllable in question, which has been suggested to me by Professor Gussmann.

The reduction of English vowels under lack of stress has long escaped a satisfactory formulation. The problem is that the result of the process, namely shwa, is rather difficult to characterise in terms of distinctive features. Hence it is no less problematic to specify the changes occurring in reduced vowels. It has been worked out for French in Anderson (1982b) and suggested for English as well in Anderson (1982a) that the result of reduction processes should be viewed as an “empty” vowel slot, i.e. a vocalic position specified for no quality features which still performs the role of the nucleus within the syllable. Vowel reduction must then be understood as a dissociation process delinking a vocalic slot in the skeleton under certain conditions from its segmental features.

Let us reverse the idea and say that the second syllable of *momentary* does not undergo vowel reduction as a consequence of its destressing, but it cannot be stressed because its underlying representation contains an empty V slot instead of a full vocalic feature complex. This slot is filled by a late redundancy rule associating empty vowel matrices with feature values representing the right contextual variant of [ə] to be introduced.

Note that neither in *momentary* nor in its base word *moment* does the second vowel ever show up in its full form.² The same situation obtains in the

² Note that apart from *momentary* there is *momentous* where the second syllable bears the main stress. We suppose that the latter word comes from *momentum* with a fully specified second vowel. The two words, *moment*/mɒmənt/ and *momentum* (mɒmentVm), may have been borrowed independently into English.

case of many nouns and adjectives in *-ary* and *-ory*:

| | | | |
|---------------|---------------|----------------|--------------|
| (3) legendary | ['ledʒəndəri] | cf. legend | ['ledʒənd] |
| voluntary | ['vɒləntəri] | cf. volunteer | ['vɒlən'tiə] |
| secondary | ['sekəndəri] | cf. second | ['sekənd] |
| prebendary | ['prebədəri] | cf. prebend | ['prebənd] |
| sedentary | ['sedəntəri] | | |
| desultory | ['desəltəri] | | |
| inventory | ['invəntəri] | | |
| promontory | ['prɒməntəri] | | |
| repertory | ['repətəri] | cf. repertoire | ['repətwa:] |
| offertory | ['ɒfətəri] | cf. offer | ['ɒfə] |

At least in the case of the verb *second* ['sekənd] if the second syllable had contained a fully specified vowel, the word should have been stressed and pronounced as the other verb of the same spelling, i.e. [si'kɒnd]. Here the assumption of an empty V slot accounts for the lack of stress on *-con-* in both the base and the derivative.

Most of the examples adduced by Hayes in support of his Sonorant Des-tressing also yield to the analysis with empty V slots: their shwas preceding sonorants never alternate with full vowels. Cf.:

| | |
|-------------------|-----------------|
| (4) a. gílbértite | |
| árgéntite | cf. árgént |
| b. sépréntite | cf. sérpént |
| sátúrnine | cf. sátúrn |
| cólumbine | |
| (4) b. continued | |
| célandine | |
| brígandine | |
| brílliantine | |
| gálantine | |
| églantine | |
| quárantine | |
| válentine | |
| líbertine | cf. líberty (?) |
| vésper-tine | cf. vésper |
| Flórentine | cf. Flórence |

Such an analysis is particularly convincing with monomorphemic words. Here are some examples and the representations proposed for them:

| | |
|---------------|-------------|
| (5) Hóttentòt | /hɒtVntɒt/ |
| Bálderdash | /baldVrdæʃ/ |
| Háckensack | /hækVnsæk/ |

| | |
|-------------|--------------|
| Álgernòn | /ælgVrnɒn/ |
| Jáckendòff | /dʒækVndɒf/ |
| ámpersand | /æmpVrsænd/ |
| dávenport | /dævVnpɔrt/ |
| cávalcade | /kævVlkæd/ |
| mérchandise | /mɜrtʃVndiz/ |

If we rejected the idea of empty vocalic slots and tried to establish representations with all vowels exhaustively specified, there would be no evidence as to what vowels should be postulated. The representations in the right column of (5) reflect then the speaker's actual knowledge of the words on the left.³

One source of empty vocalic slots may be lexical representation. This must be the case with those instances of [ə] which persist throughout various derivatives of a morpheme. See, for example:

| |
|---------------------------------|
| (6) conifer — coniferous |
| adulterous — adultery |
| ponder — ponderance |
| temper — temperance — temperate |

Compare, however, the following pairs:

| |
|-----------------------|
| (7) utter — utterance |
| enter — entrance |

The form *entrance* reveals that the underlying form of the base morpheme is /entr/. The sequence *-tr-* in the coda of the verb would violate the Sonority Hierarchy, therefore a rule inserts an empty V to break the unsyllabifiable cluster.⁴ The rule reads approximately:

| | |
|---|--|
| (8) V insertion | where: R — Rhyme |
| $\begin{array}{c} R \\ \\ \emptyset \rightarrow V / C _ \textcircled{C} \\ \qquad \\ [] \quad [+son] \end{array}$ | $\begin{array}{c} \textcircled{C} \text{ — extrasyllabic consonant} \\ V \text{ — empty vowel slot} \\ \\ [] \end{array}$ |

³ As a matter of fact, Hayes expresses the same idea on p. 261: "for a speaker who hears only the *ábracadabra* variant, the underlying vowel quality of the second syllable is not available owing to the lack of phonological alternations". However, he is not able to capture the generalisation because of the insufficiencies of his framework.

⁴ The difference between an underlying empty V slot and one introduced by a rule is sometimes obliterated by syncope. We assume that there is an optional empty V deletion rule which applies in fast speech and affects Vs in open syllables. It accounts for variant pronunciations of words such as *literature* ['lɪtəriʃə].

Then resyllabification creates a new syllable on the V slot. In some dialects a rule of sonorant spreading follows which bleeds the rule of shwa insertion. Consequently, we get either [ˈentr]/by sonorant spreading/ or [ˈentə] (by shwa insertion and final *r*-drop).⁵

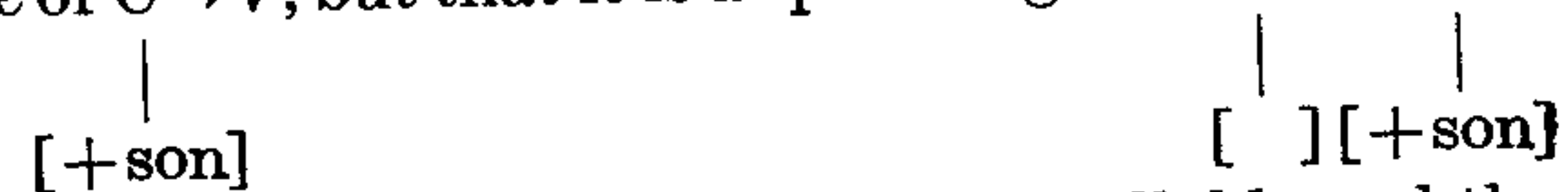
The same analysis can, as a matter of fact, be also applied to the words in (3), (4) and (5). It may be assumed that, for instance, *prebendary*, *gilbertite* and *Hottentot* come from /prebndæri/, /gilbrtīt/ and /hɔtntɔt/, respectively. Syllabification rules leave out extrasyllabic sonorants, since *-bn-*, *-br-* and *-tn-* are not possible codas in English, and *-nd-*, *-rt-* and *-nt-* are not possible onsets, either. Then (8) applies inserting a V in front of the sonorants. In the absence of direct evidence such as *ø* ~ *ə* alternations in related words it may seem arbitrary to decide in favour of or against such a solution. However, since (8) is necessary in English phonology anyway, we reduce the amount of redundancy in the lexicon assuming that the Vs in question are also its results.

If we now want empty Vs to account for the lack of stress on syllables containing them, we must make foot construction rules act so as not to stress syllables with underspecified nuclei. Instead of reformulating the English Stress Rule and Strong Retraction we suggest the following restriction on the operation of foot construction rules:⁶

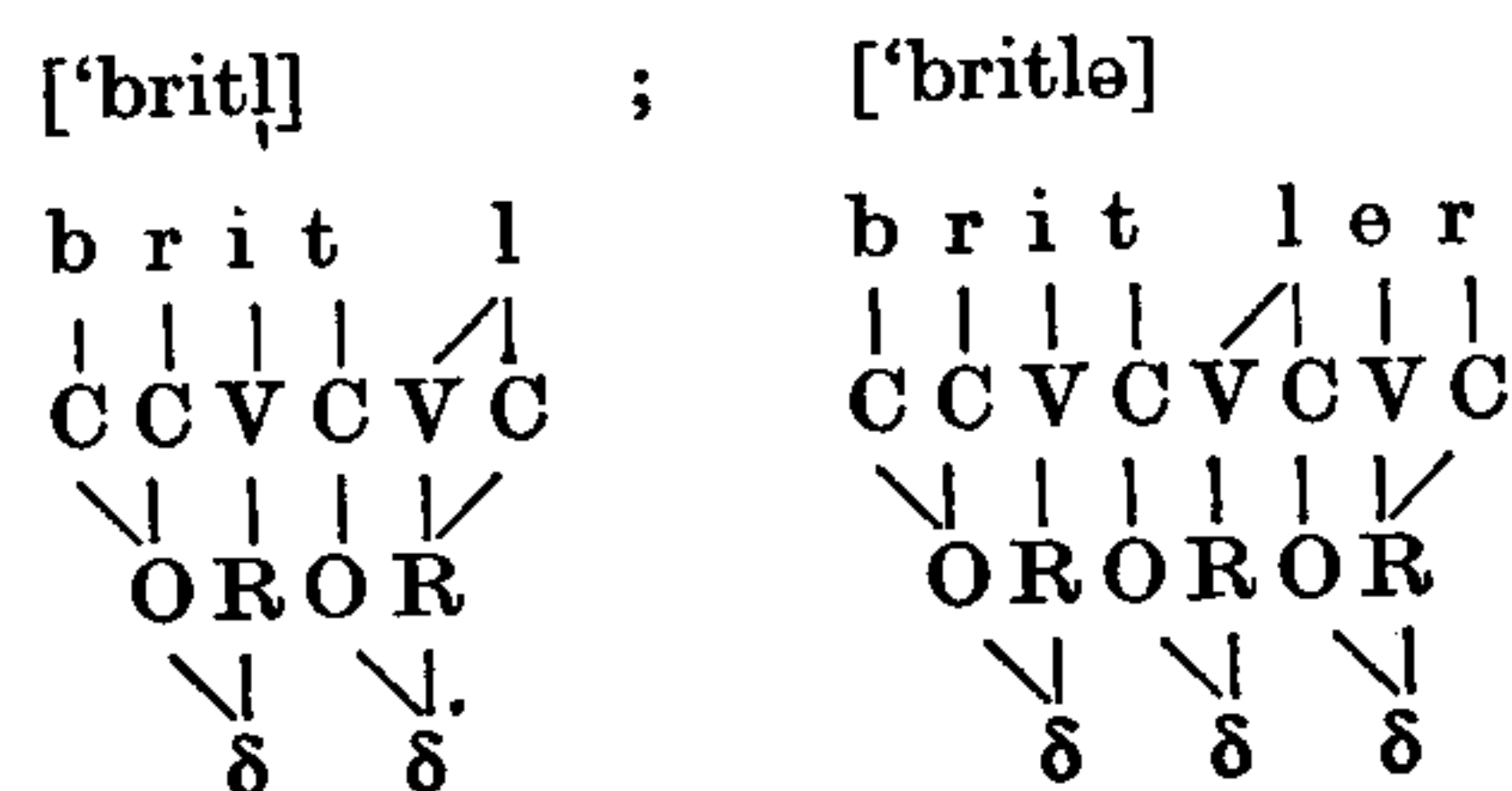
(9) Do not mark strong or create a monosyllabic foot a syllable containing a single empty V node in the nucleus.⁷

Christine ter Mors (1985) argues that this is the rule of syllabification in Klamath that introduces empty V nodes where they are demanded by the syl-

⁵ Unlike in some other analyses (e.g. Mohanan (1985)), we do not suppose that sonorant syllabification brings about a change of C → V, but that it is a spreading rule: V C.



Observe that a syllabic sonorant may function as both the nucleus of one syllable and the onset of the next one:



⁶ Condition (9) can easily be translated into a grid theory such as, for instance, that of Halle and Vergnaud (1986): "Do not place a line 1 grid over an empty vowel".

⁷ The restriction must differentiate between short [ɚ] and long [ɚ:] which may carry stress. There is good reason to suppose that the latter sound at least at some stage in the derivation is a bimoric empty nucleus VV.

lable template. However, her analysis cannot be transplanted to English. Many class I suffixes, for instance, verbal *-en-*, *-ate-* and *-ise-*, attach to bases with specific syllabic structure: *-en* selects only monosyllables, while *-ate-* and *-ise-* forms of two or more syllables (cf. Gussmann 1986). It follows that syllabification must come before any suffixation. But if we assume then that the syllabification rule inserts empty V slots, there is no way to derive *entrance*. We conclude therefore that V insertion is distinct from syllabification.

The analysis presented above — one making use of empty vocalic nodes and of a rule inserting Vs — can be shown to have numerous advantages over any previous one. First and foremost, it views vowel reduction to [ə] as one and the same (delinking) process in the case of all vowels, no matter what their feature values are. It relates all occurrences of shwa tracing them back to empty Vs. Thus, it explains why both reduced vowels and inserted ones are [ə]. It also enables us to account for the fact that shwa, unlike any other vowel, appears in unstressed syllables exclusively. Last but not least, we can handle sonorant syllabification in a plausible way (cf. note 5).

Let us now consider the position of (8) among other phonological rules. Note the following words:

| (10) | A | B | C |
|------|-----------|-----------------------|--------------|
| | remember | remembered | remembrance |
| | | remembering | |
| | cumber | cumbered | cumbrance |
| | | cumberer _N | cumbrous |
| | resemble | resembled | resemblance |
| | [riˈzemb] | [riˈzemb]d | [riˈzemb]əns |

The words in (C) are derivatives of class I suffixes, i.e. those preceded by "+", while the words in (B) are derived by means of class II and inflectional suffixes carrying "#". We could conclude that (8) applies if the word boundary follows the extrasyllabic sonorant, and not the morpheme boundary. However, (8) should also be applicable to the words in (3), (4) and (5) where there is no evidence for an internal boundary to trigger the rule. Besides, boundary distinctions have commonly been rejected as insufficient to handle various cases of application and non-application of phonological rules in derived contexts. Several other solutions have been postulated instead, of which Lexical Phonology offers one of the most appealing. According to it, there are two types of rules: lexical, applying only in derived contexts, and postlexical, applying "across the board". Our rule of V node insertion applies to nonderived forms, hence should be ordered among postlexical rules. If it were so, however, it would not differentiate between e.g. *-er_N* and *-ance_N* derivatives. Therefore we conclude that the principle of strict cyclicity restricting the application of the so-called level 1 phonological rules to derived environments is untenable.

The validity of some aspects of cyclic theories of phonology has already been questioned several times (cf. Gussmann (1985), Szpyra (1985); Szpyra's doctoral dissertation (1986) not only contains profound criticism of Lexical Phonology, but also offers alternative proposals and solutions). Cyclicists themselves admit that cyclicity may be the property of some (and not all) lexical strata (cf. Halle and Mohanan (1985), Kiparsky (1985)). We would like to devote more space to the latter work, since it discusses several processes from different languages which have the same property as our V slot insertion: they apparently disobey the original version of the Strict Cycle Condition (cf. Mascaró (1976)). Kiparsky reformulates the Strict Cycle Condition (henceforth: SCC) so that it does not restrict rules of the last lexical level. This obviously amounts to a serious weakening of a most fundamental principle of Lexical Phonology. We would like to put forward an alternative analysis and compare briefly both approaches against the background of some of the processes discussed in Kiparsky (1985).

Our proposal owes a lot to McCarthy's (1979) theory of nonconcatenative morphology. It is based on the idea that in the derivation, morphemes may not concatenate but remain on separate tiers until the process of Tier Conflation, whereby the information represented on independent tiers is mapped onto a single tier (cf. McCarthy (1986)). All the rules preceding Tier Conflation treat the morphemes as separate entities. Let us assume that English class I affixes as well as irregular inflectional ones do concatenate with their base words (Level I morphology), whereas class II affixes, compound constituents and regular inflectional endings do not (Level II morphology).⁸ Phonology also applies in two blocks — one before and the other Tier Conflation (cf. note 8), but they are not sandwiched between morphological strata. Derivation proceeds in the following manner. Level I derivatives and simplex words which have not entered any affixations in the first stratum undergo Level I phonological rules which are insensitive to their internal morphological structure. Structures added in Level II morphology remain as yet on separate tiers and are interpreted in isolation. Afterwards Tier Conflation takes place followed by other phonological rules which now operate on structures including material affixed on Level II. Within this framework rule (8) applies early in Level I phonology. As a matter of fact, no rule can be found which must precede (8). Hence phonological Level I may be supposed to begin with V-slot insertion.

⁸ The results of this paper do not bear on the question whether English has two or more levels of morphology. If, however, more strata should be postulated (e.g. II—class II derivation, III—compounding, IV—inflection), it follows that there must be several Tier Conflations and several layers of phonology.

Such a model offers a natural explanation of the fact acknowledged in Kiparsky (1985): that Level I phonological rules do not apply to forms entering class I affixations. While Kiparsky needs to reformulate the Strong Cyclicity Condition to account for the phenomenon, in our framework this follows from the assumption that there are no internal cycles in Level I phonology.

Consider now the simplification of final /mn/ in English which takes place word-finally and before suffixes other than class I ones:

- | | | |
|---------|-----------------------------------|---------------------------------------|
| (11) a. | damn+ation | hymn+al |
| | damn+able | hymn+ology |
| b. | dam $\text{\textcircled{a}}$ | hym $\text{\textcircled{a}}$ |
| | dam $\text{\textcircled{a}}$ #ing | hym $\text{\textcircled{a}}$ # #index |

As our V-insertion, the rule in question may not be ascribed to Level I of Lexical Phonology because it applies to underived *damn*, *hymn*, etc. Neither is it postlexical, since it differentiates between class I and other suffixes. Kiparsky's SCC must block the application of the simplification rule until the word level to derive the correct result. Within our framework, on the other hand, *n*-deletion turns out a regular pre-Tier Conflation (or Level I) rule.

Kiparsky claims the SCC is necessary to dictate the cyclical application of rules in derived contexts and "across the board" application in non-derived environments. One of the rules applying in both ways is said to be Icelandic *u*-epenthesis. Consider the following forms (Kiparsky, 1985: 90):

- | | | | | |
|------|-----------|-----------|--------------------|----------|
| (12) | dag+um | →dögum | bylj+um | →byljum |
| | dag+r | →dagur | bylj+r | →bylur |
| | dag | dag | bylj | →byl |
| | dag+r#inn | →dagurinn | bylj+r#inn | bylurinn |
| | dag#inn | →daginn | bylj#inn | →bylinn |
| | lifr+um | →lifrum | (does not take -r) | |
| | lifr | →lifur | (does not take -r) | |
| | lifr#ina | →lifrina | | |

where: /dag/ — "day", /bylj/ — "snowstorm", /lifr/ —

level — case endings: dat. pl. /um/,
nom. masc. sg. /r/,
acc. sg. — null,

level 2 — the enclitic article /inn/, /ina/ —
(nom. and acc. sg.).

Under Kiparsky's analysis, the cyclic *u*-epenthesis may operate on derived /dag+r/ and /bylj+r/, but not on /lifr/. The input to level 2 morphology becomes [dagur], [byljur], but still [lifr] (hence *lifr* ≠ *i'na* without *u*). The *u* in underived *lifur* is inserted by a postlexical application of the same rule.

We think that there is no need for multiple application of *u*-epenthesis. Apparently Icelandic has only one Level II (or post-Tier Conflation) rule of V-insertion whose operation is shown in *lifur*. The suffix *-r*, on the other hand, carries an underlying V slot. The empty slots of both sources are filled in with the feature values for [u] by a late redundancy rule.

It would take us far beyond the main concern of this paper to deal with the other processes discussed by Kiparsky. Let us remark, however, that they also yield to a noncyclic analysis. This, combined with the results of the preceding discussion, questions the role of the SCC as the language universal principle organising the lexicon. It would be, however, too hasty to draw a conclusion on the basis of just a few individual processes from various languages. Let us therefore restrict ourselves to English.

As far as the latter language is concerned, V insertion is not an isolated piece of evidence against strict cyclicity. As has already been said, many more counterexamples may be found in the work of many researchers. Anderson's remark (1982a) still holds true that, as a matter of fact, most evidence for the cycle is confined to the area of stress. Note that in Halle and Mohanan's (1985) account of English phonology the bulk of rules ascribed to cyclic stratum 1 are metrical. The cyclic nature of metrical rules in English is well-known. However, as to the other rules included in stratum 1, we cannot see why they should be regarded as cyclic.

The distinct character of English metrical rules against the rest of phonology has often been pointed out, e.g. in Anderson (1982a) and Kaisse and Shaw (1985). Unlike most phonological rules, they build structure rather than change it. Hence their mode of application is likely to differ from the rest of phonological rules. That is to say, the cyclicity of English stress assignment does not entail the cyclicity of English phonology in all. In fact, our analysis points to the opposite. Certain rules may be assumed to apply cyclically without endorsing the claim that phonology and morphology are intermingled. This is the viewpoint expressed in a recent article by Halle and Vergnaud (1986):

- (13) "For us, as for SPE, morphology is distinct and separate from phonology. Morphology interacts with phonology in that it creates the objects on which the rules of phonology operate" (1986:10).

Halle and Vergnaud's framework differs from ours in many respects. Among other things, they assume that phonological strata may still be specified as

cyclic or noncyclic. However, since their paper is devoted to stress phenomena, it includes hardly any evidence for cyclicity elsewhere in phonology.

Our proposal concerning the organisation of morphology and phonology requires much more evidence embracing a wide range of phonological processes in English and their interactions with morphology; this is far beyond the scope of the present paper. Let us point out, however, that unlike any other approach this one incorporates the double nature of English morphology: partly root-based and partly word-based.

The idea that skeletal slots may function independently of feature matrices, which underlies our analysis, is the basic assumption of the more recent version of Autosegmental Phonology. On the other hand, no other approach has been so successful in describing stress phenomena as Metrical Phonology.⁹ This apparent paradox calls for some compromise between the two competing theories.

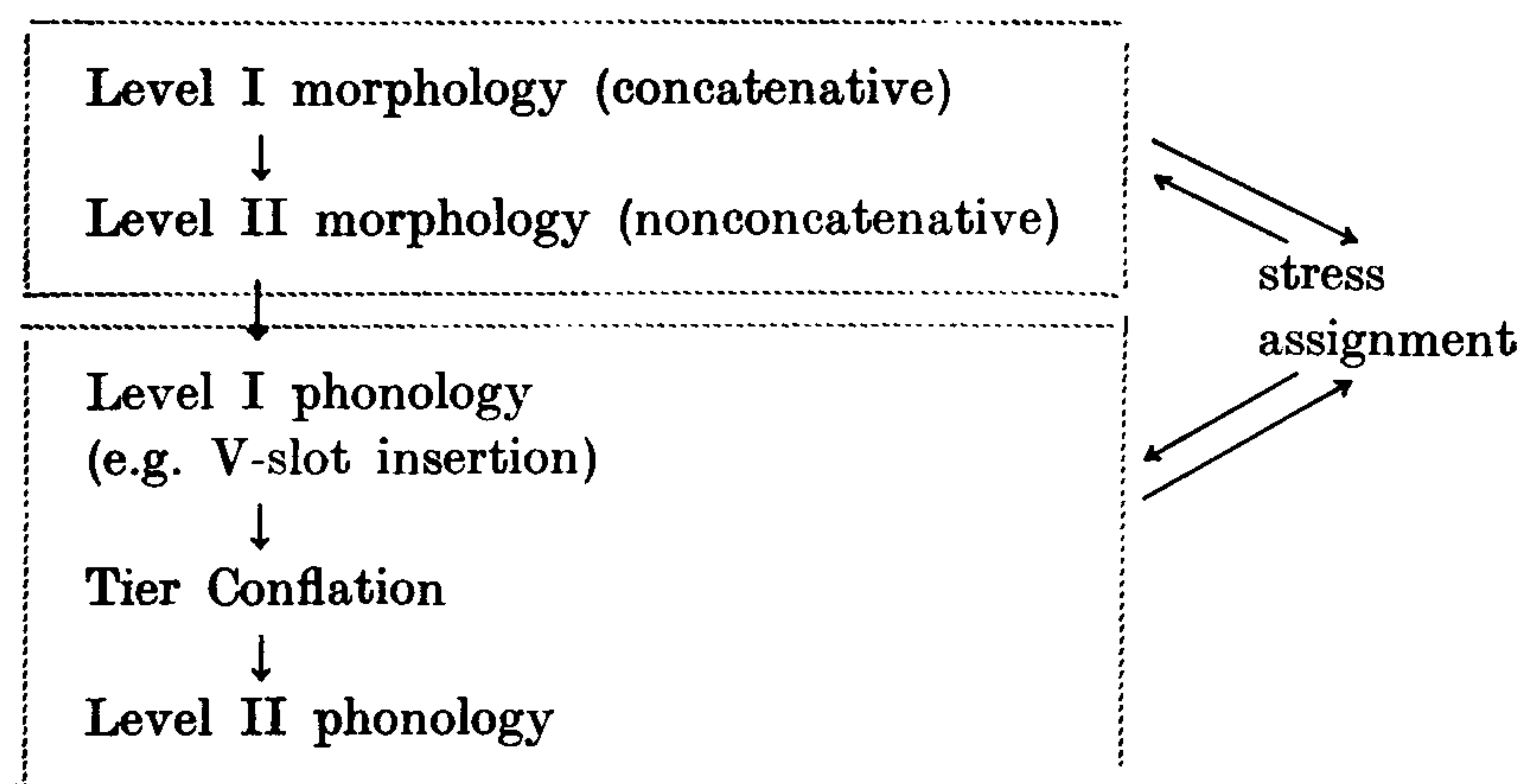
As a matter of fact, the theory which gains growing popularity, Three-Dimensional Phonology, is a combined autosegmental-metrical framework, with the predominance of the autosegmental model. The segmental slots of its skeletal tier perform simultaneously the role of the terminal elements of the metrical structure. The adequacy of such a framework is supported by the results of the present paper. We hope to have shown that the metrical analysis provides useful devices for an adequate account of stress, but a nonlinear model of language is simultaneously necessary.

The basic aim of this paper has been to account for the phenomenon known as Sonorant Destressing and to consider the questions which turn up in the analysis concerning the choice of the right descriptive formalism and the model of English phonology and morphology. Let me recapitulate the most important points which have emerged in the course of the preceding discussion.

- 1) There is no rule of Sonorant Destressing in English.
- 2) A shwa in a normally stressed position which does not alternate with \emptyset or a full vowel in related words comes from an underlying empty V slot.
- 3) A shwa followed by a sonorant and alternating with \emptyset in related words is an empty V node introduced by V insertion (8) at the beginning of phonological derivation.
- 4) A syllable with an empty V slot in the nucleus may not be stressed due to condition (9).
- 5) Nonlinear Phonology promises what appears to be the most adequate framework for the analysis of phonological processes.

⁹ See Griegerich (1985).

The following model of English morphology and phonology has been sketched out:



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