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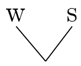
Approaches to Rhythmical Variation in English

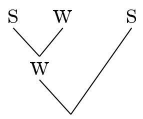
1 The two processes of English Rhythmical Variation

RHYTHMICAL VARIATION in English is a change in the prominence pattern of a double accented word (or double accented phrase) when it is embedded in a phrase which contains at least one further accent. The variation is motivated by a strive to produce equal distances between the accents of the phrase.[1] It is a well-known fact that English words like *thirteen,* which are double-accented in isolation (cf. (1a)), may lose either their second or their first accent when they are embedded in a phrase, depending on whether they are closely followed or preceded by an accented word in the same phrase (cf. (1b, c)). (The symbol ˈ signals a pitch accent on the syllable whose orthographic form the symbol precedes.)

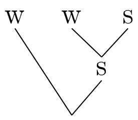
(1) a. ˈthirˈteen



b. ˈthirteen ˈmen (Iambic Reversal)



c. ˈjust thirˈteen (Iambic Exaggeration)



[1] Rhythmical variation contradicts the general assumption which was adopted in Chomsky and Halle (1968), viz., that prominence relations are preserved under embedding.

The two accents of the word *thirteen* in (1a) are also known as "secondary stress+primary stress", because the first accent is somewhat weaker than the second.[2] Losing the second accent is called IAMBIC REVERSAL (cf. Liberman & Prince 1977 : 319), because the originally [weaker+stronger] (i.e., iambic) prominence pattern of the word is reversed into a [stronger+weaker] prominence pattern when the word is closely followed by another accent in the same phrase. Iambic Reversal occurs in left-branching structures, cf. (1b). The other process, viz., the loss of the first accent of the word when it is closely preceded by an accent in the phrase, does not have an established name in the English linguistic literature; I will call it IAMBIC EXAGGERATION, because the already weaker initial accent becomes relatively even weaker. Iambic Exaggeration occurs in right-branching structures, cf. (1c).

2 Research on English Rhythmical Variation

2.1 The theoretical significance of Rhythmical Variation

The processes shown in (1) have drawn considerable attention among English phonologists because they raise important theoretical questions like those in (2):

(2) a. Are the two kinds of processes separate phenomena or just manifestations of one and the same thing?
b. Are they lexical or postlexical phenomena?
c. In which metrical phonological framework can they be best represented?

Although the two processes are obviously related to each other (Jones 1964 : 253f), Iambic Reversal, (1b), has received far more attention than Iambic Exaggeration, (1c). Iambic Reversal (also known as Stress Shift, cf. e.g., Wells 1990) has a vast literature. In addition to Liberman & Prince's tree-and-grid-based account (1977) there are a large number of accounts proposed by other phonologists. These include Kiparsky's tree-based "Rhythm Rule" (1979), Prince's grid-based "Move X" (1983), Selkirk's grid-based "Beat Movement" (1984), Hayes' "Move X" (1995). Halle & Vergnaud (1987) use the term "Rhythm Rule" not only for shifts of word stress at the phrase level, as in the example ˈ*thirteen* ˈ*men,* but also for the word level

[2] In English both of these are pitch-accented: the pre-primary secondary stress initiates a non-nuclear intonational contour, and the primary stress initiates a nuclear intonational contour within the intonational phrase.

phenomenon of weakening the final foot in words like *forˈmaldehyde.*[3] Others have provided accounts of Iambic Exaggeration, e.g., Giegerich's tree-based "W-Pairing" (1985), Hayes' "Beat Addition" (1984, 1995), or tried to treat both Iambic Reversal and Iambic Exaggeration along the same lines: Hayes' tree-and-grid-based "Rhythmic Adjustment" (1984), Gussenhoven's accent-based "Rhythm Rule" (1991), etc.

In the following I attempt to give an overview of the most influential developments in the investigation of English rhythmical variation, paying special attention to the answers which the various approaches have provided to the questions in (2). The review will be inevitably selective.

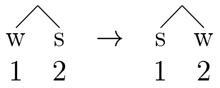
2.2 Liberman & Prince's Iambic Reversal rule

Liberman & Prince (1977) provide the first comprehensive analysis of rhythmical variation in English, but they only deal with Iambic Reversal. This is because Liberman & Prince establish prominence patterns in terms of *s* and *w* nodes, and it is only Iambic Reversal that reverses prominence patterns that are given in these terms (changing [w s] into [s w]). By contrast, Iambic Exaggeration does not change the [w s] pattern. The fact that the *w* becomes weaker (or the *s* stronger) does not affect the [w s] pattern because the Liberman–Prince-framework is unable to express different degrees of weakness or strength.

Liberman & Prince (1977 : 319) find that the metrical tree grants "permission" for Iambic Reversal to occur, if it contains a structure to which the Iambic Reversal rule in (3) can be applied.

[3] For a criticism of this extension of the term see Burzio (1994 : 70). Nevertheless, the term is also used in this extended sense in Halle (1998).

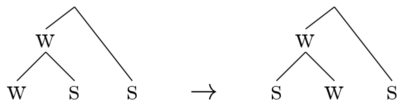
(3) **Iambic Reversal (optional)**



Conditions: 1 Constituent 2 does not contain the designated terminal element of an intonational phrase.
2 Constituent 1 is not an unstressed syllable.[4]

An alternative formulation of Iambic Reversal in tree structure is offered by Kiparsky's Rhythm Rule (1979). The advantage of this tree-based rule is that it incorporates Condition 1 of (3).

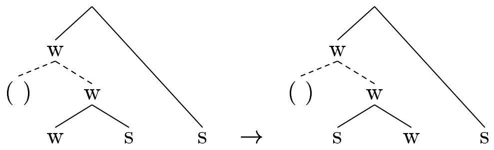
(4) **Rhythm Rule**[5]



However, Liberman & Prince claim that the use of the metrical tree alone to specify Iambic Reversal is insufficient and therefore it has to be complemented by another device, the metrical grid. Although the grid in this framework is built on the basis of the information contained in the tree, it presents this information in a novel way. The principle for constructing

[4] Condition 1 prevents the change if it leads to loss of accent on a constituent which is the strongest constituent of the phrase, so that e.g., *Chi'nese expert* (meaning 'an expert on the Chinese language') does not become *'*Chinese expert.* Condition 2 prevents the change when the syllable whose stress would be increased is originally stressless, so that e.g., *a ma'rooned 'soldier* never becomes **a 'marooned 'soldier.*

[5] Since Kiparsky's tree-based definition of the Rhythm Rule does not always allow iterative lower-level reversals to take place, Hogg & McCully (1987 : 146) propose a less restrictive modification of the rule:



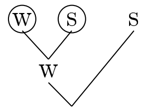
well-formed grids is the Relative Prominence Projection Rule (Liberman & Prince 1977 : 316).

(5) **Relative Prominence Projection Rule (RPRR)**
In any constituent on which the strong-weak relation is defined, the designated terminal element of its strong subconstituent is metrically stronger than the designated terminal element of its weak subconstituent.

We assume that the word *thirteen* enters the phrase *thirteen men* with its original (underlying) prominence pattern and undergoes Iambic Reversal (a switch in its *w* and *s* nodes) there. So the initial (underlying) metrical tree for *thirteen men* is the lower half of (6). On the basis of this tree, and in conformity with the RPRR, we can build the metrical grid in the upper half of (6). (The letter L stands for Level in the grid.)

(6)

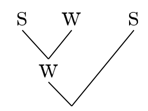
L3			×
L2		×. . . .	×
L1	×	×	×
	thirteen		men



In the grid of (6), the grid marks (×-es) on L2 are clashing, because they are adjacent and their counterparts at the next lower level (L1) are also adjacent. (The clashing marks are connected by a dotted line.) According to Liberman & Prince (1977 : 311), such a clash motivates the reversal of the sequence [w s] into [s w] within the tree. (The relevant labels are circled in the tree.) The new tree, in the lower half of (7), serves as input to a new grid, in the upper half of (7), in which the clash has been resolved.

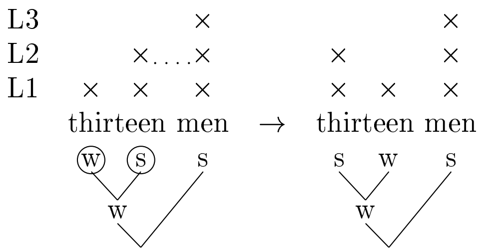
(7)

L3			×
L2	×		×
L1	×	×	×
	thirteen		men

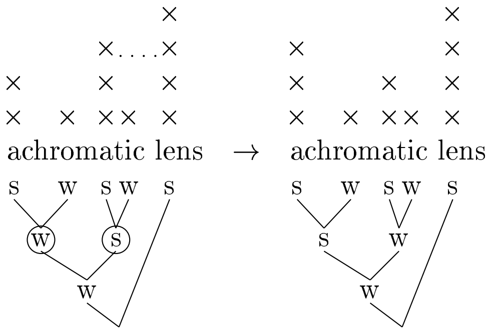


Although (6) is acceptable and so the new pattern (7) is not obligatory, the latter sounds better than the former because it is metrically alternating. In (7) the grid marks on L2 are alternating because they are adjacent but their counterparts one level down (on L1) are no longer adjacent.

The pre-reversal, (6), and post-reversal, (7), representations can be combined in one diagram, (8), with an arrow between the two, to show the direction of the optional process:

(8)


Liberman & Prince are of the opinion that a clash in the grid produces the "pressure" (motivation) for the change. A grid clash (Liberman & Prince call it "stress clash") can only be defined in terms of grid levels and not in terms of tree structure. Iambic Reversal can take place even when there are intervening syllables between the clashing grid marks, as in (9); cf. Liberman & Prince (1977 : 317):

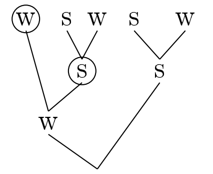
(9)


Nevertheless, the tree is also necessary, because it provides the "permission" for the change by yielding the input to the grid. So Liberman & Prince's account is a TREE-AND-GRID-BASED ANALYSIS.

The grids we have seen so far are "minimal" in the sense that they contain the least possible structure. The RPRR allows both minimal and non-minimal grids. In theory, it would not prevent us from building a grid like (10) for the tree in (6). But this would not be a minimal grid.

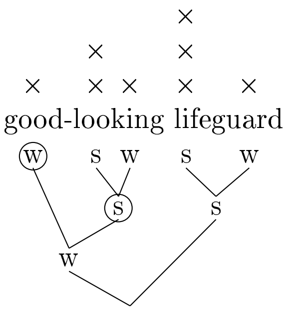
(10)
```
          ×
          ×
          ×
     ×....×
     ×    ×
  ×  ×    ×
  ×  ×    ×
  ×  ×    ×
thirteen men
```

In order to avoid an infinite number of possible grid representations of one and the same prominence pattern, the grids should be made as minimal as possible. For instance, by constructing a minimal grid for *Montana cowboy,* Liberman & Prince (1977 : 321) are able to give an explanation of why *Montana* resists Iambic Reversal. According to this explanation, it rejects the reversal because, though the tree provides the permission, the grid does not have a clash which would provide the motivation for the change.

(11)
```
          ×
     ×    ×
  ×  × ×  ×   ×
Montana cowboy
```


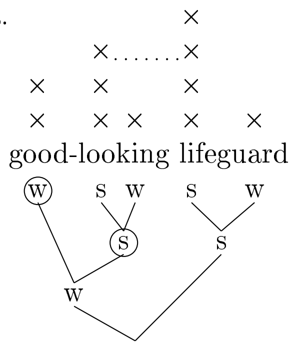
However, Liberman & Prince (1977 : 322) themselves realize that a completely minimal grid like (12) for *good-looking lifeguard* is inadequate because it cannot show a clash which obviously exists. If there were no clash here, the phrase would not be submissible to Iambic Reversal. Since most people submit (12) to Iambic Reversal, its grid must contain a clash.

(12)



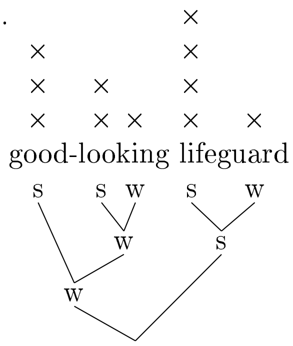
Therefore Liberman & Prince define minimality of the grid in such a way that lexical monosyllables like *good,* when labelled *w,* should have an L2 grid mark (with all the necessary adjustments in the heights of the other columns in accordance with the RPRR). Ultimately a new grid, (13a), will arise, which is already capable of showing the clash which motivates Iambic Reversal. The result of Iambic Reversal is shown in (13b).

(13) a.



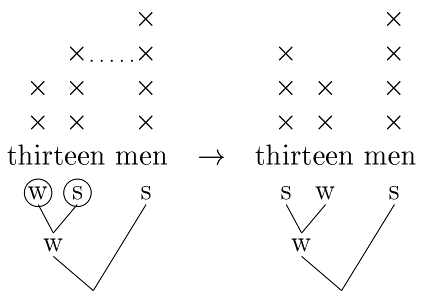
→

b.



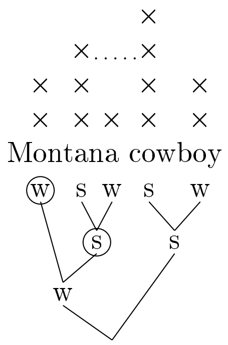
Hogg & McCully (1987 : 140–43) claim that Liberman & Prince's suggestion concerning lexical monosyllables is an ad hoc solution and they suggest a more general principle for regulating additional grid marking. This more general principle is that, when marked *w* in the tree, any syllable that is the head of a stress foot (i.e., which contains a non-reduced vowel) should have two grid marks over it, while any syllable that is NOT the head of a stress foot should have only one grid mark. The stress foot might be part of a word (such as *thir-* in *thirteen,* or *bam-* in *bamboo*), an affix (such as *pre-* in *pretonic*), or a lexical monosyllable (such as *good, hard, well* or *guard*). In other words, stress feet should have at least L2 representation. I call this principle "the minimally enhanced grid principle" and the grids reflecting it can be called "minimally enhanced grids", in order to distinguish them from the minimal ones. For instance, the minimally enhanced versions of the grids in (7) are shown here as the grids in (14).

(14)



However, while the minimal grid for *Montana cowboy,* (11), did not contain a clash, its minimally enhanced version in (15) does.

(15)



Since native speakers do not normally carry out Iambic Reversal here, the only logical conclusion is that *Montana* is one of those words that are lexically marked exceptions to Iambic Reversal.[6]

In English, Iambic Reversal is not restricted to certain classes of words; practically all words (apart from the lexical exceptions) and phrases embedded in larger phrases may systematically undergo the variation if they have the underlying secondary+primary stress pattern; cf. e.g., ˈ*pontoon*

[6] Other lexically marked exceptions include e.g., *Alberta, titanic, loquacious, obese, ordained, forlorn,* etc. (cf. Hayes 1984 : 56f).

ˈbridge, ˈDundee ˈmarmalade, ˈacademic ˈdiscipline, ˈgood-looking ˈtutor, etc. (cf. Hogg & McCully 1987 : 129–137).

2.3 Selkirk's Beat Movement

Criticism of the tree-and-grid-based models led to the emergence of new versions of metrical phonology which managed to get rid of the tree and used the metrical grid alone. Although the first advocate of this trend was Prince (1983), the first really comprehensive treatment of GRID-ONLY PHONOLOGY was offered by Selkirk (1984).

In Selkirk's account there is no need for the metrical tree. The underlying grid is constructed by the Text-to-Grid Alignment rules and then modified by the Grid Euphony rules. One of these Grid Euphony rules is Beat Movement. Selkirk (*op.cit.* : 55, 168) defines Beat Movement for English as (16).

(16) **English Beat Movement**

$$\begin{array}{ccccccc}
 & & \times & & & & \times \\
 & \times & \times & & \times & & \times \\
\times & \times & \times & \rightarrow & \times & \times & \times
\end{array}$$

Iambic Reversal is the result of the Beat Movement rule. Selkirk agrees with Liberman & Prince that Beat Movement (and so Iambic Reversal) is motivated by a clash in the grid. When the grid has been constructed and contains a grid clash, it triggers Beat Movement, which abolishes the clash by sending the left member of the clash to the left, as in (17), cf. Selkirk (*op.cit.* : 167–169).

(17)

$$\begin{array}{ccccccc}
 & & \times & & & & \times \\
 & \times\ldots & \times & & \times & & \times \\
\times & \times & \times & & \times & \times & \times \\
\multicolumn{3}{c}{\text{next-door neighbour}} & \rightarrow & \multicolumn{3}{c}{\text{next-door neighbour}}
\end{array}$$

Selkirk's grids do not display constituency. However, a cluster of junctural time units called "silent demibeats" can be interpolated on the bottom level of the grid after certain word-final syllables within phrases (cf. Selkirk *op.cit.* : 314), and these indicate to some extent the phrase boundaries that are missing in Selkirk's system. These silent demibeats can grow into columns after application to them of another Grid Euphony rule, viz., Beat Addition, (18), (cf. Selkirk *op.cit.* : 55).

(18) **English Beat Addition**

$$\begin{array}{ccccc} & & & \times & \\ \times & \times & \rightarrow & \times & \times \end{array}$$

Left dominant, R–L

The silent demibeat columns can interfere with the Grid Euphony rules: they can undo a clash and thus prevent Beat Movement from taking place. This is why Beat Movement (and so Iambic Reversal) occurs in (19a) but not in (19b), (cf. Selkirk *op.cit.* : 185). The underlined $\underline{\times}$-es are silent demibeats.

(19) a.

$$\begin{array}{cccc} & & & \times \\ \times & & & \times \\ \times & \times & & \times \\ \times & \times & (\underline{\times}) & \times \ldots \\ \multicolumn{2}{c}{\text{Marcel}} & & \text{Proust} \end{array}$$

b.

$$\begin{array}{cccccc} & & & & & \times \\ & \times & & & & \times \\ \times & \times & & \underline{\times} & & \times \\ \times & \times & (\underline{\times}) & \underline{\times} & \underline{\times} & \times \ldots \\ \multicolumn{2}{c}{\text{Marcel}} & & & & \text{proved} \end{array}$$

Selkirk's insistence on the grid clash as being the cause of Beat Movement (and so of Iambic Reversal) is problematic in cases like *ideal editorial,* where there is NO clash in the grid constructed by the Text-to-Grid Alignment rules, but there may still be Iambic Reversal, cf. (20).[7]

(20)

$$\begin{array}{ccccccc} & & & & \times & & \\ & \times & & & \times & & \\ \times & \times & \times & & \times & & \\ \times & \times & \times & \times & \times & \times & \times \\ \text{i} & \text{deal} & \text{e} & \text{di} & \text{to} & \text{ri} & \text{al} \end{array}$$

What Selkirk (*op.cit.* : 189f) suggests is that (20) is not in fact the appropriate underlying grid for *ideal editorial.* She claims that, if Beat Movement (i.e., Iambic Reversal) does take place in this phrase, then the strongest beat on the first and second word bears a pitch accent. Since "[a] syllable associated with a pitch accent is more prominent (on the grid) than any syllable that is not associated with a pitch accent" (Selkirk *op.cit.* : 152),

[7] Other examples of this kind include *telegraphic communication, Chinese bamboo,* etc.

this means that the strongest syllables of the words in this phrase should be aligned with 4th and 5th level grid positions, respectively, cf. (21). In (21) there will be a clash and so Selkirk believes Beat Movement can apply (*op.cit.* : 190); PA labels pitch accent.

```
(21)                      ×
          ×...............×
          ×               ×
      ×   ×        ×      ×
      ×   ×  (×)   ×   ×  ×  ××
      i d ea l     e d i t o r i a l
          |               |
          PA              PA
```

Unfortunately, however, Selkirk's suggestion is unacceptable. First, it makes use of the notion of pitch accent in a rather ad hoc way. It is not at all clear why and how the pronunciation of (20) can lack pitch accents in the same positions. Secondly, and more importantly, Selkirk does not notice that Beat Movement is NOT possible in (21), despite the clash, because the structural description of Beat Movement is not met. Beat Movement would only be possible here if there were three ×-es over the first syllable, cf. Hogg & McCully's criticism (1987 : 203).

Selkirk does not speak explicitly about Iambic Exaggeration, but the mechanism she provides is able to produce cases of Iambic Exaggeration in more than one way. In (22) the second column in the grid of *thirteen* is heightened by one grid mark because *just thirteen* is a phrase, to which the English Nuclear Stress Rule applies and this rule increases the prominence of the rightmost constituent. As a result, the relative prominence of *thir-* is felt to be even weaker.

```
(22)                                  ×
      ×        ×          ×           ×
      ×     ×  ×          ×        ×  ×
      ×     ×  ×          ×        ×  ×
      just thirteen   →   just thirteen
```

But Iambic Exaggeration can also occur as a result of Beat Addition (18). In (23) the phrase *blind mice* is part of the larger phrase *three* *blind mice.* Beat Addition will strengthen the stress of *three* because adjacent syllables of equal strength are to be avoided. Since however the height of the first grid column now reaches the height of the third, the third column must also be promoted by one level, to restore the original stress peak (this is required by the Textual Prominence Preservation Condition; cf. Selkirk 1984 : 56, 100f).

(23)

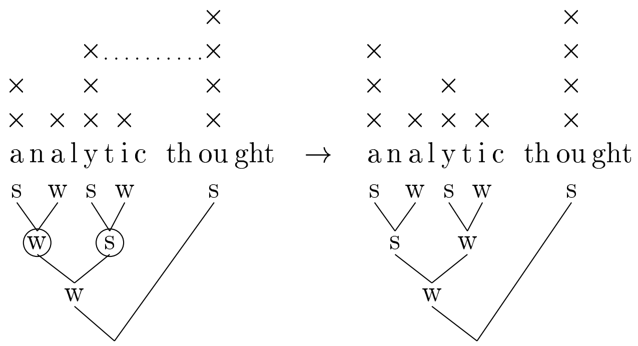
	a.				b.				c.		
											×
			×		×		×		×		×
	×	×	×		×	×	×		×	×	×
	×	×	×		×	×	×		×	×	×
	×	×	×		×	×	×		×	×	×
	three	blind	mice	→	three	blind	mice	→	three	blind	mice

(23c) creates the impression that *blind* is now "less stressed" than it used to be.

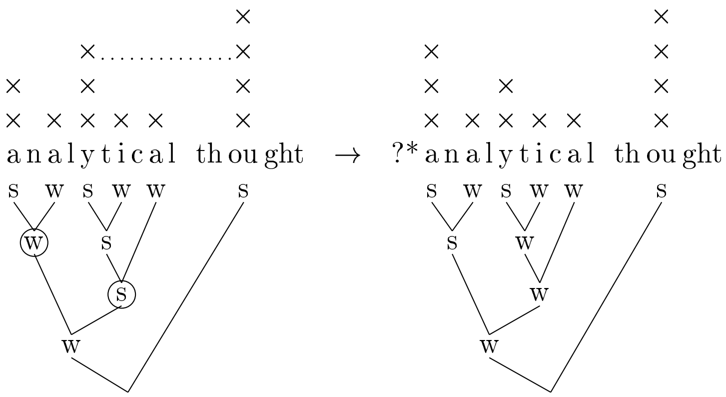
2.4 Hayes' Rhythmic Adjustment

In Liberman & Prince (1977) or in Selkirk (1984) the notion of grid clash is crucial for the explanation of Iambic Reversal. However, as Hayes (1984 : 39–41) points out, a fair range of examples show that grid clash is neither a necessary nor a sufficient basis for predicting when Iambic Reversal will apply. For instance, it will almost surely take place in (24) but is much less likely in (25) and quite unlikely in (26), although all three grids contain the required clash.

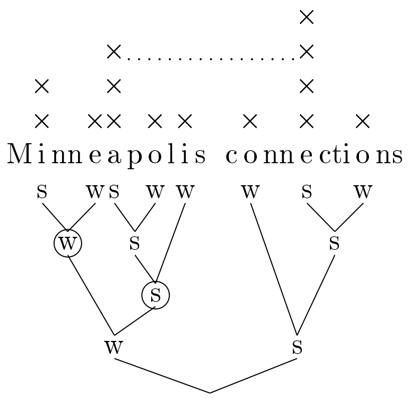
(24)



(25)



(26)



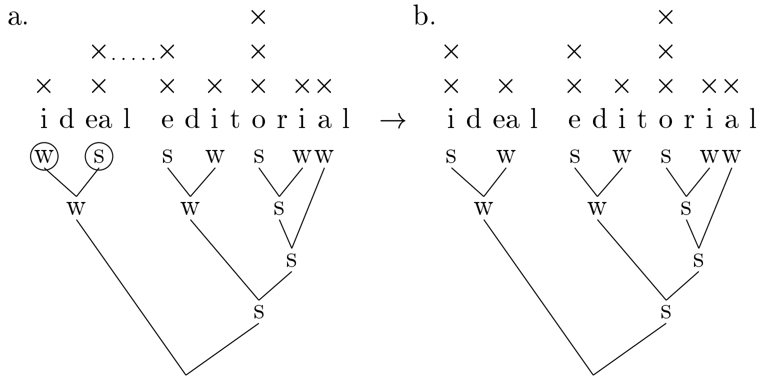
It seems that Iambic Reversal is normal in cases where there is a disyllabic interval between the original accents, (24), less likely in cases where there is a trisyllabic interval, (25), and unlikely when there is a quadrisyllabic interval, (26), despite the grid clash in all of them.

So Hayes (1984) proposes an alternative to grid clashes. Like Liberman & Prince (1977), he also retains a TREE-AND-GRID ANALYSIS, but for him the tree represents linguistic stress and the grid represents rhythmic structure. He finds that certain rhythmic structures are highly valued, i.e., "eurhythmic" in the sense that they are pleasant to the ear, whereas other rhythmic structures are less so, and that "the propensity of the Rhythm Rule [i.e., Iambic Reversal, L.V.] to apply is determined by how much it increases the eurhythmy of the text" (1984 : 44). Eurhythmy requires a particular spacing of marks to be found at some level of the grid. This interval centres around 4 syllables, cf. (*op.cit.* : 46).

(27) **Quadrisyllabic Rule**
A grid is eurhythmic when it contains a row whose marks are spaced close to four syllables apart.

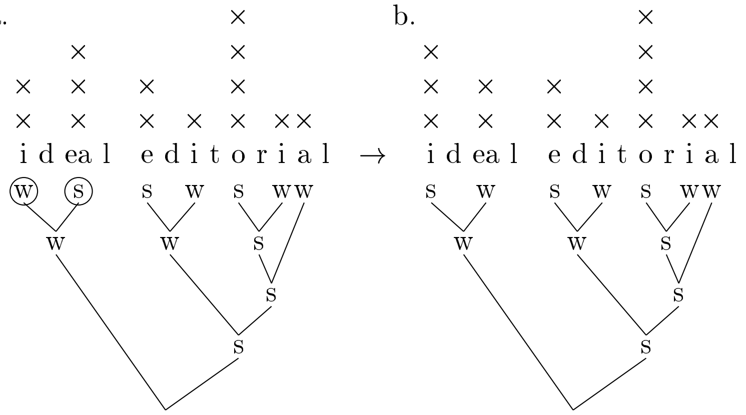
In (24), before Iambic Reversal, there is a disyllabic interval before the primary stress. After the reversal, however, there is a quadrisyllabic one, which is preferred. This is why Iambic Reversal is very likely there. But in (25) the reversal would turn a trisyllabic interval into a pentasyllabic one, which is no improvement if four syllables is the ideal distance. Consequently, Iambic Reversal, though possible, is less likely. And in (26) we already have a pentasyllabic interval before the reversal and the reversal would only increase that interval, which is already too large in comparison with the ideal four syllables. So Iambic Reversal is blocked.

For Hayes' framework phrases like *ideal editorial,* where Selkirk's analysis breaks down (cf. **2.3** above), constitute no problem at all. Since Hayes follows Liberman & Prince (1977) in constructing minimal grids on the basis of the trees, his representation of *ideal editorial* would be (28).

(28)


Although the minimal grid for the phrase (28a) contains a clash, the real reason for the Iambic Reversal shown in (28b) is not the presence of the clash in (28a) but the fact that the reversal increases the interaccentual distance from three syllables to four syllables, and so (28b) is more eurhythmic. The explanation for Iambic Reversal will be the same if we use the "minimally enhanced grid", (29), for the phrase (cf. **2.2** above), which happens to coincide with Selkirk's grid.

(29) a. b.



There is no clash in the grid of (29a), but Iambic Reversal still applies because it increases the eurhythmy of the grid. So Hayes's Quadrisyllabic Rule has great explanatory power because it is able to account for Iambic Reversal even in cases where there is no clash in the grid.

At the same time it must be pointed out that the Quadrisyllabic Rule is probably not quite as general as Hayes suggests: it is a strong tendency rather than a real rule. In Wells (1990) I have counted more than 500 concrete phrases exemplifying Iambic Reversal, about 16% of which do not obey Hayes' Quadrisyllabic Rule. In many cases an original trisyllabic interval is increased to a pentasyllabic one, and since this does not increase eurhythmy, Hayes would say the reversal was superfluous and questionable (like in (25) above), but it takes place nevertheless; see e.g., *ˈabsent-minded proˈfessor, ˈartificial inˈtelligence, ˈconscientious obˈjector, ˈdiplomatic imˈmunity, ˈelementary ˈparticle, ˈfundamental miˈstake, ˈintroductory ˈoffer, ˈpsychological ˈwarfare, ˈtransformational ˈgrammar,* etc. In other cases the already ideal or overlong interval is increased so that the result is less eurhythmic, and according to Hayes' prediction reversal should be blocked (as in (26) above), but it is not; see e.g., *ˈartificial respiˈration, ˈcategorial deˈnial, ˈdiametrically opˈposed, ˈextrasensory perˈception, ˈmouth-to-mouth resusciˈtation, ˈoperational reˈsearch, ˈretrospective exhiˈbition, ˈtranscendental mediˈtation,* etc. Nevertheless, the Quadrisyllabic Rule works in more than 80% of the examples, which is a very high ratio.

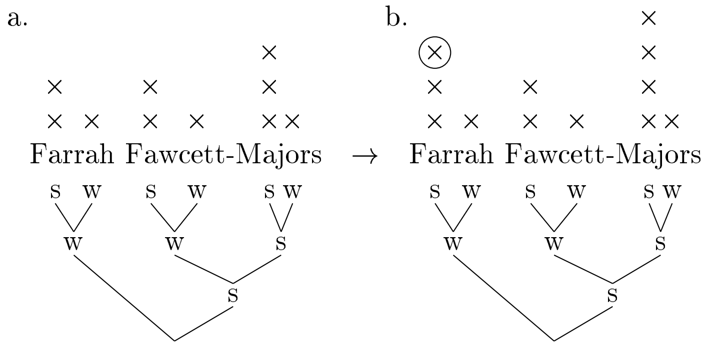
The level selected by the Quadrisyllabic Rule is called the level of scansion; this is one level down from the level of the stress peak. Additional eurhythmy is provided by further rules. Ideally the level of scansion is divided evenly by a grid mark on the next lower grid level; this is known as the Disyllabic Rule (Hayes 1984 : 48), and the second highest level bears two grid marks, spaced as far apart as possible; this is the Phrasal Rule (*op.cit.* : 52).

Hayes' analysis has another advantage over Liberman & Prince's. It can achieve rhythmic alternation in right-branching structures, i.e., it explicitly accounts for what I call Iambic Exaggeration, too. Eurhythmy in such cases is achieved not by Iambic Reversal but by Beat Addition.

(30) **Beat Addition**
Freely add additional marks to the grid columns, provided the relative prominence relations specified in the tree are preserved.

This does not permit an uncontrolled addition of grid marks, the output grid must be as eurhythmic as possible. For instance, the circled grid mark on L3 in (31b) is the result of Beat Addition (cf. Hayes 1984 : 38, 48).

(31)



The output, (31b), is maximally eurhythmic: the level of scansion (L3) has four syllables (required by the Quadrisyllabic Rule), it is divided evenly by a grid mark at the next lower level (required by the Disyllabic Rule) and the second highest level (L3) has two grid marks, spaced as far apart as possible (required by the Phrasal Rule).

It seems, then, that Hayes (1984) has two rules: (a) the Rhythm Rule (or Iambic Reversal Rule, inherited from Liberman & Prince) for the process of Iambic Reversal, *affecting the tree*; and (b) the Beat Addition rule (Hayes' own) for Iambic Exaggeration, *affecting the grid.* Both are motivated by eurhythmic considerations. However, Hayes manages to reformulate Beat Addition as a tree-affecting rule called Rhythmic Adjustment

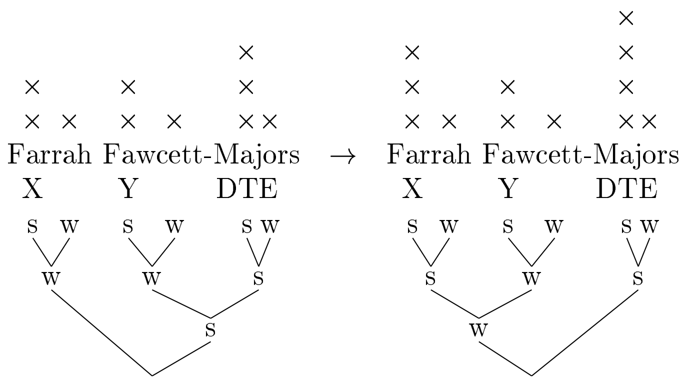
(1984 : 64). DTE in the rule stands for DESIGNATED TERMINAL ELEMENT, i.e., the strongest stressed element in a phrase.

(32) **Rhythmic Adjustment**
In the configuration . . . X Y. . . DTE. . . , adjoin Y to X.

It is important to note that “the adjoined element is always labeled *w*” (Hayes *ibid.*). By “adjunction” he means “that the sequence XY is made a constituent, with Y weak relative to X” (Hayes 1995 : 383).

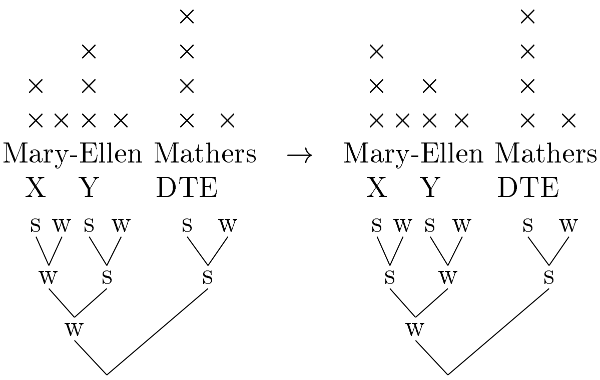
If X and Y are not sisters, Rhythmic Adjustment makes them sisters by restructuring the tree, as in (33). As a result, *Fawcett,* i.e., the initial constituent of *Fawcett-Majors,* feels weaker than before the adjustment.

(33)



However, Rhythmic Adjustment, (32), turns out to be more than just a tree-based reformulation of Beat Addition; it also incorporates Iambic Reversal (the Rhythm Rule). When it functions as Iambic Reversal, X and Y are sisters. In this case the adjunction is vacuous in terms of constituent structure but renders Y weak in relation to X; it carries out a shift of labelling (Hayes 1984 : 67). The following representation is based on an example from Hayes (1995 : 383).

(34)



In order to avoid overgeneration in certain left-branching structures, Hayes (1984) introduces the principle of Maximality. This principle states that metrical rules must analyse their terms maximally. This is satisfied in two cases: (i) Y and DTE are sister nodes and they are both c-commanded by X (cf. (33)), (ii) X and Y are sister nodes and they are both c-commanded by DTE (cf. (34)).[8] In both of its functions the English Rhythmic Adjustment rule is a leftward operation.[9]

So Hayes' Rhythmic Adjustment collapses both kinds of English rhythmical variation (i.e., both Iambic Reversal and Iambic Exaggeration) into a single, tree-based rule.[10]

[8] In Hayes's more recent work (1995 : 385) the principle of Maximality has been abandoned and its job is done by the more general principles of the Continuous Column Constraint and the Faithfulness Condition.

[9] Hayes' model has been extended to further features of rhythmical variation in English and Dutch by Kager & Visch (1988). Dutch Rhythmic Adjustment occurs not only in a leftward direction, as in English, but also in a rightward direction. Kager & Visch define rightward Rhythmic Adjustment as the mirror image of leftward Rhythmic Adjustment: "In the configuration ... DTE... Y X..., adjoin Y to X" (*op.cit.* : 52).

[10] Incidentally, mainly for reasons "that there are configurations in which it appears to be easier to apply Beat Addition than the Rhythm Rule," Hayes (1995 : 397) adopts separate accounts for the Rhythm Rule and Beat Addition again, and so loses the generalisation present in the Rhythmic Adjustment of Hayes (1984), which unified those rules.

2.5 Gussenhoven's accent-based model

Gussenhoven's model (1991) can be called "ACCENT-BASED" because it starts out from the assumption that all English stresses that are associated with pitch accents, whether they are traditionally regarded as primary (nuclear) or secondary (prenuclear), are equally accents. Gussenhoven recognises only three stress degrees for English: ACCENTED FOOT-HEADS (corresponding to primary-stressed and pre-primary secondary-stressed syllables in other analyses), NON-ACCENTED FOOT-HEADS (corresponding to tertiary-stressed and post-primary secondary-stressed syllables of other analyses), and NON-FOOT-HEADS (corresponding to other syllables).[11]

Gussenhoven points out that (i) Iambic Reversal is not reversal at all but de-accentuation of the medial accent in a series of three accents within the phonological phrase, (ii) the process called Iambic Exaggeration in the present study is no different from Iambic Reversal in its nature, and (iii) both can be accounted for by one single rule, the English Rhythm Rule.

(35) **English Rhythm Rule** (Gussenhoven 1991 : 17)

$$* \rightarrow \emptyset \;\Big/\; {}_{\phi}(* \_\_ \; * \ldots)_{\phi}$$

The rule works from left to right. The asterisks represent accents on syllables that are the heads of phonological feet. The Greek letter ϕ stands for "phonological phrase".[12]

[11] Gussenhoven (1991 : 6) admits that the last accented foot-head in an English phrase (which is called primary or nuclear stress in other analyses) has greater prominence than the other accented foot-heads in the same phrase (these are called secondary or prenuclear or head stresses in other analyses). But he attributes this greater prominence of the final accent to its position and to the presence of the final boundary tone which enhances the accent melodically, and so he assigns no theoretical status to the difference between nuclear and prenuclear accents. This conflation of primary and secondary stresses (i.e., nuclear and prenuclear accents) into the single category of accented foot heads in English may be debatable (cf. Ladd 1986 : 316). On the other hand, the conflation of all pitch-accented syllables into one stress category ("accent") receives support from Hungarian, where such conflation is necessary in the analysis of stress and rhythmical variation, cf. Varga 1998.

[12] It may seem that Gussenhoven's accent-based account will break down in de-accented portions of utterances, where there are no pitch accents but both kinds of rhythmical variation can be observed nevertheless (cf. Hayes 1995 : 370). Gussenhoven (1991 : 25–28) foresees this objection and claims that in these cases "pre-boundary lengthening" automatically creates different patterns of durational prominence in English, and these patterns give rise to a sensation of rhythmical variation.

Gussenhoven's Rhythm Rule explicitly provides a unified analysis for both types of English rhythmical variation, Iambic Reversal and Iambic Exaggeration. Incidentally, it also explains the reduction of the medial stress in words like ˈ*indi.viduaˈlistic* (where . indicates the reduced stress).[13]

The English Rhythm Rule is a postlexical rule, but it works cyclically in the sense that it respects constituent structure and "will apply in lower constituents before it applies in higher ones" (Gussenhoven 1991 : 18). The generally assumed non-cyclicity of postlexical rules can only mean that the Strict Cycle Condition does not hold postlexically (*op.cit.* : 17). In (36) the Rhythm Rule (RR) first causes Iambic Exaggeration on the word *Chinese,* (36a), and then Iambic Reversal on the phrase *ethnic Chinese,* (36b), (*op.cit.* : 23).

```
(36) Lexicon:  *          * *      *
               ethnic, Chinese, backing

     a. RR-1:  *          * *                  *            *
              (ethnic Chinese)           →   (ethnic Chinese)

     b. RR-2:  *            *     *            *                  *
              (ethnic Chinese backing)   →   (ethnic Chinese backing)
```

Gussenhoven shows that formations belonging to Stratum 2 of lexical phonology, viz., compounds, and words with Stratum 2 suffixes, resist Iambic Reversal if their first constituent has two accents, because the Initial Accent Deletion rule, (37), cancels the initial accent in them.

(37) **Initial Accent Deletion** (Gussenhoven 1991 : 9)
$* \rightarrow \emptyset \;/\; \_\_\, *$ (Stratum 2)

Consequently, compounds whose left-hand constituent is underlyingly a double accented phrase or word (cf. (38a, b)), or words with a Stratum 2 suffix

[13] Gussenhoven's (1991) Rhythm Rule preserves the peripheral accents and cancels the medial accent in a phonological phrase; as a result the phrase becomes more prominent towards its edges than towards its middle. Selkirk, too, in more recent work recognises a Phrase Edge Prominence constraint, which she states in the following form: "The most prominent syllable of an edge constituent is more prominent than that of a constituent not located at an edge" (1995 : 565). However, she thinks this can be achieved by strengthening the edges rather than by de-accenting the middle (*op.cit.* : 564–568).

attached to an underlyingly double accented stem (cf. (38c)) will undergo Initial Accent Deletion, after which they are no longer suitable for Iambic Reversal because they have only one accent left (cf. Gussenhoven 1991 : 10f).

(38) a. [Second ˈLanguage Conference] ˈbrochure
b. [ChiˈInese expert]'s adˈvice (i.e., 'expert on Chinese')
c. [Albert ˈHall-ish] ˈarchitecture

Gussenhoven is of the opinion that "eurhythmy may have a smaller role to play than has been assumed" (1991 : 23). For instance, he reanalyses Hayes' examples (1984 : 49f) given here as (39a) and (39b). Hayes concludes that the shift of stress from *-teen* to *thir-* is only possible in (39a), where the Disyllabic Rule allows it, but not in (39b) where the Disyllabic Rule cannot apply.

(39) a.

				×
			×	×
×			×	×
×	×	×	×	×

(a) hundred thirteen men (= 113 men)

b.

			×
		×	×
×		×	×
×	×	×	×

one thirteen Main (Street) (= 1.13 Main Street)

Gussenhoven (1991 : 24) thinks differently. He points out that this difference is not related to the different number of syllables in the two phrases, rather it is related to the fact that in (39a) we have a numeral, while in (39b) we have a sequence of numerals, and that numerals, but not sequences of numerals, are restructured in the course of the syntactic–prosodic constituent mapping. Thus in (39a) a left-branching syntactic structure [[*hundred thirteen*] *men*] is restructured into a right-branching prosodic structure [*hundred* [*thirteen men*]], as shown in (40). Since such restructuring is not possible with sequences of numerals, it does not happen in (39b).

(40)

$$\text{Morphosyntax}\quad [\ [\ [\ \text{a}\ \overset{*}{\text{hundred}}\ \overset{*\ \ *}{\text{thirteen}}\ ]_{\text{Num}}\ \overset{*}{\text{men}}\ ]_{\text{N}}\ ]_{\text{NP}}$$

$$\text{Prosody}\quad [\ [\ \text{a}\ \overset{*}{\text{hundred}}\ ]_{\phi}\ [\ \overset{*\ \ *}{\text{thirteen}}\ \overset{*}{\text{men}}\ ]_{\phi}\ ]_{\phi}$$

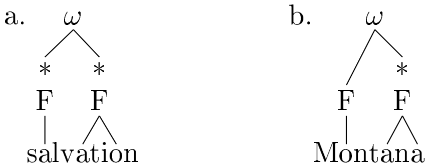
$$\text{RR}\quad [\ [\ \text{a}\ \overset{*}{\text{hundred}}\ ]_{\phi}\ [\ \overset{*\quad}{\text{thirteen}}\ \overset{*}{\text{men}}\ ]_{\phi}\ ]_{\phi}$$

Gussenhoven considers both types of English rhythmical variation as postlexical phenomena. However, he does not subscribe to Kaisse's view (1985, 1987, 1990), according to which English rhythmical variation belongs to the P1 stratum of postlexical rules. In Kaisse's two-stratum postlexical model P1 rules are a special subset of postlexical rules, which are "closest to the lexicon and thus share many characteristics with lexical rules" (1990 : 130) and which "apply after all lexical rules and before all P2 rules" (*op.cit.* : 128), the latter being the classical postlexical rules.

According to Kaisse (1990 : 135–137), English rhythmical variation belongs to the P1 stratum of postlexical phonology because, though postlexical, it shares a number of features with lexical rules. First, it has lexical exceptions, e.g., *obese, superb, abstemious, grotesque,* etc., which do not undergo the variation. Secondly, its output is available to rules of versification (*A ˈTennessee ˈdrummer called ˈBette. . .*). Thirdly, its output may be lexicalised, see e.g., the adjectives *ˈabstract, ˈabject,* etc. Fourthly, it is sensitive to nested compound and syntactic bracketing (cf. *ˈone-thirteen ˈJay Street,* vs. *Bill's ˈthirteen ˈclothes pins*). A fifth lexical characteristic of English rhythmical variation is that it is structure preserving in the sense that both the input and the output stress patterns are possible lexical stress configurations (cf. *ˈMissisˈsippi* vs. *ˈAbernathy*). It is only the criterion of ingradience whose fulfilment is questionable. P1 rules should not be gradient, but rhythmical variation does display some gradient features. We know from Hayes (1984) that the closer together the stressed syllables are, the more likely it is that rhythmical variation will apply (cf. *ˈTennesˈsee abbreviˈations,* vs. *ˈTennessee ˈrelatives*). However, distances measured in terms of syllable numbers can be defended as not representing true gradience.[14] In sum, Kaisse believes that rhythmical variation in English essentially belongs to P1 rules.

[14] A greater problem for the ingradience criterion is that the spacing requirement of eurhythmy may count not syllables but actual time, a possibility suggested by Hayes (1984 : 70–73).

Gussenhoven (1991 : 20) refuses Kaisse's (1987, 1990) argument that relevance to versification is a characteristic of lexical(-like) rules. For instance, in British English, linking *r*, which is inserted postlexically, is relevant to rhymes, so poetic relevance is not necessarily a lexical-like feature. Consequently the fact that rhythmical variation has poetic relevance is no proof in itself that rhythmical variation belongs to P1 phenomena. Gussenhoven also denies some of the other arguments in Kaisse, but less convincingly. He suggests that what seem to be lexicalized reversals (e.g., adjectives like *abstract*) can also be regarded as basic lexical representations, and so they do not necessarily prove that rhythmical variation belongs to P1 rules. It is clear, however, that they do not disprove it either. Furthermore, Gussenhoven says that there are no lexical exceptions to rhythmical variation because in his system apparent lexical exceptions like *obese* or *Montana* are represented with only one accent (on the main stressed syllable). For instance, while *salvation* can undergo reversal because it has two accents in its underlying representation (cf. (41a)), *Montana* cannot undergo reversal because it has no accent on the initial foot in its underlying representation (cf. (41b)).

(41)


However, assuming only one underlying accent in cases like (41b), is no different from saying that such cases represent lexically marked idiosyncrasies, as opposed to cases like (41a).

So while it is certain that English rhythmical variation is postlexical, the assumption that it belongs to the P1 layer of postlexical phonology is plausible even if debatable.[15]

[15] Evidence from Hungarian lends indirect support to the P1 interpretation of English rhythmical variation. The Hungarian counterparts of English rhythmical variation belong to two different, though adjacent strata: Final Weakening is a P1 phenomenon of postlexical phonology, whereas Trochaic Reversal belongs to the precompiled layer of lexical phonology in the sense of Hayes 1990; cf. Varga 1998. The lexical and near-lexical nature of the variations in one language makes plausible the assumption that they may be near-lexical (P1) in another.

3 Conclusion

In this paper I have reviewed the most influential schools analysing English rhythmical variation in the past 20 years or so, paying special attention to Liberman & Prince's tree-and-grid-based model (1977), Selkirk's pure grid model (1984), Hayes' tree-and-grid model (1984), and Gussenhoven's accent-based model (1991).

From this overview it is clear that (a) rhythmical variation is very common in English; it can happen to all words and phrases that are double accented, i.e., have a secondary+primary stress pattern (disregarding the lexical exceptions, which, however, just because they resist rhythmical variation can also be analysed as having only one accent), (b) the two kinds of English rhythmical variation (Iambic Reversal and Iambic Exaggeration) are symmetrical: both apply to the same set of underlyingly double accented words and phrases, (c) both kinds can be analysed uniformly as deaccentuation of the medial member of a series of three accents in a phonological phrase, as described in Gussenhoven's (1991) accent-based analysis, (d) they are postlexical phenomena, possibly belonging to the P1 stratum of postlexical phonology (in the sense of Kaisse 1990).

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