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1. This book is a product of the authors' joint research over a decade and the first comprehensive study on stress in nonlinear phonology. The theory of stress developed in this work builds on the results of the three main streams of current phonological theory: metrical theory, where the following works are representatives: Liberman and Prince 1977, McCarthy 1979, Hayes 1980, Prince 1983, and Hammond 1986; autosegmental theory, which has now developed into a general theory of phonological representation (cf. Archangeli and Pulleyblank 1986 and Sagey 1986); and lexical phonology of Halle and Mohanan 1985. Halle and Vergnaud (H&V) make essential use of the findings of the three theories and attempt to construct a universal theory of stress along the lines of Hayes 1980, Prince 1983, and Hammond 1986, and they take an intermediate position between the standard version of metrical theory (e.g. Hayes 1980) and the treeless grid theory (e.g. Prince 1983) because in their theory both grids and metrical constituents (feet in Hayes's term) play important roles.

This book is also seen as a product of an attempt to make a local account for phonological phenomena which seem to be action at a distance. H&V's theory of stress is based on the strong and explicit hypothesis that all phonological processes are characterized as local. Stress phenomena, many of which are at first glance action at a distance, are not exceptions. They are all characterized as local. In this respect, this book is the first comprehensive attempt to make a local account of stress. It can be said, therefore, that H&V's theory is radically different from the theory of Chomsky and Halle 1968 (henceforth, SPE), which captures many phonological phenomena as action at a distance by utilizing variables in their rule writing system.

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Because of its two prominent features mentioned above, this book can be seen as novel. In fact, the theory of stress developed in this book has implications for the theory of stress and for phonological theory in general in that H&V aim at a completely local account of stress, which no one has ever attempted to make, and that the notion of locality is now of great theoretical significance in generative grammar. This book will evidently become one of the most important and epoch-making works in the study of stress and in phonological theory.

This book consists of three parts. Part I, 'The metrical theory of stress', which contains three chapters, is the heart of this book and provides a full illustration of H&V's theory of stress. In chapter 1, 'On the representation of stress', a new system of stress representation is proposed which essentially relies on metrical grids and the newly proposed metrical constituent structure. In chapter 2, 'Refinements and elaboration', a new device, the rule of line conflation, is introduced into the theory. Chapter 3, 'Stress and the cycle', treats the relation between stress and morphology.

Part II, 'Formalism', contains chapters 4 and 5, the former dealing with topics of 'Constituent construction and natural boundaries' and the latter being devoted to constructing 'The formal theory of metrical constituent construction'.

Part III, 'Applications', consists of chapters 6 and 7, the former of which presents case studies of stress systems of various languages and the latter of which is exhaustively devoted to a reanalysis of English stress, one of the most well-studied stress systems in generative phonology.

It is hardly possible to make a thorough review of this book within a limited space given. I will confine myself to the topics discussed in Part I of this book and those concerning English stress, touching upon other topics only if they are related to discussion in this review. Specifically, I will commit myself to surveying and evaluating H&V's proposals on the following topics: the representation of stress (sections 2 and 3), line conflation and the role of locality (sections 4 and 5), stress and the cycle (sections 6 and 7), the effective use of planes (sections 8 and 9), and English stress (sections 10 and 11).

2. H&V argue in chapter 1 that stress is not relational in nature and that there are at most four stress levels within a word and is no upper limit within a compound and a phrase. In order to capture the nature of stress, metrical grids are chosen as a notational device. In addition, the
metrical constituent structure, which is defined as a stress domain containing one rhythmic position that is distinguished from all the others as being more prominent, is introduced into the metrical structure. Metrical trees play no role.

There are two kinds of parameters for the metrical constituent: \( [+HT] \) (\( \equiv [\pm \text{Head Terminal}] \)) and \( [+BND] \) (\( \equiv [\pm \text{Bounded}] \)). For \( [+HT] \) constituents, the position of a head is specified by the parameters [left] (\( \equiv \text{left-headed} \)) and [right] (\( \equiv \text{right-headed} \)). In terms of these parameters, six kinds of metrical constituents are generated, as indicated in 1.

\[
\begin{align*}
(1) \quad & \text{a. } [+HT, +BND, \text{ left}] & \text{b. } [+HT, +BND, \text{ right}] \\
& \begin{array}{c}
\ast \\
\ast \\
\ast
\end{array} & \begin{array}{c}
\ast \\
\ast \\
\ast
\end{array} \\
& \begin{array}{c}
\ast \ast \\
\ast \ast
\end{array} & \begin{array}{c}
\ast \ast
\end{array} \\
\text{c. } [+HT, -BND, \text{ left}] & \text{d. } [+HT, -BND, \text{ right}] \\
& \begin{array}{c}
\ast \ast \ast \ast \\
\ast \ast \ast \ast
\end{array} & \begin{array}{c}
\ast \ast \ast \ast
\end{array} \\
\text{e. } [-HT, +BND] & \text{f. } [-HT, -BND] \\
& \begin{array}{c}
\ast
\ast
\ast
\ast
\end{array} & \begin{array}{c}
\ast \ast \ast \ast \ast
\end{array}
\end{align*}
\]

Notice that 1f is prohibited in accordance with H&V’s Recoverability Condition, which states: Given the direction of government of the constituent heads in the grammar, the location of the metrical constituent boundaries must be unambiguously recoverable from the location of the heads, and conversely the location of the heads must be recoverable from that of the boundaries. Thus, there is no language whose parameter settings are \( [-HT, -BND] \) and there are five permissible metrical constituents in H&V’s theory. The constituents in 1a–d correspond to Hayes’s binary and unbounded feet, respectively. The constituent 1e, on the other hand, has no counterpart in Hayes’s theory. Notice also that neither dactylic nor the anapestic constituent is permitted.

The directionality of metrical constituent construction is important for the bounded constituents. They are constructed either from left to right or from right to left. It should be noticed finally that in H&V’s theory, unlike that of Hayes, quantity sensitivity is not invoked in metrical constituent construction. No restrictions are imposed on heads or nonheads.

Grids and metrical constituents are not mere theoretical artifacts but motivated on empirical grounds. The motivation for adopting grids is that they are able to represent stress levels directly and to treat stress displacement (e.g. the Rhythm Rule in English) adequately. Prince 1983
and Selkirk 1984 claim that labeled metrical trees cannot represent stress levels directly or treat stress displacement adequately. H&V completely agree with Prince and Selkirk and argue that stress is represented by metrical grids consisting of columns and layers of lines.

The motivation for metrical constituents is threefold. The first kind of motivation comes from stress shift in Modern Russian caused by the deletion of a stressed vowel. This phenomenon is exemplified in the pair zajóm ‘loan’ (nom.) and zájma (gen.). The second kind of motivation stems from stress shift in Sanskrit caused by glide formation, which converts high vowels into glides in prevocalic position. The phenomenon is exemplified in the pair deví ‘goddess’ and devyás.

H&V assume that stressed vowel deletion and glide formation automatically cause the deletion of a line 0 asterisk and the movement of asterisks above line 0 to the adjacent stress-bearing element within the same metrical constituent. The line 0 parameter settings for Russian and Sanskrit are [+HT, −BND, right] and [+HT, −BND, left], respectively. In addition, there are two assumptions hidden, it seems to me. In Russian, a word-final nonbranching rime is extrametrical; in Sanskrit, there is a rule assigning stress to a long vowel underlyingly. On the basis of the above assumptions and the rules, zajma and devyás are derived as in 2.

\[
\begin{align*}
(2) & \quad \text{a. } & \ast & \ast & \text{o-dele-*} & \ast & \ast & \text{b. } & \ast & \ast & \text{glide} & \ast & \ast & \text{line 1} \\
& \quad \text{(*) formation} & \ast & \ast & \text{line 0} \\
& \text{zajom} & \rightarrow & \text{zajma} & \text{deviáš} & \rightarrow & \text{devyás}
\end{align*}
\]

The third kind of motivation involves stress shift in Winnebago caused by vowel insertion into a metrical constituent, which causes the reconstruction of constituents (the Domino Effect). It is exemplified in ma ashárach ‘you promise’, which is derived from ma ashrách. H&V assume that in Winnebago the word-initial mora is extrametrical and that binary right-headed constituents are constructed from left to right. The Domino Effect is observed in the derivation of ma ashárach in 3.

\[
\begin{align*}
(3) & \quad \ast & \ast & \text{vowel} & \ast & \ast & \ast & \ast & \text{Domino} & \ast & \ast & \ast & \ast & \text{line 1} \\
& \quad \text{(*) insertion} & \ast & \ast & \ast & \ast & \text{Effect} & \ast & \ast & \ast & \ast & \ast & \text{line 0} \\
& \text{ashrach} & \rightarrow & \text{ashrach} & \text{ashrach} & \text{ma asharach}
\end{align*}
\]

Without the metrical constituent, the three phenomena above cannot be treated properly. The direction of movement cannot be predicted.

The metrical constituents in 1a–d are supported by the fact that they are able to account for stress facts in various languages. The metrical constituent in 1e is empirically motivated only by stress facts in Cayuvava, where stress falls on every third mora counting from the end
of a string. H&V assume that the word-final mora is marked as extrametrical and that the parameter settings for line 0 are \([-HT, +BND, \text{right to left}]\). As a simple illustration, observe in 4 the metrical structure of \(c\ddot{a}d\acute{a}d\tilde{\ddot{o}}\tilde{\ddot{b}}\tilde{\ddot{u}}\tilde{\ddot{r}}\tilde{\ddot{u}}\tilde{r}\tilde{c}\) ‘ninety-nine’.

\[
\begin{align*}
(4) & \quad * \quad . \quad . \quad . \quad . \quad \text{line 1} \\
& \quad (* *) \quad (**) \quad (** *) \quad \text{line 0} \\
& \quad \text{ca a diro\tilde{b}}\tilde{u}ruruc\langle e \rangle
\end{align*}
\]

3. I find basically correct the adoption of metrical grids as a notational device and the introduction of the metrical constituent into the theory. In these two respects, there arises no serious problem. Rather, there are some advantages.

For example, the introduction of the metrical constituent makes it possible to give a principled account for data which were first adduced as counterexamples to the treeless grid theory. Among the examples is stress shift in Eastern Arabic, which is seen in the example \(\ddot{\ddot{i}}n\ddot{k}\ddot{a}\tilde{s}\acute{a}r\tilde{a}t\) ‘she got broken’, which is assumed to be derived from \(\ddot{\ddot{i}}n\ddot{k}\acute{a}s\acute{a}r\acute{a}t\). Cf. Al-Mozainy, Bley-Vroman, and McCarthy 1985 (AB&M). AB&M reject a grid-based analysis on the grounds that the direction of stress shift cannot be predicted, and propose a tree-based alternative assuming the level of feet.

AB&M’s criticism of a treeless theory does not hold for H&V’s framework. Stress shift in \(\ddot{\ddot{i}}n\ddot{k}\acute{s\acute{a}r}at\) is properly treated, as in 5, on the assumption that in Eastern Arabic, a mora-counting language, the word-final rime is extrametrical and that the parameter settings for lines 0 and 1 are \([+HT, +BND, \text{left, right to left}]\) and \([+HT, -BND, \text{right}]\), respectively. The direction of stress shift is correctly predicted.

\[
\begin{align*}
(5) & \quad . \quad * \quad . \quad . \quad . \quad \text{vowel} \quad * \quad * \quad \text{line 2} \\
& \quad (\ast \ast) \quad . \quad \text{deletion} \quad (\ast \ast) \quad (\ast \ast \ast) \quad \text{line 0} \\
& \quad ? \text{in kasar}(at) \quad \rightarrow \quad ? \text{in ksarat}
\end{align*}
\]

The example in 5 serves as supporting evidence for the metrical constituent. More importantly, it shows that as far as stressed vowel deletion is concerned, H&V’s theory is empirically equivalent to a tree theory assuming the prosodic category foot.

The elimination of quantity sensitivity in metrical constituent construction, which further implies the elimination of restrictions on heads and non-heads, is successful in most cases. In fact, it has at least two theoretical advantages. First, as H&V note, stress systems of languages
such as Aklan can be accounted for without recourse to ad hoc diacritics that Hayes 1980 makes use of. A second advantage is that the number of unmarked metrical constituents are reduced to five. Notice that in Hayes's theory, there are twelve unmarked metrical constituents (feet in his term). The reason for the reduction seems to be that a clear distinction is drawn between universal and language-particular aspects of stress by eliminating quantity sensitivity. Thus, the reduction of the number of unmarked metrical constituents can be highly valued. The elimination of quantity sensitivity is an important contribution to the theory of stress.

The superiority of H&V's theory becomes clearer if the stress in Klamath and Lenakel is considered. The stress systems of these languages, which are first adduced by Hammond 1986, are reanalyzed by H&V. Although they do not mention it explicitly, H&V offer a better account of exceptional cases to Hammond's by utilizing independently motivated devices. Thus, take the Klamath noun *papápak'a* 'scream' and the Lenakel verb *tinagamwáam* 'you two will see it', both of which Hammond 1986 treats as exceptions. In H&V's framework, however, they are no exceptions and are treated as regular forms on the following assumptions. In Klamath: i) a word-final short syllable is marked extrametrical; ii) the parameter settings for lines 0 and 1 are [+HT, −BND, right], and iii) a line 0 asterisk on the penultimate light syllable is deleted if the word has at least three syllables. In Lenakel: i) tense vowels are assigned a line 1 asterisk; ii) the parameter settings for line 0 are [+HT, +BND, left, right to left] in a cyclic stratum and [+HT, +BND, left, left to right] in a noncyclic stratum; those for line 1 are [+HT, −BND, right]; iii) lines 0 and 1 are conflated; and iv) a line 1 asterisk preceding another line 1 asterisk is deleted.

It is now clear that H&V's framework is much superior both to Hayes 1980 and to Hammond 1986. The main reason is that H&V adopt the grid and the metrical constituent structure and eliminate the distinction between quantity-sensitive and quantity-insensitive constituents. This also implies the superiority of grids to trees. In line with H&V, the debate over grids and trees may be put to an end, unless independent motivation is found for metrical trees.

Although there is a lot of supporting evidence for it, H&V's theory involves at least two theoretical problems with the representation. First, there still remains slight room to argue for the need of trees as a stress notation. There are still a number of examples which cannot be given a
direct explanation within H&V's framework. This can be seen in the contrast between Peter's three red shirts (2-3-4-1) and overdone steak blues (2-3-3-1), both of which are cited from Hayes 1984. In H&V's framework, the Nuclear Stress Rule (NSR), the Compound Stress Rule (CSR), and the Rhythm Rule (RR) apply in a cyclic fashion. For the former case, the desired output is derived. For the latter, an undesired output is derived as in 6.

$$\begin{array}{cccc}
\ast & \ast & \ast & \ast \\
\ast & \ast & \ast & \ast \\
\ast & \ast & \ast & \ast \\
\ast & \ast & \ast & \ast \\
\end{array}$$


Of special interest here is the flattening in the latter case, which has a left-branching structure. H&V (268) analyze cases like this and argue in the same line with Prince 1983 and Selkirk 1984 that they have the contour indicated in 6. Commonly hidden in these analyses is the assumption that the flattening is a phonetic phenomenon. If this is correct, the derivation in 6 is not problematic. Hayes 1984 contends, however, that the flattening is stable in left-branching structures. He takes the fact as evidence for trees and argues that it is properly treated in terms of a general constraint on rules applying to trees. The same line of argument is made by Kager and Visch 1988 for different kinds of examples in Dutch.

Even if Hayes's observation is correct, H&V's theory can account for the fact by formulating a rule deleting an asterisk in certain positions. Compared with the treatment in Hayes 1984, such a treatment seems to be ad hoc. Hayes's analysis is theoretically superior to a possible one in H&V's theory. Thus, one might be able to argue that trees play a minimal role. Our task, then, is to examine whether or not Hayes's general constraint can be translated into a constraint on rules applying to grid configurations.

Another problem is with the status of the metrical constituent 1e, and it is more important. H&V's arguments for adopting the constituent is basically correct. Nevertheless, the parameter settings [−HT, +BND] are peculiar in that they generate the only non-head-terminal constituent and that the constituent seems to be useful only for the account of Cayuvava stress.

It is in fact possible to postulate dactylic constituents for the account of Cayuvava stress. This is the strategy that Davis 1985 and Haraguchi 1988 adopt. Davis argues that the dactylic constituent is needed for the
account of stress facts in other languages such as Estonian, Mantjitjara, and Walmatjari. Among them, Mantjitjara may possibly be a counterexample and can function as evidence for the dactylic constituent. In this language, main stress falls on the first syllable and secondary stresses fall on every second or every third syllable thereafter. Cf. Davis 1985. Thus, ŋurilpāyilitjūŋku ‘we (pl. excl.) were looking for you’. It seems that 1e cannot account for the stress pattern of this case properly. If the pattern is not derived through stress shift or stress deletion, the pattern does not seem to observe the Recoverability Condition. However, much is not known about Mantjitjara as far as the data in Davis 1985 are taken into consideration. An extensive investigation will be necessary to clarify the stress system of the language.

Haraguchi (1988: 264ff.) adopts the dactyl constituent for Cayuvava on purely theoretical grounds. In fact, he claims that the parameter [±HT] should be replaced by the parameters [Binary/Ternary]. His arguments, however, are not strong enough to reject 1e because there are few empirical bases for adopting dactyl and anapestic constituents.

We must recognize here that it is implied in 1e that stressed vowel deletion must not take place. If a stressed vowel is deleted, the direction of stress shift cannot be predicted. H&V’s theory would face the same problem as that of a treeless grid theory which does not assume the metrical constituent. In Cayuvava, there seems to be no rule which deletes a stressed vowel and causes stress shift, as far as the limited data in Key 1961 are taken into consideration. In the languages adduced in Davis 1985, it is not clear whether or not such a rule is operative.

In order to reject 1e, therefore, we must find a language containing a rule of stressed vowel deletion whose line 0 parameter settings can be [−HT, +BND]. Such a language has not been found. There seems to be no positive reason to reject 1e at present. Whether or not [±HT] should be replaced by [Binary/Ternary] is still an open problem.

4. H&V propose in chapter 2 a new device, called line conflation, which is of great theoretical importance. The device serves to erase secondary stresses which are generated in the course of derivation but do not actually surface by conflating two lines. Line conflation is motivated by stress facts in languages like Eastern Cheremis, Turkish, Macedonian, Latin, and Polish. Take as an example the stress pattern of Eastern Cheremis, where the following generalization can be made: Stress falls on the last syllable that has a full vowel, but in words where all syllables
have only reduced vowels, stress falls on the first syllable. H&V (51) assume that in Eastern Cheremis full vowels are assigned a line 1 asterisk underlyingly and that the parameter settings for lines 0 and 1 are [+HT, −BND, left] and [+HT, −BND, right], respectively. These two assumptions account well for the stress pattern of words containing only reduced vowels but produces unattested metrical structures in words containing full vowels. Take the word slaapəazəm ‘his hat’, which contains two full vowels. On the two assumptions, an unattested metrical structures are produced, as in 7a. To yield a correct pattern, as in 7b, H&V assume that there is a rule which conflates lines 1 and 2.

(7) a. . * . line 2  b. . * . line 2
    (* *) . line 1     (. * .) line 1
    (* *) line 0    * (* *) line 0
  slaapəazəm            slaapəazəm

Line conflation is also shown to be operative in languages like Creek and Cairene Arabic. H&V observe that in those languages binary constituents function as a counting device of a limited sort. Stress facts in those languages can be accounted for locally only by iteratively constructing binary constituents. Take the stress assignment in Creek, where an H-tone is assigned to a syllable bearing main stress. In this language, if a word contains no heavy syllable, stress falls on the last even-numbered syllable; if a word contains a heavy syllable, on the other hand, stress falls on the last even-numbered syllable counting from the last heavy syllable in the word. H&V (59f.) argue that the stress pattern of Creek is accounted for by setting the parameters for lines 0 and 1 as [+HT, +BND, right, left to right] and [+HT, −BND, right], respectively, and by conflating lines 1 and 2. Consider in 8 the derivation of the stress pattern of the word hoktaki ‘woman’.

(8) . . * line 2 . . * line 2
    (* . *) line 1 line conflation (. . *) line 1
    (*)(* *) line 0 * (* *) line 0
  hoktaki                hoktaki

5. The introduction of line conflation is closely related to the theoretical requirement that metrical constituents be constructed exhaustively and that all phonological processes be characterized as local. If these requirements do not have any disadvantage, the introduction of the rule to the theory of stress is justified.

The former requirement is justified in chapter 4 on formal grounds.
Specifically, H&V (118, 128, 138) argue that this requirement is derived from the fact that the procedure for constructing the metrical constituent structure is the simplest possible deterministic procedure. This justification is reasonable. Thus, to this, I have no objections.

H&V’s analysis of the stress pattern of Eastern Cheremis is of course subject to the above-mentioned requirements, and, as far as the data they analyze are considered, their analysis does not have any disadvantage. In this respect, H&V succeed in analyzing stress facts in Eastern Cheremis in a local fashion. However, it is also possible to analyze stress in the language in another way. For example, Hayes 1980 proposes the following rules to generate stress patterns in Eastern Cheremis: i) a rule constructing a left dominant unbounded quantity-sensitive tree at the right edge of a word; ii) a rule constructing a right dominant word tree. It is indeed true that Hayes’s analysis has the same empirical coverage as H&V’s analysis.

Nevertheless, H&V seem to provide a theoretically superior account to Hayes’s for the following reason. In Hayes’s analysis, at the first stage of derivation, a quantity-sensitive unbounded foot is constructed at the right edge, so that some kind of counting device would be necessary to find the first full vowel counting from the end of a word. It is generally said that there is no counting device in the grammar. If this is valid, Hayes’s analysis of the stress pattern of Eastern Cheremis will not be on the right track.

H&V are also successful in an analysis of Creek stress. There would be no other way to provide a principled account for stress facts in the language and to maintain the locality thesis. If an unbounded right-headed constituent were postulated for an analysis of Creek stress, some kind of counting device would be required to find the last even-numbered syllable in a word, to find the last heavy syllable in a word, and to find the last even-numbered syllable counting from the last heavy syllable in a word. A counting device must not be introduced. The only way to avoid such a disadvantage is to iteratively construct binary constituents from left to right. In such an analysis, no disadvantage will arise.

These two arguments above amply show that no particular disadvantage arises in a local account of stress in languages like Eastern Cheremis and Creek. It is reasonable to postulate binary constituents for an account of stress phenomena which would otherwise be captured as action at distance and to assume that binary constituents function as a counting device of a limited sort. We can say, therefore, that the intro-
duction of line conflation is quite reasonable.

6. H&V also investigate the relation between stress and the cycle in chapter 3. First, H&V assume that the lexicon consists of a series of strata and that as in SPE, morphology constitutes a distinct module from phonology. Morphological processes are not assigned to each stratum but take place before lexical items go into phonology. Only phonological rules are assigned to each stratum. In this respect, H&V’s lexical phonology is different from that of Halle and Mohanan 1985 (H&M), who assume that morphology and phonology do not constitute distinct modules and that both morphological and phonological rules are assigned to each stratum in the lexicon. The motivation for completely distinguishing morphology and phonology is that on this assumption such a theoretically significant problem as the ordering paradox does not arise.

Second, extending McCarthy’s 1986 proposal for nonconcatenative morphology in Semitic languages to concatenative morphology, H&V assume that cyclic affixes are represented on a distinct plane from the stem, as in 9a, whereas noncyclic affixes are represented on the same plane as the stem, as in 9b. In addition, cyclic affixation is accompanied by a process that copies the content of the stem onto the plane of the affix, leaving the content of the stem plane intact and subsequently accessible to other rules, as in 10. However, H&V do not explicitly mention the motivation for extending McCarthy’s proposal to languages where concatenative morphology is operative.

(9) a. 

It is also necessary here to refer to the relation between stress and cyclic affixation in more detail. To treat the relation, H&V (83) propose a
convention, called the Stress Erasure Convention, which is formulated as follows: 'In the input to the rules of cyclic strata information about stress generated on previous passes through the cyclic rules is carried over only if the affixed constituent is itself a domain for the cyclic stress rules. If the affixed constituent is not a domain of stress rules, information about stresses assigned on previous passes is erased'. Notice incidentally that the stress domain is specified in a particular grammar. For example, in Diyari, all suffixes constitute the domain for stress rules. In English, on the other hand, only a small number of suffixes like -oid and -ode in mulluscoi'd and electrode constitute the domain for stress rules.

The Stress Erasure Convention is supported in particular by the stress pattern of Vedic. There are two things to be taken into consideration in analyzing Vedic stress. First, the stress pattern is subject to the Basic Accentuation Principle, whereby stress falls on the leftmost accented vowels, or, in the absence of an accented vowel, on the leftmost vowel. Second, in the language, the distinction is important between dominant suffixes, which are cyclic, and recessive suffixes, which are noncyclic. As a simple illustration, take the stress pattern of the word rath+in+e (dat. sg.) 'charioteer'. In this word, the stem rath is underlyingly accented, and the suffix in is dominant and underlingly accented. It should be noticed that an underlyingly assigned accent in the stem does not surface and that only the accent assigned to the suffix in is retained and surfaces. This fact is accounted for in a principled manner only if we assume that dominant suffixes are cyclic and that the Stress Erasure Convention mentioned above is operative.

There are, however, some kinds of exceptions to the Stress Erasure Convention. Theoretically significant exceptions are seen in stress facts of Damascene Arabic, Russian, Chamorro, and English. As examples consider transderivational phenomena in Chamorro and English. In the first place, take the following examples in Chamorro: inèNNu?lu? ‘peeping’, inèNNu?lo?na ‘his peeping’, and inèNNu?lu?niha ‘their peeping’. In Chamorro, stress is assigned in a cyclic fashion, and neither na nor niha constitutes a stress domain. It is thus predicted that ne is unstressed in the latter two cases. Contrary to the prediction, however, stress is retained. Next, consider a transderivational relationship observed in English, where stress is assigned in a cyclic fashion. Take words such as instrument, instrumèntal, and instrumèntality. Because -al and -ity are both cyclic suffixes, a stress pattern like *instrùmentality is expected to surface. Such a pattern is unattested, however.
In order to account for cases like those mentioned above, H&V (97) propose the rule of stress copy, which is formulated as follows: Copy the line 1 asterisk from the metrical planes of earlier cycles. In Chamorro examples, the line 1 asterisk assigned to *ne on the first cycle is copied. In English examples, the stress on *men on the second cycle is copied. In both cases, the correct stress patterns are generated.

7. I have no particular objections to H&V's proposal that morphology and phonology constitute distinct modules because the framework works effectively to account for stress and because no serious theoretical problems arise as in the framework of lexical phonology of H&M and others. There arise no serious problems, either, for the assumption that cyclic affixes are represented on a plane distinct from the stem, whereas non-cyclic affixes are represented on the same plane as the stem. H&V's argument for adopting this assumption, however, seems to be rather weak. For, as mentioned above, H&V do not provide positive evidence for extending McCarthy's proposal for Semitic languages to other languages like English.

This does not mean, however, that H&V's proposal on cyclic and non-cyclic affixes should be rejected. There are at least two pieces of supporting evidence which H&V do not mention at all. The first kind of supporting evidence comes from transderivational phenomena seen in Chamorro and English. Recall again that in English words like instrumentality, stresses assigned on earlier passes are retained. The retention of stresses is explained by postulating stress copy, which is further based on the assumption that cyclic affixes are represented on a plane distinct from the stem and that at the stage of rule application, the content of the stem plane is copied onto the affix plane, leaving the content of the stem intact.

It might be possible to analyze transderivational relationships by assuming that cyclic affixes and stems are represented on the same plane. In this analysis, however, some ad hoc rules must be formulated in order to assign stress to a syllable which bears stress on earlier passes.

A second kind of supporting evidence comes from the peculiar behavior of the English category-changing affix *en, which forms verbs by attaching to adjectives and functions as both a prefix and a suffix. Lawrence, Abe, Horiuchi, and Okazaki 1989 (LAHO), who demonstrate that *en is underlyingly */N/*, argue that *en is a cyclic affix on the grounds that its affixation causes some structural changes. Thus, */N/* assimilates
to following labial consonants in cases like *embrown*, and */t/ is deleted in cases like *soften* (cf. soft *[soft]*). LAHO observe that the prefix *en-* is very peculiar in that it is not changed into *er-* or *el-* before the liquids (*enlarge*, not *ellarge*), whereas other cyclic prefixes undergo this change (*irregular*, not *inregular*), which, according to LAHO, is caused by the deletion of */N/* before */l/* and */r/*. LAHO argue that this peculiar behavior can be explained by assuming that the prefix *en-* is a copy of the suffix *-en* and that cyclic affixes are represented on a plane distinct from that of a stem. Thus, after applying a copying rule, *enlarge* is represented as in 11a, where the suffix and the prefix are fused into one in accordance with the Obligatory Contour Principle. At this stage, */N/-deletion may apply in word-initial position, but its application brings about a violation of a principle proposed by Steriade (1982: 60), which requires that no unit in the melodic core which is shared between several skeletal positions should be accessible to rules whose structural description is met by only one of the linked matrices. Thus, */N/* cannot be deleted and the form *enlarge* is correctly derived.

Suppose, however, that cyclic affixes are represented on the same plane. After applying a copying rule, *enlarge* is represented as in 11b, where */N/-deletion can be applied because its application does not bring about any violation of universal principles thus far proposed. In this analysis, the form *ellarge* would be derived.

(11) a.  
X X X X X X  
|  |  |  |  |  |  |
l a j  

b.  
X X X X X X  
|  |  |  |  |  |  |
N l a j N  

Nonapplication of */N/-deletion in cases like *enlarge* can properly be accounted for only if we assume that a cyclic affix and a stem are represented on distinct planes. The peculiar behavior of *en-* serves as supporting evidence for H&V’s proposal on the representation of cyclic affixes. It follows, then, that H&V’s extension of McCarthy’s proposal is quite reasonable.

8. A different feature of H&V’s theory of stress is the effective use of planes, which is seen in their analysis of stress shift in Tiberian Hebrew. This phenomenon is exemplified in the example *kāat‘būu* (3 pl. of the verb *kaatāb* ‘to write’), where *‘* represents a reduced vowel. To capture the nature of this phenomenon, H&V (69) assume with Rappaport 1984: i) that more than one metrical constituent structure may be asso-
ciated with a given central line of phonemes, ii) that metrical constituent structure need not always be interpreted in stress terms, and iii) that a special relationship holds between the head of a metrical constituent and the rest of the elements in the constituent. On these assumptions, H&V propose a second metrical plane, called the reduction plane, which is not relevant to stress assignment but only to vowel reduction.

Specifically, as indicated in 12, the phenomenon is treated by a rule deleting a line 0 asterisk of a head on the stress plane, which is not a head on the reduction plane. On the stress plane the parameter settings are [+HT, +BND, left, right to left] (line 0) and [+HT, -BND, right] (line 1), while on the reduction plane the parameter settings for line 0 are [+HT, +BND, right, right to left].

(12) stress plane

| line 2 | . * . | line 1 | (* *). asterisk (* . *) vowel |
| line 0 | ( * ) ( * ) deletion ( * ). ( * ) reduction |

kaata-buu \rightarrow kaata-buu \rightarrow [kàat'bûu]

red. plane

Interestingly, the idea that more than one metrical structure may be associated with a given central line of phonemes is applied to the analysis of stress in Yidiny and Pirahä. In Yidiny, for example, stress falls on even-numbered syllables, if the word contains an even-numbered syllable with a long vowel; otherwise, stress falls on odd-numbered syllables. To capture this fact, H&V (24) assume two stress planes, both of which are binary and constructed from left to right. The difference is that one plane (P1) is right-headed, while the other plane (P2) is left-headed. A rule deletes P2 if on P1 there is a constituent head dominating a long vowel; otherwise, the rule deletes P1. Take the contrast between wawa-1 'see' (inf.) and wawa:-d' in-ù (antipassive, past) as an example. In the former, as in 13a, P1 is deleted because no long vowel is contained; in the latter, as in 13b, P2 is deleted, because the vowel in the second syllable is lengthened by one of the lengthening rules in the language.

(13) a. ( * ) b. ( * . * ) line 1 P1

wawa-1 wawa:-d'in-ù

( * ) ( * ) ( * ) \rightarrow \phi line 0

( * ) \rightarrow \phi line 0

( * ) . ( * . * ). line 1 P2
9. I find the introduction of the reduction plane, or, more generally, that of a second metrical plane, quite reasonable. That is because it is supported by some segmental phenomena in other languages. The first case is high vowel deletion in Old English, which is exemplified in such examples as word (nom. and acc. pl. of word 'word'), which is derived from word+u and deman (inf. 'to judge'), which is derived from dēm+i+an. Cf. Keyser and O'Neil 1985. A second case is vowel deletion in Yawelmani. This phenomenon is exemplified in examples like comla? 'will cause to V', which is derived from the form cuum+ilaa+? and pulma 'full blooded one', which is derived from pun+in+a+?. Cf. Archangeli (1984: 184–95). The third case is vowel lengthening in the Nakijin Dialect of Japanese. It is seen in examples like ?agaaruN 'to rise', which is derived from ?agaruN and uduurukaasuN 'to surprise', which is derived from udurukasuN. Cf. Haraguchi (1988: 51–4). These three phenomena are apparently very complicated. By positing a second metrical structure, however, they are shown to be simple. In fact, their essential nature can explicitly be captured.

Given H&V's proposal, however, there arises a question of whether or not two stress planes must be generated in the analysis of Yidin'. H&V's theory seems to be in a dilemma. If a single stress plane is generated, quantity sensitivity is invoked. On the other hand, if quantity sensitivity is eliminated, two stress planes must be stipulated. To eliminate quantity sensitivity, H&V seem to take the latter position.

Viewed from a metatheoretical standpoint, however, this analysis seems to be problematic. H&V's analysis seems to violate a hidden assumption in generative phonology which requires that redundancy must be avoided in representation. Some apparently redundant representations observe this requirement, and two similar representations have a distinct role from each other. For example, trees and grids in Hayes 1984, the former for stress, the latter for rhythm, and two metrical structures in Rappaport 1984, one for stress assignment, the other for vowel reduction. H&V's two stress planes seem redundant. Both of them are generated only for stress assignment, and they do not have a distinct role from each other.

Another reason to cast doubt on H&V's analysis of Yidin' stress is that there still remains the possibility of weakening H&V's assumption that quantity sensitivity is eliminated. It is actually possible to give a principled account of Yidin' stress with a single stress plane, based on a promising idea of McCarthy and Prince 1986 (M&P). A possible analysis
would be subject to the following procedure. First, metrical constituents which are binary and left-headed are constructed from left to right. At the next stage, segmental rules apply which are relevant to stress assignment. The application of stress rules must precede that of segmental rules. Otherwise, Penultimate Lengthening, which lengths a vowel of the penultimate syllable of an odd-numbered word, cannot be characterized as local.

Take again the words wawa-l and wawá:-dʕin-ú. In both cases, stress is assigned to produce the forms (wawal) and (wáwa) (dʕinu). At the next stage, Penultimate Lengthening applies to the latter, producing the form wawa:-dʕin-u. This form does not represent the actual stress pattern, so that stress must be shifted to produce the pattern (wawa:) (dʕinú). This stress shift may be due to two different reasons. The stress shift in the left metrical constituent is due to the Principle of Quantity/Prominence Homology, which requires that if \( \alpha \) is in the same constituent as \( \beta \) and is greater than \( \beta \) in quantity, stress should fall on \( \alpha \). Cf. M&P (9). The shift in the right constituent is to maintain the uniformity of metrical constituency within a word. (Notice that M&P (9) propose an analysis of Yidiny stress similar to the above analysis but different from it in that lengthening rules apply before stress rules.)

If the above analysis is valid, the question arises again of whether or not the distinction between quantity-sensitive and quantity-insensitive constituents are necessary. To answer this question, we must again recognize that H&V succeed in eliminating the distinction in most of the languages they analyze. The answer is, thus, that the parametrization can be made with respect to quantity sensitivity. At this stage, the next question arises of why quantity sensitivity is parametrized. The clue to answer this question lies in M&P's another proposal, the Uniformity Parameter, which can be restated as follows: A language may require that all metrical constituents have the same constituency (i) within the language (TYPE A) or (ii) within a word (TYPE B). Most of the languages H&V analyze belong to TYPE A. Those which belong to TYPE B are Yidiny and Pirahã. From this follows the striking conclusion that if a language belongs to TYPE A, quantity sensitivity is not invoked in metrical constituent construction and that if a language belongs to TYPE B, quantity sensitivity is invoked.

The proposed analysis has the same empirical coverage as that of H&V and observes the locality thesis and other requirements. It must be admitted, however, that stress shift in Yidiny proposed above does not
seem to be allowed in H&V's theory. The shift does not belong to either of the following two classes allowed in H&V's framework: stress shift from one head to another (e.g. the Rhythm Rule in English) and stress shift through the disappearance of a stress-bearing element (e.g. stress shift in Russian, Sanskrit, and Tiberian Hebrew). A further investigation is necessary to solve the problem of the dual stress plane and that of quantity sensitivity in metrical constituent construction.

10. H&V devote one chapter, chapter 7, to a reanalysis of English stress within their own framework. Integrating the findings in SPE and Hayes 1980, H&V assume that in English stress rules apply in both the cyclic and the noncyclic strata. In the cyclic stratum, suffixes and the word-final syllables of nouns containing a short vowel are marked as extrametrical, and line 1 asterisks are assigned to heavy syllables by what H&V call the Accent Rule. At the next stage, stress rules apply in a cyclic fashion: Metrical constituents are constructed cyclically, whose parameter settings for lines 0 and 1 are [+HT, +BND, left, right to left] and [+HT, −BND, right], respectively. At the last stage in the cyclic stratum, lines 1 and 2 are conflated.

Next in the noncyclic stratum. At the first stage, the stress rules apply once again. At the next stage, the word-internal rhythm rule, which serves to retract main stress to the immediately preceding stressed syllable, applies to specified classes of words. At the last stage, Stress Deletion and segmental rules apply, producing a surface stress pattern. As an example, take the stress pattern of ονοματοπόεια, whose derivation proceeds according to the above-mentioned procedure, as in 14.

\[(14)\]

**extrametricality** .. .. * stress (* . * . *)

**Accent Rule** * * * * rules (* *) (* *) (* )

→ onomatopoei⟨a⟩ → ono mato poei⟨a⟩

.. .. * . .. .. * .

(. . . . *) . stress (* . * . *)

**conflation** * * * * (* ) . rules (* *) (* *) (* *)

→ ono mato poei⟨a⟩ → ono mato poei a

The above-mentioned procedure can account for stress patterns of a large class of English words. There are, however, three exceptions to H&V’s proposed procedure. The first kind of exceptions are related to stress copy, and it was discussed in sections 6 and 7.

A second kind of exceptions involve underived adjectives and verbs
like *solid and *follow, and the suffixes -ic and -id. In the former case, H&V's theory predicts unattested stress patterns like *solid. This problem is resolved by assuming that the word-final consonant of an un-derived adjective and a verb is invisible to stress rules. In the latter case, these suffixes are simply marked as exceptions to extrametricality. Otherwise, vowel shortening in cases like static cannot be explained, for H&V (253) formulate English Vowel Shortening as a rule which shortens a stressed vowel which is followed by an unstressed syllable within the same line 0 constituent.

The third kind of exceptions involve words containing suffixes like -oid, -ode, -ary, -ory, -atory, -tive, and -ative. The above-mentioned procedure produces unattested patterns like *mulluscoid and *élémentary. This problem is resolved by assuming that these suffixes constitute the domain for stress rules. Thus, in élémentary, main stress is assigned both to the stem and the suffix, and it is not erased by line conflation. The stress pattern of the word is derived, as in 15, by applying stress rules (SR's), the Rhythm Rule (RR), and Stress Deletion (SD).

\begin{align*}
(15) & \quad \ldots \quad * \quad \ldots \quad * \\
& \quad \ldots \quad (*) \quad \ldots \quad (*) \quad \ldots \quad * \\
& \quad (. \quad *) \quad (. \quad *) \quad RR(* \quad *) \\
& \quad \text{conflation \quad \quad \quad (*) \quad (*) \quad SR's(**) \quad (*) \quad SD(**) \quad (*)} \\
& \quad \rightarrow \quad \text{élémentary} \quad \rightarrow \quad \text{élémentary} \quad \rightarrow \quad \text{élémentary}
\end{align*}

11. H&V's analysis of English stress has the same empirical coverage as the analyses thus far proposed. In addition, H&V treat exceptional cases to their framework by utilizing independently motivated devices. On these two respects, I have nothing to say.

An important aspect of H&V's analysis of English stress is that Hayes's English Stress Rule (ESR) and Stress Retraction Rule (SRR) are reduced to the same set of rules. In particular, Hayes's rules are reduced to a rule which constructs binary constituents on line 0, and a rule which constructs unbounded constituents on line 1. H&V's rule functions as the ESR when they apply in the cyclic stratum, while they function as the SRR when they apply in the noncyclic stratum. The reduction of the ESR and the SRR into the same set of rules is in a sense quite natural, for they are very similar in nature. Both the ESR and the SRR construct left-dominant binary feet, the difference being that the former is quantity-sensitive, while the latter is not. H&V's stress rules correctly predict positions where stress is assigned. It can be said, therefore, that H&V's
analysis of English stress is successful as a whole.

Another important aspect of H&V's analysis of English stress is that the three shortening rules, *ic*-Shortening, Cluster Shortening, and Trisyllabic Shortening, are reduced to a single vowel shortening rule, which are characterized as local in terms of the metrical structure. Particularly important is the fact that Trisyllabic Shortening, which is nonlocal as it stands, is eliminated from the grammar of English. This shows that H&V's proposed metrical constituents make it possible to account for phonological phenomena other than stress as local. It follows, then, that H&V's analysis of English stress is not unreasonable.

H&V's theory, however, is not free from theoretical and empirical problems in analyzing English stress. There are at least two problems. The first problem is that in H&V's theory, the position of main stress of a word is not automatically predicted. Specifically, there is no device to govern the applicability of the word-internal rhythm rule. It seems to apply in an arbitrary fashion. In the standard version of metrical theory, the position of main stress of a word is completely predictable from the geometry of metrical trees in accordance with the labeling convention, which requires that dominant nodes be labeled strong if and only if they branch. Within the framework of *SPE*, which is radically different from that of metrical theory, the position of main stress is in principle predictable by rule. Compared with these two frameworks, H&V's framework does not seem to be superior with respect to the prediction of the position of main stress. Our task, then, is to investigate whether or not a device like the labeling convention can be formulated, based on grid configurations.

Another problem is that there are few good reasons to treat suffixes like *-ic* as an exception to extrametricality. They are marked as exceptions in order only to maintain H&V's Vowel Shortening Rule. This problem, however, could be circumvented, without modifying H&V's rule for extrametricality, by incorporating Yip's 1987 promising proposal that in suffixes triggering vowel shortening, the suffix-initial vowel should not exist in the underlying representation because it is mostly the vowel */i/* and because its occurrence is completely predictable. At the stage where shortening rules apply, the suffix-initial vowel */i/* does not exist, either. It is inserted at a later stage by default. Yip further argues that the three shortening rules in English thus far proposed should be reduced to Cluster Shortening. Thus, at the stage a shortening rule applies, *static* is roughly represented as */stæt+k/*, and the vowel */æ/* is
shortened by the rule of Cluster Shortening.

There are some more problems with H&V's analysis of English stress, but, for lack of space, I cannot refer to them.

12. Thus far, I have summarized the content of H&V's theory of stress, evaluated their proposals on both theoretical and empirical grounds, and, if there is a problem, presented conceivable alternatives in an informal way. As a whole, H&V's attempt to treat stress locally by utilizing grids and constituents can be said to be successful in so far as the data examined here are concerned. There is one more topic which has not been discussed in this review for lack of space. It is the problem of Formalism, which is discussed in Part II of this book. H&V attempt to justify the devices they utilize on formal grounds. Suffice it to say here that their justification of the devices is successful in the most crucial respects.

Seen in the history of the study of stress in generative phonology, this book presents the most articulated theory, and based on interesting facts in a lot of languages, provides us with a new point of view on the nature of stress and that of other phonological phenomena. No other study on stress is so exhaustive as H&V's theory. No other study on stress analyzes so many languages as H&V. In these respects, this book has the possibility of playing a role similar to that of SPE. Therefore, as mentioned at the outset of this review, this book will inevitably become one of the most influential works in phonological theory.

It can be said that we are again at the starting point with exciting topics and problems. We are left with the task of finding theoretically significant data, with the task of elaborating the theory of stress, and with the task of identifying the nature of locality in phonology.

REFERENCES

—, and DOUGLAS PULLEYBLANK. 1986. The content and structure of phonological representations. ms., University of Arizona and University of Southern California.
CHOMSKY, NOAM, and MORRIS HALLE. 1968. The sound pattern of English. New

Davis, Stuart. 1985. Ternary feet reconsidered. MS., MIT.


Lawrence, Wayne P.; Jun Abe; Hiroaki Horiuchi; and Masao Okazaki. 1989. English en: Prefix or suffix. MS., University of Auckland and University of Tsukuba.


-. 1986. OCP effects: Gemination and antigemination. LI 17.207–63.

-. and Alan Prince. 1986. Prosodic morphology. MS., University of Massachusetts and Brandeis University.


