In this chapter we have two principal concerns. The first is to argue for a particular analysis of the patterns of English word stress within the general framework laid out in chapter 2. In so doing, we will show that the proposed core theory of metrical grid construction is eminently well suited to providing the basis for a descriptively adequate treatment of the rhythmic properties of English words. Needless to say, this new approach to English stress necessitates a serious revision in our conception of the role of prosodic or metrical tree structure in representing and characterizing these patterns. We will show that the account proposed here is as good as, and even better than, the tree-based accounts of Selkirk 1980b and Hayes 1980, 1982. With this grid-based analysis of English word stress, then, we hope to establish the plausibility of the general approach to characterizing patterns of prominence (at the lower levels) that we are arguing for in this study.

English word stress is notoriously complicated. On the basis of a study of English word stress alone, one would probably never arrive at even a rudimentary understanding of what might constitute a universal or core theory of word stress patterns. Indeed, no consensus has been reached concerning even the basic elements of a description of English word stress. The approach we will take here is to view English word stress through the eyes of a core theory of word stress. In taking this approach, we are following the pioneering work of Halle and Vergnaud 1979 and Hayes 1980, 1982. As these authors have emphasized, an adequate general theory of word stress patterns is absolutely necessary, in order to severely limit the range of possible descriptions (grammars) available, given a particular range of data, and thus to answer the projection problem. We will examine the possible grammars of English made available by the core theory defined in chapter 2, and it will become clear that one of these grammars is quite successful in characterizing the fundamentals of the English patterns. We will also examine the conditions under which deviations from the basic patterns arise, developing along the way the outlines of a theory of the rules that may modify basic patterns. In this effort, we are indebted in particular to Hayes 1980, 1982. Hayes has shown that surface divergences from the basic patterns may be more considerable than had been anticipated in earlier work (Liberman and Prince 1977, Selkirk 1980b) and has proposed a system of rules to account for them that forms the backdrop of the analysis we will present here.

Our second concern in this chapter is the relation between the syntactic constituent structure of English words and these patterns of stress. According to our theory of the syntax-phonology mapping, construction of the hierarchies of phonological representation proceeds in cyclic fashion, the particular rules governing that construction operating only within designated syntactic domains. The analysis of the syntax-phonology relation for a particular language, we suggest, involves specifying (i) which among the universally defined construction rules are at play and (ii) the syntactic domains within which they operate. We will presuppose the account of English word syntax presented in Selkirk 1982. This account gives an essentially syntactic characterization of the important distinction between the neutral and nonneutral affixes of English. As Siegel 1974 has shown, a generalization can be made about the distribution of neutral and nonneutral affixes in word structure: neutral affixes systematically fall outside of nonneutral ones in the order of affixes contained within words. The analysis defended in Selkirk 1982 is that the different affix types have different places, so to speak, in the structure of English words. Neutral affixes are sister to constituents of the category type Word, and nonneutral affixes are sister to constituents of the category type Root.1 Because Roots (in English) are always embedded within Words (or other Roots) and Words are never embedded within Roots (but only within other Words), it follows that neutral affixes are always outside nonneutral affixes. We will show how this syntactic difference between affixes of the two classes is systematically reflected in their differing phonological properties, among them the ones relating to stress. We will propose, essentially, that the grid construction rules crucially involved in word stress have the Root category as their domain, and thus fail to incorporate the neutral affixes into canonical word stress patterns.
There are a number of respects in which the theory of the syntax-phonology relation being presented here is quite standard. A fully elaborated syntactic constituent structure tree, in this case the structure internal to words, is taken to be the representation with respect to which patterns of stress are defined, and these patterns are claimed to be defined in cyclic fashion, by rules with designated syntactic domains of operation. What is nonstandard here is, first, the conception of the stress patterns themselves as being embodied in a suprasegmental hierarchical representation (the metrical grid); second, the conception of stress rules not as phonological rules per se but as rules that construct a phonological representation; and third, the notion that the principle of the cycle governs this mapping from syntactic representation to phonological representation, but not (necessarily?) the application of “real” phonological rules (section 1.3). As for the theory of English word syntax being presupposed here, it is quite standard in its assumptions about the nature of word structure and, more generally, syntactic structure, and the nature of the rule system for generating it (see section 3.1).

The elimination of boundary elements from phonological representation is another nonstandard feature of this general theory of phonological representation and its relation to syntactic representation, and of this particular analysis of English words. Boundaries have no role in defining the domains of the grid construction rules responsible for generating patterns of English word stress: these rules have a domain defined uniquely in terms of syntactic constituent structure. Moreover, it has been shown that many other putatively boundary-sensitive rules of English phonology are in truth sensitive to syllable structure (see especially Kahn 1976) and that the limits of syllables may coincide with the limits of certain types of syntactic constituents. Boundary elements are not required to demarcate the limits of these constituents, however (contra Kahn): in the context of the present theory, (re)syllabification is simply confined to domains defined in terms of syntactic constituent structure. The implicit claim, then, is that any “work” done by boundaries in (a standard) linguistic description, as in the SPE account of the phonological distinction between neutral and nonneutral affixes, is better and more appropriately done in this framework, either by the syntactic structure itself, which directly governs the construction of phonological representation, or by one of the two hierarchies of phonological representation thus created, both of which do encode to some degree the syntactic relations of surface structure.

We must say at the outset that this chapter by no means offers an exhaustive treatment of the stress patterns of English words. Such a treatment would require more time and space than are available. Our purpose in presenting this sketch of the relation between English word structure on the one hand and the metrical grid alignments of words on the other is to provide an example, reasonably well motivated, but not fleshed out and justified in all its details, of what an analysis looks like within the general framework we have described. We hope that this example will prompt further research along the lines suggested here.

3.1 English Word Syntax

The structure of words in English is basically no different in nature from the structure of phrases or sentences. It may be represented as a labeled bracketing or tree. In Selkirk 1982 it is argued that word structures are generated by a system of context-free rewriting rules, and that lexical materials is inserted into structures thus generated, as in Chomsky 1965. One main feature of the general theory proposed in Selkirk 1982 is of special interest here: namely, the idea that the categories involved in word syntax have the same formal character as syntactic categories, which, according to the \( X \) theory of phrase structure presupposed here, are decomposed into (i) a category type or level specification and (ii) a category name specification. The former corresponds to the number of pairs of the category: the symbols \( X \), \( \bar{X} \), and \( \bar{\bar{X}} \) stand for categories of different types. The latter corresponds to the “feature bundle” that specifies, among other things, that a category is nominal as opposed to verbal, for example. (The “bundle” will also include any diacritic features of the category.) The category type Word (\( X^6 \), or simply \( X \)), of which Noun (N), Adjective (A), and Verb (V) are instances, is the “lowest” in the \( X \) hierarchy to play a role in phrase structure. At the same time, we suggest, it is the highest category involved in a description of English word structure. The others are Root (\( X^{-1} \), or \( X' \)) and Affix (\( X^0 \)). Noun root (N'), Verb root (V'), etc., are instances of the former type; Noun affix (N"), Verb affix (V"), etc., are instances of the latter. The idea, then, is simply that a description of the syntax of words has available to it an array of categories defined in \( X \) terms, and that generalizations embodied in the rewriting rules generating word structures may be formulated in terms of such category distinctions. We will make crucial use of this idea in our analysis of English affix classes.
We have shown in Selkirk 1982 that Word and Root are recursive category types, and that the word structure grammar of English contains rules like \( N \rightarrow N \ N, \ V \rightarrow P \ P, \ A \rightarrow N \ A', \ A' \rightarrow N' \ A'' \), etc. Speaking very "schematically," the context-free grammar for English words contains rules of the following sort:

(3.1) \( \text{Word} \rightarrow \text{Word Word} \)

(3.2) \( \text{Word} \rightarrow \text{Word Affix} \)

(3.3) \( \text{Word} \rightarrow \text{Affix Word} \)

(3.4) \( ?\text{Root} \rightarrow \text{Root Root} \)

(3.5) \( \text{Root} \rightarrow \text{Root Affix} \)

Root \( \rightarrow \text{Affix Root} \)

Rules like (3.1) generate the native English compounds. It is not entirely clear whether the schema (3.4) is required for generating the so-called Greek compounds. The others are responsible for introducing suffixes and prefixes. As should be clear from this rule system, an affix that necessarily appears as sister to a Word will appear outside an affix that requires a Root sister.

Affix morphemes, on this theory, are lexical items. The information contained in the lexical entry of such a morpheme includes a subcategorization frame, which indicates what sort of category the affix may have as its sister in word structure. The proposal of Selkirk 1982 is simply that, in addition to indicating what the category name of that sister constituent must be, a subcategorization frame for an affix morpheme may also indicate what its type (or level) must be. On this theory, neutral affixes (the Class II affixes of Siegel 1974) subcategorize for categories of type Word; nonneutral affixes (Siegel's Class I) subcategorize for categories of type Root. Table 3.1 is a sample listing of affixes with their subcategorization frames.

Table 3.2 illustrates the word structures generated by rules of the sort schematized in (3.1) through (3.5) and by lexical insertion governed by
Word Stress and Word Structure

Table 3.2 (cont.)

<table>
<thead>
<tr>
<th>Word</th>
<th>Root</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Af</td>
<td>Word</td>
<td>Af</td>
</tr>
<tr>
<td>Word</td>
<td>Af</td>
<td>Root</td>
</tr>
<tr>
<td>Root</td>
<td>in1-substant-i1</td>
<td>non-preparat-ory1</td>
</tr>
<tr>
<td>non2-subscrib-er2</td>
<td>non-contract-ual</td>
<td>de-sanct-i1</td>
</tr>
<tr>
<td>re-soft-en</td>
<td>in-conclus-ive</td>
<td>re-humid-ify</td>
</tr>
<tr>
<td>ex-believ-er</td>
<td>de-sanct-i1</td>
<td>de-sanct-i1</td>
</tr>
</tbody>
</table>

non2-nomad-ize2
non-secular-ize
un-kind-ness

subcategorizations such as those in table 3.1. (The subscript 1 stands for nonneutral, Siegel's Class I affixes; the subscript 2 stands for neutral, Siegel's Class II affixes.) For details of this analysis, the reader is referred to Selkirk 1982.

To sum up, then, distributional considerations lead us to posit two different X levels or category types for the major (nonaffixal) categories within English words: Root and Word. Given our theory of the syntax-phonology relations, it is in principle possible for this distinction to play a role in the construction of phonological representation. For instance, the syntactic domains of rules of grid construction, resyllabification, or prosodic wording (if it existed) could be specified in terms of one or the other of these category types. And this is indeed what we claim to be the case for English: Root is the cyclic domain for those rules of word stress that have domains, such as the Main Stress Rule (see section 3.2.5). Root is also the domain of resyllabification according to the Basic Syllable Composition rules. Word, on the other hand, is the domain of a less restrictive resyllabification. Thus Root affixes are completely incorporated into the canonical patterns of stress and syllabification in English, while Word affixes are not entirely so. This is just the appropriate characterization of the phonological difference between the neutral and nonneutral affixes, as we will demonstrate.

Simply because word syntax involves two "levels," it does not necessarily follow that these "levels" will be reflected in phonological structure, as in English. Pesetsky 1979 argues, for example, that Russian word syntax has two "levels," yet he observes that there are no corresponding phonological differences. For Russian, it might be suggested, the domain of "word stress" and resyllabification is simply a category of type Xn, where n stands for word-level or below in the X hierarchy. Thus in the cyclic syntax-phonology mapping in Russian words, no heed is paid to any distinction in "level." In the context of the general theory proposed here, distinctions made available by syntactic structure, whether of the word or of the phrase, are not necessarily encoded in phonological structure. The choice of the category type or level that serves as a domain for rules constructing a phonological representation is precisely one of the parameters along which languages may differ.

Before we turn to the phonological representation of English words, we will briefly review two earlier approaches to English word syntax and its relation to English word phonology. In the SPE analysis, the structure of words is conceived of as a labeled bracketing or tree, as is the structure of phrases, though the system of rules involved in generating word structures is not explicitly mentioned. Rules of the phonology are divided into two classes, cyclic and noncyclic (the latter sometimes referred to as "word-level" rules). Cyclic rules, such as the English stress rules, apply in cyclic ("bottom-up") fashion on domains defined in terms of syntactic constituent structure. In the SPE analysis of English, certain stress rules apply on cyclic domains of category type word (i.e., "noun, verb, or adjective"), others on the phrase. No distinction in category type is made within words, where all nonaffix constituents are assumed to be of the same type as the word of the phrase structure component. This lack of distinction in category type within the word is not a matter of principle, of course, but simply one of
Following Newman 1946, the SPE authors conceived of the two English affix classes as being distinguished solely on the basis of their phonological properties. It was observed about neutral affixes that (a) they did not enter into the canonical patterns of word stress (hence the term neutral, for “neutral with respect to stress”), (b) they failed to be analyzed (or “counted”) by certain phonological rules, such as Trisyllabic Laxing, Velar Softening, and Coronal Assibilation, and (c) certain rules (putatively) restricted to word-final environments, such as Sonorant Syllabification, applied before them. The phonological behavior of nonneutral affixes was seen to be quite different. It was observed that (a) they enter into the canonical patterns of word stress, (b) they are “visible” to such rules as Trisyllabic Laxing, and (c) word-final rules do not apply before them. The SPE analysis of this difference, quite an ingenious one, was that the affixes of the different classes are separated from the words (sic) to which they attach by boundary elements of different types. The proposal was that a word boundary, #, intervenes between a neutral affix and its sister constituent, while a morpheme boundary, +, intervenes between a nonneutral affix and its sister. This proposal was made in the context of a general theory of phonology that accorded systematically different properties to the two types of boundaries. Briefly, the theory held that phonological rules applying to a string of segments could ignore the presence of a morpheme boundary in that string. For English, this meant that the stress rules, and rules like Trisyllabic Laxing, would treat an affix separated from its sister by only a + as though the two formed part of the same word, honorarily monomorphic. As for word boundary, the theory held that it would block the application of a rule that did not explicitly mention it in its structural description; this boundary could also provide a “positive” environment for rules, such as those limited to word-final position. Thus, by formulating the stress rules and rules like Trisyllabic Laxing in such a way that their structural descriptions did not include #, the SPE analysis ensured that the application of these rules to strings containing neutral affixes would be blocked, and ensured as well that word-final rules would find their environments satisfied before neutral affixes. Thus, in SPE, the differences between the two affix classes lay in the property of being associated with one boundary or the other. Whether an affix took one or the other had to be specified as part of its lexical entry.

As mentioned earlier, the motivation for boundaries falls away in the theoretical framework being developed here. The SPE analysis of the affix classes was made in the context of an inadequate analysis of English morphology, and an insufficiently developed understanding of the nature of phonological representation and its relation to syntactic structure. As will become clear, the phonological phenomena that the SPE analysis sought to explain have a straightforward treatment within the present theory.

Siegel 1974 was the first to observe a regularity in the distribution of the affixes of the two classes with respect to each other: namely, that the neutral affixes appear outside the nonneutral ones. We have called this the Affix Ordering Generalization and have provided further support for it in Selkirk 1982. Siegel, and M. Allen 1978 following her, have sought to relate the phonological properties of the affixes to these distributional properties. Their proposal departs significantly from the standard theory, in that it relies on a different conception of the relation between the various components of the grammar. Siegel’s and Allen’s proposal is that certain word formation rules may “apply before” certain rules of the phonology, while other word formation rules may “apply after” these rules. Specifically, they propose that the nonneutral morpheme boundary affixes be “attached before” the English stress rules apply and that the neutral word boundary affixes be “attached afterward.” Rules of compounding then follow these. On this theory, then, affixation and compounding rules apply in the course of a derivation, and may be extrinsically ordered with respect to each other and with respect to phonological rules. Boundaries do not play a role in distinguishing the stress-related properties of the affix classes: this is accomplished by the ordering of the affixation rules and the stress rules. (But boundaries are assumed to be required for the role they have with respect to other phonological rules.) A theory of word syntax according to which morphological rules may be extrinsically ordered into levels (or “blocks”) does not entail, however, that word formation rules and rules that build a phonological representation (e.g., stress rules) or apply to it (i.e., phonological rules) should be interspersed. A theory of word formation such as Siegel’s and Allen’s is consistent with a theory of the syntax-phonology relation in which these phonology-related processes apply in a cyclic fashion to the structures generated by the (ordered) rules of the word syntax, if what they generate is a labeled tree. In practice, however, advocates of Siegel’s and Allen’s theory of word syntax, including Kiparsky 1982
foundations of that description. This is a "syntax-first" model, where the syntax-phonology relation from the approach we are advocating permits an insightful characterization of the stress-related properties of constituent structure formation rules before rules constructing or modifying phonological representation. On this model, just as there are rules in the grammar for defining a well-formed surface phrase structure, so there are rules for defining a well-formed surface word structure. It is claimed that for words, as for phrases, a set of context-free rewriting rules provides the foundations of that description. This is a "syntax-first" model, where the organization of the grammar into components imposes an ordering of constituent structure formation rules before rules constructing or modifying phonological representation. The purpose of this book is to develop this theory of the syntax-phonology relation and an analysis of the particulars of English within that framework. In this chapter and in chapter 7, we will show that an entirely satisfactory, even illuminating, account of the stress-related properties of English words can result from a syntax-first theory of the syntax-phonology relation. In the immediately following chapters, we will show that the same general framework permits an insightful characterization of the stress-related properties of phrases. We will claim, then, that a theory that views the syntax-phonology relation in the same way for words and phrases is not only possible, but desirable. This claim that a unified theory of stress patterns, we ask two basic questions: What text-to-grid alignment rules are involved (if any)? and What grid euphony rules are involved? With respect to the latter rules, we also ask, What parameters govern their application? The answers to these questions will constitute the basic grammar of word stress for English.

We begin with the patterns of stressed and stressless syllables, i.e., the alignment of syllables (or lack thereof) with positions on the basic beat level. Are there any basic beat rules at play in English? The answer, clearly, is yes. There is an overwhelming tendency for syllables with long, or tense, vowels (CVV) to be stressed in surface patterns: *dàta, róðite, éulógize*. In contrast, open syllables with lax, or short, vowels (CV) behave quite differently. A noninitial CV will be stressed only if followed by at least one stressless syllable: *Álabáma, Améríca, initial, métricálity*. An initial CV may be stressed regardless of what follows: *súttée, ráccon, sãtile*. These facts alone suggest (a) that there is a basic beat rule that distinguishes at the least between CVV syllables and CV syllables, aligning only the former with second-level beats, (b) that there is a basic beat rule requiring the alignment of syllables in initial position with a second-level grid position (on the Root domain, as we will show), and (c) that the Beat Addition that is responsible for the alignment of CV syllables with the second level is left dominant. Given the core theory, no other options are available. If CVV syllables are consistently stressed in surface patterns, then they must be so in the basic (underlying) patterns; if initial syllables may be stressed regardless of what follows, then a position-sensitive basic beat rule must be at play. And so on. But note that, already, this basic analysis implies a certain concomitant analysis of divergences from the basic patterns. Because basic beat rules and Beat Addition at the second metrical level are (by hypothesis) obligatory, underlying CVV syllables that on the surface are stressless (and contain reduced vowels), as in *expláin* (cf. *expláin*), must somehow be "destressed" by separate rules of the grammar, as must initial stressless CV or CVC syllables, such as those in *Améríca or cóndémm*. Such "destressing" rules, which will be discussed in section 3.3, might be called grid transformations. Given the core grammar approach, it is the proper characterization of these later grid transformations that requires the greater part of the analytical "work" done by the language learner or the linguist.

Assuming that this outlined analysis of the basic patterns is essentially correct, two questions still remain: what is the precise nature of the basic beat rule that differentiates between syllable types, and what is the directionality of Beat Addition? The answer to the first question requires an understanding of the facts concerning the stressing of syllables of the shape CVC, where V is a lax vowel: do these behave like

---

3.2 Grid Construction in English Words

3.2.1 The Second Metrical Level

For each metrical grid level relevant to the representation of English stress patterns, we ask two basic questions: What text-to-grid alignment rules are involved (if any)? and What grid euphony rules are involved? With respect to the latter rules, we also ask, What parameters...
CVV syllables or CV syllables? In surface patterns, CVC syllables may be stressed in the absence of a following stressless syllable, either in final position or before another stressed syllable: chimpanzee, gymnast, convict, Agamemnon, Adirondacks, parsnip. This behavior is like that of CVV syllables, and completely unlike that of CV syllables. Yet CVC syllables are unlike CVV syllables in that it is quite common for them to appear stressless on the surface: hymnal, catalyst, appendectomy, expurgate, Nebuchadnezzar. In this, they appear to resemble CV syllables. But our core theory allows no middle ground. There is no way for the CVC syllables of the earlier examples to have been made "stressed" except by a basic beat rule aligning CVC syllables with a second-level grid position. And because, by hypothesis, basic beat rules are not optional—do not have the possibility of sometimes aligning CVC syllables and sometimes not—the stressless CVCs of the latter examples must therefore be analyzed as arising in some other fashion. This is indeed the view we will seek to uphold: that surface stressless CVC syllables arise (in large part) via a grid transformation that "destresses" basic-beat-aligned CVCs in specific circumstances. Our analysis of the basic beat rules of English is thus as follows:

(3.6)

**English Text-to-Grid Alignment (Basic Beat Level)**

a. Align a syllable of type CVV or CVC with a basic beat. 14
b. Align a syllable in initial position in the Root domain with a basic beat.

The first we will call the **Heavy Syllable Basic Beat Rule** (HBR), and the second the **Initial Basic Beat Rule** (IBR).

To complete this analysis of the patterns at the basic beat level, we need to specify the directionality of the left-dominant GE rule of Beat Addition. It can be shown to apply right to left. Given this, the stress patterns of English words consisting only of CV syllables, for example, would be as shown in (3.7b) and (3.8b):

(3.7) (3.8)

a. x a. x
x x x x x x x x x x
CV CV CV CV CV CV CV CV CV
\[ \downarrow \text{BAR-L} \] \[ \downarrow \text{BAR-L} \]
b. x x b. x x
x x x x x x x x x x
CV CV CV Ex.: vānillā CV CV CV CV Ex.: Mississippī

The (b) grid alignments are produced on the basis of the partial grids in the (a) examples, which themselves are the product of the universal Demibeat Alignment and the English IBR. The Main Stress Rule (MSR) of English, a domain-end prominence rule that is yet to be discussed, will align the last basic beat in the Root domain with a third-level beat. And a "destressing" rule, also yet to be discussed, will demote the initial syllable of vanillā. These rules will produce the surface patterns of (3.7d) and (3.8c):

(3.7) (3.8)

c. x c. x x
\[ \text{MSR} \] CV CV CV CV CV CV = Mississippi
\[ \text{Destressing} \] CV CV CV = vānillā inapplicable

Of course, these are not the only patterns exhibited by words with comparable syllabic compositions. Pāmēlā and Āmērīcā are also attested. With Hayes 1980, 1982, we will assume that the availability of two patterns for words of these shapes reveals nothing about the basic analysis of English stress patterns in terms of the universal core theory, but instead simply attests that the grammar of English offers the possibility that the final syllable in a domain may be "ignored," as extra-metrical, by the rules constructing the stress patterns. (See the following section.) The final syllables of Pamela and America are thus assumed to be extra-metrical. The derivation of their stress patterns would proceed as follows:

(3.9) (3.10)

\[ \text{Pa me (la)}_{\text{em}} \] \[ \text{A me ri (ca)}_{\text{em}} \]
\[ \text{DBA} \] x x (x) x x x (x)
\[ \text{IBR} \] x x (x) x x x (x)
\[ \text{BA}_{\text{RL}} \] inapplicable x x x (x)
\[ \text{MSR} \] x x (x) = Pāmēlā x x x (x)

\[ \text{Destressing inapplicable} \] x x x (x) = Āmērīcā
This, then, is the analysis of the alternative set of patterns for CVCVCV and CVCVCVCV. Notice now that if Beat Addition applied left to right, then all these patterns could not be derived, as long as the other aspects of the analysis were left unchanged (in particular, the assumption that there exists a TGA rule of IBR that is intrinsically ordered before Beat Addition). 

(3.11) shows the patterns that could be derived by left-to-right Beat Addition:

(3.11)

<table>
<thead>
<tr>
<th>Pattern</th>
<th>CVCVCV</th>
<th>CVCVCVCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBA</td>
<td>CV CV CV</td>
<td>CV CV (CV)</td>
</tr>
<tr>
<td>IBR</td>
<td>x x x x x</td>
<td></td>
</tr>
<tr>
<td>B(AL-R)</td>
<td>x x x inapplicable</td>
<td></td>
</tr>
<tr>
<td>MSR</td>
<td>x x x x x</td>
<td></td>
</tr>
<tr>
<td>Destressing</td>
<td>x x x inapplicable</td>
<td></td>
</tr>
</tbody>
</table>

Among these there is no possible derivation of Mississippi, though the patterns corresponding to vanilla, Pamela, and America are generated. For this reason, Beat Addition must apply right to left in English.

To sum up, then, the parameters governing the operation of Beat Addition on the second metrical level in English are set as follows:

3.2.2 Extrametricality

Before we examine the grammar of the patterns found at the higher metrical levels in words, it is necessary to properly introduce the notion of extrametricality, which has come to play an important role in recent metrical treatments of stress. Liberman and Prince 1977 introduce the term to describe syllables, usually found at the limits of words, that are systematically ignored in the computation of stress patterns in English. Hayes 1980, 1982 has shown that the notion bears fruit in the treatment of stress patterns in a great variety of languages. As Hayes points out, it allows one to severely restrict the inventory of possible foot types and more generally the inventory of possible stress systems in language. We believe Hayes's argument for extrametricality to be convincing, and we adopt the notion here.

Specifically, Hayes proposes that the grammar of a language may stipulate that a single constituent of some designated type (e.g., segment, syllable, foot, morpheme) is extrametrical. It is also proposed by Hayes 1980, 1982 and Harris 1982 that extrametricality, an admittedly powerful device, be severely constrained, so as to characterize only constituents found at the extremes of particular domains. Hayes 1982 states that the domain of extrametricality in English is the phonological word, by which he means the syntactic word minus the neutral (= Root) affixes or the domain of the word stress rules (personal communication). We suggest that extrametricality is defined only with respect to syntactic domains, since only syntactic domains govern the applicability of grid construction rules. We propose moreover that just two sorts of constituent may be extrametrical — syllables and segments — thereby rejecting the possibility of assigning the property of extrametricality to morphological constituents or to prosodic constituents higher in the prosodic hierarchy than the syllable. (Of course, since we claim that there is no prosodic constituent foot, feet cannot be treated as extrametrical.) This is an entirely natural restriction within
our theory of stress patterns. The sort of information about a word (or phrase) to which "stress rules" have access in the construction of a metrical grid is limited to the internal structures of the syllables in sequence on a particular domain and the metrical grid that is aligned with this syllable sequence. The sorts of things that are ignored are of the same type: in the case of an extrametrical segment, an element of internal syllable structure is ignored; in the case of an extrametrical syllable, as we see it, a syllable (and the grid position(s) with which it may be aligned) are ignored. Why extrametricality should be confined to the limits of morphological domains, as it apparently is, and why it should be restricted to just one segment or syllable in that position are questions for which neither this theory nor Hayes’s provides an answer. These are merely stipulations, ones that allow for an interestingly restrictive theory of possible perturbations in the patterns expected on the basis of a core theory of stress.

Further restrictions that we propose for extrametricality are that it is a property of lexical items, that the ascription of extrametricality to a syllable or segment will "precede" the application of any and all grid construction rules, and that any generalizations concerning the assignment of extrametricality are therefore to be expressed in the form of lexical redundancy rules. We will elaborate on this restriction below.

A final proposal concerning extrametricality is that it is not relevant to all grid construction rules, but only to those that in effect "care" whether a final (or initial) segment or syllable is within a particular cyclic domain. This restriction has important consequences. Given our theory of stress patterns, segment extrametricality will be relevant only to basic beat rules, and specifically only to those that appeal to the internal composition of syllables, for no other rules of grid construction pay heed to the segmental composition of the string. A final CVC syllable, for example, would be treated as a CVC syllable by a basic beat rule like the HBR, if the final C were extrametrical. In English, Hayes argues (and we concur), a final C may be extrametrical. This must be so if the grammar is to generate the stress pattern of Nantucket [næntəkɪt], for example. Were that final C not extrametrical, Demibeat Alignment and the basic beat rules of English would give the partial grid of (3.13).

\[(3.13)\]
\[
\begin{array}{ccc}
\times & \times & \\
\times & \times & \times \\
\end{array}
\]

Nantucket

There would be no room for Beat Addition to apply, and the medial syllable (a lax open one) would not be aligned with a basic beat (that is, it would not be "stressed"). As far as the syllable-structure-sensitive basic beat rules of English go, then, an English CVC at the limit of the constituent \(a\) in (3.14a) may be treated as if it had the structure in (3.14b):

\[(3.14)\]
\[
\begin{array}{c}
\sigma \\
\beta[\ldots a[\ldots CVC_{em}]a \ldots ]\beta \\
\end{array}
\]

On the cyclic domain \(\alpha\) the final syllable would act like a CV syllable; on the higher domain \(\beta\), however, that syllable would be treated like any other CV syllable on that domain.

We propose a similar conception of syllable extrametricality. Here, too, the function of extrametricality is in essence to redefine the limits of a cyclic domain. A syllable is extrametrical with respect to a particular syntactic constituent, and by being extrametrical it is treated as if it were outside that constituent. Thus a word with a word structure representation like (3.15a) would be treated, in the cyclic application of rules, as if it had the representation (3.15b):

\[(3.15)\]
\[
\begin{array}{c}
\sigma \\
\beta[\ldots a[\ldots CVC_{em}]a \ldots ]\beta \\
\end{array}
\]

That is, on the cycle on \(\alpha\), the extrametrical syllable will be ignored. On the cycle on \(\beta\), however, it will act like any other syllable in the sequence on \(\beta\). This is a consequence both of viewing extrametricality as being defined with respect to a particular constituent and of our theory of grid construction rules, which, at the word level at least, ignore the constituency internal to a cyclic domain.

This conception of syllable extrametricality has another interesting consequence in the context of our grid-based theory of stress patterns: grid construction rules for which the location of the limits of the cyclic domain is irrelevant will not be affected by extrametricality. Demibeat Alignment is such a rule. The prediction, then, is that syllables are
neither extrametrical with respect to Demibeat Alignment. This merely amounts to claiming that all syllables of an utterance enter into the overall rhythmic organization of the sentence, which appears to be a correct representation of the facts. Under this theory of extrametricality, the basic beat rules that appeal only to the internal composition of a syllable, but not to its position within a domain, are also not subject to syllable extrametricality (though they may be affected by segment extrametricality, as we have shown). Thus it is predicted, for example, in a language like English, with its HBR, final syllables of the form CVV(C) and CVCC(C) will always be stressed—even though extrametricality of final syllables is a possibility. This is by and large correct for English. The reason that the prediction is not entirely borne out in fact is that final consonant extrametricality is also possible in English. The more specific prediction about the application of the HBR made by the entire system of extrametricality in English is that final CVC will be basic-beat-aligned in an underlying pattern only if its final C is not extrametrical, whereas final CVCC will always be basic-beat-aligned (regardless of whether its final C is extrametrical), as will final CVV and final CVVC. Of course, since a final CVCC that is basic-beat-aligned in an underlying pattern could subsequently be destressed, the failure of a final CVCC to be stressed on the surface, as in têmpêst, pêrfêct, etc., is not counterevidence to our claim. (As for surface final stressless CVV, as in hûppê, nárrôw, móttô, etc., we claim, as do most others, that these are derived from an underlying final lax CV, tensed after grid construction in final position. See note 10.)

It is important to understand that the fact that syllables may be aligned with basic beats by the HBR does not mean that they are not extrametrical. Our theory is that syllable extrametricality is relevant only to grid construction rules for which the position of a syllable with respect to the limits of a cyclic domain is relevant, or to those grid construction rules whose structural descriptions refer to sequences of grid positions (and by extension the sequences of syllables aligned with those positions). Into this category fall (i) position-sensitive basic beat rules, (ii) Beat Addition on the second metrical level, whose application is directional and requires the representation of a “starting point” (see examples (3.7)–(3.10)), and (iii) domain-end prominence rules, such as the English Main Stress Rule. Thus it is entirely possible under this theory for a syllable to have been aligned with a beat by the HBR and at the same time for it to be extrametrical with respect to one of these other rules. In the investigation of main word stress assignment to follow, we will give examples where this must be the case.

What we have proposed, then, is a theory of extrametricality that is rather restrictive and makes what seem to be the correct predictions about (i) which sorts of grid construction rules may be affected by extrametricality and which may not, and (ii) the irrelevance on a higher cyclic domain of extrametricality that is particular to a lower syntactic constituent. We will show that this theory provides the proper foundation for a full treatment of extrametricality in the English word stress system. The analysis draws heavily on the insights of Hayes 1980, 1982, but casts those insights in a somewhat different way in the grammar.22

Hayes observes that in English verbs and adjectives a final consonant is quite typically extrametrical; in other words, the final syllable of a verb or adjective is stressed if it consists of CVV(C) or CVCC, as in (3.16a) and (3.16b), but not if it is simply CVV, as in (3.16c). (The examples are from Hayes 1980.)

(3.16)

| a. divine | b. torment | c. astonish |
| atone | robust | common |
| obey | usurp | develop |
| discreet | overt | illicit |

Consonant extrametricality is also found in nouns, as in the case of Nantucket, although, as Hayes points out, the effects of syllable extrametricality, which is quite common in nouns, tends to obscure the role of consonant extrametricality in determining the stress patterns of nouns. Hayes 1980 suggests that the grammar of English contains rule (3.17), whose function is to assign extrametricality marking to final consonants:

(3.17)

\[ [+\text{cons}] \rightarrow [+\text{em}] / [\ldots \quad \text{word}] \]

(We give the rule as Hayes formulates it, though its proper domain is actually the Root; see section 3.2.5.) Our alternative, presumably more desirable because it is more restrictive and at the same time consistent with the facts, is that extrametricality is a property of lexical items, in their lexical entries. This amounts to saying that English has the following lexical redundancy rule:
Word Stress and Word Structure

(3.18) \[ \ldots \text{C_em root} \text{ is well formed} \]

It would also be possible to assign extrametricality by rule, as long as it were the first rule in the grammar. But because there are exceptions to consonant extrametricality, we prefer to view it as a matter of lexical representation. We suggest, then, that words like those cited in (3.16c) have the following lexical entries:

(3.19) 
\[ \text{[a sto nish_em]} \quad \text{[i lli cite_em]} \quad \text{[Nan tu cket_em]} \]

Whether a final consonant is extrametrical or not is, we submit, one of the important ways in which lexical items may differ, as well as an important source of apparent "irregularities" in the English stress system. (We will see that the same is true of syllable extrametricality.) Thus, for example, there are verbs and adjectives whose final syllables do not behave as if the final syllable is extrametrical:

(3.20)

<table>
<thead>
<tr>
<th>Verbs</th>
<th>Adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>begin</td>
<td>debonair</td>
</tr>
<tr>
<td>attack</td>
<td>harass</td>
</tr>
<tr>
<td>regret</td>
<td>acquiesce</td>
</tr>
<tr>
<td>ransack</td>
<td>prolog</td>
</tr>
<tr>
<td>combat</td>
<td>abet</td>
</tr>
<tr>
<td>deter</td>
<td>succumb</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pequod</th>
<th>troubador</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>aileron</td>
</tr>
<tr>
<td>diadem</td>
<td>daffodil</td>
</tr>
<tr>
<td>Karloff</td>
<td>shindig</td>
</tr>
<tr>
<td>Peking</td>
<td>Agamemon</td>
</tr>
<tr>
<td>Molotov</td>
<td>Adirondack</td>
</tr>
<tr>
<td>Aztec</td>
<td>gazelle</td>
</tr>
</tbody>
</table>

There are nouns of this sort as well:

(3.21)

<table>
<thead>
<tr>
<th>Nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>affair</td>
</tr>
<tr>
<td>pollywog</td>
</tr>
<tr>
<td>Karloff</td>
</tr>
<tr>
<td>Peking</td>
</tr>
<tr>
<td>Molotov</td>
</tr>
<tr>
<td>Aztec</td>
</tr>
</tbody>
</table>

| gavotte |
| saccade |
| diadem |
| maniac |
| ocelot |
| Mamaroneck |

(These examples, and many more, are brought together in Ross 1972.)

Our analysis is that in the lexical entries of these words, the root-final consonant is not marked extrametrical.

Hayes takes a different approach. Rather than viewing the latter cases as simple exceptions to root-final consonant extrametricality, he suggests that words with final stressed CVC are stressed (i.e., footed or basic-beat-aligned) not by rule, but in their lexical entries. It is puzzling that Hayes should suggest this, since his stress rules (foot assignment rules) would regularly assign stress to syllables of the form CVC here—as long as neither the syllable itself nor the final consonant were extrametrical.23 As Hayes seems to see it, syllables could be exceptionally stressed by whatever means in the lexicon. The fact that only final CVCs (but never final CVs, for example) are lexically stressed is a mere coincidence. But this approach misses what appears to be an obvious generalization: that a final CVC syllable can be stressed because, quite generally, a CVC syllable can be stressed regardless of what follows. All that it takes to allow that final CVC to be stressed by the independently motivated rules of the grammar is to not treat its final consonant as extrametrical.

As for the extrametricality of syllables in English, Hayes argues that it is in general found in nouns, but not in verbs and adjectives (if they are unsuffixed). We agree that final syllable extrametricality is possible in English nouns. It is necessary to assume this in order to derive the basic beat pattern of America. However, we do not agree that extrametricality is the rule. The basic beat patterns of Mississippi and vanilla are derived in entirely regular fashion if it is assumed that their final syllables are not extrametrical. We suggest, then, that the lexical entries of America and Mississippi differ simply in whether or not their final syllable is extrametrical, as in (3.22):24

(3.22) \[ \text{A me ri (ca)m} \quad \text{Mi ssi ssi ppi} \]

Again, Hayes avoids using extrametricality to characterize the difference. He suggests instead that the final syllable of Mississippi is indeed extrametrical and that stress is assigned to the penultimate CV because it bears a diacritic marker \([+H]\), which notes that the syllable is "hon·orarily heavy." The stress rules are then taken to have the power to treat a syllable so marked as if it were indeed heavy.25 In our opinion, such an analysis is undesirable. The use of a diacritic like this opens Pandora's box. It is in the nature of this use of a diacritic that there are no principles governing its distribution. It is therefore predicted that many stress patterns might exist that are simply not attested. It would be predicted in particular that a CV syllable could be stressed regardless of what followed it. But this is false.26 Again, the more restrictive and therefore more interesting hypothesis, one that accords with the facts, is simply that the difference between Mississippi and America
lies in the extrametrical status (or lack of it) of their final syllables. We therefore suggest the following lexical redundancy rule for English:

\[(3.23) \text{[\ldots} \sigma_{en}]_{n\text{om}} \text{ is well formed in the case of nouns.}\]

It is not merely nouns whose final syllables may be extrametrical. Hayes demonstrates that the final syllable of suffixed adjectives and verbs is also typically extrametrical. What shows the extrametricality of the final syllable of a suffixed adjective or verb is both its failure to receive the expected final main stress when the final syllable is stressed, as in molluscoid and criticize, for example, and the failure of a penultimate CV to be stressed, as in original, primitive, magnanimous. The generalization that the final syllable of a suffix is extrametrical extends to nouns as well: stalactite, positron, neutrality. The question now is how to express this generalization concerning suffixed forms. We propose the following rule:

\[(3.24) x[\ldots \sigma_{en}]_{\text{at}}x \text{necessarily}\]

This says simply that extrametricality within suffixes is the rule.

To sum up, we are in essence adopting Hayes’s idea that extrametricality is a crucial notion in an analysis of English word stress patterns. The use to which it is put is somewhat different in our analysis, however. First, our theory of extrametricality allows only segments and syllables to be extrametrical, and it allows only rules that are in some way sensitive to domain edges to be affected by extrametricality. Second, within the context of that theory, we suggest an analysis of “exceptions” in English word stress that relies on the notion of extrametricality. It is the property of having an extrametrical final syllable or segment, or not, that is claimed to be one of the ways in which lexical items identical to each other in their syllabic composition may nonetheless differ in their behavior with respect to word stress. (The only other important way in which lexical items differ is in their susceptibility to undergoing certain rules of destressing. We will take up this matter in section 3.3.)

3.2.3 The Third Metrical Level and Above

3.2.3.1 The Main Stress Rule According to the grid-based theory of stress outlined in chapter 2, if a text-to-grid alignment rule plays a role at the third metrical level or above in a language, it is a domain-end prominence rule. (This is the proposal made by Prince 1981, 1983.) English words do reliably contain one stressed syllable that is more prominent than the others, and it tends to be located toward the right-hand limit of the word. According to the core theory, then, there is a “Main Stress Rule” at play, which gives third-level prominence (or higher) to the rightmost basic beat within a domain. That domain, as we will show, is the Root, not the Word. Our analysis, then, following Prince 1981, 1983, is that the “Main Stress Rule” of English is a rule of the following sort:

\[(3.25) \text{English Main Stress Rule: Text-to-Grid Alignment, Third Metrical Level (provisional formulation)}\]

Align the rightmost basic beat within a Root constituent with a grid position on the third metrical level.

Given the core theory of stress, and given English word structure, the only other alternatives would be either a rule that placed “main stress” (at least a third-level beat) on the rightmost beat within a Word domain, or a rule that placed it on the leftmost basic beat within either a Root or a Word domain. These alternatives are out of the question, and the first, as we will show in section 3.2.4, is not consonant with the facts. We are left, then, with rule (3.25). Let us examine now what support there is for this rule as the correct generalization about the locus of main word stress in the basic underlying patterns of English words. The more general question is whether there is support for Prince’s proposal that, in core theory, the only options available for third-level text-to-grid alignment are domain-end prominence rules that promote either the first or the last beat within a domain.

Given our analysis of the patterns of beats on the second metrical level, along with the possibilities in English for final consonant and final syllable extrametricality, rule (3.25) predicts several loci of main word stress, which are tabulated in (3.26)–(3.28). (The symbol \(\sigma\) alone stands for “any sort of syllable.” The symbol ! before a word means that it has more than one possible analysis.)
In (3.26a) the heavy final syllable that is aligned with a basic beat by the HBR is not itself extrametrical (nor, in the case of CVC, is the consonant extrametrical), and it thus receives main stress. This is the only circumstance in which final main stress is possible in English. (A final CV is never basic-beat-aligned, and is therefore never aligned with a third-level beat.) Penultimate stress, on the other hand, has a variety of sources, and for some words more than one analysis is available. The analysis of vanilla, Nantucket, and so on, in (3.26b) is unambiguous. These can only have been derived if the final syllable is not extrametrical (though the final C must be), because the only source for the basic beat on their penultimate CV is Beat Addition, which therefore must have "seen" that final syllable (cf. the discussion above). The analysis of the basic patterns of Electra, marina, etc., is not unambiguous, however. These patterns could have arisen either as instances of (3.26b), where the final CV(Cem) syllable is not extrametrical, or as instances of (3.27a), where it is. In either case, the penultimate heavy syllable would be given a basic beat and the final syllable would not. Note that yet another basic underlying pattern is available to amalgam, Poseidon, and the others with stressless final CVC: the pattern in (3.28a). In the examples used to illustrate (3.28a), all the final heavy (extrametrical) syllables are stressed on the surface. But if, as mentioned earlier, a rule is at work in English that may desstress CVC syllables that are not aligned with third-level beats (i.e., are not "main-stressed" or "second-
arily stressed”), then amalgam, Poseidon, etc., have a possible derivation on the basis of (3.28a) as well (see section 3.3.3). This multiplicity of sources for such words is not at all vexing, however, for each option available in the different analyses (syllable extrametricality, CVC de-stressing) is independently motivated in the grammar.

The analysis of Monadnock in (3.28a), with its final stressed but not main-stressed CVC syllable, is of course not ambiguous. For the final syllable to have been basic-beat-aligned, it must be analyzed as heavy (i.e., the last C is not extrametrical); but the lack of main stress on that final syllable shows that the entire syllable must itself be extrametrical. The analysis of Mashpee is also unambiguous. For the final syllable to be stressed, it must be (underlyingly) a CVV syllable (note 10), but one that is extrametrical. These, then, are cases of extrametrical syllables that receive a grid alignment by one sort of grid construction rule (the HBR), but not by another (the Main Stress Rule).

As for the cases of antepenultimate main stress, the final syllable in such cases is necessarily extrametrical, and the penult is necessarily a CV syllable: if the final syllable is extrametrical, then Beat Addition cannot align the penult with a basic beat, and if the penult itself is CV, the HBR will not align it with a basic beat, either. Whether the final extrametrical syllable is heavy and basic-beat-aligned, as in (3.28b), or light (or “extrametrically” light), as in (3.27b), Beat Addition will ignore it in its right-to-left sweep and thus will place a basic beat on the antepenult, which will then be main-stressed on words where the antepenult itself is light, as in America. When the antepenult is itself heavy, of course, it is not Beat Addition, but the HBR, that is responsible for placing the basic beat that is promoted to “main stress.”

The notion of extrametricality clearly does a considerable amount of work in this analysis of English word stress. In particular it explains the surface divergences from the domain-end prominence rule (3.25) that are exhibited in (3.28). Without syllable extrametricality, (3.25) would align a grid position of level three (or higher) with the last basic beat, which is here located on the final syllable.

From the restriction of extrametricality to single syllables, together with rule (3.25), it follows that if there is a stressed syllable following main stress in English roots, it is necessarily in final position. Given this analysis, the stress patterns of (3.29) cannot be derived.

As the examples show, the stress patterns in (3.29) are impossible. Rule (3.25), modulo single syllable extrametricality, therefore captures just the right sort of generalization about the placement of “main stress” in English.

It would be useful to recall here how the generalizations about main word stress placement are expressed in Liberman and Prince’s analysis. Liberman and Prince propose that the metrical trees that group together feet in English are right-branching and that the basic generalization governing the assignment of prominence relations (in the form of s/w labels) is roughly speaking as follows (p. 308):

\[(3.30)\]

**Lexical Category Prominence Rule (LCPR)**

Given two nodes, \(N_1, N_2\), \(N_2\) is strong \((s)\) iff it branches.

According to this analysis, the trees below would be assigned the following labels:

\[(3.31)\]

a. b. c.

s

w

s

w

s

w

s

w

re consonation

Wisconsin

Mashpee

The syllable dominated only by \(s\) labels in the tree is the main-stressed syllable in the word. The overall branching pattern of the tree, together with the LCPR, guarantees that main stress will tend to fall toward the right end of the word. The requirement that the right-hand node branch has the result that the main stress will not be final. This is of course a
correct result if the final syllable is stressless, but it is not always borne out in fact when the final syllable is stressed, as for example in *inter-sec-t, Tennessee*. To account for these cases, Liberman and Prince add several provisos to the LCPR, which have the effect of allowing limited exceptions to it. Hayes 1980 adopts Liberman and Prince's account, though he offers a slightly different one in Hayes 1982 that makes fruitful use of the extrametrical property of final syllables. Our claim, which is essentially an adaptation of the one made by Prince 1981, 1983, is that trees and potentially complex labeling conventions are not required at all in order to express the appropriate generalizations about placement of main word stress in English and other languages. Prince's grid-based theory of main word stress placement is that the possibilities are either "promote the last" or "promote the first" of the basic beats within a specified domain. A domain-end prominence rule of this type, (3.25), along with a judicious appeal to extrametricality—which we now on independent grounds to be available to a grammar—predicts exactly the loci of main word stress that are attested in English.

3.2.3.2 Grid Euphony on the Third Level  So far in this section we have investigated the well-foundedness of the claim that a text-to-grid alignment rule like (3.25) provides the right analysis of the location of the most prominent beat in the metrical grid alignment of English words. Two further issues require attention. The first concerns the role of grid euphony rules in deriving the full patterns of rhythmic prominence at the third level or higher, and the second concerns the precise nature of the formulation of the Main Stress Rule.

The English Main Stress Rule is a TGA rule that is specific to a syntactic domain. It establishes the location of greatest grid prominence within that domain. In chapter 2 we suggested that the application of TGA rules is (intrinsically) ordered before the application of GE rules on any cyclic domain. This ordering expresses the generalization that the location of the beats added, deleted, or moved by GE rules on a particular level within that domain depends on the location of the beats on that level whose presence is required by TGA. There is a further generalization that the grammar of English—and, more generally, the theory of grid construction—must express. It is that, within a cyclic domain, a GE rule like Beat Addition may not undo the effects of a TGA rule like the English Main Stress Rule by introducing greatest prominence in a location not specified by the TGA rule. In chapter 2 we proposed to account for this with the Textual Prominence Preservation Condition (TPPC), (2.25), which specified that "A TGA rule assigning main stress in roots must seemingly "re-apply," is the TPPC. The TPPC will guarantee that the prominence relations required by the Main Stress Rule are "restored," as in (3.32).
correct result if the final syllable is stressless, but it is not always borne out in fact when the final syllable is stressed, as for example in *intersect*, *Tennessee*. To account for these cases, Liberman and Prince add several provisos to the LCPR, which have the effect of allowing limited exceptions to it. Hayes 1980 adopts Liberman and Prince’s account, though he offers a slightly different one in Hayes 1982 that makes fruitful use of the extrametrical property of final syllables. Our claim, which is essentially an adaptation of the one made by Prince 1981, 1983, is that trees and potentially complex labeling conventions are not required at all in order to express the appropriate generalizations about placement of main word stress in English and other languages. Prince’s grid-based theory of main word stress placement is that the possibilities are either “promote the last” or “promote the first” of the basic beats within a specified domain. A domain-end prominence rule of this type, (3.25), along with a judicious appeal to extrametricality—which we know on independent grounds to be available to a grammar—predicts exactly the loci of main word stress that are attested in English.

3.2.3.2 Grid Euphony on the Third Level So far in this section we have investigated the well-foundedness of the claim that a text-to-grid alignment rule like (3.25) provides the right analysis of the location of the most prominent beat in the metrical grid alignment of English words. Two further issues require attention. The first concerns the role of grid euphony rules in deriving the full patterns of rhythmic prominence at the third level or higher, and the second concerns the precise nature of the formulation of the Main Stress Rule.

The English Main Stress Rule is a TGA rule that is specific to a syntactic domain. It establishes the location of greatest grid prominence within that domain. In chapter 2 we suggested that the application of TGA rules is (intrinsically) ordered before the application of GE rules on any cyclic domain. This ordering expresses the generalization that the location of the beats added, deleted, or moved by GE rules on a particular level within that domain depends on the location of the beats on that level whose presence is required by TGA. There is a further generalization that the grammar of English—and, more generally, the theory of grid construction—must express. It is that, within a cyclic domain, a GE rule like Beat Addition may not undo the effects of a TGA rule like the English Main Stress Rule by introducing greatest prominence in a location not specified by the TGA rule. In chapter 2 we proposed to account for this with the Textual Prominence Preservation Condition (TPPC), (2.25), which specified that “a TGA rule applying on a syntactic domain d, is necessarily satisfied on that domain.”

Recall the discussion of the higher-level stress patterns of *reconciliation* and *chimpanzee* (section 2.3.2.3). Each of these words contains three “stressed” (basic-beat-aligned) syllables, the last of which is the most prominent of all. And of the two stressed syllables that precede, the first is more prominent than the second. The metrical grid representation of these patterns must therefore be as follows:

(3.32)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>x</th>
<th></th>
<th>b.</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>xxx</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
| reconcili ation | chimpanzee

We suggest that the presence of the “secondary stress” on *re-* and *chim-* is to be attributed to the (obligatory) operation of the rule of (left-dominant) Beat Addition on the third metrical level within words. The rule would take as input the representations of (3.33), which are the output of a “first” application of the Main Stress Rule:

(3.33)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>x</th>
<th></th>
<th>b.</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>xxx</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
| reconcili ation | chimpanzee

The operation of Beat Addition would give as output the representations in (3.34), which are not acceptable, for the reasons given in chapter 2.

(3.34)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>* x</th>
<th>x</th>
<th></th>
<th>b.</th>
<th>* x</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>xxx</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>
| reconcili ation | chimpanzee

(We argued, moreover, that a further application of Beat Addition on the fourth metrical level, giving initial main stress, was unacceptable.) What ensures that the representations in (3.34) will not be left as is, and that the TGA rule assigning main stress in roots must seemingly “re-apply,” is the TPPC. The TPPC will guarantee that the prominence relations required by the Main Stress Rule are “restored,” as in (3.32).
Actually, it is not necessary that TGA rules and Beat Addition should be ordered. The same effect could be achieved merely by requiring that both the TGA rules and the GE rules be satisfied simultaneously on the cyclic domain. In either case, the TPPC ensures the precedence of TGA prominence over GE prominences.

Now there are certain English words with three stressed syllables—for example, *Ticonderoga*—that are described as having two possible loci of secondary stress. Given the (left-dominant) Beat Addition analysis, however, only one of these pronunciations can be derived: *Ticonderoga*, in which secondary stress is two away from the main stress. The other (putative) location of secondary prominence is on the syllable aligned with the basic beat that is adjacent to the basic beat under main stress: *Ticonderoga*. This prominence could not have been derived through left-dominant Beat Addition. We suggest, however, that a different interpretation of the facts is in order. Specifically, we suggest that in the latter case Beat Addition has not occurred at all, and that the intuition that the syllable *-con-* has greater prominence than *Ti-* is not to be explained in terms of an alignment of *-con-* with a third-level beat. It is quite conceivable that *-con-* may be heard as more prominent when it is at the same level of rhythmic prominence as the preceding syllable because it is itself followed by a weak syllable, whereas the preceding *Ti-* is not. In what follows we will assume this interpretation of the facts and see where it leads. With this interpretation, we are claiming that *Ticonderoga* may have either of the metrical grid alignments in (3.35):

\[
\begin{align*}
(3.35) & \\
a. & x & b. & \\
& x & x & x & x & x & x & x \\
& x & x & x & x & x & x & x & x
\end{align*}
\]

\[
\text{Ticonderoga} \quad \text{Ticonderoga}
\]

It turns out that independent evidence exists that the second pattern should be described as an (exceptional) failure of Beat Addition to apply in the word. As Liberman and Prince 1977 and Kiparsky 1979 point out, the application of the ‘Rhythm Rule’ (= the GE rule of Beat Movement) appears to be relatively unacceptable in cases where it would create the configuration \( \sigma \overline{\sigma} \overline{\sigma} \). Thus compare *Móntana cówboy* (cf. *Montana*) to the perfectly acceptable *Carolina cówboy* (cf. *Carolina*). Liberman and Prince’s claim, which is adopted and codified by Kiparsky, is that the configuration \( \sigma \overline{\sigma} \overline{\sigma} \) is disfavored—in grid or tree terms, that either (3.36) or (3.37) is disfavored.

\[
(3.36) \\
\sigma \sigma \sigma
\]

\[
(3.37) \\
* s \quad w
\]

Kiparsky, when the left-hand \( s \) does not branch (Kiparsky 1979)

The suggestion is that there is an output condition that rules out the offending configuration. Such an output condition enters into competition, so to speak, with the clash-eliminating Beat Movement that would derive the stress reversal in *Montana cowboy*.

Since Beat Movement is only optional (see chapter 4), it does not apply. Note now that the existence of such an output condition could explain the optionality of Beat Addition in *Ticonderoga*. Beat Addition should apply obligatorily to *Ticonderoga*, in which case only (3.35a) would be derived. Our proposal is simply that it may fail to apply where it should, because of the effect of the same output condition that makes Beat Movement less likely in *Montana* than in *Carolina*.

When Beat Addition fails to apply, the result is (3.35b), which is heard as prominence on *-con-.* It would seem, then, that obligatory left-dominant word-internal Beat Addition, modulo this output condition, makes just the right predictions about the presence and location of secondary word stress in English.

When Beat Addition fails to apply, the result is (3.35b), which is heard as prominence on *-con-.* It would seem, then, that obligatory left-dominant word-internal Beat Addition, modulo this output condition, makes just the right predictions about the presence and location of secondary word stress in English.

The other GE rule needed in a description of the patterns of beats on level three or higher in English words is Beat Movement. We defer discussion of this rule, though, until we explicitly investigate the motivation for the cycle in section 3.4. There we will show that, like Beat Addition, Beat Movement contributes to defining the patterns of secondary stress that in essence “emanate from” the locus of main word stress defined by the TGA English Main Stress Rule.

Let us now consider some details of the formulation of the English Main Stress Rule. As is clear from examples with secondary stress, the Main Stress Rule must be formulated not simply to introduce a beat on
the third metrical level, but to have the possibility of introducing a beat on the third metrical level or higher, so that the main stress introduced will be more prominent than a neighboring third-level beat introduced by Beat Addition. We must therefore revise the formulation of the Main Stress Rule in (3.25). The new formulation is (3.38), where \( x \) is a grid position and the ellipses are variables over grid positions in the vertical and horizontal dimensions.

(3.38)

**English Main Stress Rule:** Text-to-Grid Alignment, Third Metrical Level (revised)

\[
X_j \not\in \text{loot} \quad \frac{\ldots}{\ldots} \quad X_i \in \text{Root} \quad \Rightarrow \quad \text{Root} \quad \frac{\ldots}{\ldots} \quad \text{Root}
\]

Conditions:

(i) \( X_i \) is a second-level beat

(ii) \( X_i \neq X_j \)

As formulated, (3.38) could assign a fourth-level prominence to the final basic beat if there were a third-level prominence earlier in the word, as in *réconciliation* or *chimpânezé*. But what ensures that (3.38) will assign a fourth-level prominence there, as it must? It is conceivable to add a third condition to the rule: namely, "\( X_j \) is a beat on a metrical level \( n \), where \( n \) is greater than the metrical grid level \( m \) of any other beat in the word." But we prefer not to do so. Such a condition would seem to duplicate the effect of the Textual Prominence Preservation Condition, and in fact a small revision of the TPPC would make the condition unnecessary as part of (3.38). Thus we propose the following revision of the TPPC:

(3.39)

**Textual Prominence Preservation Condition** (revised)

Within a syntactic cyclic domain \( d \), a grid position assigned by a text-to-grid alignment rule on the third metrical level or higher is always (minimally) more prominent than any other prominence on that domain.

(As written, the TPPC is prevented from applying at the basic beat level. If it were to apply there, Beat Addition would be impossible in a language that had basic beat rules.) With this condition, (3.38) will assign the appropriate level of main word stress to *réconciliation*.

The revised TPPC requires that the highest grid position introduced by a rule such as (3.38) be only minimally higher than any other on the domain. Such a restriction ensures that no more grid positions will be introduced than are required either for creating a judicious alternation of strong and weak beats or for satisfying the structural description of the rule itself. Moreover, the proposed revision of the TPPC permits us to avoid including as a condition on the rule (3.38) itself the requirement that the TGA-specified prominence be greater than any other. That this is the correct approach will become obvious in chapter 4, where we will show that the TPPC so formulated guarantees just the right relative prominences in phrasal and compound stress patterns, as well as allowing the English Nuclear Stress Rule and Compound Stress Rule to be formulated without separate conditions on each to guarantee that they assign minimally greater prominence.

Note, finally, that given the formulation (3.38) (and in particular conditions (i) and (ii) combined), a third-level grid position will be aligned with a basic-beat-aligned (stressed) syllable within a root (and thus within a word) regardless of whether or not the word contains another stressed syllable. According to this proposal, then, “main word stress” is not a strictly relational concept. There are a number of reasons for imputing an inherent third-level grid alignment to some stressed syllable of a root, regardless of context. First, there is the intuition that monosyllabic words are reliably more prominent than ordinary stressed syllables in words: *circumstance ≠ circle dance.* Second, the TGA rules assigning prominence within compounds and phrases, to be discussed in chapter 4, "seek out" a third-level prominence (but ignore other prominence), and they treat the stressed syllable of a monosyllabic word like other syllables having a third-level prominence. The third reason, to be elaborated in chapter 7, is that by assuming that normal lexical items have a third-level prominence (at the least), it is possible to distinguish between these and the so-called function words simply by assuming that the latter do not necessarily have such a prominence. The basic phonological property of function words—the ability of monosyllabic ones to destress—can be explained by assuming that they have only a second-level prominence. For these reasons, then, we consider it necessary for the Main Stress Rule of English to assign third-level prominence at the least.

This completes our analysis of the basic patterns of English word stress.
3.2.4 The Question of Domain

Of the grid construction rules that we have examined so far, only two specifically mention a characteristic domain of application. These are the Initial Basic Beat Rule and the Main Stress Rule. We need to explicitly examine the motivation for the characterization of the domains that has been given. We must also reflect on the role of domains for rules like Beat Addition, which make no mention of them.

As it is formulated, it is only within constituents of the category type Root that the English Main Stress Rule seeks out a domain-final basic beat to which to assign greatest prominence. It is predicted, then, that material outside the (cyclic) Root domain will have no effect on the location of main stress in English words. This is exactly the case. As can be seen from examining the “derivations” in table 3.3, a Root suffix such as -al will bring about a change in the locus of main stress, but a Word suffix such as -less will not.

The derivation of the stress pattern of the Noun root instrument is straightforward. The HBR aligns in- and -ment with basic beats, but since -ment is extrametrical with respect to Nr, it is the preceding basic beat, aligned with in-, that is promoted to a third-level beat by the Main Stress Rule. When that Nr is a Noun (nominal word), as in examples (a) and (c) in table 3.3, all that remains in the derivation is the destressing of the final nonsecondarily stressed CVCC syllable. (Destressing, and the assumption that it is “postcyclic,” will be discussed in section 3.3 and in chapter 7.) When the Nr instrument is embedded within another root constituent in word structure, as in instrumental, its basic stress pattern is susceptible to modification.

On the A' cycle in example (b), the Root suffix may or may not be basic-beat-aligned by the HBR, depending on whether or not the final C is extrametrical.32 (If it is basic-beat-aligned, it will later be destressed.) In any case, that entire syllable -(t)al is final in the Root domain, and it is extrametrical. The Main Stress Rule seeks the (honorarily) final basic beat -men- in the A' domain, which here is the penult, and promotes it to main stress status. The former main stress on in- now has the status of a secondary stress. (Probably some extension of the minimality convention imposed by the TPPC will then minimize the derived grid in (b), reducing in- to second-level and -ment to third-level.) The important point is that the stress pattern derived for instrumental differs significantly from that of instrumentless. This difference can be attributed simply to the fact that the English Main Stress Rule has a Root domain.
In (c) of table 3.3, the pattern of the N' is retained on the N cycle. On the following A cycle, there is some grid construction activity, but none that affects the basic pattern of instrument. The suffix -less is aligned with a demibeat; it may or may not be aligned with a basic beat by the HBR, depending on whether or not consonant extrametricality is defined on words. In either case, the syllable would be destressed. What is significant is that the MSR does not apply on this domain. Were it to be applicable on the Word domain, it would find a basic beat farther to the right than in here —ment (which is no longer extrametrical) and/or -less (if it is not extrametrical) — and would thus align the rightmost one found with main word stress. Since this does not happen, we conclude that the English MSR is confined to constituents of type Root.

The Initial Basic Beat Rule is the other "stress rule" of English that is specific to a domain. We have suggested that it takes categories of type Root as its domain. This of course will guarantee word-initial stress, since a Root is a word in syntactic structure.33

The GE rule of Beat Addition strictly speaking has no domain of its own. As a GE rule, rather than a TGA rule, it makes no explicit reference to the syntactic structure of the text (the syllabified surface structure of the sentence). Of course, given that GE rules apply cyclically alongside TGA rules in the construction of phonological representation, when they apply they have only the fragment of metrical grid available to them that is contained within the bounds of the current cyclic domain. This is why a GE rule like Beat Addition may appear to have a syntactic domain. More specifically, there are two ways in which Beat Addition may appear to have a syntactic domain of its own. First, on the second metrical level it is directional, and the starting point of its directional sweep in English is the right end of what appears to be the Root domain. An equivalent characterization, however, is that it begins its right-to-left sweep from the end of the (partial) grid that is in place. This characterization is consistent with our view that GE rules like Beat Addition are sensitive only to the grid, not to the text. Second, Beat Addition might be thought to have its own syntactic domain because it is obligatory on some domains, but not on others. As mentioned in chapter 2, Beat Addition is obligatory "within the word," but not, apparently, on the phrase. Actually, it is the root within which it is obligatory. This is shown by the lack of alternation that is possible when there is a longish sequence of Word suffixes (outside the root), as in colorlessness, mändràikelike, and so on. It is shown as well by the fact that sequences of two or more stressless function words are possible on the phrase (see chapter 7). Does not the obligatoriness of Beat Addition with respect to a particular domain show that it has a domain? We think not. Rather than viewing the obligatoriness of Beat Addition as a property of that individual role, defined with respect to a particular domain, we could view it as part of a more global "output condition" or "filter" on the metrical grid, a condition which itself has a domain.

What it means for Beat Addition to be obligatory within the root in English is that the basic patterns contain no rhythmic lapses. No sequences of two weak beats on any metrical level (unless the lapses arise through extrametricality, or as in the Ticonderoga case, or, as we will show, through destressing). Alternation is maximized in roots (while a respect for the grid alignments required by the TGA rules is maintained). We might posit a general filter on grids, specific to a particular domain, that guarantees this absence of lapses, rather than proposing that Beat Addition is obligatory within some domain. We will formulate that condition as follows for English:

\[(3.40)\]

**The Anti-Lapse Filter (English)**

Within the domain of a root, there may be no lapses.34

(Such a condition may have a different domain for other languages, or it may not be applicable at all.) Note that this formulation guarantees that it is within the same domain (in English, the Root) that Beat Addition on both the second and the third metrical levels is obligatory; this requirement appears to be correct.

This alternative characterization of the obligatoriness of Beat Addition — introduced alternation in roots has the advantage of keeping GE rules like Beat Addition in check, not allowing them to have syntactic domains of their own, and thus narrows considerably the range of grammars made available by the theory. Of course some theory of the notion "possible domain of Anti-Lapse Filter" will now have to be developed, if we are to meet the goal of providing a sufficiently restrictive theory. We suggest that the domain of an anti-lapse output condition or filter like (3.40) will be identical to the domain of the TGA rule that assigns "main word stress" in the language. The idea behind this proposal is that there will be a tightly organized rhythmic organization at the lower levels of the grid, but only on the domains where that lower level organization is defined. And this is the domain of main word stress assignment. This correlation in domains is attested in English. It remains to be seen whether it holds up in other languages as well. The Anti-
Lapse Filter will be adopted here, and we will assume that it takes effect cyclically.

3.2.5 Summary
Thus far, we have presented an analysis of what we have referred to as the basic patterns of English word stress. It is an analysis couched in terms of the grid-based core theory of stress patterns presented in chapter 2, which is inspired in large part by Prince's 1981, 1983 work. We have relied crucially on Hayes's insight that consonant and syllable extrametricality give a good account of divergences from the basic patterns that are to be found at the limits of the stressing domain. Our first specific claim about English is that the patterns of stressed and stressless syllables, which in a grid-based theory are understood in terms of patterns at the basic beat level, result from the presence in the grammar of English of (a) two TGA rules, drawn from the universal repertoire: the Initial Basic Beat Rule (IBR) and the Heavy Syllable Basic Beat Rule (HBR), which treats CVV and CVC alike, and (b) a GE rule of Beat Addition, which on the basic beat level in English is left-dominant and right-to-left directional. Our second claim is that the patterns of prominence among stressed syllables (on the third metrical level or higher) result from the combined effects of (a) a TGA rule of the domain-end prominence type, the Main Stress Rule, and (b) GE rules, in particular (left-dominant) Beat Addition. Given the facts of English and the possibilities of analysis made available by the core theory we have proposed, we are in effect forced to this analysis of the basic patterns of word stress in English. This is a highly desirable state of affairs—when the descriptive options are so radically constrained that only one or a small number of grammars are available on the basis of the data.

As we have mentioned, surface stress patterns diverge in various ways from the basic patterns, and it must be shown that a grammar of the sort outlined here can adequately explain this behavior. We will do so in the next section.

We have not undertaken a critique of foot-based accounts of the basic English word stress patterns, but have instead focused on empirical generalizations that these earlier accounts sought to express and on the particular analysis of these patterns made available by the metrical grid theory of stress. Within a metrical tree (and foot) theory of stress patterns it is indeed possible to capture many of the same generalizations about basic patterns in English that are captured with a metrical grid theory, and for that reason a point-by-point comparison is not particularly useful. It is in assessing the different theories for their ability to make sense of a whole host of phenomena—including the basic word stress patterns of other languages, destressing rules that may modify these patterns, phrase stress patterns, and rhythmically related syntactic timing—that we may decide which is the more explanatory and the more desirable.

3.3 Destressing

3.3.1 General Properties of Destressing Rules
Divergences from the predicted basic patterns of English word stress that are found in actual pronunciations all consist of stressless (non-basic-beat-aligned) syllables that ought to have been stressed (basic-beat-aligned) by the text-to-grid alignment and grid euphony rules of the proposed basic grammar. Our account of these surface divergences involves a small number of destressing rules, which eliminate a grid position on the basic beat level when certain conditions are met.

All destressing rules that we have encountered have the following property: their structural descriptions appeal to the nature of the rime of the syllable whose grid alignment is to be affected. In our rule typology, then, they do not qualify as GE rules, whose structural descriptions are formulated solely in terms of the metrical grid. In other words, destressing is not an instance of the GE rule of Beat Deletion. Destressing rules are also clearly not TGA rules, which all have the property of creating grid positions in alignment with the text. Thus destressing does not belong to either class of rules that contribute to defining the well-formed (basic) syllable-to-grid alignment for a sentence of a given language.

All destressing rules of English appear to eliminate only basic beats that are not also aligned with a position on a higher metrical level. That is, they affect syllables that are stressed, but not main-stressed or secondarily stressed. Hayes observes this, and puts the generalization in these terms (1982:257): "No foot that is in strong metrical position may be deleted." In our theory, we will express the condition in grid terms:

\[(3.41)\]

Higher Prominence Preservation Condition (HPPC)

No strong basic beat may be deleted.
(Recall that a beat is *strong* if it is aligned with a beat on a higher metrical level.) For destressing rules to respect such a condition, of course, it must be the case that they follow the operation of the grid construction rules that are responsible for establishing alignments with beats on the third metrical level or above. In the present section we will show that destressing rules in English indeed follow all grid construction rules within words; that is, they apply only after the word cycle is complete.

Note now that there is a principle from which it would follow that all destressing rules applicable in the word follow all grid construction rules within the word. This is the principle that only rules that construct (define) phonological representation operate cyclically, and that other rules are postcyclic, confined to applying to the complete phonological representation that is the output of the cyclic syntax-to-phonology mapping. (Recall the discussion in section 1.3.) The ordering of destressing rules and grid construction rules in English words therefore might be seen to support this general principle of grammar. Alternatively, it might simply be the case that destressing is cyclic, but that it has constituents of level Word (and perhaps higher) as its domain. Since the basic stress patterns are defined on the earlier Root domain, it would follow from this specification of domain that “destressing” followed “stressing.” According to this analysis, it would simply be an accident of English that these processes are ordered as they appear to be. This alternative is not to be dismissed easily, and in chapter 7 we will argue in its favor. In this chapter, we will not attempt to decide the issue. Which of the alternatives correctly describes the “postcyclic” of destressing will not affect our results here.

If destressing rules follow (cyclic) grid construction rules, and if they are limited to modifying the grid alignments of syllables whose basic beats are not strong, then it is clear that they are extremely limited in their ability to distort the stress patterns defined by the basic grammar of TGA and GE rules. A destressing rule will eliminate a basic beat already in a “trough” in the metrical grid, creating an even greater “trough,” as for example in (3.42).

\[(3.42)\]
\[
a. \quad x \quad x \\
\quad x \quad x \\
\quad x \quad x \quad \Rightarrow \\
\quad x \quad x \\
\quad \ldots \sigma \quad \sigma \quad \sigma \quad \ldots \\
\quad \ldots \sigma \quad \sigma \quad \sigma \quad \ldots
\]

Given this restriction, it is understandable that the language learner could arrive at an analysis of basic patterns in terms of the core theory without too much difficulty.

We take destressing to be responsible for the presence in the surface patterns of English of any stressless CVC whose stresslessness cannot be attributed to final consonant extrametricality. Thus stressless final CVCC and any nonfinal stressless CVC must have been destressed by such a rule. If destressing rules follow all the basic grid construction rules, as suggested, then an important prediction about the distribution of stressless CVC syllables is made—namely, that these syllables will occur only in positions where in the basic patterns CVC would not receive main stress or secondary stress. We will show that this prediction is borne out. We also take destressing to be responsible for the presence of nonfinal ternary feet (i.e., sequences of \(\sigma \quad \sigma \quad \sigma\)), as in *abracadabra*. In this we follow Hayes 1980, 1982, who argues convincingly that nonfinal ternary feet arise from a more basic \(\sigma \quad \sigma \quad \sigma\) sequence.

### 3.3.2 The Abracadabra Rule: A Source for Ternary Feet

In our treatment of stress in English and in our core theory of stress, we adopt Hayes’s claim that there are no ternary “feet” in the basic patterns of stressed and stressless syllables, except at the limits of a domain (a position where extrametricality might in effect add a second syllable to the pattern). Hayes makes a good case for this claim for English; we will present his argument in its essentials below, though translated into metrical grid terms.

The important observation made by Hayes is that the distribution and composition of nonfinal ternary feet are quite restricted. They appear in surface patterns before a main-stressed syllable, when no other syllable precedes in the word, and only if the middle syllable in the sequence is CV, as in (3.43). (The following examples are from Hayes 1982:257.)

\[(3.43)\]
\[
\text{abracadabra} \\
\text{LúxipálIla} \\
\text{Pémigewassett} \\
\text{Őkefenóke} \\
\text{Winnipesaukee}
\]
When four syllables precede the main stress, what one finds is the sequence of binary “feet” predicted by the basic analysis, as in (3.44) (examples from Hayes 1982:260).

(3.44)

Apalachicola Ókalolahócehee
onomátopéia hámaméliánthum
ípecácuána Há niménióa
Pópocátepél Antanánarívo
Ánurádhapúra

That words of the shape in (3.44) should have only a succession of binary “feet” is particularly significant. If ternary “feet” were allowed as part of the basic patterns, then there is no reason why the words (or some of them) should not have the pattern [\(\ddot{\sigma}\ddot{\sigma}\ddot{\sigma}\ddot{\sigma}\ldots\)], composed of a monosyllabic “foot” (or stressless syllable) followed by a ternary “foot.” The fact that they do not have this pattern therefore supports the conclusion that ternary “feet” arise only in special circumstances, and not in the patterns generated by the basic grammar of stress.

Given our theory of English stress (and its counterpart in Hayes’s system), the basic pattern assigned to Apalachicola is as follows.

(3.45)

\[\text{[æ pV læ cV kÓ IV]}\]

DBA \[x \ x \ x \ x \ x\]

IBR, HBR \[x \ x \ x \ x \ x\]

BA \[x \ x \ x \ x \ x\]

MSR, BA \[x \ x \ x \ x \ x\]

This is the pattern that we see on the surface. However, the basic pattern derived for *abracadabra* (3.46a), is not the same as the surface pattern (3.46b).

(3.46)

a. \[\text{[æ brV kV dæ brV]}\]

DBA \[x \ x \ x \ x \ x\]

IBR, HBR \[x \ x \ x \ x \ x\]

BA \[x \ x \ x \ x \ x\]

MSR \[x \ x \ x \ x \ x\]

b. \[x \ x \ x \ x \ x \ x \ x \ x \ x \ x \ x \ x \ x \ x \ x \]

*abracadabra*

We claim, following in the spirit of Hayes, that the grammar of English contains a destressing rule that maps the output of (3.46a) into (3.46b).

A word needs to be said about the basic pattern in (3.46a). Unlike (3.45), (3.46a) has no secondary stresses: the only third-level or higher grid alignment in (3.46a) is that of the main stress. We are presuming, clearly, that Beat Addition has not applied on the third metrical level to produce an initial secondary stress. Recall from the discussion of the Ticonderoga examples that there is an output condition disfavoring the creation, by GE rules, of the configuration \(\ddot{\sigma}\ddot{\sigma}\ddot{\sigma}\). We are suggesting here that that output condition brooks no exceptions when that first syllable is CV, as in *abracadabra*—in other words, that the output condition always overrides the Anti-Lapse Filter and prevents Beat Addition from applying in these circumstances. There is good reason to think that this analysis, and hence the representation in (3.46a), is correct. Observe that when there is a heavy syllable in the middle of a sequence of three preceding the main stress, and when the first syllable is CV, that first CV is typically destressed and stress falls on the second, as in (3.47).

(3.47)

Mónôngahéla
Atascadero

With the assumption that Beat Addition does not apply on the third metrical level here—because of the (absolute) negative filter \(^*\text{CV} \ddot{\sigma} \ddot{\sigma}\)—the derivation of the correct surface patterns is absolutely straight-
forward. The basic grammar of stress gives (3.48), and the basic-beat-aligned initial CV syllable Mo- is then destressed (by Monosyllabic Destressing; see the next section) to give (3.49), which is the appropriate surface representation for examples such as those in (3.47).

(3.48)  
\[ mV \text{ nan ga hi IV} \]

DBA  
\[ xx xx xx \]

IBR, HBR  
\[ xx xx xx \]

BA  
\[ x \]

MSR  
\[ xx xx xx \]

BA blocked

(3.49)  
\[ xx x \]

Monongahela

Note that if third-level Beat Addition had been allowed to apply to Monongahela, it would have produced the grid alignment in (3.50), which is not attested on the surface.

(3.50)  
\[ xx x xx xx \]

Monongahela

To avoid this undesirable consequence of third-level Beat Addition, some additional rule of grammar would have to be posited to modify the representation in (3.50) (or rule it out). In contrast, by assuming that there is no Beat Addition at all in such cases, we have an immediate explanation (in the form of the derivation of (3.48) from (3.49)) for the stresslessness of the initial syllable of Monongahela and other such words. We assume, then, that no third-level Beat Addition has taken place here; and we simply make the same assumption for abracadabra.

We suggest the following formulation for the destressing rule creating ternary “feet,” which we dub the Abracadabra Rule:\(^{37}\)

\begin{align*}
\text{Abracadabra Rule} \\
x & \Rightarrow x x \\
\sigma CV & \Rightarrow \sigma CV
\end{align*}

A medial syllable loses its basic beat alignment, and a ternary “foot” is thereby created. We repeat the derivation of the surface pattern of abracadabra here:

(3.52)  
\[ xx x xx \Rightarrow xx x xx \]

abracadabra abracadabra

The raison d’être for this rule is probably that it eliminates a clash on the basic beat level of the metrical grid. From the point of view of the Principle of Rhythmic Alternation, the representation derived by the Abracadabra Rule is more euphonious (or eurhythmic) than the representation to which it applies. (Recall that the PRA disallows clashes, and allows lapses consisting of at most two adjacent weak beats.) Note, however, that the Abracadabra Rule creates a configuration that would be ruled out by the Anti-Lapse Filter, if that filter were applicable at this point. This is one reason for considering the Anti-Lapse Filter to be cyclic (and not surface true), limited in operation to its (prior) Root domain.

Note also that the impulse to eliminate second-level clashes is not without its limits. The Abracadabra Rule does not eliminate a clash when the medial syllable is heavy. It does not apply to the Monongahela cases, nor does it apply to the Ticonderoga cases, of which we list more in (3.53):

(3.53)  
Ticonderoga  
Dòdécanéesian  
Ömposépanósuc  
Srírangapátínam

There is a notable absence of ternary “feet” here.\(^{38}\)

We agree with Hayes, then, that ternary “feet” are not basic in the repertoire of English stress patterns and that they are produced in just the circumstances specified by the destressing rule. Where we part
company with Hayes is in the characterization of the process and in the sort of rationale that can be offered for its existence. Given a metrical grid theory of the representation of stress, the Abracadabra Rule has both a simple structural description and a simple structural change: a basic beat in a particular position in the metrical grid is identified and deleted. Moreover, the rule can be understood as one that creates a more optimal grid, where optimality is defined in terms of the PRA. A tree-based treatment of the phenomenon, such as the one offered by Hayes, does not share these advantages.

The rule that Hayes proposes is formulated as follows (1982:258):

\[
F' \rightarrow \phi / F
\]

\[
R
\]

\[
V_i
\]

It states that a branching foot dominating two syllables, the first of which is open, is deleted if it is preceded by a nonbranching foot. (A quite general condition, mentioned above, ensures that a deleted foot must be in weak position in the metrical tree.) Rule (3.54) applies to the basic tree structure (3.55a) to produce (3.55b); following this, a rule of Stray Syllable Adjunction (SSA) is required in order to produce the fully ramified surface tree structure in (3.55c).

\[
a. \\
\text{b.} \\
\text{c.}
\]

Destressing

Visibly, given a tree theory of the representation of stress, powerful operations are required. Rule (3.54) eliminates tree structure, leaving an ill-formed tree. SSA builds it back up again. Even if SSA is more generally motivated, as Hayes argues, a rather unconstrained general theory of tree transformations is required. In a grid-based theory of stress, on the other hand, there is no constituency, and thus no issue of derived constituent structure. Moreover, the class of destressing rules seems to be limited to those that delete a single grid position. A metrical grid theory of stress therefore provides the basis for a far more restrictive theory of possible destressing rules than does the tree-based theory. It also provides some basis for explaining why such rules as destressing should exist in the first place, whereas a tree-based theory does not. In a tree-based theory, the output representation (3.55c) is no more optimal than the underlying representation from which it is derived. (In some cases, as when the first syllable is heavy, the basic pattern is clearly more optimal than the surface one.) It is for this reason, and others to be made explicit below, that we believe the metrical grid theory of the representation of stress is to be preferred.

3.3.3 Monosyllabic Destressing: Stressless CVC and Related Matters

The other primary agent of destressing in English is a rule we call Monosyllabic Destressing. Given our basic analysis of English stress patterns, all CVC syllables are aligned with basic beats by the Heavy Syllable Basic Beat Rule (HBR) in the basic (underlying) pattern, except those whose final consonant is extrametrical. It is Monosyllabic Destressing, we claim, that is (largely) responsible for the lack of stress (basic beat alignment) exhibited by certain CVC syllables in the surface patterns of English words. It is this rule, too, that destresses CV syllables that have been promoted to a basic beat alignment by the Initial Basic Beat Rule (IBR). The role that we are claiming for Monosyllabic Destressing is a big one. It replaces the rule of Initial Destressing, as well as Medial Destressing and the so-called Arab Rule. In earlier analyses these rules all shared the property that they demoted (destressed, defooted) a syllable only when it satisfied three conditions: (i) it was not main-stressed or secondarily stressed, (ii) it was immediately followed by another stressed syllable or was word-final, and (iii) it was constituted of a CV and sometimes a CVC. Our proposal is that these rules are just one, and we formulate it, provisionally, as follows:
Monosyllabic Destressing

\[ \begin{align*}
x & \Rightarrow x \\
\sigma_i & \Rightarrow \sigma_i
\end{align*} \]

Conditions (provisional):

a. If \( \sigma_i = CV \), then obligatory.

b. If \( \sigma_i = CV \begin{bmatrix} +\text{cons} \\ +\text{son} \end{bmatrix} \), then optionally and “often.”

c. If \( \sigma_i = CV \begin{bmatrix} +\text{cons} \\ -\text{son} \end{bmatrix} \), then optionally and “seldom.”

Note that we needn’t state that there is no third-level or higher grid position above \( \sigma_i \). We are claiming, as does Hayes, that it is a general fact about destressing rules that they apply only in the absence of main or secondary stress. The conditions, very awkwardly put here, are an attempt to state that the rule operates virtually always when the syllable in question is a CV, and with decreasing likelihood in CVC syllables, depending on whether the closing consonant is a sonorant or an obstruent. The fact that the rule does not mention CVCC and CVV should be taken to mean that it virtually never (or rarely) applies with syllables of this type. It is not obvious that these conditions have to be built into the statement of the rule, but we do so here for the sake of explicitness.

What is not stated is the condition that the rule not apply if the syllable to be destressed is followed by a weak syllable: \textit{Mississippi} does not undergo destressing to become \textit{MississippI}. Monosyllabic Destressing applies only to basic-beat-aligned syllables that either precede other stressed syllables or are word-final. It would be highly desirable if that condition (that no weak syllable follow) were to result from some other, more general principle of grammar.Were this the case, it would not be necessary to add another condition to (3.56) stating that “\( \sigma_i \) is not followed by \( \sigma_j \) (a weak syllable).”

The impermissible derivation is one mapping grid configuration (3.57a) into (3.57b):

\[ (3.57) \]

\[ \begin{align*}
a. & \ x \\
& \Rightarrow x \sigma \sigma \\
& \Rightarrow x \\
\end{align*} \]

In (3.57) an “alternation” is lost (and a lapse produced). We will hypothesize that it is precisely the loss of an alternation that is avoided, on general grounds, and that there is a principle of grammar, indeed a (universal) condition on the application of grid transformations, that blocks a rule from applying if an alternation will be lost. We will call this the Alternation Maintenance Condition (AMC) and formulate it as already shown in (3.57).

But what about the Abracadabra Rule? It performs just the sort of operation that the AMC precludes, mapping grid (3.58a) into (3.58b):

\[ (3.58) \]

\[ \begin{align*}
a. & \ x x \\
& \Rightarrow x x x \\
\end{align*} \]

Suppose we take the AMC to govern only destressing rules that are in some sense contextless. This property would distinguish Monosyllabic Destressing from the Abracadabra Rule. The former looks neither to the right nor to the left, but the latter has a crucial environment on the left. We speculate that it is the more detailed formulation of the latter rule that allows it in effect to override the AMC. Obviously, the status of such a condition can only be assessed when destressing rules from other languages are examined; but for the time being we will assume it as a working hypothesis. Its presence in the grammar (as part of universal grammar) makes it unnecessary to include the additional condition mentioned in the statement of Monosyllabic Destressing.

The function of Monosyllabic Destressing, like that of the Abracadabra Rule, is to create a yet more euphonious grid alignment for a word. It eliminates clashes at the basic beat level, but it does so only when the syllable to be demoted is light enough. Let us look at some examples (many drawn from Ross 1972).
Word Stress and Word Structure 122

(3.59)
a. allýv, potato  Exceptions: raccóoon
Málóne, suttée
Mónongahela, Róckètte
vánilla, augúst
Ámerica, bássón
májólica

b. Wíscónsin  Exceptions: harmónica
condition, bándána
permít, etcétera
Bèrlín, ândrogynous
fertílity, tèmpéstuous

Malone bassoon suttee
Monongahela initial Rockette
vanilla develop august
America Decameron bassoon
Majólica

(3.60)
a. allýv, Harvard
sátire, bingo
Wábash

b. Álabama, Athabaskan
Mississippi, execución

c. Tyróne, Odéssa
Péking, idióom
Saigon, pugnacious
factitious

The examples in (3.59) and (3.60) show that Monosyllabic Destressing can do the work of Initial Destressing. (3.59) lists words that have undergone destressing. The (a) cases contain CV syllables, and the (b) cases CVC syllables of various types. There are exceptions to the rule in both cases. The examples in (3.60) are not exceptions, however. They simply do not satisfy the rule’s structural description. The initial syllables of the (a) cases have main or secondary stress, those of (b) are followed by a weak syllable, and those of (c) do not have the correct syllable composition. Actually, the status of some (c) examples, such as factitious and pugnacious, is doubtful; they may be either exceptions to the rule or examples where it should not apply. It all depends on the precise characterization of the conditions in the rule.

Consider next some cases of stressless CVC(C) in final position.

(3.61)
a. pérfect, Máynárd
témpest, Éverést
effôt, inhéritáncée
stándárd, présidént
méliusk, bólíx
módést, ménidáncént

b. prógram/prógrácm, objéct/objéct
póetéss/póetéss
déna'blé/sdéna'blé
lábyrínth/lábyrínth
Decámerón/Decámerón

condíción, condición
exist, bándána
permít, etcétera
Bèrlín, ândrogynous
fertílity, tèmpéstuous

Wisconsin indicative
condition, bándána
permít, etcétera
Berlin fertility androgynous

Tempestuous

(3.61)
a. perfect, Maynard
tempest, Everest
effort, inheritance
standard, president
melusin, bollix
modest, mendicant

Wisconsin indicative
condition, bandana
permit, etcetera
Berlin fertility androgynous

tempestuous

The examples in (3.59) and (3.60) show that Monosyllabic Destressing can do the work of Initial Destressing. (3.59) lists words that have undergone destressing. The (a) cases contain CV syllables, and the (b) cases CVC syllables of various types. There are exceptions to the rule in both cases. The examples in (3.60) are not exceptions, however. They simply do not satisfy the rule’s structural description. The initial syllables of the (a) cases have main or secondary stress, those of (b) are followed by a weak syllable, and those of (c) do not have the correct syllable composition. Actually, the status of some (c) examples, such as factitious and pugnacious, is doubtful; they may be either exceptions to the rule or examples where it should not apply. It all depends on the precise characterization of the conditions in the rule.

Consider next some cases of stressless CVC(C) in final position.

The examples in (3.61a–c), it must be assumed that the stressless final syllable has been destressed by Monosyllabic Destressing. In the cases of (3.61a) the syllable ends in a consonant cluster; therefore, regardless of whether the last C is extrametrical or not, the HBR would view the syllable as heavy and align it with a basic beat. The words in (3.61b) end in a CVC whose stress may vary in the pronunciation of some individual speakers. We take this to indicate optionality in the application of Monosyllabic Destressing, rather than variability in the lexical entry of the words, where the final C might be extrametrical one moment and not the next. The examples in (3.61c), whose final CVC is always stressless, have two possible derivations: if their final C is extrametrical, they would never have been stressed in the first place; but if their final C is not extrametrical, they must be seen as instances of an obligatory application of Monosyllabic Destressing. As for the examples in (3.61d), whose final CVC is never destressed, some are clearly exceptions to the rule, in that CVCs of the same type are destressed in
other words. Compare *gymnast* with *témpest* or *Lómábárd* with *stán­
dárd.* But for some CVCs, such as those ending in nondental consonants, it may simply be that the rule should not apply—that the conditions should be formulated so as not to allow them to be de­
stressed. We leave this question open here, referring the reader to Ross 1972, where several generalizations regarding CVC stress and its relation to consonant type emerge.

Finally, consider cases of medial destressing. In these cases, a syllable (usually immediately preceding the main stress of a word) is de­
moted from the basic beat alignment that it would have as a result of the HBR.

(3.62)

a. Mózâmbique  
    Exceptions:  
    *chimpânzée*  
    *Hálícarnássus*  
    *ròdomontáde*  
    Nébúchádnézar  
    pâráphénália  
    Kilmánjáro  

b. convérśátron  
    Exceptions:  
    *éxpéctáció*  
    *réláxáció*  
    *rétárdáció*  
    *aféctáció*  
    *dispénsáció*  
    *dömésticity*  
    *collécctivity*  
    *infóráció*  
    *annéxáció*  
    *condénsáció/cóndénsáció*  
    *éméndáció/éméndáció*  
    *authénticity/authénticity*  
    Jápánése  
    *spécificity*

The examples of (3.62a) are monomorphemes where the HBR would have given rise to a basic beat alignment on the syllable immediately preceding the main-stressed syllable. The examples of (3.62b) are morphologically complex ones where the pronunciation of the embedded words (*condense, collective, inform, domestic, Japan, specific, etc.*) shows that there is some stressing to be undone in the derived word. Note that the facts belie the claim, made in SPE and elsewhere, that the absence of stress on the medial syllable is a sign that the word does not have a cyclic history wherein that syllable was stressed on an earlier cycle. In all of the words in (3.62b), the earlier cyclically assigned stress has been removed from the medial syllable. Notice, too, that even when there is no apparent cyclic history, that medial syllable may have stress (exceptionally), as in *délécétáció*. Words like *réláxáció*, which have both a cyclic history and a medial stress, we treat like *delectation*, as exceptions to Monosyllabic Destressing.

Whether or not a word is an exception to Monosyllabic Destressing is an important source of idiosyncrasy in the grammar of English. This and whether or not the final consonant of a word is extrametrical account for almost all the idiosyncrasies in the stressing of CVC in English words.

Our basic analysis of English stress patterns, our assumptions about extrametricality, and the rule of Monosyllabic Destressing constitute what we believe to be the correct theory of the distribution of stressed and stressless CVC in English. According to this grammar, CVC syllables are always stressed in the basic patterns (unless the final C is extrametrical), and the specific prediction is made that a stressless CVC arises only in positions where (as an underlying stressed CVC) it would have had no main or secondary stress. This is very different from the claim made by Selkirk 1980b or by Hayes 1980, 1982. Selkirk 1980b puts no restrictions on the distribution of stressless CVC, treating CVC either like CV or like CVC in the basic patterns. Hayes 1980, 1982 refuses this position, citing the impossibility of assigning stress patterns to words like *Nínóthčká* that fail to stress the penultimate CVC (and that fail, moreover, to give it main stress): *Nínóthčká*. The present theory overcomes this deficiency. As for Hayes’s own analysis, it has the peculiar property of stressing (footing) only CVC syllables that are (speaking roughly) at the right extreme of the word (though not in the final position). His analysis thus cannot account for the medial stressed syllable in *Hálícarnássus or chimpánzée*; significantly, it must consider them exceptional in having stress. On our theory they are only exceptional in not *losing* it, by Monosyllabic Destressing. Hayes also treats final stressed CVC as exceptional, a position we have already contested in section 3.2.2 on extrametricality.

We will not provide any further critique of the particulars of Hayes’s analysis of CVC. We observe simply that our theory, which is that CVC must everywhere be treated the same in the basic patterns, is more restrictive and therefore, everything else being equal, to be desired—if it accords with the facts. We submit that the theory does accord with the facts, when one takes into account the rule of Monosyllabic De-
stressing and final consonant extrametricality. Since Hayes's analysis also requires the notion of extrametricality, as well as a rule or rules that are the analogue of Monosyllabic Destressing, then everything else is equal, and the "stress CVC everywhere" theory should presumably be adopted.

Before proceeding, we should discuss one set of cases that are apparently problematic for our theory of CVC (as they are for Hayes's theory)—those in (3.63):

(3.63)

<table>
<thead>
<tr>
<th>Word</th>
<th>Hypothetical</th>
<th>Misanthrope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hákénsåck</td>
<td>Hótten tôt</td>
<td>misânthrópe</td>
</tr>
<tr>
<td>Álgernôm</td>
<td>ámpér-sând</td>
<td>báldèrdâsh</td>
</tr>
<tr>
<td>cávelcâde</td>
<td>páîndrôme</td>
<td>mérçhândise</td>
</tr>
<tr>
<td>Áberdèen</td>
<td>Áppélbàum</td>
<td>Árkânsâs</td>
</tr>
</tbody>
</table>

Given our analysis, there is no way to avoid assigning stress (a basic beat alignment) to the penultimate CVC syllable of such words. Then either that syllable or the final (stressed) one would receive "main stress." The final syllable here, in avoiding main stress, must be extrametrical. Thus medial main stress should have been derived, as in (3.64):

(3.64)

<table>
<thead>
<tr>
<th>Word</th>
<th>Hypothetical</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBA</td>
<td>[hæ kVn sæk]</td>
</tr>
<tr>
<td>HBR, IBR</td>
<td>x x x x (final C not extrametrical)</td>
</tr>
<tr>
<td>MSR</td>
<td>x x x x</td>
</tr>
</tbody>
</table>

Yet this is incorrect.

Hayes's analysis faces a similar problem. His solution is to destress the medial stressed (footed) syllable before the assignment of main stress to the word. This solution presupposes a theory of grammar that allows stressing rules and destressing rules to mingle freely. Earlier we advanced the general hypothesis that destressing rules are postcyclic and thus that they follow all rules of grid construction. If this hypothesis is correct, then Hayes's analysis cannot be.

Interestingly, there is an alternative analysis of these forms that appears to be just as illuminating, which presupposes that the basic stress rules apply before any grid transformation. Our proposal is that a grid transformation retracts the main stress (third-level beat) that was assigned to the medial stressed syllable of (3.64) and places it on the preceding basic beat. We call this rule Sonorant Retraction, for reasons that will soon become clear, and formulate it as follows:49

(3.65)

Sonorant Retraction

```
R = [+son] [+cons]
```

From (3.64) this rule will derive (3.66a), which by Monosyllabic Destressing becomes (3.66b), the correct surface pattern:

(3.66)

```
a. x
x x x
x x x
x x x
x x x
Hackensack
```

The formulation of the rule reflects in large part the empirical generalizations brought to light by Hayes—that in words of the troublesome Hackensack variety the medial CVC that must be made to lose its stress (in one way or another) is closed by a sonorant (cf. phlògístôn, not phlògístôn), that the rule does not operate if two syllables precede the CVC syllable (cf. Adirondâcks), and that it does not operate if the following syllable is stressless.

Note that this rule accounts in a similar way for morphologically complex examples discussed by Kiparsky 1979 and Hayes 1980, 1982. The observation made by Kiparsky (attributed to Gill Gane) is that in words with the suffixes -ary and -ory main stress would fall on a CVC preceding the suffixes, if the CVC were preceded by two syllables, as in (3.67a), or if it ended in an obstruent, as in (3.67b). Otherwise that syllable is stressless.

Note that this rule accounts in a similar way for morphologically complex examples discussed by Kiparsky 1979 and Hayes 1980, 1982. The observation made by Kiparsky (attributed to Gill Gane) is that in words with the suffixes -ary and -ory main stress would fall on a CVC preceding the suffixes, if the CVC were preceded by two syllables, as in (3.67a), or if it ended in an obstruent, as in (3.67b). Otherwise that CVC would be stressless, and the main stress would appear earlier in the word, as in (3.67c).
(3.67)

a. élémentary  
  cômplimentary  
  rudimentary 

b. trajéctory  
  perfunctory  
  répértory 

c. légendary  
  mémóntary  
  invéntory 

Kiparsky and Hayes observe similar behavior in front of other stressed suffixes:

(3.68)

a. adamantine  
  archimandrite  
  salamandroid 

b. ulexine  
  stalactite  
  molluscid 

c. saturnine  
  gilbertite  
  helminthoid 

The rule of Sonorant Retraction accounts for these facts without putting the destressing rule in the cycle, unlike the account of Kiparsky and Hayes. Representative derivations are given in (3.69), where we assume with Hayes that these stressed adjective suffixes (even the surface bisyllables -ary and -ory) are extrametrical:

(3.69)

<table>
<thead>
<tr>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Postcycle</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="ary">element</a>_{em}</td>
<td>[perfunctory]</td>
<td><a href="ary">legend</a>_{em}</td>
</tr>
<tr>
<td><a href="ary">element</a>_{em}</td>
<td>[perfunctory]</td>
<td><a href="ary">legend</a>_{em}</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
Viewing Trisyllabic Laxing as a morphologically governed rule (in effect, a rule of allomorphy) has a number of important consequences. One is that the rule will precede destressing and any other postcyclic rules of the grammar. It is consistent with our view of the organization of the grammar that morphologically governed rules be precyclic (restricted to applying either in the course of "word formation" or "in the lexicon") or cyclic (interspersed among the rules constructing phonological representation). The latter possibility exists because the domains of such rules are defined crucially in terms of syntactic structure (of which morphological structure is a special case).

In either case, the input to destressing, which may still be presumed to apply to explanation, will not include a medial CVV in an environment in which it would have been affected by Trisyllabic Laxing. With the assumption that Trisyllabic Laxing is cyclic, the derivation of stressless medial CV in explanation proceeds as in (3.70a). The derivation is in many respects comparable to that of Jàpànese (cf. Jàpán), which we include for comparison.

(3.70)

a. [ex plain] a tion  
b. [Ja pan] ese

Cycle 1

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex plain & & x & & x & & x & \\
\end{array}
\]

Cycle 2

\[
\begin{array}{cccccccc}
& x & & x & & x & \\
 x & & x & & x & \\
 x & & x & & x & \\
 ex plain & & x & & x & \\
\end{array}
\]

Trisyllabic Laxing

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 x & & x & & x & & x & \\
\end{array}
\]

Resyllabification

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex plain & & x & & x & & x & \\
\end{array}
\]

DBA, HBR

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex plain & & x & & x & & x & \\
\end{array}
\]

MSR

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex plain & & x & & x & & x & \\
\end{array}
\]

The Cycle

BM

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex pla na tion_{em} & & x & & x & & x & \\
\end{array}
\]

Postcycle

\[
\begin{array}{cccccccc}
& x & & x & & x & \\
 x & & x & & x & \\
\end{array}
\]

Monosyllabic Destressing

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex pla na tion & & x & & x & & x & \\
\end{array}
\]

Output\textsuperscript{52}

\[
\begin{array}{cccccccc}
& x & & x & & x & & x & \\
 x & & x & & x & & x & \\
 ex pla na tion & & x & & x & & x & \\
\end{array}
\]

This completes our examination of the role of Monosyllabic Destressing in deriving the surface stress patterns of English.

3.4 The Cycle

Having shown that the English Main Stress Rule has a specific syntactic domain, we now want to show that rules of grid construction like the MSR apply in cyclic fashion. From the fact that a rule may have a characteristic syntactic domain of application, it by no means necessarily follows that this rule must apply cyclically. It could be that the rule is governed by something like the A-over-A Condition (Ross 1967, for example), so that when constituents of its domain type are embedded within each other, it applies only on the highest instance of its domain. Or it could be that the rule applies simultaneously on all constituents that are its domain, or that it applies only each time a new constituent of its domain type is generated by the rules of the morphology. Each of these theories would allow for grid construction rules to have a characteristic syntactic domain, but would not require that those rules proceed from the most deeply embedded upward in cyclic fashion.

In what follows, we will present several arguments (one due to Kiparsky 1979) that an A-over-A application of stress rules (grid construction) is impossible. To show this, it is enough to show that morphologically complex words of type A have a stress pattern that is different from that of monomorphemic words of type A in just those ways that would be predicted if the stress rules had had access to information about the internal composition of the former in terms of cate-
word categories of type A. We will also present arguments (one due essentially to Kiparsky 1979) that a simultaneous application of stress rules (grid construction) is impossible. None of these arguments appears to distinguish crucially between a theory in which the principle of the cycle governs the way in which rules apply in the course of the syntax-phonology mapping and a theory in which there is no cycle, but rather an application of rules each time a new word is "generated." There are reasons for adopting the cyclic theory, however, to which we will turn later.

It turns out that the only grid construction rules of English that have the potential for providing evidence of a cyclic (non-A-over-A, non-simultaneous) construction of the grid are those applying at the third metrical level and above. The analogous state of affairs obtains in a metrical tree theory. As shown by Kiparsky 1979 and Hayes 1980, 1982, it is the assignment of the metrical tree structure involved in the representation of main and secondary word stress that gives crucial evidence for the cycle. For lack of space, we will not explore why this should be so; but we note that the reasons are partly accidental and partly principled.

One of Kiparsky’s arguments for the cycle turns on the fact that monomorphemic words like Ticonderoga and its fellows (supposedly) have two possible patterns of "secondary stress" before the main stress of the word (cf. (3.35a) and (3.35b)), while morphologically complex words like those in (3.71) have only one pattern.

(3.71)
sensationality *sensaciónalidade
iconoclastic *icônoclástica
anticipation *anticipación
totálitarian *totlinian
supériority *supériority
théâtricité *théâtricité

Words like Ticonderoga and sensationality are otherwise identical in the relevant respects: they contain a sequence of three syllables before the main stress, where the syllables are of the type heavy-heavy-light. Kiparsky claims that the availability of only one pattern for sensationality but two for Ticonderoga is to be attributed to cyclic assignment of main stress in the former. We agree with Kiparsky in this claim, while taking issue with the details of his tree-based analysis. The derivation of sensationality, given the grid-based theory and the cycle, would be as follows:

(3.72)

Here the earlier (cyclic) assignment of a third-level main stress to -at- is carried over on the higher cycle. Because that third-level position is present on -at-, Beat Addition cannot apply to promote the initial syllable sen- to third-level prominence. And because the Montana-motivated output filter (3.36) is at play here, Beat Movement does not dislodge that grid position and move it to the left. Thus the difference between sensationality and Ticonderoga is explained. Note that this explanation requires us to assume that the Montana Filter is absolute with respect to Beat Movement in words, but not so with respect to Beat Addition. Recall that on our account the initial secondary stress of Ticonderoga is produced by Beat Addition, in violation of the filter, whereas the pattern Ticonderoga is claimed to be what is derived (or rather, left untouched) when Beat Addition, discouraged by the filter, does not apply (cf. (3.35a), (3.35b), and (3.36)). Perhaps the reason that Beat Movement is entirely blocked by the filter, whereas Beat Addition is not, is that the latter exhibits a much stronger tendency to apply, at all metrical levels, than the former. (Within words, this is in particular because of the Anti-Lapse Filter.) The point of the contrast, in any...
event, is that it indicates the presence of a third-level grid position introduced on an earlier (or embedded) cyclic domain in sensationality.

Hayes 1982 points out that a similar sort of argument can be made on the basis of the contrast between monomorphemic and morphologically complex words having the shape of abracadabra. Complex words like those in (3.72a)

(3.72)  
a. subliminality   b. *subliminality  
collaterality   *collaterality

do not contain the ternary feet that would be produced by the Abracadabra Rule if they were treated like monomorphemes (see (3.72b)). Rather, they have a secondary stress on the second syllable, not on the first. This is what would be produced if grid construction were cyclic, as in (3.73).

(3.73)  
[[subliminal i(tY)em]]

Cycle 1

x
x
x
x
x
subliminal

Cycle 2

x
x
x
x
x
x
x

DBA, BA

subliminality

x
x
x
x
x
x

MSR

subliminality

BA

inapplicable

BM

blocked (by the Montana Filter)

Postcycle

Abracadabra

inapplicable (blocked by the third-level position on -lim-)

These cases show that grid construction rules need to apply on successively embedded syntactic constituents, not just on the highest one.

Note also that such examples give additional evidence for the role of the Textual Prominence Preservation Condition in the grammar. The general statement of the TPPC is that within a cyclic domain, a grid position assigned by a TGA rule on the third metrical level or above is (minimally) more prominent than any other grid position within that particular cyclic domain. It has so far been motivated as a condition guaranteeing that a beat introduced by the MSR will be more prominent than any introduced by the GE rule of Beat Addition. In these examples it ensures that a beat introduced by the MSR on the current cycle is more prominent than a beat introduced by the MSR on an earlier cycle. The TPPC is therefore quite general in effect, not restricted to adjudicating the relation between a TGA rule on the one hand and a GE rule on the other.

Next we must consider the possibility that instead of applying cyclically, grid construction rules apply on all relevant syntactic domains simultaneously. There are two possible versions of a simultaneous theory. According to one, both TGA rules and GE rules are met simultaneously on all appropriate domains. This particular version is not tenable because it does not predict the patterns attested. A GE rule may move or eliminate a prominence required by a TGA rule (on a lower domain). This is what happens in *expectation*, for example, where the final prominence appropriate to the verb *expect* is deflected by Beat Movement. A theory with simultaneous TGA and GE on all domains is therefore not possible. According to a second possible version of a simultaneous theory, all TGA rules might be said to be met simultaneously on all relevant domains, and the partial patterns established on this basis might then be submitted to the GE rules. But this is not possible as an account of the TGA—Beat Addition relation, for example. If the appropriate textual prominence is to be maintained, Beat Addition must not undo the effects of a TGA rule, which it could if ordered afterward and if the TGA rule were prohibited from reapplying. (Recall the discussion of the MSR—Beat Addition relation in sections 2.2.2 and 3.2.2.) This version is therefore not tenable either. Our analysis, instead, is that there is a cycle and that TGA and GE rules like Beat Addition are met simultaneously on each successive cyclic domain, in a manner governed by the TPPC.

Another argument in favor of the cycle comes from Kiparsky 1979. Kiparsky seeks to explain the pronunciation of a complex form like *expect* when it is found in isolation (*expect*), with an affix like *-ation* (*expectation*), and on the phrase (*expect rain*). (For convenience, we use integers here to indicate stress levels: 0 = stressless, 1 = main word stress, 2 = "secondary" stress, 3 = stressed.) The pronunciation of *expect* arises from an application of destressing to *expect*; the lack of
initial destressing in *expectation* is attributed to the operation of the “Rhythm Rule” (Beat Movement), which is said to throw a secondary stress onto ex- (from *pect-*, in a clash with *-ation*) and thus to render it impervious to destressing. To derive *expectation*, then, the Rhythm Rule (Beat Movement) must precede destressing. But the pronunciation *expect rain* shows that the Rhythm Rule must follow destressing. If destressing had not already taken place, the Rhythm Rule, applying now on a phrasal domain, would derive *expect rain* (just as it derives *abstract art* (from *abstract art*)). Thus this evidence does show that the Rhythm Rule (Beat Movement) cannot be said to apply simultaneously on both the word and the phrase domain (because of the intervening application of destressing).

This may appear to be an instance of the classic sort of argument for the cycle. Seemingly, one can explain these facts by assuming that there is a cycle, that both Beat Movement and destressing are cyclic, and that Beat Movement is ordered before destressing. But in fact this is not a classic argument of that sort, for, as Kiparsky 1979 points out, destressing is not a cyclic rule. It is instead postcyclic. Thus we are seemingly confronted with a paradox: a cyclic rule that is both preceded and followed by a postcyclic rule. What could it mean for a rule to be “postcyclic” in such cases? We have an answer to this question, and a solution to the apparent paradox, but we will postpone presenting it until chapter 7, where we will examine the role of Monosyllabic Destressing in the phrase and the sentence in some detail.

To conclude, we have presented arguments weighing against both a one-time A-over-A application of grid construction rules and a simultaneous on-every-domain-at-once application. With Kiparsky 1979 and Hayes 1980, 1982, we believe that these arguments establish the possibility of a cyclic mode of application of “stress rules” within words, a possibility that becomes a necessity once more evidence is in.

As suggested earlier, one might entertain two different sorts of explanation for the correlation noticed by Kiparsky and Hayes between secondary stress placement and presence of internal morphological structure. One comes from the theory of the cycle, the other from a theory like the one proposed by Siegel and Allen, whereby the stress rules apply “in the course of word formation.” As Kiparsky 1982a points out, such a theory allows for eliminating the cycle as a mode of application within words. Kiparsky considers this a desirable consequence, assuming (following Liberman and Prince 1977) that there is no cycle above the level of the word. His point is that, in the absence of a phrasal cycle, eliminating the cycle from the level of the word would mean eliminating it from the grammar entirely, providing a certain consistency at least.

Leaving aside for the moment the issue of the (non)existence of the phrasal cycle, note that eliminating the cycle as a mode of application within the word crucially depends on the correctness of Siegel and Allen’s theory of word formation. If our 1982 approach to word syntax is correct, and if words may be generated “on the spot” that have more than one affix, then the notion of the cycle as a mode of application is required.

In Selkirk 1980b we proposed a particular noncyclic approach within the general framework of our 1982 theory of word syntax. This approach was incorrect, for the following reasons. We suggested that the stress pattern of a lexical item be listed as part of its lexical entry (in which case the stress rules of the language constitute a set of redundancy rules over the phonological representation of lexical items). Moreover, we suggested that when a new word is generated (by affixation, for example) on the basis of an existing one, the existing word brings its stress pattern with it when it is “inserted” into the newly generated abstract word structure tree. A “new” application of the stress rules, introducing only “minimal changes” in the old lexical item, was considered to follow lexical insertion as an automatic consequence, if the newly created word structure contained the affix and the old lexical item within the appropriate syntactic domain. (So far, it seems to be merely a notational variant of Siegel and Allen’s approach.) That “new” application of the stress rules was not considered to be an instance of cyclic application. Our mistake was in not understanding that the model sketched, which allows for the lexical representation of stress, is consistent with cyclic application. It is simply the case that if this model is correct, then most evidence for the cycle disappears, but not all of it. What is crucial to proving the existence of the cycle is an application of the stress rules on (at least) two successive domains, that is, a derivation in which a new word structure generated by the rewriting rules contains two “new” Root affixes, and hence two embedded Root domains.

Let us invent an example. Suppose that the word *probationality* is concocted (by some bureaucrat concerned with criminal affairs) and that *probational* is not a lexical item of the language. According to Selkirk 1982, the word is generated in the following way. The rewriting
rules of word syntax generate the abstract word structure (3.74a), and the lexical items *probation* (with its internal structure, if any), *-al*, and *-ity* are lexically inserted, as in (3.74b).

(3.74)

a. 

```
            N
           / \
          N'   \\
             /  \\
            A'    \\
               /    \\
              N'   Af  Af
                /  \\
               N'   Af  Af
```

N = Noun
N' = Noun root
A = Alias
Af = Alias feature

b. 

```
            N
           / \
          N'   \\
             /  \\
            A'    \\
               /    \\
              N'   Af  Af
                /  \\
               N'   Af  Af
```

Recall that, as a lexical item, *probation* is a Noun and a Noun root. It is its Root status that allows it to be inserted into (3.74a) here. (We are ignoring its internal structure, if it has any.) Given such a structure, even if *probation* comes into the tree from the lexicon with its stress pattern assigned, the stress rules must apply cyclically, for *probationality* has a stress pattern reflecting its internal structure, just as *sensationality* does. The general point, then, is that given a rewriting grammar of word structure (a "syntax-first" theory), wherein complex new words are generated as illustrated here, rules must apply cyclically.

Our theory treats words no differently from phrases in characterizing their structure and in characterizing the structure-dependency of the rules that define phonological representation on the basis of syntactic representation. The rules of the syntax-phonology mapping that construct the metrical grid have syntactic domains and apply in cyclic fashion. If it is not so obvious that the principle of the cycle is required for words, it is because lexical items may be listed with their stress patterns in the lexicon. But the possibility of generating new multi-layered word structure is there, and the proper phonological interpretation of these structures requires that the cycle have a role in the mapping of word structure into phonological representation, if the rewriting grammar for word syntax of Selkirk 1982 is correct.

3.5 Summary of Rules and Conditions

The following rules and conditions have played a role in our description of English word stress patterns.

**Text-to-Grid Alignment**

Basic beat rules

- Heavy Syllable Basic Beat Rule
  (parameters = CVV, CVC)
- Initial Basic Beat Rule
  (parameters = left, Root)
- Domain-end prominence rule
- Main Stress Rule
  (parameters = right, Root)

**Grid Euphony**

Beat Addition

- Second level
  (parameters = left-dominant, right-to-left)
- Levels above second
  (parameter = left-dominant)

Beat Movement

- Levels above second
  (parameter = left)

**Grid Transformations**

Abracadabra Rule
Monosyllabic Destressing
Sonorant Retraction

**Universal Conditions**

Textual Prominence Preservation Condition
Anti-Lapse Filter
  (parameter = Root)
Higher Prominence Preservation Condition
Alternation Maintenance Condition
?Montana Filter

3.6 The Role of Prosodic Categories in English Word Stress

The analysis of English word stress offered in the preceding sections makes crucial appeal to one sort of prosodic constituent—the syllable.
The internal structure of syllables and the number occurring within a particular syntactic domain are reflected in the rhythmic patterns of English words. The syllable sequence provides the anchor, so to speak, of that rhythmic patterning: the representation of the stress pattern of an utterance on our theory is the alignment of the syllables of the utterance with a metrical grid. The syllable, then, has a solid place in the theory of the phonological representation of English words. A characterization of the notion "possible stress pattern" of English depends on it, as do a theory of English phonotactics and a theory of phonological rule domains (cf. chapter 1).

The status of other prosodic constituents in the phonological representations of English words, and in phonological theory as a whole, is debatable. We would claim that no prosodic constituent other than the syllable has a role in the representation and characterization of English word stress patterns. Here we take issue with Selkirk 1980b and Hayes 1980, 1982 regarding English and with Halle and Vergnaud 1979, Hayes 1980, and others regarding the general theory of word stress. Yet other prosodic constituents could nonetheless have a place in the theory of phonological representation if a theory of phonotactics or of phonological rule domains required them. We will claim that there is no motivation for the foot (in English, and more generally), either as a unit of phonotactic description or as a unit serving as the characteristic domain of phonological rules.

Phonotactic arguments for the foot have been based essentially on the view that stress patterns are a matter of phonotactic description—that characterizing the notion "possible stress pattern" is quite analogous to characterizing the notion "possible syllable" and "possible sequence of syllables." It is claimed that characterizing the notion "possible foot" and "possible sequence of feet" provides an analysis of patterns of stressed and stressless syllables. This is the position taken for English word stress in Selkirk 1980b, for example. But as we have shown, this position is misconceived. Stress patterns are a matter not of phonotactics, but of the alignment of a syllable sequence with a rhythmic structure, represented as a grid. Thus there is no motivation for the foot as a unit of phonotactic description. The only remaining motivation for the foot, therefore, would come from a theory of phonological rule domains. Kiparsky 1979 has argued that the foot is the domain for certain allophonic rules in English, a characterization accepted in Selkirk 1980b. Selkirk 1978b, however, offers a quite satisfactory account of the same phenomena that does not appeal to foot structure. The debate is therefore open for English; and it remains to be seen whether there is evidence from other languages as well pointing to the necessity of the foot as a domain for rules.

Earlier studies (Liberman and Prince 1977, Selkirk 1980b) have argued that there is a roughly word-sized constituent of prosodic structure that has a place in the phonological representation of English utterances. That constituent has been referred to as the mot, the prosodic word, the word, the phonological word, and so on. One primary motivation for the prosodic word (Liberman and Prince's mot) was its role in indicating when a subpart of a metrical tree belonged to a single word and when it belonged to a compound or a phrasal constituent. Specifically, Liberman and Prince's Compound Rule was claimed to "see" branching structure, but not word-internal branching structure (see Liberman and Prince 1977 and Selkirk 1980b for discussion). The mot was a level below which the Compound Rule could not look. It will be clear from the treatment of compounds to be given in chapter 4 that this characterization of the Compound Rule is incorrect, and the primary motivation for a prosodic word in the representation of stress patterns thereby disappears. As for the contribution of the prosodic word as a means of representing the difference between "stress" and "main word stress," it is supplanted by the metrical grid and the third-level beat. It remains to be seen whether the prosodic word is at all motivated as a domain of phonological rules; but, as mentioned in chapter 1, we believe that it is not, and that it is either the rhythmic disjuncture of syntactic timing or the syntactic structure itself that gives the appropriate representation of "word" for rules of the phonology.