

On the Strict Layer Hypothesis

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1. Introduction

As a project to reflect nonphonological information into phonology in a systematic way, prosodic phonology has achieved significant results. For example, prosodic categories such as syllable, foot, phonological word etc. are proved to play a role as a domain of phonological rules and morphological processes (McCarthy & Prince 1986 et sequel). Also, the category foot is crucially depended on when we account for rhythmic patterns of so called stress-timing languages.

In this article, I will argue that although I basically agree upon the fundamental tenet of prosodic phonology, the principles assumed in the process of mapping between morphological or syntactic structures into prosodic structures are subject to criticism. For this purpose I will propose that some principles as assumed by Selkirk (1984) and Nespor & Vogel (1986) should be abandoned. Henceforth, I call the strong position regarding prosodic constituency as Strict Layer Hypothesis (SLH), following the traditional term and the position which allows skipping a certain prosodic category as the Weak Layer Hypothesis (WLH), in accordance with Itô & Mester (1992). The evidence in favor of WLH will be provided for diverse levels of prosodic hierarchy. The data for the argumentation are mostly from English.

The organization of this paper is as follows: section 2 is concerned with the problems with the basic assumptions of SLH and the apparent problem with SLH, the ambisyllabicity. The main part of this study, section 3 will focus on foot formation of

English materials and show that the properties of the moraic trochee of English strongly favor WLH rather than SLH. Another evidence for WLH will be sought from Clitic Group Formation in section 4. Section 5 concludes the argument for WLH.

2. The Strict Layer Hypothesis

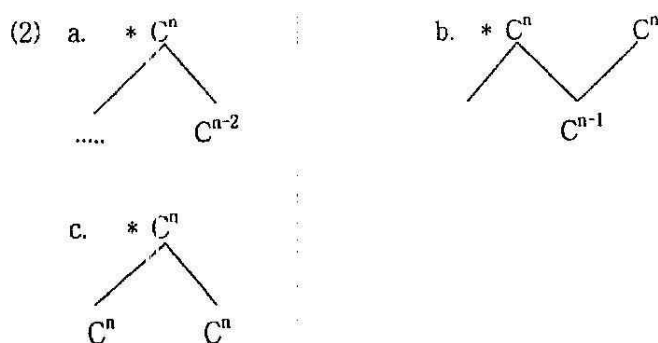
2.1. Problems with Basic Premises

The basic tenet of SLH, as formulated by Selkirk (1984) or Nespor & Vogel (1986) can be summarized as follows:

(1) The Strict Layer Hypothesis

Each constituent of level n must be immediately dominated by a constituent of level $n+1$, while each constituent of level n must dominate only constituents of level $n-1$.

By this condition, each of structures in (2) is ruled out.



As is the case with other linguistic constraints, SLH was motivated to limit the power of phonology, which otherwise allow a virtually unlimited number of possible structures. Needless to say, any conditions on linguistic rules should be based upon empirical data. The prohibition of structures like (2b) is relatively uncontroversial.

However, the exhaustive parsing principle to disallow the structure (2a) has a different property. As already designated by Itô & Mester (1992), some empirical data contravene the exhaustive parsing and demand the relaxation of the principle of exhaustive parsing.

Crucial arguments against exhaustive parsing can be obtained in the current view of prominence relation. Note the another principle underlined in prosodic structuring of Nespor & Vogel (1986: 7).

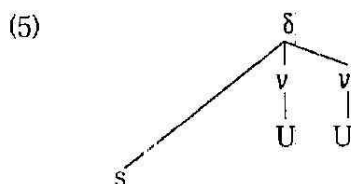
- (3) The relative prominence relation defined for sister nodes is such that one node is assigned the value strong (s) and all the other nodes are assigned the value weak (w).

Considering that the category foot is a main carrier of prominence relation, let us focus our attention on the foot structure. The allowance of unlimited number of weak positions within a foot stands for an unbounded foot type. However, recent concept of foot refutes this type of foot formulation. The binary branching property of foot type (Kager 1993, Mester 1994) strongly shows the inadequacies of allowance of unbounded foot types. To maintain the binary branching type of foot, it is necessary to leave unfooted materials at the left/right edge (4a,b), or at midial position (4c).

- (4) a. $c (\sigma \sigma) (\sigma \sigma)$ b. $(\sigma \sigma) (\sigma \sigma) \sigma$
 c. $(c \sigma) \sigma (\sigma \sigma)$

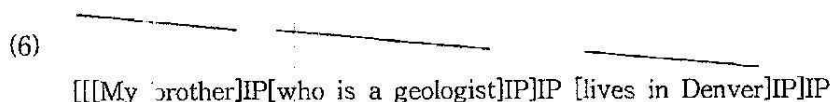
The limitation of prominence relation to the binary nature of foot level is well-motivated. As Ladefoged (1982), Goldsmith (1976) points out, the argument for the multiple-differentiation of prominence degree is scantily evidenced. It is amply proved that the seemingly emergence of prominence degree is due to pitch accent assigned at a primary stressed position at the surface level. The same thing happens in the realm of syllable. One of the reasons that prosodic phonologists regard syllable as a terminal category of prosodic hierarchy, e.g. Selkirk (1984), Nespor & Vogel (1986), is that the syllable-internal structure does not obey the nature of other prosodic categories: heterogeneous branching of onset and rhyme which in turn

consists of nucleus and coda. However, the moraic phonology obviates this type of argument. If we regard that a mora constitutes a terminal node, it constitutes the evidence refuting SLH, as seen by the association of onset to the syllable node.



The segment posited in onset directly attaches to syllable, skipping moraic tier.

Next, for the prohibition of prosodic structure (2c), Ladd (1986) offers interesting data. On the basis of instrumental study of the following intonation contour, Ladd shows that the intonation phrase in English sometimes fails to obey SLH.



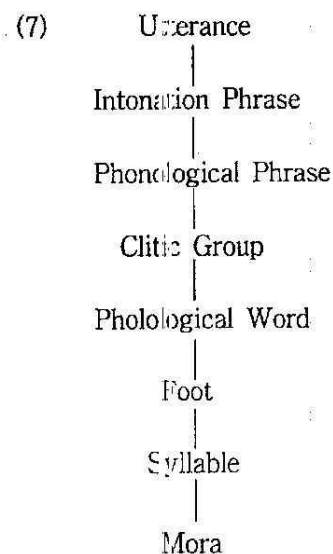
The intonation contour of the above whole sentence demonstrates that the declination on the matrix clause is essentially the same whether it is uttered with the parenthetical or as a complete utterance by itself. It means that the matrix sentence constitutes a single domain, regardless of whether it is interrupted by another domain. The dependence between non-adjacent elements argues for the correctness of the prosodic structure depicted in (6) and refutes SLH. For this reason, the assumption that the rules that construct the phonological hierarchy are not recursive in nature should be abandoned.

Now, it is clear to mitigate the absurdly strong position of SLH and replace it by a weak position.

2.2. Ambisyllabicity as an Escape Clause

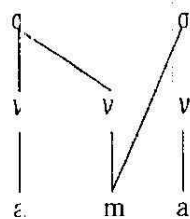
In the above, we noticed that the basic premises of SLH are shaky and felt the need of relaxation regarding the principles involved in prosodic constituency. But we left one structure (2b) as it stands. Here it is necessary to scrutinize this type of

prosodic constituency. The ambisyllabicity of a segment can be reconsidered in terms of this purpose. Before we discuss the problem, let us consider the prosodic categories. When we take into account the moraic phonology and morphology, it is generally agreed to the hierarchy depicted in (7).¹

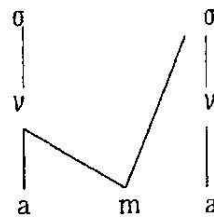


In the following sections, I will deal with relevances of the prosodic categories above foot level to the discussion of the adequacy of the principles subsumed in SLH. Now, notice the configurations involving ambisyllabic or geminate segments.²

(8) a. a geminate segment



b. an ambisyllabic segment



¹ Henceforth, the following abbreviations appear for the prosodic categories: ν (mora), σ (syllable), φ (foot), W (phonological word), P (phonological phrase), I (intonation group), U (phonological utterance).

² The reverse of dual membership seen in geminates can be observed in the complex segments like prenasalized segments, affricates. Anyhow, it is obvious that the one-to-one correspondence between adjacent tiers is not absolutely obeyed.

For the violation of SLH in (8), Itô & Mester (1992) answer that the prosodic domination relation defining constituentship of dominance relation and the autosegmental association relation, like in (8), interpreted as temporal coordination are two fundamentally different formal relations. Only the former, but not the latter obeys proper bracketing. Nespor & Vogel (1986) advocates the emergence of the configurations like (8) under the principle of SLH in the similar way. They point that segments belong not to moraic tier or syllable tier, but to the whole prosodic categories. That is to say, segments are independent of prosodic categories.

Consequently, in spite of the wide-spread appearance of ambisyllabicity or geminate segments, the constraint opposing dual membership of a prosodic category to a higher node can be maintained.

3. The Weak Layer Hypothesis

In this section I will demonstrate that WHL must replace SLH as a legitimate notion for prosodic constituency. The evidence is obtained from foot and clitic group formation in English.

3.1. Foot Formation

3.1.1 Violation of SLH at Word Level

For the account of English stress, it is generally agreed that English rhythmic units consist of bimoraic trochees and foot formation proceeds from right to left. Here, we accept the idea that final syllables in nouns and adjectives and the final consonant of verbs are extrametrical in English (Hayes 1981). Also it is true that minimal words in English are bimoraic, which is the logical consequence of Minimality Condition of prosodic morphology (McCarthy & Prince 1986, Itô 1991, Itô & Mester 1991, etc.); since English foot is strictly bimoraic, it logically follows that minimal word is bimoraic. When we scan English data in terms of these criteria, it is unavoidable to result in trapped syllables in word-initial positions, as displayed in (9).³

(9) Initial Trapping

- | | | |
|-----------|------------------|----------------|
| a. Ju(ly) | b. hy(pocri)<sy> | c. spa(ghetti) |
| Pe(ru) | a(part)<ment> | a(polo)(getic) |
| I(ran) | | |

In (9a) extrametricality is blocked by Minimality Condition, otherwise monomoraic foot will emerge. Both the ordinary cases of (9b,c) and exceptional blocking of extrametricality in (9a) give rise to initial trapping. The unfooted materials left by the leftward footing are also found in medial positions.

(10) Medial Trapping

- (vi)o(late)
 (abra)ca(debra)
 pre(va)ri(ca)<te>
 a(nni)ti(la)<te>
 in(gra)ti(a)<te>

To maintain SLH, it is necessary to the unfooted syllable should be adjoined to adjacent foot. However, this analysis is untenable. First, it is hard to find the evidence of the adjunction of unfooted syllable. At least, no evidence is available to justify the Stray Adjunction at the basic level.³ Elimination of unnecessary categories is justified by the principle of Occam's Razor.

Instead, the unnaturalness of unfooted material leads to undergo certain phonological processes: deletion, shortening or lengthening of adjacent syllables. In English, among the options, shortening is enforced.

³ By the general notational convention, the angled bracket denotes extrametricality of a concerned segment or prosodic categories and for the sake convenience, I denote the unit foot by parenthesis.

⁴ Here I follow Kager's (1993) analysis, which assumes two levels in foot formation: basic level and surface level.

- (11) di(vi)<ne> + ity => di(vi)ni<ty> => di(vini)<ty>
 (co)<rie> +ic => (co)nic => (coni)<c>
 (na)tic<n + al> => (natio)<nal>
 (o)me<n + ous> => (omi)<nous>

The vowel shortening enables the structures involving trapped syllables to accommodate the unfooted syllable into legitimate foot domains and warrant ideal trochaic rhythmic units. So the vowel shortening occurring in (11) functions to maintain SLH. However, as will be seen next section, the principles of SLH are violated more often than not.

3.1.2 Violation of SLH at Phrasal Level

In this section we will deal with the problem of violation of SLH at phrasal level. Especially, we are concerned with the unfooted materials in (9) and (10). Why do the unfooted syllables remain as they stand? For these questions, there are two possible solutions.

First, examine the character of the vowel quality involved in the trapped syllables. It is obvious that they undergo vowel reduction at the phrasal level. When we accept the idea of Halle & Mohanan (1985) that vowel reduction can be conceived as a process of moraic loss, it seems to be possible to solve the problem. That is, even though in some cases word-initial or medial trapped syllables violate SLH at the lexical level, they are rescued by vowel reduction which functions to eradicate the extra moras regarding rhythmic ideal of strict bimoraic units at the post-lexical level. However, this solution suffers from an error of logical paradox. If we assume all the vowel reductions give rise to demoraic syllables, the basic framework of rhythmic units would be demolished. That is, the bimoraic foot comes to be a single moraic unit in that the vowel at the second weak position at a trochaic foot is deprived of its moraic quality. Consequently, even at the phrasal level, SLH can not survive. Also this analysis violates the Morpheme Integrity Principle Constraint (McCarthy & Prince 1995:339), by which morpheme boundaries should be strictly respected in the prosodic constituency.

The second solution for the survival of the trapped syllables is obtainable when we note that all the linguistic processes are not confined to single words but typically ignore word boundaries. Citation forms are a form of speech that is idealized. This observation seems to promise us to maintain SLH at the surface level in that the trapped syllables have chances to attach to the preceding foot, as analyzed by Giegerich (1992).

(12) (Large ba)(lloons)(fly)(high).

However, it is not a real argument in favor of SLH. The attachment of the trapped syllable to the preceding foot is allowed only for the word-initially trapped syllable. The attempt to ignore the word boundary does not affect the word-medial syllables as in (10). Also, the rhythmically trapped syllables posited at the sentence or utterance initial positions resist the tidy layering as seen in (13).

(13) Pe(ru bæ)(longs to de)(veloping)(countries)

Even though the ignoring of word boundary at the connected speech is successful in some cases, the utterance-initially trapped syllable *Pe-* in (13) has no chance to attach to the preceding foot. So this type of footing does not warrant the observation of SLH at the phrasal level.

3. 2. Nonexistence of a Degenerate Foot

Nespor & Vogel (1986: 91) tries to parse the initial trapped syllables in (9a) as a degenerate foot.

(14) (Ju)(ly)
(Pe)(ru)
(I)(ran)

Of course, the attempt to allow the degenerate feet at this position is a last resort

to hold the principles of SLH at the expense of other aspects of prosodic phonology. In their framework, actually any types of foot are allowed: a degenerate foot, a bimoraic foot, an unbounded foot. Among these foot type, the existence of degenerate feet is most controversial. In the stress-timed languages like English, German, Russian, the primary function of the prosodic category of foot is to account for the rhythmic patterning based on stress contour of a sequence. The allowance of degenerate feet at the unstressed syllable is likely to demolish the nature of foot in these languages. For these reasons, this type of analysis is hard to be justified. Furthermore, concerning this problem it would be impossible to apply the concept of catalexis of Kiparsky (1992). Since the first syllable is located in a weak position, a potential catalectic syllable can be posited nowhere. Notice that a catalectic syllable is posited at a weak syllable and a strong syllables are never missing. The assumption that there is no degenerate feet in English can be clarified in the following examples.

- (15) (bo)(vine)
 (ca)(nine)
 (pro)(ton)
 (mo)(rad)
 (ka)(pok)

If the words in (15) are pronounced as double feet in their rhythmic contour, by the condition of Foot Binarity (McCarthy & Prince 1995: 321), moras should be licensed at the righthand foot. But it never happens except in stacatto pronunciation. There is no evidence to claim the existence of this foot type.

Then, what about the emergence of seemingly monomoraic foot in the following examples?

- (16) (sa)(ti)<re>
 (sa)(pi)<re>

The word-initial foot is certainly consists of a single mora in (16), as it stands. In spite of that, these examples are not real counterexamples to the condition of Foot

Binarity. Regarding this matter, Giegerich (1992: 172) suggests an answer in terms of formulation of ambisyllabicity in the following way.

(17) Ambisyllabicity in English

A consonant is ambisyllabic if it is part of a permissible cluster
and if it immediately follows a stressed lax vowel.

According to this formulation, the consonants at the initial position of the second feet attach to the preceding syllable and bimoracity of the lefthand foot is satisfied.⁵

3.3. Incorporation of Extrametrical Syllables

So far, I have shown that the principles of SLH are excessively strong for the account of setting up feet and instead we must allow unfooted materials in certain circumstances. In this section, examining some phonological phenomena referring to the prosodic category of foot as an application domain, I will attempt to argue for the position that the strict bimoracity is rigidly observed at the foot level and the unfooted materials attach to phonological word level, unlike Kager's (1993) argumentation who believes the condition of strict bimoracity should be relaxed at the surface level.

3.3.1. Flapping

When we assume that all the extrametrical syllables are invisible to all the phonological operations, we meet some problems in accounting for flapping phenomena in English.⁶

⁵ Notice that ambisyllabicity is enforced only when the consonant at hand follows a lax vowel. After tense/long vowels, ambisyllabicity never happens under Giegerich's formulation. Giegerich (p.219) justifies this claim with reference to stress contour, aspiration, and glottalization in English, among others. For example, aspiration of voiceless stops occurs in the words like *apron*, *matron*, because they fail to be ambisyllabic. For the detail, see Giegerich (1992).

⁶ We assume that even though some principles of SLH are violated, it is not easy to

- (18) po(ta)<to>
 (ar)<tle>
 spa(ghetti)
 (eti)<ette>
 (wri)<ter>

The problem arises from the fact that flapping targets not only segments incorporated into ordinary foot, but also extrametrical segments which are invisible to phonological rules referring to foot at their application domain. If we accept the idea of Nespor & Vogel (1986) that the flapping in English refers to the uppermost level Phonological Utterance for its domain, there is no problem to explain the occurrence of flapping in (18). If the invisible extrametrical syllables are incorporated into a prosodic category before arriving at Phonological Utterance level, the flapping at alveolar stops can be explained.

3.3.2. Nasal Assimilation

Among the examples in (19), the nasal place assimilation applies only to (19a). However, the prosodic structure at basic foot level is not differentiated from (19b).

- (19) a. (con)<gress>
 (con)<quer>
 b. con(gressio)<nal>
 con(cur)

As is in the case of flapping, it makes sense to assume that the process is triggered at the higher level than foot.

skip all the intermediate categories from syllable to Phonological Utterance. Thus, it is safe to think that the extrametrical syllables are incorporated into phonological words before they are incorporated into more higher prosodic categories.

4. Clitic Group

4.1. The Status of Clitic Group

In prosodic phonology, the independent status of Clitic Group is somewhat controversial. However, if specific combination of a word and an enclitic or proclitic forms the domain of a phonological rule, we can make use of the evidence for the existence of clitic group. Hayes (1984) argues that Clitic Group should be allowed as a legitimate prosodic category superordinate to phonological word on the basis of a couple of phonological phenomena. Note the following examples.

- (19) *v*-Deletion
- a. [Please]C [leave me]C [alone]C
 - b. [Please]C [leave]C [Maureen]C [alone]C

As will be seen in the later, sentence internal pronouns form a clitic group with leftward lexical words in English. The fact that *v*-Deletion applies to (19a), but not to (19b) stands for the application domain of the rule, clitic group rather than phonological word. If we insist that the application domain of the rule is phonological word, it would be impossible to account for the blocking of the rule in (19b).

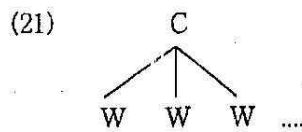
Another argument for the existence of clitic group in English is seen in *s*, *z*-Palatalization.

- (20) a. [is Sheila]C [coming]C
 b. [Laura's]C [shadow]C

The limitation of palatalization to (20a) means that the proclitization makes it possible to form a single prosodic unit with an adjacent category and palatalization occurs within the category. I feel that this type of analysis makes sense. In the following I limit our attention to the relevance of clitic group formation to the discussion of SLH.

4.2. Clitic Group Formation

First of all, let us consider the formulation of clitic group in terms of SLH. To maintain the strong position, it is necessary to construct a following type.



This type of construction reflects the idea that all the phonological words congregate to form the immediate superordinate unit, clitic group, as is the case with other prosodic structure formations. The point of this type of reasoning is that each enclitic and proclitic is entitled to form an independent phonological word before they attach to the host, which is another phonological word. However, the argument to license an separate phonological word to clitic elements is highly doubtful, considering the results obtained from recent phonological research.

Consider the specific elements eligible to be a clitic. In English, monosyllabic function words are candidates to be a clitic.

(22) a. Enclitic

[He's a]C [man]C
[He'l]C [come]C

b. Proclitic

['s that]C [true?]C
['m I]C [going with you]C

Aside from utterance-initial position, all the contracted auxiliaries and pronouns, prepositions form clitic group with the preceding host words. Here we must note the different behaviors of particles from prepositions. The inherent nature of particle of having stress is sharply distinct from prepositions.⁷

(23) a. Preposition

[I]C [looked up]C [the chimney]C

[I]C [looked up it]C

b. Particle

[I]C [looked]C [up]C [the chimney]C

[I]C [looked it]C [up]C

Although segmental structure of most prepositions and particle is non-distinct, prosodic structures involved in two syntactic categories are clearly distinct. Prepositions form a clitic group with a preceding phonological word, whereas particles behave as independent clitic group. More interesting is the case of compound verbs consisting of verb + particle + preposition.

(24) [John]C [put]C [up with this]C [nuisance]C

[Mark]C [do]C [away with the]C [old]C [papers]C

Unlike prepositions, particles are stressed and form an independent clitic group.

4.3. Relevance to the Weak Layer Hypothesis

In general, monosyllabic function words in English are pronounced as doublets: weak and strong forms. The strong forms appear when they are received a special emphatic accent in a specific semantic situation. In unmarked cases, the prepositions at the sentence-final positions are deaccented.

⁷ Particles are *away, back, through, down, up, out, on, off, over, under*. All of the above words except *away* and *back* also serve the function as prepositions. Several words, such as *at, of, to, with, without* function only as prepositions. The evidence for the distinction between particles and prepositions is quite subtle. Kreidler (1992: 224) calls the sequence verb plus particle as 'compound verb.'

- (25) What did they listen *to*?
 What was he sitting *on*?
 Is this the article the doctor referred *to*?

As far as the principles of SLH is concerned, the primary point to be discussed with respect to clitic elements is that they cannot afford to constitute an independent phonological word. By the strong condition of Minimality in Prosodic Morphology, to form prosodic categories above foot level, the total weight of the units must be more than two moras. In this sense, it is difficult to regard the following structures as phonological words,

- (26) a. * W
 |
 ϕ
 |
 σ
 |
 t o
- b. * W
 |
 ϕ
 |
 σ
 |
 'Il

The preposition (26a) and contracted auxiliary (26b) fail to form an independent phonological word. Since Minimality Condition applies to lexical words, those functional categories are exempted from the condition and for this reason they are allowed as separate grammatical words. Nonetheless, the function words are not eligible to be separate phonological words. Consequently, it is necessary to relax the condition of SLH and allow the following types of clitic group.

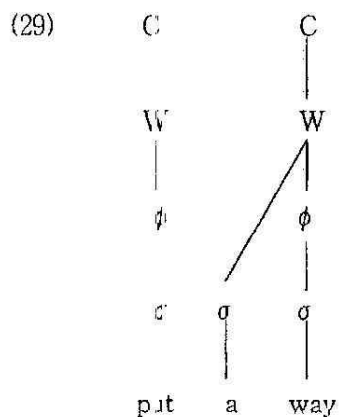
- (27) a. C
 / \
 W ϕ
 | / \
 σ σ σ
 | | |
 to Boston
- b. C
 / \
 W ϕ
 | |
 σ σ
 | |
 John 'Il

As illustrated above, to correctly explain clitic group formation in English, it is necessary to skip not only a single superordinate nodes, but also multiple number of nodes. Since clitics are not assigned stress, they are unable to be dominated by both foot and phonological word nodes. In this regard, the argument for SLH is strongly refuted.

Next, consider the case of particles. As mentioned above, they are assigned stress and able to form a separate foot. Then, what, about Minimality Condition? Do all of the English particles satisfy the condition? The answer is positive. All of the English particles consist of at least two moras, which are fundamental condition to form a foot.

- (28) a(waɪr)
 (back)
 (though)
 (in)
 (out)
 to(geɪtər)

These structure are sufficient to lay down foot and its superordinate, phonological word.



5. Conclusion

Prosodic phonology started to accomodate the discrepancy between phonological structure and morphological or syntactic structures. This enterprise has been successful to reveal the interactions between different linguistic components. Also, its success is due to the modular approach of phonology, lexical phonology and morphology, autosegmental phonology, grid theory of prominence relation. As far as non-phonological information is involved in phonological processes, this type of semi-autonomous approach is inevitable. Moreover, the current elaboration of potential prosodic categories, especially, the category foot leads us to reconsider the Strict Layer Hypothesis. Up to now, I have reviewed the problems with the strong condition and showed that the condition should be relaxed in certain aspects. Of course, the relaxation of the condition to a weaker position must pay the price: we must admit trapping (unfooted materials), and catalexis. Despite the price we must pay, we can still advocate our analysis when we can find solid foundation of the revised principles of the prosodic units when some phonological or other phenomena apply within the modified domain. The loss resulted from discarding SLH can be compensated in other respects.

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