On Cycles and Levels in English Stress Assignment*

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1. Introduction

Since Chomsky and Halle (1968), it has been widely assumed that stress assignment in English is achieved by utilizing the notion *cyclicity*; that is, under an assumption that a set of stress assignment rules applies cyclically. In addition to this, *levels* are postulated in recent versions of metrical theory such as Halle and Vergnaud (1987; henceforth H & V), Idsardi (1992), etc., following the work of Kiparsky (1982). Employing these two notions, H & V construct a model of the lexicon in which stress assignment rules are distributed into cyclic or noncyclic levels (i.e. *stratum* in H & V's terminology).

Although H & V's model seems to be successful in accounting for English stress for the most part, it still seems to be possible to simplify the stress assignment system at least for English. To be concrete, it seems that the notions of cycles and levels do not have to be posited in such a model that does not assume interaction between morphology and phonology. In this paper, we will review and reexamine the two notions, and will suggest that it be possible to establish a system of English stress assignment without these notions.

2. Review and Reexamination

2.1 H & V's Model of Lexicon

H & V's model of the lexicon originates in Kiparsky's (1982) in that the difference in rule application, i.e. cyclic or noncyclic, can be reduced to levels in the lexicon. Kiparsky proposes that the lexicon consist of several levels, each of which contains morphological operations and phonological rules. Below is the model he assumes:
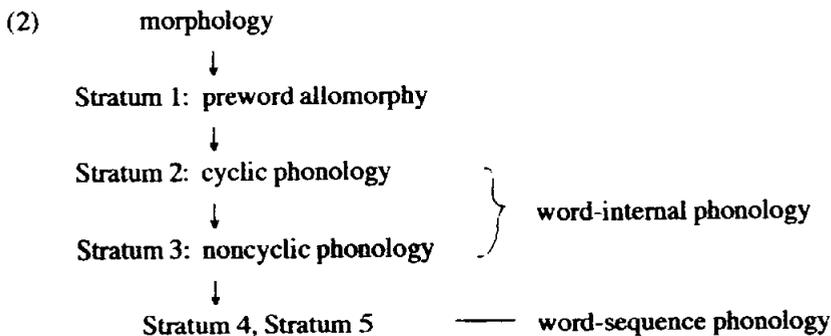
(1)

In this framework, it is possible to analyze cyclic rules as applying at one level, and noncyclic rules as applying at another level. Moreover, since morphological operations precede phonological rules at each level, it is also possible to regard cyclic rules as applying every time a word undergoes affixation. A set of cyclic rules keeps on applying to the string of morphemes until all the affixes are attached to create an intended word. On the other hand, noncyclic rules apply only once to the whole string of morphemes. This means that noncyclic rules apply after all affixation has been completed.

In general, it is assumed that the cyclic level(s) precede(s) the noncyclic one(s), since if the order were reversed all words would undergo cyclic rules even if the word contains a noncyclic affix. However, a serious problem arises in this assumption. Although it is predicted that cyclic suffixes never attach to stems containing a noncyclic affix in this framework, such a sequence often arises in English word-formation, as Aronoff (1976) points out. Take *ungrammaticality* as an example. The suffix *-ity* is proved to belong to the cyclic level from the fact that words with the suffix sometimes have stress on the different syllable from the stem; e.g. *spécial* vs. *speciálity*. The prefix *un-*, on the other hand, is assumed to be a noncyclic affix since it does not affect stress assignment; e.g. *lúcky* vs. *unlúcky*. Note that the prefix is not attached to a noun, but to an adjective; e.g. **unluck* vs. *unlucky*. Therefore, in the case of *ungrammaticality*, it is predicted that *un-* is attached to *grammatical*, not to *grammaticality*. This is impossible in the framework of Lexical Phonology, since the cyclic suffix *-ity* cannot follow affixation of the noncyclic prefix *un-*. This problem is called the *bracketing paradox*.

On the basis of this fact, H & V propose the following organization of the lexicon as an alternative to (1):

(2)   morphology
               ↓
    Stratum 1: preword allomorphy
               ↓
    Stratum 2: cyclic phonology   ⎫
               ↓   ⎬ word-internal phonology
    Stratum 3: noncyclic phonology   ⎭
               ↓
        Stratum 4, Stratum 5   ——— word-sequence phonology

In this framework, they argue, the bracketing paradox never occurs. Since morphology precedes phonology, all the affixation processes are carried out before phonological rules apply. Phonological rules, whether cyclic or noncyclic, apply after all the morphological processes, including allomorphy, have applied.

2.2 Cyclicity

The notion of cyclicity is originally introduced by Chomsky and Halle (1968) to account for such a difference in stress patterns as *còndènsátion* vs. *còmpensátion*. In this contrast, the former has two secondary stresses, i.e. on the first and the second syllables, whereas the latter has only one stress, i.e. on the first syllable. Chomsky and Halle argue that this fact reflects the difference in the stress assigned in the previous 'cycle'. Note that the second syllable of the former word has primary stress in the previous cycle, i.e. *condénse*, but that of the latter does not, i.e. *cómpensàte*. From this fact, Chomsky and Halle assume that stress assignment rules apply cyclically to the output, every time a suffix is attached. This explanation has been a strong piece of evidence for positing cyclicity in phonology.

As the metrical theory develops, the motive of cyclicity has changed. In the theory of H & V, for example, the notion is used to account for the difference of primary stress in derived words. The stress pattern *instruméntal*, which is derived from *instrument*, is assumed to be assigned by 'cyclic' application of the stress assignment rules. The rules first apply to the cycle *instrument* to place primary stress on the first syllable, and then they apply again to the next cycle *instrumental*, after the *Stress Erasure Convention* (SEC), which erases stresses assigned on the previous cycle, placing the stress on the penultimate syllable. The correspondence of secondary stress in derived words with primary stress in the stem is guaranteed by the independent rule *Stress Copy*, which copies the primary stress assigned in the previous cycle(s).

In this framework, however, cyclicity does not have to be postulated. Note that in this theory the original argument for cyclicity does not hold, since stresses assigned in the previous cycle are erased by the SEC and thus cannot influence the subsequent cycles. Stress Copy does not provide a substitutive argument, since it is not a theoretical consequence as cyclic rule application in original argument, but just an ordinary rule: the rule can be formulated without the notion of cyclicity.[1] If the preceding cycle cannot have influence on the later cycle, it is entirely unreasonable to assume cyclic stress assignment. The process of constructing a

metrical structure, and breaking the whole structure, and again constructing another structure seems quite a roundabout way. Why do not we assume that stress is assigned only to the last 'cycle'? Such an assumption is completely reasonable since all the morphological processes are carried out before the word enters the phonological section in H & V's model (2).

2.3 Levels

Although H & V postulate a number of rules in the noncyclic level, the reason is not clear why they have to belong to this level. As for the 'cyclic' rules, there is motivation; that is, since derived words often have primary stress on the different syllable from that of the stem, the rules should apply cyclically, erasing previous stresses. The 'noncyclic' rules, however, do not have such motivation. Note that the main role of the 'noncyclic' level is to assign secondary stresses in H & V's framework. Like primary stress assignment, the secondary stress of derived words often falls on the different syllable from that of the stem. What is more, secondary stress assignment is often affected by the primary stress of the previous cycle (e.g. *còndènsátion*). It is possible to treat secondary stress assignment in the same way as primary stress assignment, i.e. as applying at the cyclic level, but there seems to be no reason to assume that the process applies at the noncyclic level.

The reason that H & V assign secondary stress assignment to noncyclic stratum would be that it applies quantity-insensitively while primary stress assignment is quantity-sensitive. Note that the second heavy syllable in *còmpensátion* does not have secondary stress. This difference can be explained only by distributing rules of primary and secondary stress assignment to distinct levels in the H & V's theory, since they assume exhaustivity of foot construction but deny its non-iterativity. However, recent studies such as Idsardi (1992) reveal that exhaustivity is not necessary in foot construction. Moreover, although iterative foot construction requires a counter-intuitive mechanism called *conflation* to erase all stresses but primary one assigned at the 'cyclic' level, such a mechanism is not necessary in non-iterative (non-exhaustive) construction (cf. section 3.1). Note that Halle (1990) provides an argument which proves that conflation is necessary in some languages, but the argument never proves that non-iterative foot construction is impossible universally.

It is true that English stress assignment needs two distinct systems, one for primary stress and the other for secondary stress, but this does not enforce us to assume two distinct levels. In fact, among the rules H & V posited in the noncyclic level, none of them is proved to

apply at this level. They are just assumed to belong to this level since they apply during or after secondary stress assignment. Therefore, if secondary stress is assigned at the cyclic level, they can also belong to that level.

There is another reason that H & V assume bi-level derivation: the 'stress domain' suffixes. They assume that some English suffixes constitute a domain for stress assignment in and of themselves. The stem and the 'stress domain' suffix each acquire stress at the cyclic level, and they are conjoined together at the noncyclic level to place a primary stress. This is only possible in bi-level derivation. Note, however, that Zamma (1993, 1995) proposes that it is unnecessary to assume such a mechanism in English stress assignment. Zamma argues that 'stress domain' analysis is problematic in several respects, and that it is more natural to account for the stress patterns of 'stress domain' suffixes in normal derivation by postulating several devices. We should not posit 'stress domain' for some English suffixes, and hence we do not have to assume bi-level derivation in English.

Finally, consider the case of the "bracketing paradox" example. As we have discussed above, the word *ungrammaticality* has the following morphological structure:

(3)   [[un-[grammatical]$_c$]$_{nc}$ -ity]$_c$ ('c' stands for 'cyclic' and 'nc', 'noncyclic')

In H & V's model, the above word must undergo the following derivation (H & V (p.81)). At the cyclic level, the first cycle [grammatical] undergoes cyclic rules and acquire primary stress on the antepenultimate syllable. At the same level, the second cycle does not undergo the cyclic rules and have primary stress on the same syllable as that of the previous cycle, since this cycle contains the noncyclic prefix *un-*. Finally, the third cycle acquires the primary stress on the antepenultimate syllable through the cyclic rules, including the SEC. What is interesting here is the function of the property of affixes: cyclic/noncyclic. Clearly their role is to show whether the word containing them is the domain for rule application at the cyclic level. This means that the term 'noncyclic' as a property of affixes is negatively defined as 'not undergoing cyclic rules': it never guarantees that the word containing the affix is the domain of rule application at the noncyclic level.

3.   English Stress Assignment without Cycles and Levels

We have seen that there is no strong argument for positing cycles and levels in English

stress assignment, both theoretically and empirically. In fact, stress assignment in English can be accounted for without these notions, as we will see in section 3.1. The original argument for cyclicity can now be reduced to Stress Copy, which is formulated minutely in section 3.2.

3.1 An Alternative Model

In this section we will explore an alternative model of English stress assignment which does not assume cyclic and bi-level derivation.[2] This means that we assume that stress assignment rules apply only once to the outermost domain, just at one level. Specifically, we employ the following model:

(4)   morphology
           $\downarrow$
         Representation A

           $\downarrow$ $\leftarrow$ Stress Assignment Rules
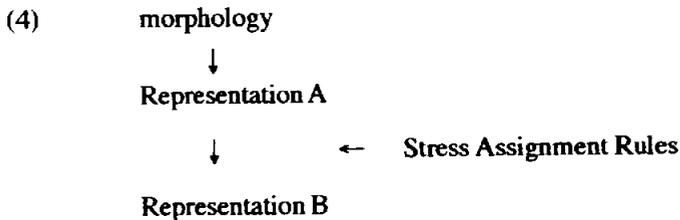
         Representation B

Following H & V, we assume that morphological operations precede phonology and produce a sequence of morphemes, which we will call Representation A. To this representation, stress assignment rules apply to produce Representation B.[3] The domain of the rule application is determined by a feature which is assigned to suffixes. Although H & V assume the feature [+ cyclic], we will rename this feature and call temporarily [+ domain], since we do not assume cyclicity. The outermost structure with [+ domain] undergoes stress assignment rules. Consider the following examples (the abbreviation 'd' stands for 'domain'):

(5) a. $[[[\text{origin}]_{+d} \text{-al}]_{+d} \text{-ity}]_{+d}$

     b. $[[[\text{natur}]_{+d} \text{-al}]_{+d} \text{-ness}]_{-d}$

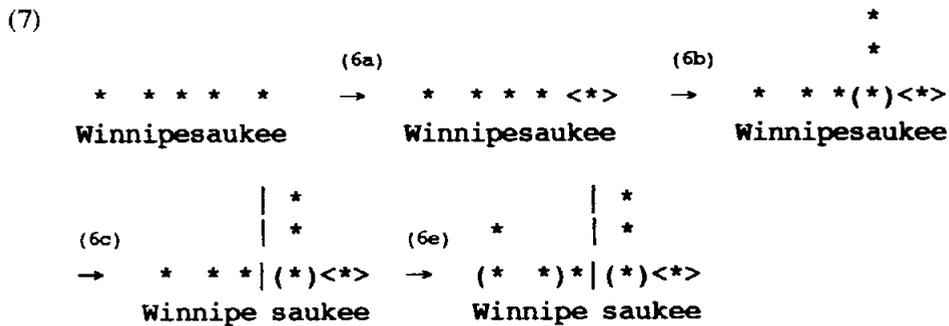   c. $[[\text{un-}[\text{grammatical}]_{+d}]_{-d} \text{-ity}]_{+d}$

In (5a), stress assignment rules apply to *originality*, since this constitutes the outermost domain. The rules apply to *natural* in (5b), since *-ness* is [- domain]. In (5c), which is a typical example of the Bracketing Paradox problem, the whole sequence *ungrammaticality* undergoes stress assignment: the structure with [- domain] is nullified by the outermost [+

domain].

We employ the following rules for stress assignment:

(6)   a.   Extrametricality

       b.   Quantity-sensitive Primary Stress Assignment (non-iterative)

       c.   Prosodic Circumscription

       d.   Stress Copy

       e.   Quantity-insensitive Secondary Stress Assignment (iterative)

       f.   the Rhythm Rule

Note that these rules are essentially the same as those employed in previous studies. The only difference is that we assume that primary stress assignment is non-iterative. We will illustrate how these rules operate, taking *Winnipesaukee* as an example (Stress Copy and the Rhythm Rule are discussed in the next section).

(7)

```
                                                                          *
                    (6a)                           (6b)                   *
  *   *  *  *   *     →     *   *  *  * <*>   →     *   *  *(*)<*>
  Winnipesaukee             Winnipesaukee          Winnipesaukee

                     |  *                           |  *
  (6c)               |  *          (6e)       *      |  *
   →     *   *  *|(*)<*>            →    (*   *)*|(*)<*>
         Winnipe saukee                 Winnipe saukee
```

The final syllable undergoes extrametricality. Since the penultimate syllable is heavy, primary stress falls on this syllable by quantity-sensitive stress assignment, which applies only once (i.e. non-iteratively). The pretonic sequence becomes the domain for secondary stress assignment by Prosodic Circumscription (cf. McCarthy and Prince (1990), Idsardi (1992), etc.), and the stress is assigned by (6e). Recall that Zamma (1993) proposes that the unmarked directionality of (6e) is left-to-right as in the case of (7) (cf. Halle and Kenstowicz(1991)), although it is sometimes determined by a suffix which the word contains. Even though the example has only one secondary stress, there are a great number of words with more than one secondary stresses, which suggests that secondary stress assignment apply iteratively.

As we have seen in (7), we can predict the correct stress pattern of *Winnipesaukee*

without positing two levels in English stress assignment. Since the rules in (6) are essentially the same as H & V's, stresses of many other non-derived words can be accounted for in the same way as *Winnipesaukee*. As for derived words such as those in (5), on the other hand, the correct position of primary stress can be predicted by (6a) and (6b), under our assumption that the outermost structure becomes the domain. Secondary stress assignment is often affected by Stress Copy. In the following section, we will see that this rule can be formulated without assuming cyclic derivation in phonology.

3.2 Stress Copy

Before we consider the precise formulation of the rule *Stress Copy*, let us see its importance in English stress assignment. The rule is indispensable in order to account for not only the contrast between *còndènsátion* and *còmpensátion*, but also the ones observed in (8), which are taken from Zamma (1993).

(8)   a.   monópolìze, ecónomìze, contémporìze, hypóthesìze

        b.   nátionalìze, líberalìze, géneralìze, ánimalìze

Although all the examples in (8) consist of four syllables, there is a difference between (8a) and (8b) in placement of primary stress: the former has primary stress on the second syllable, but the latter on the first. Zamma (1993) proposes that the crucial contrast lies in whether the word has the original word from which it is derived morphologically. Note that *nationalize* is derived from *national* by attaching *-ize*, whereas *contemporize* consists of the root *contempor-* (cf. *contempor-ary*) plus *-ize*. We assume that in the words in (8b), the primary stress of the original word is copied to the first syllable of the derived word and thus this syllable acquires primary stress through the Rhythm Rule. Observe the difference in derivation:

(9)
```
         | *                    | *                   *
         | *      (6e)      *   | *      (6f)     *        *
  *   *  *|(*)     →      * (*  *)|(*)     →      * (*   *)(*)
  contempo rize          contempo  rize          contempo rize
```

```
(10)        | *                    | *                    | *
            | *        (6d)   *    | *        (6e)   *    | *
       * *  *|(*)    →    * *  *|(*)    →   (* *)  *|(*)
       nationa lize          nationa lize          nationa lize


            *
 (6f)       *         *
       →   (* *)  *(*)
           nationalize
```
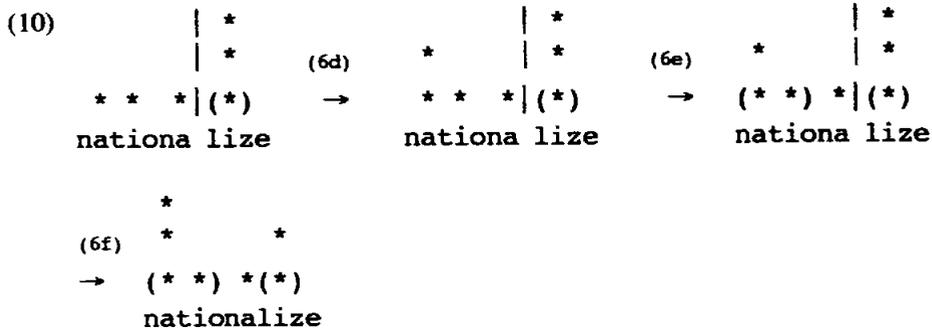
In words which do not have the original word, foot construction to the circumscribed sequence applies from right to left, the way which is specified for the suffix -ize (i.e. (9)). In words which have the original word, on the other hand, Stress Copy places a stress before foot construction applies (i.e. (10)). This stress is respected in foot construction, and thus a trochaic foot is constructed over the first and the second syllables. In both cases, the Rhythm Rule places primary stress on the stresses assigned in this way.

As we have seen above, Stress Copy plays an important role in English stress assignment (Hammond (1989) also submits the same proposal). Any system which does not utilize this kind of rule (cf. Halle and Kenstowicz (1991) and Halle, Harris and Vergnaud (1991)) is problematic in accounting for the fact observed above and in Hammond (1989). Although Halle and Kenstowicz employ a rule which stresses heavy syllables of lexically restricted words, such an analysis is ad hoc since it cannot capture the contrast in (8a) and (8b).[4] Similarly, the approach proposed by Hulst (1992), who assumes that "secondary stress assignment is *post-lexical*, possibly phrasal (p.2)", has the same problem: the contrast in (8) cannot be captured, since post-lexical rules will not produce such differences. This contrast clearly shows that secondary stress assignment is a lexical process in English.

On the same ground, an optimality theoretic approach (cf. Prince and Smolensky (1993)) seems to be problematic. This theory does not postulate derivation in phonology, and assumes that a phonological phenomenon, including stress assignment of course, occurs because of hierarchically-ranked constraints. It scarcely seems to be possible also in this theory to capture the contrast in (8), since formulating a constraint to do so would be very hard. Moreover, it is not clear in this theory whether it denies morphological derivation as well. Note that Stress Copy targets the stress in the original word, which is only possible in a system that assumes morphological derivation.

In our system, of course, the relation between derived words and original words can be properly maintained. In the morphological component, which precedes phonology, words are derived by suffixation, and the relation is attained in this process. Stress Copy counts on this relation, and retrieves the information of the stress in the original word.[5]

It is important to note here that since we do not assume cyclic application of stress assignment rules, we can do without the SEC. Recall that Harris (1989) offers a serious criticism of the SEC, arguing that Stress Copy, as well as 'stress domain' suffixes, "clearly undermines the empirical force of the SEC (p.344)". Since we do not have to postulate the SEC in English, positing Stress Copy does not pose any theoretical problems.

Now we will consider how Stress Copy should be formulated. The following three points would be the issues in its formulation:

(11) a.   Which word's stress does the rule copy?

b.   Is it both primary and secondary stress that are copied, or just primary one?

c.   Is the copied stress the one before the Rhythm Rule applies, or after?

Previous studies have different assumptions in these regards. H & V assume that only the primary stress before the application of the Rhythm Rule is copied, although it can be the one of any words with which the word has morphological relation.[6] Hammond (1989), on the other hand, assumes that both primary and secondary stress are copied, but only the word from which the word is derived (concerning the Rhythm Rule, it is not clear how he assumes).[7] We will propose that Stress Copy should be formulated as follows:

(12) Stress Copy

Place a stress on syllables which contain primary and secondary stress in the original word.

We assume that the copied stress of the original word is the ones after the Rhythm Rule has applied. Note that it is entirely odd in our system to assume that the stresses before the application of the Rhythm Rule are copied. Why should it be the stress of an intermediate structure, i.e. the one before the Rhythm Rule, that becomes the target of the rule? The reason that H & V assume the target stress is the one before the Rhythm Rule would be that they assume bi-level derivation: since they assume that both the Rhythm Rule and Stress Copy

apply at the noncyclic level, the target stress of Stress Copy should be the one at the cyclic level, that is, the stress before the Rhythm Rule applies. Yet, since we do not assume bi-level derivation, targeting on the intermediate structure is completely a strange assumption.

There is a piece of evidence which suggests that H & V's assumption for Stress Copy, i.e. to copy only primary stress before the application of the Rhythm Rule, be inadequate. Let us first observe the following contrast (the data are taken from Wells (1990)):

(13) a.   monòpolizátion, commèrcializátion, legìtimizátion
      b.   nàtionalizátion, lìberalizátion, gèneralizátion

Although the words in (13) contain four syllables before the primary stress, (13a) have secondary stress on the second syllable while (13b) have the stress on the first syllable. This contrast cannot be captured in H & V's assumption. Note that the words in (13) are all derived from stems ending with -ize. As we have observed above in (9) and (10), stems of this kind have primary stress on the suffix before the Rhythm Rule applies. If the target stress of Stress Copy is the primary stress before the Rhythm Rule applies, the contrast in (13) cannot be accounted for, since the copied stress would always fall on /-iz-/ and there is nothing to explain the contrast. On the other hand, the contrast is accounted for if the copied stresses are the ones after the Rhythm Rule, since the rule places primary stress on the first or second syllable of the original words.

Next, we consider the issue in (11a). Take *originálity* as an example. With our formulation in (12), it is correctly predicted that the primary stress of *oríginal* is copied. In H & V's analysis, on the other hand, things are much more complicated. Note that *originálity* relates with both *órigin* and *oríginal*. If stress of any word with which the word has relation can be copied, it is predicted that stresses of both words are copied on *originality*. However, this is not the case. The stress patterns **òriginálity* and **òrìginálity* never occur: it is always *originálity*. Stress Deletion (cf. H & V (p.239)) may produce the correct stress for this word, of course, but it is necessary in this analysis to provide a certain device to delete the stress on /o/, not on /ri/. The same is true for *hàrmonizátion*. Although this word should have morphological relationship with *hármony*, *harmónic* as well as with *hármonìze*, containing the same root *harmon-*, stress patterns like **hàrmònizátion* and **harmònizátion* never arise. Our formulation in (12) easily predicts only the correct stress; *hàrmonizátion*.

The remaining issue is then the one in (11b). Consider the following contrast from Wells

(1990):

    (14) a.   denòminátional (< denòminátion)

          b.   rèpresentátional (< rèpresentátion)

Although both words in (14) contain three syllables before the primary stress, (14a) contains secondary stress on the second syllable while (14b) have it on the first syllable. This contrast is best accounted for if we attribute it to the stresses of the original word. Thus, we conclude that secondary stress can be the target of Stress Copy. In the case of (13), however, the copied stress which is the secondary stress of the original word is not obvious. This may be because Stress Deletion (cf. H & V (p.239)) erased the stress on -*ize*.

4. Summary

We have seen that there is no theoretical or empirical reason to postulate the notions of cycles and levels in English stress assignment: the argument for cyclicity does not hold in the recent framework of metrical theory, and no stress rules should be assigned to the noncyclic level. Actually, English stress can be accounted for in our alternative model which utilizes neither of these notions. Stress assignment rules apply only to the outermost structure, which is determined in our analysis by the feature [+ domain] assigned to the suffixes. The rules apply at one level intermediated by Prosodic Circumscription, one of which applies quantity-sensitively and non-iteratively, and the other quantity-insensitively and iteratively.

We have also seen that Stress Copy is important in English stress assignment and proposed a minute formulation of the rule. This rule is properly accommodated to our analysis, which postulate the morphological component before phonology: it copies the stress of morphologically related word.

Notes

    * I am grateful to Shosuke Haraguchi, Masao Okazaki, Yukiko Kazumi, Noriko Nemoto, and Takeshi Shimada for their insightful comments and suggestions.

    1 Note that both the derived word and its original word are produced distinctively at the morphological component before they enter the phonological component. Since the relation between them is guaranteed at the preceding component, the rule of copying stress can be

formulated appropriately. If one may argue that cyclicity is necessary for this rule, s/he is faced to the problem which Harris (1989) raises. See section 3.2 for detailed discussion.

2 Although we consider only stress assignment in this paper, it may be possible to eliminate all the 'cyclicity' in English phonology. Note that this notion crucially depends upon the facts about stress.

3 It is possible to assume that, following Harmonic Phonology (cf. Goldsmith (1993), etc.), Representation A corresponds to the morphophonemic representation and Representation B to the phonemic representation. However, since we do not have conclusive evidence to prove this correspondence, we simply suggest the possibility and leave this issue unsolved.

4 Actually, Halle and Kenstowicz also assume the Stress Copy rule ((82):p.491). However, this assumption is contradictory to their claim that "this distinction [= the contrast in the position of the secondary stress; HZ] is an idiosyncracy of individual lexical items (p.461)".

5 We do not consider how the relation should be represented formally. We can assume H & V's *plane* representation, or we can say that a *connection* is constructed in a connectionist framework. We must await future research on this issue.

6 The structure in (50) in H & V (p.249) suggests that two stresses are copied for *instrumentality*, one from *instrument* and the other from *instrumental*. Moreover, the second structure in (54) (p.250) shows that it is the primary stress of *classify* before the Rhythm Rule that is copied for *classification*.

7 Hammond makes a contradictory assumption concerning the Rhythm Rule. In (4a) (p.141), on the one hand, he assumes that the copied stress is the one before the Rhythm Rule applies. On the other hand, it is the stress after the rule applies that is copied in (9) and (10) (p.144).

References

Aronoff, M. (1976) *Word Formation in Generative Grammar*, MIT Press, Cambridge, Massachusetts.

Chomsky, N. and M. Halle (1968) *The Sound Pattern of English*, Harper and Row, New York.

Goldsmith, J. (1993) "Harmonic Phonology", in *The Last Phonological Rule*, ed. by J. Goldsmith, 21-60, University of Chicago Press, Chicago.

Halle, M. (1990) "Respecting Metrical Structure", *Natural Language and Linguistic Theory* 8, 149-176.

Halle, M., J. W. Harris and J.-R. Vergnaud (1991) "A Reexamination of the Stress Erasure Convention and Spanish Stress", *Linguistic Inquiry* 22, 141-159.

Halle, M. and M. Kenstowicz (1991) "The Free Element Condition and Cyclic versus Noncyclic Stress", *Linguistic Inquiry* 22, 457-501.

Halle, M. and J.-R. Vergnaud (1987) *An Essay on Stress*, MIT Press, Cambridge, Massachusetts.

Hammond, M. (1989) "Cyclic Secondary Stress and Accent in English", *WCCFL* 9, 139-153.

Harris, J. W. (1989) "The Stress Erasure Convention and Cliticization in Spanish", *Linguistic Inquiry* 20, 339-363.

Hulst, H. van der (1992) "The Independence of Stress and Rhythm", paper presented at the 7th International Phonology Meeting (Phonologica 7).

Idsardi, W. (1992) *The Computation of Prosody*, Doctoral dissertation, MIT, Cambridge, Massachusetts.

Kiparsky, P. (1982) "Lexical Morphology and Phonology", in *Linguistics in the Morning Calm*, ed. by the Linguistic Society of Korea, 3-91, Hanshin, Seoul.

McCarthy, J. and A. Prince (1990) "Foot and Word in Prosodic Morphology: the Arabic Broken Plural", *Natural Language and Linguistic Theory* 8, 209-284.

Prince, A. and P. Smolensky (1993) "Optimality Theory: Constraint Interaction in Generative Grammar", ms., Rutgers University and University of Colorado.

Wells, J. C. (1990) *Longman Pronunciation Dictionary*, Longman, Essex.

Zamma, H. (1993) "Stress Retraction in English", *Tsukuba English Studies* 12, 131-161.

Zamma, H. (1995) "Accentuation of *-ory*, *-ive*, and *-ion*", to appear in *English Linguistics* 12.

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