Verbal Compounds in Malayalam

Shûichi YATABE

Mohanan (1986) shows that compounds in Malayalam can be grouped into two categories, sub-compounds and co-compounds, and that the various phonological differences between the two are accounted for if we assume that they are formed in different strata (namely levels) in the lexicon. In this paper I will argue that sub-compounds in Malayalam should be further divided into two subcategories: verbal compounds and root compounds. I will show that this subclassification makes it possible to eliminate several residual stipulations found in Mohanan's (ibid.) account. Section 1 presents the facts that motivate this subdivision, section 2 critically evaluates various possible ways to incorporate the subdivision in question into the overall theoretical framework, and section 3 argues for a particular analysis of verbal compounds in general.[1]

1.   Verbal Compounds and Root Compounds in Malayalam

Mohanan (1986) shows that sub-compounds in Malayalam undergo Onset Fusion (p. 86), Sonorant Degemination (p. 87), Stem-Initial Gemination (p. 90), Stem-Final Gemination (p. 92), and Nasal Deletion (p. 95), and that both sub-compounds and co-compounds undergo Vowel Lengthening (p. 100) and Vowel Sandhi (p. 101). He further points out that verbal compounds, which he takes to be a type of sub-compound, do not undergo Stem-Final Gemination or Nasal Deletion. In this section, I will first recapitulate Mohanan's observation (in subsections 1.1–1.2), and then argue (in subsections 1.3–1.7) that not only Stem-Final Gemination and Nasal Deletion but also Onset Fusion, Sonorant Degemination, Stem-Initial Gemination, Vowel Lengthening, and Vowel Sandhi are inapplicable to verbal compounds.

Before presenting the data, let me define the terms *verbal compounds* and *root compounds*, terms that I borrow from Roeper and Siegel (1978). Verbal compounds are those compounds whose head is a deverbal element and whose non-head constituent is functioning as an argument of that head. Root compounds are those compounds in which there is no predicate-

argument relationship between the immediate daughters.

Throughout this section, my discussion will be deliberately terse, as a detailed exposition of Malayalam phonology will take up too much space. Readers not familiar with the relevant aspects of the language are referred to Mohanan (1986).

1.1. Stem-Final Gemination

Stem-Final Gemination, which is formulated in (1), applies to root sub-compounds, as shown in (2), but not to verbal sub-compounds, as shown in (3) (both of the examples are from Mohanan (ibid.)).

(1) Stem-Final Gemination:

$$C \longrightarrow CC / \underline{\qquad}] [$$
$$\begin{Bmatrix} \mathfrak{t} \\ r \end{Bmatrix}$$

(2) kaaṭə, aana $\longrightarrow$ kaaṭṭaana
forest elephant   untamed elephant

(3) kaaṭə, ooṭ, i $\longrightarrow$ kaaṭooṭi
forest run (agentive)   jungle roamer

1.2. Nasal Deletion

Nasal-Deletion, which is formulated in (4), applies to root sub-compounds, as shown in (5), but not to verbal compounds, as shown in (6) (both of the examples are from Mohanan (ibid.)).

(4) Nasal Deletion:

$$[+\text{nasal}] \longrightarrow \emptyset / \overset{\displaystyle N\ O\ N}{\left|\ \left|\ \right| \underline{\qquad}\right] {}_N [}$$
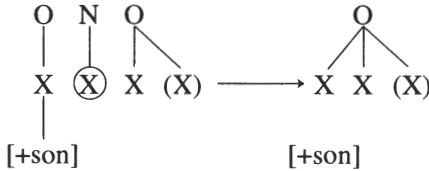
(5) malsyam, caṇta $\longrightarrow$ malsyaccaṇta
fish   market   fish market

(6) maṟam, weṭṭum, i $\longrightarrow$ maṟamweṭṭi
tree,   will cut (agentive)   axe

1.3. Onset Fusion

Onset Fusion, which is formulated in (7), applies to root sub-compounds, as shown in (8) (which is from Mohanan (ibid.)), but does not apply to verbal compounds, as shown in (9) and (10).

(7) Onset Fusion:

$$
\begin{array}{c}
\text{O N O} \\
\text{| | } \diagdown \\
\text{X (X) X (X)} \\
\text{|} \\
\text{[+son]}
\end{array}
\quad \longrightarrow \quad
\begin{array}{c}
\text{O} \\
\diagup \diagdown \\
\text{X X (X)} \\
\\
\text{[+son]}
\end{array}
$$

(8) waaḷə, ṭala   ⟶ waaḷṭṭala

    sword head   sword point

(9) a. kayarə, kayar, i   ⟶ kayarəkayari

         rope   climb (agentive)   rope climber

    b. *kayarkkayari

(10) waaḷə, ṭiin, i   ⟶ waaḷəṭiini

     sword eat   (agentive)   sword eater

The following example is an apparent counterexample, but not a real counterexample. This form is possible simply because [m] is a possible coda in the language.[2]

(11) tiiṭṭam,   ṭiin, i   ⟶ tiiṭṭanṭiini

     excrement eat   (agentive)   excrement eater

1.4. Sonorant Degemination

Mohanan (ibid.) formulates the rule of Sonorant Degemination as follows.

(12) Sonorant Degemination:

$$
\text{C} \longrightarrow \emptyset \; / \underline{\quad} \; \underset{\text{[+son]}}{\underbrace{\text{C C}}}
$$
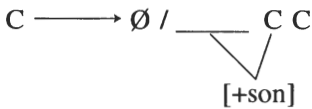
Mohanan (ibid.) cites four "exceptions" to this rule, which are shown below.

(13) pal*l*ə,   poṭi   ⟶ palləpoṭi

     tooth   powder   powdered tooth

(14) kaṇṇə, waiḏyāṛə ⟶ kaṇṇəwaiḏyāṛə

     eye   doctor   eye specialist

(15) peṇṇə, keṭṭə   ⟶ peṇṇəkeṭṭə

     woman tying   marrying (a woman)

(16) kaḷḷə,   kuṭiyan ⟶ kaḷḷəkuṭiyan

     toddy   drinker   drunkard

Three of the forms, namely (13), (15), and (16), can be regarded as verbal compounds. Therefore, they will no longer be counterexamples to the rule of Sonorant Degemination if

we assume that this rule does not apply to verbal compounds.

The following example lends further support to the assumption that verbal compounds do not undergo Sonorant Degemination.

(17) a. kallə, nookk, i   ⟶ kallənookki
         stone look (agentive)   one who looks at stone
      b. *kalnookki

1.5. Stem-Initial Gemination

Stem-Initial Gemination, which is formulated in (18), applies in root sub-compounds, as shown in (19), but does not apply in verbal compounds, as shown in (20).

(18) Stem-Initial Gemination

$$
C \longrightarrow C \quad C \:/\: X\:]\:[\:\rule{2cm}{0.4pt}
$$

$$
\begin{bmatrix} +son \\ -nasal \end{bmatrix} \begin{bmatrix} -son \\ +Drav \end{bmatrix}
$$

(19) pallə,   poṭi ⟶ palppoṭi
     tooth   powder   tooth powder

(20) moorə, kuṭiyan ⟶ moorəkuṭiyan
     buttermilk drinker   one who drinks buttermilk

This is unexpected because *kuṭi-* 'drink' is Dravidian and should undergo this phonological rule according to Mohanan's formulation of the rule.

Notice that the two component words in (19) are the same as those in (13). The compounds made up of those words, however, undergo different sets of phonological rules. This observation clearly illustrates the necessity to distinguish verbal compounds from root compounds.

1.6. Vowel Lengthening

Vowel Lengthening, which is formulated in (21), applies to root sub-compounds, as shown in (22), but does not apply to verbal compounds, as shown in (23).

(21) Vowel Lengthening

$$
N \longrightarrow N \quad /\:\rule{2cm}{0.4pt}\:]\:[
$$
[+Sanskrit]

(22) wadhu, gɨəham ⟶ wadhuugɨəham
     bride house   bride's house

(23) madhu, naaśini ———→ madhunaaśini
      honey destroyer   honey destroyer

Again, this is unexpected because *naaś*- 'destroy' is Sanskrit and hence should undergo this phonological rule according to Mohanan's (ibid.) formulation.

1.7. Vowel Sandhi

Vowel Sandhi, which is formulated in (24), applies in root compounds, as shown in (25) and (26).

(24) Vowel Sandhi: (in [+Sanskrit] forms)
      a. If two nuclei in a sequence are separated by an empty onset, delete the first nucleus node and the onset node.
      b. If the remaining nucleus N is not branching, link the unsyllabified X on the left to the N on the right.

(25) niila, ambaram ———→ niilaambaram
      blue sky   blue sky

(26) rati, iiśwaran ———→ ratiiśwaran
      Rati god   Rati's god

In verbal compounds, however, Vowel Sandhi does not seem to apply, although I have been unable to construct sensible examples illustrating this point.

2. A Crosslinguistic Perspective on Verbal Compounding

In this section, I will first point out some striking parallelisms between verbal compounds in Malayalam and verbal compounds in other languages (subsections 2.1–2.2) and then make some tentative (and ultimately unsuccessful) attempts to construct a crosslinguistically valid theory of verbal compounding (subsections 2.3–2.7). I will begin (in subsection 2.1) by pointing out that verbal compounds in Malayalam obey what is known as the First Sister Principle, a principle first proposed for verbal compounds in English; the First Sister Principle will provide us with a relatively robust criterion for distinguishing verbal compounds from root compounds. Then in subsection 2.2, I will observe that verbal compounds universally undergo fewer phonological rules than root compounds. In subsection 2.3, I will consider one possible analysis of the phonological peculiarities of verbal compounds, which is based on the Right Branch Condition (Otsu (1980)), and argue that it lacks crosslinguistic validity. In subsection 2.4, I will consider another possible analysis of the phonological difference

between verbal and root compounds, which is based on the categorial difference between N and V, and argue that it is stipulative at best. In subsection 2.5, I will present and criticize an analysis of compounding whereby root compounds and verbal compounds are formed at different levels in the lexicon. In subsection 2.6, I will examine whether the relevant facts cannot be captured in diachronic terms, and claim that such an account cannot be the whole story though certain properties of verbal compounds are best regarded as remnants of their historical development. And in subsection 2.7, I will examine whether it is possible to capture the difference between root compounds and verbal compounds in terms of the presence versus absence of linking morphemes.

2.1. The First Sister Principle

In this subsection, I will argue that the First Sister Principle (henceforth the FSP) (see Roeper and Siegel (1978)) applies not only to verbal compounds in English but to verbal compounds in Malayalam as well.

(27) and (28) illustrate the FSP effects in English.

(27) (from Roeper and Siegel (1978))
 a. *peace-thinking / quick(ly)-thinking
 b.   peace-making / *quick-making

(28) (from Roeper and Siegel (1978))
 constructed well by hand by workers in a factory

well-constructed by hand	*hand-constructed well
well-constructed by workers	*worker-constructed well
well-constructed in a factory	*factory-constructed well
hand-constructed by workers	*worker-constructed by hand
hand-constructed in a factory	*factory-constructed by hand
worker-constructed in a factory	?factory-constructed by workers

The FSP effects can be captured by the following general principle.[3]

(29) a. When there is no case-marking etc. that shows which argument slot the argument concerned is to be associated with, the argument is associated with the thematically lowest slot by default.
 b. The thematic hierarchy:
 <ag <re <instr <loc <man <th (predicate)>>>>>>
 (ag = Agent, re = Recipient, instr = Instrument, loc = Location, man = Manner, and th = Theme)

For instance, in example (27b), the first word in the compound must be associated with the Theme slot of the second word, because the Theme slot is the thematically lowest slot in the argument list of the second word. The facts shown in (28) can be explained analogously, if we assume (i) that certain obliques and adjuncts may or may not show up in the argument list of the verb *construct* and (ii) that the argument slot for the subject (in this case the Theme slot) is invisible to the rule stated in (29a) when the compound concerned is adjectival. (The second assumption is not so unnatural as it might seem at first blush, as the subject slot of an adjective can never be saturated through compounding; if the subject slot of the head of an adjectival compound were saturated within that compound, it would become impossible for that compound to function as an adjectival predicate (see also Grimshaw (1990) on this point).) Under these assumptions, the argument list of the verb *construct* can take the form <agent, manner, theme> (where the subject slot is underlined), allowing the first word in the compound to be associated with the Manner argument slot (*well-constructed by workers*), and it can also take the form <agent, instrument, theme>, allowing the first word in the compound to be associated with the Instrument slot (*hand-constructed by workers*).

The principle in (29) is operative in syntax, as well as in the lexicon.[4] For instance, the following facts noted by Roeper and Siegel (1978) are automatically captured by the principle, if we assume that verbs such as *hear*, *give*, and *push* always have Theme slots in their argument lists.

(30) (from Roeper and Siegel (op. cit.))
      a. They danced (for) an hour.
          We are going to walk (for) an hour.
          She drove (for) an hour.
      b. They are not going to hear *(for) an hour.
          She will give *(for) an hour.
          We pushed ?*(for) an hour.

When the time NP is accompanied by the preposition *for*, it can be correctly associated with the time slot in the verb's argument list because the preposition signals that the phrase concerned is to be interpreted as a time adverbial. When the time adverbial is expressed as a bare NP, on the other hand, it cannot be correctly associated with the time slot in the verb's argument list unless the time slot is the thematically lowest slot in that argument list, according to the principle in (29).

Now let us turn to the relevant Malayalam facts. The following compound, which is a verbal compound formed by the agentive suffix -*i*, cannot mean "one who eats with spoons."

It can only mean "one who eats spoons."

(31) spuuɳə, ʈiin, i ⟶ spuuɳəʈiini
      spoon   eat (agentive)   spoon eater

Likewise, the following compound means "piercing of the ear" (where the ear is the Theme) but not "piercing by the ear" (where the ear is the Instrument).

(32) kaaʈə, kuʈʈə ⟶ kaaʈəkuʈʈə
      ear   piercing   piercing of the ear

These observations indicate that verbal compounds in Malayalam are subject to the FSP.

The type of example listed in (28) cannot be constructed in Malayalam, because Malayalam does not have verbal compounds based on passivized verbs.

The following examples are apparent counterexamples to the claim that Malayalam verbal compounds obey the FSP. In these compounds, the first noun seems to be interpreted as the Instrument argument of the second component.

(33) kaʈʈi, kuʈʈə ⟶ kaʈʈikkuʈʈə
      knife stabbing   knife stabbing
(34) waaɭə, payatt- ⟶ waaɭppayattə
      sword fighting   sword fight

The phonological behavior of these compounds, however, shows that they are in fact not verbal compounds but root compounds. Notice that Stem-Initial Gemination, which applies in root sub-compounds but not in verbal sub-compounds, has applied in (33) and (34). Therefore, the compounds in (33) and (34) are not counterexamples to the view that verbal compounds in Malayalam obey the FSP. The first words in the compounds in (33) and (34) are simply modifiers of the second words and are not associated with any of the argument slots of those second words.

Thus it can be concluded that Malayalam verbal compounds exhibit FSP effects, just as English verbal compounds do.

2.2. Phonological peculiarities of verbal compounds in other languages

In this subsection, I will examine the phonological behavior of verbal compounds in Japanese and English and observe that verbal compounds seem to universally undergo fewer phonological rules than root compounds, though in languages such as Japanese and English the difference between the two types of compound is not as conspicuous as it is in Malayalam.

Japanese compounds usually undergo the phonological rule of Rendaku (sequential voicing), which turns an unvoiced obstruent at the beginning of the second component of a compound into a voiced one. However, Rendaku does not apply in all compounds in a mechanical manner. There are several constraints on the application of the rule, some universal, some parochial (see Otsu (1980) and Itô and Mester (1986)).

As recapitulated in Sugioka (1984), Vance (1987), and Satô (1988), the following generalization holds for the rule of Rendaku in Japanese.[5]

(35)   Rendaku does not apply when the first element in the compound concerned is interpreted as the object argument of the second element.

The following minimal pair, due to Hiroto Hoshi (personal communication, 1989), illustrates this generalization.

(36)   a. hiza, keri   ⟶   hiza-keri
           knee kicking   kicking of a knee
       b. hiza-geri
           kicking with knees

In (a), the first element is interpreted as the object argument of the second element and Rendaku does not apply, while in (b), the first element is not interpreted as the object argument of the second element and Rendaku applies. These facts can be easily explained if we assume (i) that Rendaku applies to root compounds but not to verbal compounds, and (ii) that verbal compounds in Japanese obey the First Sister Principle.[6]

The generalization in (35) is theoretically noteworthy, because it suggests that verbal compounds might *universally* undergo fewer phonological rules than root compounds; in Malayalam only root compounds undergo Stem-Initial Gemination etc., and in Japanese only root compounds undergo Rendaku (more or less).

This putative universal holds in English as well. As Roeper and Siegel (1978) observe, English verbal compounds do not undergo the Rhythm Rule, whereas root compounds do, as illustrated below.

(37)   (from Roeper and Siegel (1978))
       a. Ténnessee lover / Tennessée lover
       b. Chínese lover / Chinése lover
       c. kángaroo rider / kangaróo rider

These three examples all make the same point. *Ténnessee lover*, in which the Rhythm Rule has applied, can only be interpreted as a root compound meaning "a person who loves in

a way characteristic to Tennessee," while *Tennessée lover*, in which the Rhythm Rule has not applied, can be interpreted as a verbal compound meaning "a person who loves Tennessee." The same type of contrast obtains in the (b, c) examples as well.

Paul Kiparsky (personal communication) points out that there seems to be another possible analysis for the examples in (37). Instead of saying that root compounds but not verbal compounds undergo the Rhythm Rule, we could conceivably capture the contrast in question by saying that phrases but not compounds (which are not phrases but words) undergo the Rhythm Rule. Thus, it is conceivable that a phrase like *Tennessee lover* is analyzable either as a compound or as a phrase made up of a noun (or an adjective) and a noun and that the string undergoes the Rhythm Rule only when it is analyzed as a phrase. This line of analysis, however, wrongly predicts that a string like *Tennessee lover* can be interpreted as "someone who loves in a way characteristic to Tennessee" even when the word *Tennessee* gets primary stress on the third syllable. Roeper and Siegel's analysis, on the other hand, makes correct predictions.

Thus, verbal compounds in Malayalam, Japanese, and English seem to undergo fewer phonological rules than root compounds in the respective languages.[7]

What we have seen so far in this section (i.e. in subsections 2.1 and 2.2) strongly suggests that there must be a crosslinguistically valid theory of verbal compounding. In the remainder of this section (i.e. in subsections 2.3 through 2.7), I will make some tentative attempts to determine what that theory might look like.

2.3. The Right Branch Condition

Rendaku in Japanese obeys a constraint that is known as the Right Branch Condition. One might therefore wonder if FSP effects exhibited by verbal compounds in English, Japanese, and Malayalam are not all reducible to the Right Branch Condition.

The Right Branch Condition was first proposed by Otsu (1980). According to Otsu, Rendaku applies only to elements that are on a right branch at the lowest level of compound structure (see also Itô and Mester (1986)). Equivalently, we could state the generalization as follows:

(38) Rendaku applies only when the second element of the compound does not have internal structure.

The following examples illustrate the way this constraint works.

(39) a. nise, sakura, matsuri ⟶ nise-sakura-matsuri

         fake cherry festival   [fake [cherry festival]]

    b. nise-zakura-matsuri

       [[fake cherry] festival]

However, the phonological behavior of verbal compounds in Malayalam, which I presented in section 1, cannot be reduced to the Right Branch Condition. Stem-Initial Gemination, for example, takes place whether or not the second stem is morphologically complex.

(40) a. swarṇṇam, pallə, poṭi ⟶ swarṇṇappalppoṭi

        gold   tooth powder   [gold [tooth powder]]

    b. *swarṇṇapalppoṭi

Thus, FSP effects cannot be reduced to the Right Branch Condition.

2.4. Categorial difference

Mohanan (1986) presents one interpretation of the phonological difference between verbal compounds and root compounds in Malayalam. In this subsection, I argue that the analysis in question is stipulative, though possibly descriptively adequate.

Mohanan (op. cit.) claims (i) that verbal compounds have a ternary structure such as

    [[mar̄am] [kayar] [i]] 'tree climber' (p. 144, n. 6)[8]

and (ii) that Stem-Final Gemination and Nasal Deletion do not apply to verbal compounds because these rules require the second stem to be a noun, and not a verb (p. 107, n. 7). Mohanan (1982) argues for the first claim on the basis of the fact that Malayalam does not have compounds of the form [N V] or of the form [V i].

Mohanan's (1982) argument for the ternary structure of Malayalam verbal compounds, however, is unconvincing. The nonexistence of compounds of the form [N V] and [V i] in isolation entails the ternary structure of N-V-i compounds only if we assume with Kiparsky (1982) that there are no bound derived lexical items. As far as I am aware, there is no empirical evidence for this assumption.

In fact, there are reasons to reject this line of analysis. First, consider the following English examples.

(41) (From Kiparsky (1982, p. 20))

    moth-eaten, God-given, self-taught, hand-built, corn-fed, half-rotten

(42) (From Roeper and Siegel (1978))

    a. the well-read book

b. the oft-heard symphony

Notice that the second stems of verbal compounds in (41) and (42) exhibit suppletion. The ternary-structure hypothesis is implausible for these compounds, in that it fails to explain why forms such as *moth-eated*, *God-gived*, and *well-readed* are impossible. The most natural assumption seems to be that these compounds have the binary structure of the form [X A] (where X is either N or Adv).[9]

Next, consider the following Malayalam verbal compounds.

(43) kayarə,   kettə   ——→ kayarəkettə
     rope   tying   rope tyer
(44) malsyam, kuṭiyan ——→ malsyamkuṭiyan
     fish   drinker   fish drinker
(45) paalə,   kuṭiyan ——→ paaləkuṭiyan
     milk   drinker   milk drinker

These compounds, which consist of a usual noun and a deverbal word but are not of the form N-V-i, exhibit the phonological properties of verbal compounds, not of root compounds, just like the compounds of the form N-V-i. (43) shows no Onset Fusion, no Stem-Initial Gemination, (44) shows no Nasal Deletion, and (45) shows no Onset Fusion, no Stem-Initial Gemination. The ternary-structure hypothesis can describe these facts, but it fails to capture the generalization that any deverbal noun can be the second stem in a verbal compound.[10] In other words, the ternary-structure hypothesis predicts that it is possible for a language to allow only one type of deverbal noun (but not other types of deverbal noun) to enter into verbal compounding. This prediction is not borne out by the facts we see in Malayalam, although it is not incompatible with them.

Another problem with Mohanan's (op. cit.) account of the difference between verbal compounds and root compounds in Malayalam is that it fails to account for the difference between verbal compounds and root compounds in Japanese and hence cannot be a universally valid analysis. Rendaku, which (as I have already mentioned) applies to root compounds but not to verbal compounds, applies in a compound verb whose second stem is a verb, as shown by the following examples.[11]

(46) chi,   hashir- ——→ chibashir-
     blood run   veins become visible
(47) te,   kaker-   ——→ tegaker-
     hand   hang   undertake

(48)	kuchi,	komor-	⟶	kuchigomor-
	mouth	stay		mumble
(49)	kuchi,	hashir-	⟶	kuchibashir-
	mouth	run		devulge inadvertently
(50)	awa,	tat-	⟶	awadat-
	bubble	rise		bubble
(51)	ki,	tsuk-	⟶	kizuk-
	air	attach		notice
(52)	ne,	kir-	⟶	negir-
	price	cut		haggle

Thus, the line of analysis proposed by Mohanan (op. cit.) is not applicable in the case of Rendaku. If we state that Rendaku applies only when the second stem in a compound is a noun, we will incorrectly predict that Rendaku cannot apply in compound verbs such as the ones above.

Thus, the analysis under consideration is unsatisfactory in two respects. First, it is based on a questionable hypothesis about the internal structure of verbal compounds. Second, the analysis cannot be universally valid, as it fails to account for the behavior of verbal compounds in Japanese.

2.5. Stratum ordering

In this subsection, I will examine and argue against an analysis of verbal compounding that is based on the idea that verbal compounding constitutes a stratum that is separate from the strata for root sub-compounding and co-compounding.[12]

Given the fact that verbal compounds consistently exhibit different phonological properties from root compounds, a natural line of analysis to pursue within the theory of Lexical Morphology and Phonology is to assume that verbal compounding constitutes its own stratum. We can capture the fact that various phonological rules apply to root compounds but not to verbal compounds by saying that the stratum of verbal compounding is not part of the domain of those phonological rules.

Simply saying that verbal compounding constitutes a separate stratum, however, is not enough. We have observed that in Malayalam, Japanese, and English, verbal compounds undergo fewer phonological rules than other types of compounds. Assuming this descriptive generalization to be a universally valid one, our theory must be able to explain why such a generalization holds. One way to express this generalization within the stratum-ordering theory is to assume that the stratum of verbal compounding is ordered *after* the strata of other

types of compounding.

At the same time, it would be desirable to be able to express the intuitive unity among three types of compounding. In other words, it would be undesirable to regard three types of compounding as completely distinct, unrelated processes. One way to express the unity among root sub-compounding, co-compounding, and verbal compounding is to assume that the three strata for these compounding processes constitute continuous strata, i.e., that the strata for three compounding processes are not interspersed with the strata for processes other than compounding, such as derivation and inflection.

These conceptual considerations lead us to assume that the stratum for verbal compounding is ordered after the strata of root compounding (hence of course after the stratum of derivation), and before the stratum of inflection. We could rename the strata in the lexicon of Malayalam as follows: stratum 1 = derivation, stratum 2 = (root) sub-compounding, stratum 3 = co-compounding, stratum 4 = verbal compounding, and stratum 5 = inflection.

There are two apparent problems with this account.

First, a verbal compound in Malayalam gets only one stress, just like a root compound, but not like a co-compound, which gets as many stresses as there are heads. If we assume that stress assignment takes place at one stratum or continuous strata, we cannot capture why sub-compounds and verbal compounds behave alike while co-compounds do not.

This problem, however, can be circumvented by adopting Paul Kiparsky's (class lectures, 1989) analysis of stress assignment in Malayalam. Kiparsky assumes that sub-compounds and co-compounds have the morphological structures shown below, where S stands for stem and W stands for (morphological) word.

(53)   a. sub-compound: $[_S [_S \alpha] [_S \beta]]$
       b. co-compound: $[_S [_W [_S \alpha]] [_W [_S \beta]]]$

Assuming further that verbal compounds have the same morphological structure as (root) sub-compounds, we can capture the stress patterns of Malayalam compounds by stipulating (i) that stress assignment in Malayalam is a word-level rule, (ii) that the domain of stress assignment is a phonological word, and (iii) that phonological words are demarcated by the left edges of W's. Under these assumptions, a (morphologically simple) sub-compound or a (morphologically simple) verbal compound will constitute one phonological word and hence will receive one stress, whereas a (morphologically simple) co-compound will constitute two (or more) phonological words and hence will receive two (or more) stresses.

Second, the three types of compounding feed each other, although the level-ordering account leads one to expect otherwise.

(54) wirakə, koḷḷi, weṭṭi ⟶ wirakəkoḷḷiweṭṭi
    firewood twig   cutter   one who cuts logs for firewood

(55) aana,   kuṭīra, ṭiini ⟶ aanakuṭīraṭiini
    elephant horse eater   one who eats elephants and horses

Examples (54) and (55) show that both sub-compounding and co-compounding can be fed into verbal compounding. It is also possible for verbal compounding to be fed into sub-compounding and co-compounding.

(56) māram, kayari, maan ⟶ māraŋkayarimaan
    tree   climber deer   a type of deer that climbs trees

(57) māramweṭṭi,   kuḷaŋkoōri   ⟶ māramweṭṭiikuḷaŋkoōri
    axe (tree cutter) bucket (pond gatherer)   an axe and a bucket

These facts, however, do not constitute very strong counterevidence to the level-ordering account either; they can be accommodated into the theory if we assume that there is a loop from stratum 4 to stratum 2. (Notice that it is not necessary to postulate a loop from the stratum of co-compounding to the stratum of sub-compounding that Mohanan (1986) postulated, now that there is a loop from the stratum of verbal compounding to the stratum of root sub-compounding.)

The two modifications to the level-ordering analysis that I have just discussed are not mutually contradictory; the result of the two modifications can be schematized as follows.

(58)
1.   derivation

2.   (root) sub-compounding:
         Onset Fusion, Sonorant Degemination, Stem-Initial Gemination,
         Stem-Final Gemination, Nasal Deletion, Vowel Lengthening, Vowel Sandhi

3.   co-compounding:
         Vowel Lengthening, Vowel Sandhi

4.   verbal compounding

5.   inflection

6.   word-level phonological rules including stress assignment

This analysis seems to be descriptively adequate. Thus, the two problems mentioned above do not constitute real counterarguments against the level-ordering account.

However, there is a further problem with the level-ordering account, which I believe to be unsolvable. Since phrasal elements can occur inside compounds, it is necessary to postulate a loop from phrase-level syntax back into the lexicon. Striking evidence for this point comes from Dutch and related languages. The following Africaans examples are from De Villiers (1979).

(59) agter-die-muur-rook-er (behind-the-wall-smoker)
       in-die-straat-sit-er (in-the-street-sitter)
       laat-in-die-bed-kom-ery (late-in-the-bed-getting)
       voor-in-die-kerk-sit-er (in-front-in-the-church-sitter)
       met-die-hand-in-die-sak-staan-ery (with-the-hand-in-the-pocket-standing)
       met-die-hand-op-die-Bybel-sweer-ery (with-the-hand-on-the-Bible-swearing)

Even a language like English allows certain types of phrasal material to occur inside compounds, both verbal and root, as shown by the following examples.[13]

(60) (from Hoeksema (1985))
       historical linguistics teacher
       metrical structure erasing
       natural history teacher
       natural language learner
(61) a. (from Hoeksema (op. cit.))
          plain-clothes man
          old-age pension
          old-pals act
          First Sister Principle
          Complex NP Constraint
          Minimal Domain Principle
          Nuclear Stress Rule
          Specified Subject Condition
          Stressed Syllable Rule
          Tensed S Condition
          Uniform Three Level Hypothesis
       b. over-the-counter drug
          behind-the-scenes maneuvering
          inside-the-park home run
          broken-bat single

Kiparsky (1982) mentions this problem and proposes to allow "some limited recursion from phrase-level syntax back into morphology," but does not offer an explicit account of how to incorporate this mechanism into the overall theoretical framework.[14]

Moreover, the level-ordering account (augmented by postulation of loops) fails to explain why verbal compounds undergo fewer phonological rules than root compounds, or, for that matter, why co-compounds undergo fewer phonological rules than root sub-compounds. In order to capture the fact that co-compounds undergo fewer phonological rules than sub-compounds, Mohanan (1986) proposed to order the stratum for co-compounding after the stratum for sub-compounding. This ordering, however, does not necessarily ensure that co-compounds undergo fewer phonological rules. Most of the rules that Mohanan formulates are written in such a way that they apply only at (morphological) junctures. Since (morpho-logical) junctures are indicated by brackets and all brackets are erased at the end of each stratum, those rules can apply only to a juncture that is created in the strata where they are operative. Notice that, if all phonological rules refer to the presence of a juncture (i.e. apply only at a juncture), it will no longer be true that junctures created at an earlier stratum undergo more phonological rules than junctures created at a later stratum. Notice, at the same time, that if we postulate rules that do not refer to the presence of a juncture, the interaction of those rules and the loop will produce empirically incorrect predictions. For instance, Mohanan's (op. cit.) formulation of Onset Fusion does not refer to the presence of a juncture, and actually makes wrong predictions; nothing in the theory prevents co-compounds from being fed into stratum 2 through the loop and undergoing Onset Fusion, although the fact is that junctures created by co-compounding never undergo Onset Fusion. The same problem arises with respect to verbal compounding. If all phonological rules refer to the presence of a juncture, the theory will not predict that verbal compounds undergo fewer phonological rules than root compounds; on the other hand, if we postulate rules that do not refer to the existence of a juncture, the interaction of those rules and the loop will make empirically wrong predictions.

It is impossible to eliminate the loop. In addition to the loop, we might even have to postulate a further loop from the stratum for inflection to the stratum for compounding, in order to account for examples like the following.[15]

(62)   (from Selkirk (1982))
       parks commissioner
       programs coordinator
       buildings inspector
       home furnishing department

tryouts judge

weapons analysis

2.6. Diachronic analysis

Vance (1987) claims that Rendaku (sequential voicing) is a historical remnant of the genitive marker *no* or the locative marker *ni* that existed between what are now the first and the second elements of a compound. Consider the following attested Ancient Japanese forms.

(63) (from Vance (1987))
   a. funa-hashi
      'boat-bridge (pontoon bridge)'
   b. funa-no-he
      'boat-GEN-bow (bow of a boat)'
   c. funa-gi
      'boat-wood (wood for boat building)' cf. ki 'wood'

Vance claims (i) that forms like (63a) "presumably derived from simple juxtaposition of the two nouns and therefore did not show sequential voicing,"[16] (ii) that forms like (63b) "retained the genitive particle and naturally did not show sequential voicing either," and (iii) that forms like (63c) "presumably derived from earlier phrases like /Φuna no ki/ by vowel deletion."

This is a very plausible account of how Rendaku came into the phonology of Japanese compounds historically, but it cannot (and perhaps is not intended to) replace synchronic descriptions of the regularities governing the application of Rendaku. For instance, it seems unlikely that either of the following examples, of which the first was provided to me by Bill Poser (personal communication), had the genitive marker *no* or the locative marker *ni* between the two words at an earlier stage.

(64) a. na-zasu
         'name-pinpoint (pinpoint someone by name)' cf. sasu 'pinpoint'
   b. ne-giru
         'price-cut (haggle)' cf. kiru 'cut'

In order to account for these observations, it seems necessary to assume that Rendaku, which may have originated as historical remnants of things like *no* and *ni*, is now governed by a synchronic rule whose relation to its historical origin is indirect.

Thus a diachronic account cannot be the whole story. However, I believe that it does constitute a part of the story, and I will come back to this point in subsection 3.2.

2.7. Linking morphemes

Itô and Mester (1986) claim that the difference between those compounds that undergo Rendaku and those that do not in Japanese can be captured if we assume that there is an invisible linking morpheme in the former class of compounds but not in the latter class of compounds.

This line of analysis does not seem applicable to Malayalam facts, since Malayalam (unlike Japanese) exhibits three-way opposition among root sub-compounds, verbal sub-compounds, and co-compounds, not just two-way opposition. Theoretically, it is conceivable that there are two (or even three) different linking morphemes in Malayalam and that the presence of each morpheme triggers a different set of phonological rules, but I will not pursue this idea in this article because I have been unable to find an insightful way to implement it.

3. A Proposal

In this section, I will propose an alternative analysis of compounding that accounts for the phonological differences between verbal compounds and root compounds.

3.1. Rules for compounding

My proposal is based on the view that the grammar rule that forms verbal compounds is different from the grammar rule that forms root compounds. This is basically the idea proposed in Kiparsky (1982). The difference between this proposal and Kiparsky's (op. cit.) is that in my proposal verbal compounds are characterized as those compounds in which there is predicate-argument relationship between immediate daughters, whereas in Kiparsky's account verbal compounds are just those compounds that are headed by certain particular suffixes such as -*er* and -*ing*. I believe that my analysis, unlike Kiparsky's, succeeds in characterizing verbal compounds as a natural class.

The rules that I postulate for compounding are the following. The notation is based on the theory explicated in Pollard and Sag (1987).[17]

(65) A grammar rule for verbal compounds:
   $X[\text{PHON } f(\alpha_1, \alpha_2), \text{SEM } g(\beta_1, \beta_2), \text{LEX } +]$
   $\longrightarrow C[\text{PHON } \alpha_1, \text{SEM } \beta_1], H[\text{PHON } \alpha_2, \text{SYN } + N, \text{SEM } \beta_2, \text{LEX } +]$

(66) A grammar rule for root sub-compounds:
   $X[\text{PHON } f'(\alpha_1, \alpha_2), \text{SEM } g'(\beta_1, \beta_2), \text{LEX } +]$
   $\longrightarrow M[\text{PHON } \alpha_1, \text{SEM } \beta_1], H[\text{PHON } \alpha_2, \text{SEM } \beta_2, \text{LEX } +]$

(67) A grammar rule for co-compounds:

X[PHON $f''(\alpha_1, \alpha_2)$, SEM $g''(\beta_1, \beta_2)$, LEX +]

$\longrightarrow$ H[PHON α_1, SEM β_1, LEX +], H[PHON α_2, SEM β_2, LEX +]

The rule in (65) says that when a word pronounced as α_2 combines with a constituent pronounced as α_1 to produce a verbal compound, the pronunciation of the resulting compound is the result of applying function f to α_1 and α_2. The head daughter is required to be +N (adjective or noun) because by definition the head of a verbal compound must be deverbal. The rule in (66) says that when a word pronounced as α_2 combines with a constituent pronounced as α_1 to produce a root compound, the pronunciation of the resulting compound is the result of applying fuction f' to α_1 and α_2. Since f and f' can be different functions, this set of rules allows there to be phonological differences between verbal compounds and root compounds. Furthermore, the way the rule in (67) is stated allows co-compounds to be different from both verbal compounds and root compounds. This possibility is attested in Malayalam, as shown in Mohanan (1986) and section 1 of the present paper. It is thus no longer necessary to assign verbal compounding and root compounding to different strata in the word-formation component, or to divide the grammar of a language into two separate components, the lexicon and the syntax; it is now possible to hypothesize that the grammar of a language is simply a collection of rules such as (65)–(67).

What is shown in (65)–(67) are rule schemata, not rules. The values of f, f', etc. are determined by each particular language. For instance, in Malayalam, $f(\alpha_1, \alpha_2)$ is the result of simply concatenating α_1 and α_2, $f'(\alpha_1, \alpha_2)$ is the result of applying Onset Fusion, Sonorant Degemination, Stem-Initial Gemination, Stem-Final Gemination, Nasal Deletion, Vowel Lengthening and Vowel Sandhi at the juncture between α_1 and α_2, and $f''(\alpha_1, \alpha_2)$ is the result of applying Vowel Lengthening and Vowel Sandhi at the juncture between α_1 and α_2. In English, $f(\alpha_1, \alpha_2)$ is the result of simply concatenating α_1 and α_2, $f'(\alpha_1, \alpha_2)$ is the result of applying the Rhythm Rule at the juncture of α_1 and α_2, and it is not clear what the value of f'' should be (because there are so few co-compounds in English). In Japanese, $f(\alpha_1, \alpha_2)$ is the result of simply concatenating α_1 and α_2, $f'(\alpha_1, \alpha_2)$ is the result of applying Rendaku at the juncture of α_1 and α_2, and $f''(\alpha_1, \alpha_2)$ is the result of simply concatenating α_1 and α_2.

Each particular language may impose further restrictions on the rule schemata for compound formation, in addition to specifying the value of f, f', etc. For instance, in a language like English, the SUBCAT list on the verbal compound as a whole must be empty.

The rule in (65) treats all verbal compounds (namely, by definition, compounds that are headed by deverbal elements and that involve predicate-argument relationship) uniformly. This treatment contrasts with the analysis of verbal compounds proposed by Kiparsky (1982).

Kiparsky (op. cit.) proposes to handle those English verbal compounds ending with *-ing*, *-er*, etc. differently from other English compounds. Thus, on Kiparsky's account, compounds in (68) have nothing to do with more prototypical verbal compounds such as *problem-solving* and *truck driver*, whereas, in my analysis, such compounds and compounds in (68) (see Selkirk (1982) for more examples of this type) together form a single class.

(68) (from Hoeksema (1985))
    a. computer-readable, hand-corrigible
    b. self-command
    c. garbage-disposal, self-denial
    d. slum-clearance, self-indulgence
    e. insect-repellent, self-reliant
    f. self-possession, character assassination
    g. cancer-treatment, sales-management
    h. land-enclosure, self-exposure

It is my claim that there is no significant grammatical difference between compounds in (68) and more prototypical (and perhaps more productive) verbal compounds. I have already shown in subsection 2.4 (cf. examples (43)–(45)) that in Malayalam compounds involving predicate-argument relationship always exhibit phonological properties of verbal compounds, regardless of what deverbal suffix is contained in the head of the compound.

Fabb (1984) and Sugioka (1984) have claimed that English verbal compounds involving the suffix *-ing* should be distinguished from other compounds, on the ground that in those compounds the subject of the head cannot be expressed as the first element of the compound, as illustrated below.

(69) (from Sugioka (1984))
    a. *heart-failing / heart failure
    b. *population-growing / population growth
    c. *rain-falling / rainfall
    d. *earth quaking / earthquake

I would like to claim, albeit without any supporting arguments, that in English the grammatical subject can never be expressed within a verbal compound and that compounds such as *heart failure*, *population growth*, *rainfall*, and *earthquake* are root compounds, not verbal compounds.

I submit that the grammatical subject cannot be inside a verbal compound in English because in this language grammatical subjects are specifiers, not complements. Since the rule

(schema) for verbal compounds states that a verbal compound must consist of a head and its complement, there is no way for a specifier to be a component of a verbal compound. It is to be noted here that the Dutch counterparts of the *-ing* compounds in (69) are grammatical, as mentioned in Hoeksema (1984).

(70)   (from Hoeksema (1984))
    a. weersverandering '*weather-changing'
    b. aard-beev-ing '*earth-quaking'
    c. ambtenaren staak-ing '*civil-servants striking'
    d. grond-verzak-ing '*land-sliding'
    e. klank-verander-ing '*sound-changing'
    f. kosten-stijg-ing '*costs-rising'
    g. maag-bloed-ing '*stomach-bleeding'
    h. temperatuur-schommel-ing '*temperature-fluctuating'

This contrast between English and Dutch can be explained if we assume that grammatical subjects are complements in Dutch.[18]

3.2.   Capturing the phonological peculiarities of verbal compounds

Unfortunately, the proposed account is just like the level-ordering account in that it does not explain why verbal compounds undergo fewer phonological rules than root compounds. I submit that this fact should be captured in diachronic terms. I have already mentioned Vance's diachronic account of Rendaku, according to which Rendaku, which is observed in root compounds in Japanese, is a historical remnant of the genitive marker *no* (or the locative marker *-ni*). If we analogously assume that root compounds in Malayalam developed from two nouns connected by a genetive (or some other) marker, whereas verbal compounds developed from some other structure (probably some type of gerund in which a noun and a verb are combined without the help of any linking morpheme such as a genitive marker), then it is expected that verbal compounds should undergo fewer rules than root compounds. Root compounds would undergo various phonological rules that reflect the existence of linking morphemes at an earlier stage of the language, while verbal compounds would undergo few if any phonological rules. This line of analysis is plausible at least to a certain extent, in light of the fact that three of the seven phonological rules that apply to root compounds (i.e. Stem-Initial Gemination, Stem-Final Gemination, and Vowel Lengthening) have the effect of adding an extra slot (a consonant slot in the case of the first two and a vowel slot in the last one) to the juncture.[19]

4. Summary

In this article, I have observed that verbal compounds and root compounds in Malayalam have different phonological properties and argued that the difference between the two should be captured by setting up two separate grammar rules for constructing them. Furthermore, I have observed that verbal compounds universally undergo fewer phonological rules than root compounds and speculated that this is because root compounds, but not verbal compounds, historically develop from structures involving linking morphemes such as genitive case markers.

Notes

1) This paper could not have come into existence without the help I received from K. P. Mohanan, to whom I owe everything I know about Malayalam. In a sense, he is the "ghostwriter" of section 1 below. (See Mohanan (1995) for his recent discussion of the issue brought up in this paper.) I am also grateful to Joan Bresnan, Paul Kiparsky, Tara Mohanan, Bill Poser, Ivan Sag, Peter Sells, and Tom Wasow for their invaluable help. Needless to say, none of these individuals are responsible for the numerous loose ends that still remain in this paper. An earlier version of this paper was presented in 1991 at the XIIIth South Asian Languages Analysis Roundtable, University of Illinois, Urbana-Champaign.

2) The *m* sound at the end of the first constituent in this compound is turned into the *n* sound by an assimilation rule that applies (at least) at the postlexical level (cf. Mohanan (1986, pp. 69–70)).

3) This analysis is an extension of what is proposed in Grimshaw (1990). The version of the thematic hierarchy that I adopt here (which is based on the one argued for in Yatabe (1990; 1993, Ch.3)) is compatible with the versions that Jackendoff (1972) and Grimshaw (1990) assume. It differs from the version of the hierarchy assumed in Bresnan and Kanerva (1989) in that it assumes that Location is thematically higher than Theme. Provided that the characterization of the FSP proposed in the text is accurate, an example like *flower-arranging in vases*, discussed in Grimshaw (1990), favors the version that I have adopted here.

4) In fact, I will argue in section 3 below that it is not necessary to divide the grammar into the syntactic component and the word formation component.

5) As Satô (op. cit.) notes, there are some complications to this generalization. See Sugioka (op. cit.), Vance (op. cit.), and Satô (op. cit.) for details.

6) By the term *the First Sister Principle*, I am referring to the rule stated in (29), and not to what Roeper and Siegel (1978) proposed. Thus, the fact that word order is reiatively free in Japanese is insignificant in the present context.

7) This generalization seems to hold in Korean too. The so-called "tensification" associated with compounding takes place only in the case of root compounds (Cho (1994)).

8) Kiparsky (1982) makes the same claim for verbal compounds in English.

9) I follow Selkirk (1982) in assuming that the head of a compound like *well-read* (namly *read* in this

case) is an adjective, not a verb.

10) The same generalization holds in English as well. See section 3 below (especially (68)).

11) The examples in (46)–(52) are not verbal compounds, by definition, because the second components of these examples are not deverbal elements.

12) Sproat (1986) also argues against this type of analysis.

13) I owe the examples in (61b) to Thomas Wasow.

14) I will come back to this point in section 3 below.

15) Peter Sells informs me that there is a difference between *-er* compounds and *-ing* compounds in this regard. Thus, *books-reading sounds much worse than *books reader*. I don't have an explanation for this observation.

16) Ivan Sag (personal communication) points out that this is probably a co-compound. This interpretation is plausible in light of the fact that this word refers to an object that is both a boat (or boats) and a bridge.

17) Here *M* is intended to mean "modifier" (not "marker"), and +*N* is intended to mean "adjective or noun." See Pollard and Sag (1994) for a more recent version of the theory.

18) Along the lines suggested in Fukui (1988), I assume that there is crosslinguistic variation as to which categories take specifiers and which do not. What I need to assume here is that V takes a specifier in English but not in Dutch.

19) One possible problem with this speculation is the following. In Malayalam, there is a phonological process that applies at the syntactic juncture between a verb (or a postposition) and its complement (Mohanan (1986, pp. 148–149)), as illustrated below. Notice that the verb-initial obstruent is geminated in (ib).

(i) a. kaḷḷane   kuṭṭi   kaṭiccu.
       thief-ACC   child-NOM   bit
       'The child bit the thief.'
    b. kuṭṭi   kaḷḷane   kkaṭiccu.
       child-NOM   thief-ACC   bit
       'The child bit the thief.'

This process, as stated in Mohanan (op. cit.), applies when the complement immediately preceding the verb is in the accusative case. I am forced to assume that verbal compounds in Malayalam developed from a structure that did not contain the accusative marker between a noun and a verb.

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