

# A Note on Bantu Extensions and Syntactic Word Formation

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## ABSTRACT

Suffix order in Bantu is determined by two (sometimes conflicting) principles. According to the *Mirror Principle*, affix orders must reflect scope relations, while the *CARP template* requires suffixes to appear in a fixed linear order. This paper discusses examples from different Bantu languages where a particular affix order violates one of these principles, and it describes how these cases are analysed in two prominent syntactic theories of word formation. In Distributed Morphology, words are formed via syntactic head movement, but the linear order of affixes can be changed by morphological rules that apply post-syntactically. In an alternative approach, all possible suffix orders are derived by phrasal movement in the syntax. I show that the Bantu data support the Distributed Morphology approach, because in this theory, Mirror Principle effects follow directly from the strictly local nature of the syntactic process that derives complex words, viz. head movement.

*Keywords:* *Mirror Principle, CARP, Bantu extensions, Distributed Morphology.*

## 1. INTRODUCTION

Verb stems in Bantu languages may include a number of derivational suffixes (called "extensions") that express various functions, such as causative, applicative, reciprocal or passive. Hyman (2003: 249) proposes a morphological template, known as CARP, which determines that the default order of these four common extensions in Bantu languages is as in (1) (where > stands for "linearly precedes"):

(1) CARP template:  $V_{\text{Root}} > \text{CAUS} > \text{APPL} > \text{REC} > \text{PASS}$

Another condition that has been argued to determine affix order is Baker's (1985) Mirror Principle, which states that the linear order of affixes derived from a syntactic structure  $\alpha$  corresponds to the hierarchical order of terminal nodes in  $\alpha$ , such that, if suffix Y follows X in morphology, then the category corresponding to Y asymmetrically c-commands X in the syntax:

(2) Mirror Principle:  $[\text{word } V > X > Y]$  is derived from  $\alpha = [{}_{\text{YP}} Y [{}_{\text{XP}} X [{}_{\text{VP}} V]]]$

In this paper, I discuss how the form of complex verb stems in Bantu is shaped by CARP and the Mirror Principle and how these two constraints can be incorporated into syntactic theories of word formation. In my discussion, I do not present any new empirical facts or generalisations, but merely use existing and relatively well-known Bantu data to compare and evaluate two competing theories. Both theories assume that derivational suffixes correspond to terminal nodes in the syntax, but differ in their assumptions about how these nodes are combined into complex verb stems. In the theory of Distributed Morphology (DM; Halle & Marantz 1993 and subsequent work), verb stems correspond to morphosyntactically complex heads that are derived via syntactic and post-syntactic movement operations such as head movement, Lowering and Local Dislocation. The alternative theory of syntactic word formation, which I call here the "phrasal movement approach" (PMA), instead assumes that the order of suffixes in complex verb stems is derived by phrasal movement. According to the PMA, the verb root does not move as a head and adjoin to the terminal node corresponding to the suffix; rather, the whole (remnant) VP moves into a specifier to the left of the suffix. The resulting verb stem with the morpheme order  $V > \text{suffix}$  is not associated with a complex head, but corresponds to the maximal projection of the suffix.

My main objective is to show that the DM approach is superior to the PMA when it comes to explaining suffix order in Bantu, because in the former, the effects of the Mirror Principle are a direct consequence of the local nature of head movement. In contrast, the Mirror Principle has no privileged status in the PMA, because affix orders which violate the Mirror Principle are as easily derivable via phrasal movement as affix orders that obey it. While this latter property is sometimes considered an advantage of the PMA, I will show in my discussion of suffix order in Bantu that it is in fact a problematic aspect of this theory.

In section 2, I introduce the Mirror Principle and CARP, and I motivate the idea that semantic relations between derivational suffixes are represented through asymmetric c-command relations between the categories that correspond to these suffixes in the syntax. In section 3 I show how Bantu verb stems which violate the Mirror Principle are analysed in the PMA, and I contrast this analysis with a DM account of Mirror Principle violations. In section 4, I discuss a phenomenon, called "asymmetric compositionality" by Hyman (2003), which suggests that violations of CARP are only tolerated in Bantu when the relevant affix order observes the Mirror Principle. I interpret this phenomenon as evidence in favour of the DM analysis, in which Mirror Principle violations are analysed in terms of a post-syntactic operation which changes the underlying affix order derived by head movement. My conclusion is presented in section 5.

## 2. THE MIRROR PRINCIPLE AND THE CARP TEMPLATE IN BANTU

Baker's (1985) *Mirror Principle* states that the order of syntactic categories and the order of suffixes that realise these categories are isomorphic:

(3) The Mirror Principle (Baker 1985: 375)

Morphological derivations must directly reflect syntactic derivations (and vice versa).

The Mirror Principle can be interpreted as expressing a link between morphological locality and syntactic hierarchy: if suffix X is closer to a root than suffix Y, then the category that corresponds to Y asymmetrically c-commands the category that corresponds to X in the syntax (and vice versa):<sup>1</sup>

(4)  $[_{\text{word}} V > X > Y]$  is derived from  $\alpha = [_{\text{YP}} Y [_{\text{XP}} X [_{\text{VP}} V]]]$

Evidence for the idea of a "perfect" mapping from syntax to morphology is provided by the fact that different semantic relations are sometimes expressed by different possible suffix orders in Bantu languages. If one assumes that the semantic relations between suffixes are reflected syntactically through asymmetric c-command relations, then the following example from Bemba (M42) provides evidence for the Mirror Principle:<sup>2</sup>

- (5) a. Na-a-mon-an-y-a      Mwape      na      Mutumba.  
1S-PAST-see-REC-CAUS-FV   1.Mwape      and      1.Mutumba  
"I made Mwape and Mutumba see each other."  
b. Mwape      na      Chilufya      ba-a-mon-eshy-an-a      Mutumba.  
1.Mwape and      1.Chilufya      2.SM-PAST-see-CAUS-REC-FV   1.Mutumba  
"Mwape and Chilufya made each other see Mutumba."

[Bemba; Baker 1985: 395; glosses adapted]

The translations in (5) show that, when a causative takes scope over a reciprocal in Bemba, the resulting meaning "cause to V each other" is represented by the affix order V-REC-CAUS. In contrast, when the reciprocal takes scope over the causative, the meaning "cause each other to V" is represented by the order

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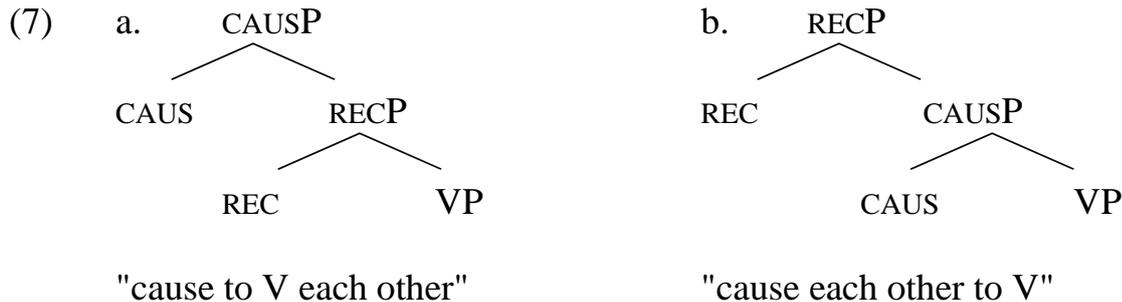
<sup>1</sup> See Baker (2002: 326): "[T]he order of morphemes in a complex word reflects the natural syntactic embedding of the heads that correspond to those morphemes."

<sup>2</sup> Morphemes are glossed as follows: 1S = first person singular; APPL = applicative; AUG = augment; CAUS = causative; FV = final vowel; PASS = passive; PAST = past tense; PROG = progressive; REC = reciprocal; SM = subject agreement marker. Numbers associated with nouns or agreement markers represent noun classes.

V-CAUS-REC (see Hyman & Mchombo 1992: 350 and section 4 for similar examples from Chicheŵa):

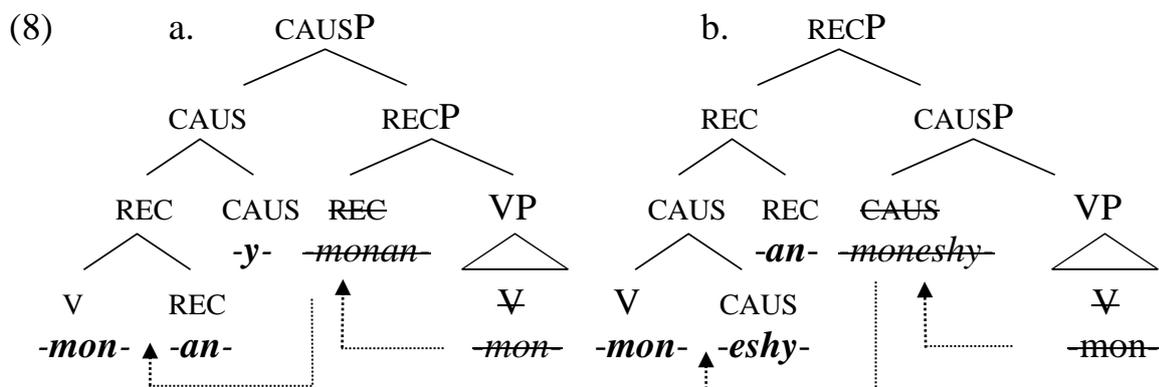
- (6) a. V-REC-CAUS: "cause to V each other"  
 b. V-CAUS-REC: "cause each other to V"

The assumption that these different scope relations are represented in the syntax via asymmetric c-command implies that the two interpretations in (6) are represented by the two different structures in (7):



The Mirror Principle then correctly predicts the correspondence between the respective suffix orders in (6) and the syntactic representations in (7). Examples like (5) from Bemba therefore provide support for the idea that different syntactic relations (which correspond to different interpretations) are reflected in the linear order of suffixes.

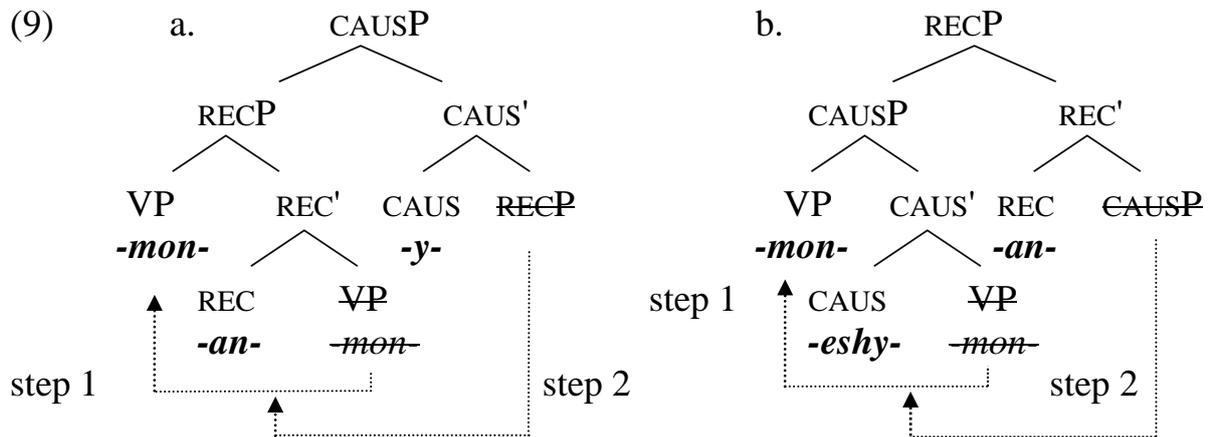
There are two prominent syntactic theories of word formation that explain how the suffix orders in (6) can be derived from the syntactic structures in (7). The first approach, put forward by Baker (1988), argues that complex verbs like those in (5) are derived via "incorporation", i.e. successive head-to-head movement. According to this approach, the verb moves from head to head in the structure, picking up the derivational affixes on the way:



Because CAUS asymmetrically c-commands the reciprocal in (7a)/(8a), the verb in this structure first adjoins to the reciprocal affix; the complex REC-head then moves and combines with the causative affix, deriving a complex CAUS-head with the affix order V-REC-CAUS. When the scope relation between REC and CAUS

is reversed, head movement derives the opposite affix order V-CAUS-REC, as shown in (8b).

A syntactic alternative to the analysis illustrated in (8), which is inspired by Cinque's (2005) influential analysis of the DP-internal order of nouns, demonstratives and other modifiers, is what I call the "phrasal movement approach" (PMA). Like the head movement analysis, this alternative assumes that suffixes are represented as heads of phrasal categories in the syntax. However, particular suffix orders are not derived via head movement, but via (remnant) movement of maximal projections (see e.g. Buell 2005; Muriungi 2008, 2014 for Bantu). On the basis of the syntactic hierarchy in (7a), the complex verb stem V-REC-CAUS is derived via so-called "roll-up" movement. As shown in (9a), the VP first moves to the specifier of RECP (step 1). In step 2, VP-movement pied-pipes the category that dominates VP, so the whole RECP, with the VP in [Spec, REC], moves to the specifier of CAUSP. When the syntactic relations are reversed, roll-up movement derives the opposite suffix order V-CAUS-REC, (9b):



Note that, in contrast to (8), the derived verb stems in (9) do not correspond to complex heads, but are spread across maximal projections (CAUSP in (9a), RECP in (9b)) (see Julien 2002 for an application of this "clausal word" approach to prefixation in Bantu).

However, not all Bantu extensions are as well behaved as the causative and the reciprocal. The examples in (10) show that the order of the causative and the applicative marker in Chicheŵa (N31) does not always reflect their scope relations:

- (10) a. Alenjé a-ku-líl-íts-il-a mwaná ndodo  
 2.hunters 2.SM-PROG-cry-CAUS-APPL-FV 1.child 10.sticks  
 "The hunters are making the child cry with sticks."
- b. Alenjé a-ku-tákás-its-il-a mkází mthíko  
 2.hunters 2.SM-PROG-stir-CAUS-APPL-FV 1.woman 9.spoon  
 "The hunters are making the woman stir with a spoon."

[Chicheŵa; Hyman 2003: 248; glosses adapted]

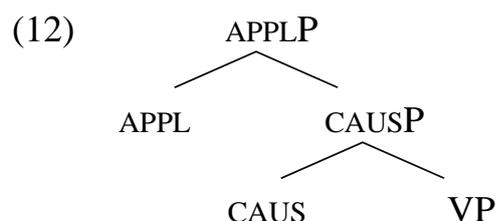
(10) demonstrates that the combination of a causative and an instrumental applicative in Chicheŵa also gives rise to scope ambiguity: (10a) is an applicativised causative (the sticks are an instrument for causing to cry); (10b) is a causativised applicative (the spoon is an instrument for cooking). The problem is that, in contrast to the order of reciprocal and causative, these two scope relations are *not* represented by different affix orders. The order of applicative and causative in Chicheŵa is invariant and always realised as *V-its-il-*.

Based on data such as (10), Hyman (2003: 249) proposes the CARP template, which determines that the causative, applicative, reciprocal and passive suffix in Bantu languages are preferably realised in the following order:

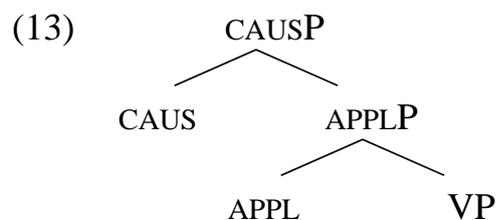
- (11)  $V_{\text{Root}} > \text{CAUS} > \text{APPL} > \text{REC} > \text{PASS}$

I henceforth follow Hyman (2003), Good (2005), McPherson & Paster (2009) and others, and take CARP to be a morphological principle that determines (11) as the default order of extensions in Bantu. I also follow Hyman in assuming that affix orders may occasionally deviate from the order determined by CARP; this possibility is a specific lexical property of certain affixes in particular Bantu languages. For example, the reciprocal suffix in Bemba (and also in Chicheŵa, as I will discuss in section 4) must have this property; otherwise, the reciprocal and the causative could not appear in the order REC-CAUS, which violates CARP.

What are the implications of the CARP template for the syntactic representation of verb stems that contain an applicative and a causative suffix? One possibility would be that, in contrast to combinations of CAUS and REC, the hierarchical relation of CAUS and APPL in Chicheŵa is fixed in the syntax and always represented as in (12), regardless of scope:



This assumption would explain why the order of affixes is rigid in (10), but it does not explain how the causative can take scope over the applicative in (10b). But if we continue to assume that different scope relations are represented by different syntactic configurations, then only the meaning in (10a) would be based on the syntax in (12), while (10b) would be based on the syntax in (13). However, given that the affix order in (10b) is *V-CAUS-APPL*, (13) violates the Mirror Principle:



It seems that we have reached a dilemma: we either have to give up the idea that meaning differences of the sort displayed in (10) are reflected in the syntax, or we have to deal with suffix orders that violate the Mirror Principle. Which approach should be chosen?

I believe that the latter approach is preferable, because there is evidence that the syntax in (13) is independently required for the analysis of certain constructions with the affix order V-CAUS-APPL. Hyman & Mchombo (1992: 359) and Hyman (2003: 264) show that the combination of the verb root *uk-*, "wake up", and the applicative marker *-il-* produces the idiomatic reading "rebel against" in Chicheŵa. When the lexicalised combination *uk-il-* is causativised, the causative suffix again separates the applicative from the verbal root, deriving *uk-its-il-*, "cause to rebel against". In order to derive this verb stem from a syntax that conforms to the Mirror Principle, one would again have to postulate a syntactic representation like (12) above, in which the causative combines with the VP first.

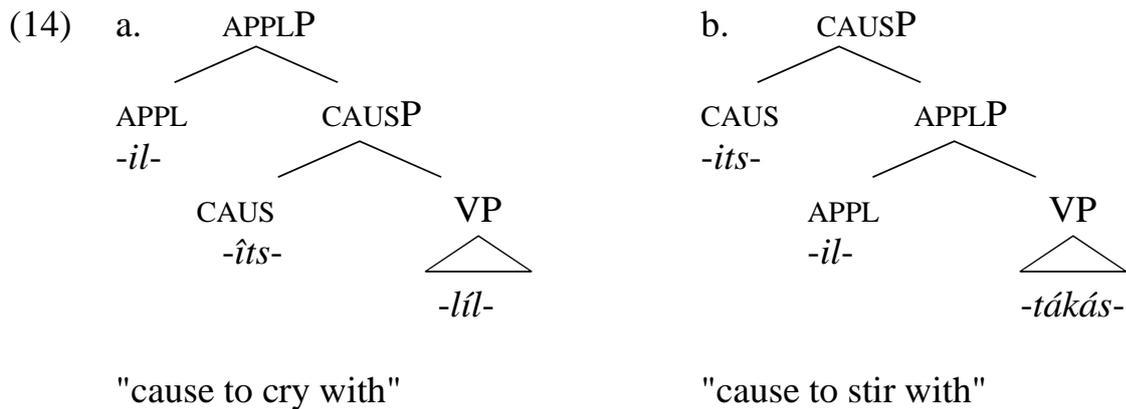
The problem with this structure is that it does not represent the lexicalised V-APPL-combination as one constituent. However, it is a standard assumption in theories of the lexicon-syntax interface that two or more elements which together form an idiomatic expression must be represented as one constituent at some level of syntax (see Marantz 1984, 1997; Jackendoff 1997, and many others). This means that the affix order *uk-its-il-* cannot be based on the syntactic representation in (12), since there is no node in this structure which would correspond to the lexical meaning "rebel against". The only syntactic representation which includes such a node is the representation in (13), where APPL combines with the VP before CAUS merges with APPL. This structure allows for the idiomatic meaning of the verb *uk-* plus applicative to be associated with the higher APPL-node. This means, however, that it must be possible to derive the suffix order *uk-its-il-* from the syntax in (13), in violation of the Mirror Principle.

Idiomatic verb-suffix combinations therefore demonstrate that in some cases, a linear affix order V-X-Y corresponds to an underlying structure in which the verb and Y form a constituent. But if this possibility exists anyway, then the most parsimonious analysis of the scope ambiguity in (10) is one which maintains the view that each interpretation is linked to a different syntax. The question that then arises for syntactic theories of word formation is how the affix order V-CAUS-APPL can be derived from two different underlying syntactic structures, of which one violates the Mirror Principle. I address this question in the next section.

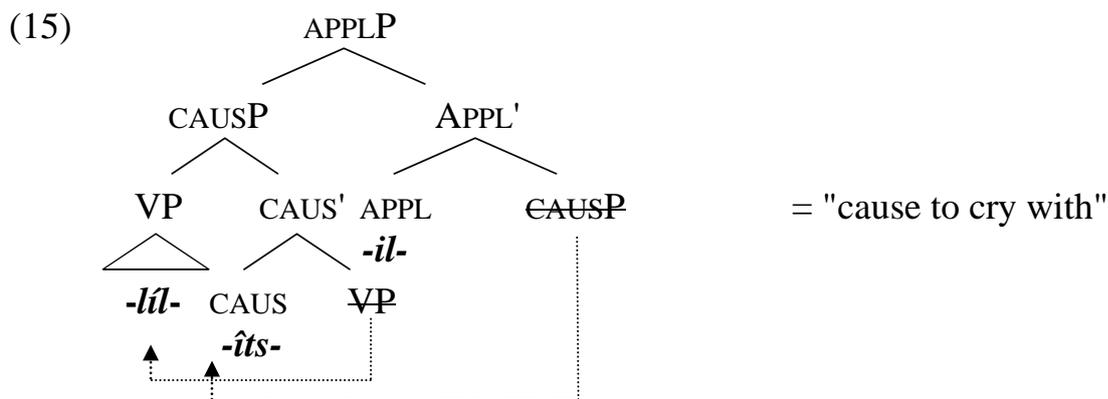
### 3. MIRROR PRINCIPLE VIOLATIONS AND SYNTACTIC WORD FORMATION

#### 3.1 CYCLIC PHRASAL MOVEMENT

The Chicheŵa examples in (10) above are discussed and analysed in Muriungi (2014: 37) in terms of the PMA. Given the scope relations expressed by these examples, Muriungi assumes that (10a) is represented by the underlying syntax in (14a), while (10b) starts out from the syntax in (14b).



According to Muriungi, the fixed affix order V-CAUS-APPL in (10) can be derived in both structures, but through different syntactic movement processes. The verbal complex *-lîl-îts-il-* in (10a), which obeys the Mirror Principle, is derived from (14a) exactly like the V-REC-CAUS and the V-CAUS-REC affix orders discussed in section 2, i.e. via roll-up movement. The (remnant) VP containing the verb root first moves to the specifier of CAUS, and then CAUSP, including the VP in its specifier, moves to [Spec, APPL]:



Importantly, as Muriungi (2008, 2014) emphasises, the PMA allows for syntactic word formation to proceed in an alternative way. In order to derive the affix order *-tákás-its-il-* from the syntax in (14b), the (remnant) VP will move to [Spec, APPL] in a first step. However, the next movement step cannot be roll-up movement of the APPLP, as this would derive the wrong order of suffixes.



### 3.2 DISTRIBUTED MORPHOLOGY AND LOCAL DISLOCATION

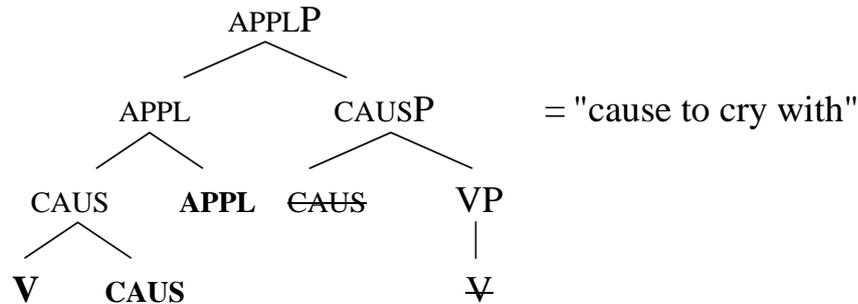
In the theory of Distributed Morphology (DM) (Bobaljik 2012; Embick 2010; Embick & Noyer 2001; Halle & Marantz 1993; Harley 2010; Marantz 1997; Noyer 1997, and many others), morphology is considered to be a set of operations in the PF-component of grammar that map the output of narrow syntax to phonology. In DM, the terminal nodes of morpho-syntactic representations ("morphemes") are supplied with phonological material ("vocabulary items") at PF, a process known as Vocabulary Insertion (or "late" insertion). In the default case, the morpho-syntactic structure targeted by Vocabulary Insertion is the output of syntactic operations such as head movement. As was shown in section 2, head movement combines different terminal nodes under one complex head by adjoining the head Y of X's YP-complement to X. However, DM postulates that complex heads can also be formed in the morphological component, via PF-operations that modify the output of syntax under specific structural conditions. One such operation is Lowering, a post-syntactic process that adjoins a head X to the head Y of its YP-complement at PF. Lowering explains, for example, that V and Infl form a complex head in English that can be the target of Vocabulary Insertion of suppletive verb forms, even though V does not move to Infl in narrow syntax. Both head movement and Lowering are sensitive to syntactic hierarchies; they apply under structural adjacency, which determines the relation between a head X and the head of its complement.

Another post-syntactic operation in DM, discussed in Embick & Noyer (2001), Embick (2007) and Embick & Marantz (2008), is Local Dislocation. Local Dislocation applies after vocabulary items have been inserted into terminal nodes and is therefore sensitive to the phonological properties of these vocabulary items. Since Vocabulary Insertion translates syntactic hierarchies into linear strings, the context for Local Dislocation is determined by linear adjacency. Local Dislocation adjoins an element X to another element Y to which it is linearly adjacent, which may reverse the order of X and Y determined by the syntax. For example, according to the analysis in Embick & Marantz (2008), the syntax of comparatives in English determines that the syntactic head Deg, which hosts the comparative feature, precedes the adjective. In the default case, Deg is therefore pronounced as a separate word preceding the adjective (as in e.g. *more intelligent*). However, when the specific vocabulary item inserted into the adjectival node has the relevant phonological properties (i.e. it consists of at most one metrical syllable), then the order of Deg and Adj is reversed by Local Dislocation, in which case Deg is suffixed to Adj and pronounced as *-er* (as in *smart-er*).

With Local Dislocation, DM offers an instrument to explain the Mirror Principle violation illustrated by the Chicheŵa example in (10b) above. In DM, the CARP template translates into a PF-requirement to align certain affixes according to the default order in (11) after Vocabulary Insertion. First, consider

the example in (10a), where the applicative takes scope over the causative ("cause to cry with sticks"). The syntax underlying this meaning determines that head movement first adjoins the verb to CAUS, and the complex CAUS-head then adjoins to APPL, deriving the complex head [[[V] CAUS] APPL], (17a). Vocabulary Insertion then derives the linear affix order *-líl-íts-il-*, (17b):

(17) a. after head movement in syntax:



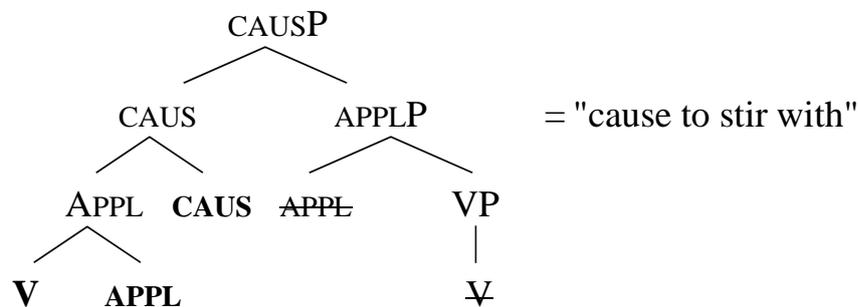
b. after Vocabulary Insertion:

[[[-líl-]-íts-]-il-]

Since the order of affixes in (17b) is CARP-compatible, no post-syntactic operations are necessary, and Local Dislocation, which would change the affix order, therefore does not (and in fact, cannot) apply.

Now consider the example in (10b), where the causative scopes over the applicative ("cause to stir with a spoon"). Here, the complex head derived by syntactic head movement is of the form [[[V] APPL] CAUS], (18a). After Vocabulary Insertion, the affix order is *-tákás-il-íts-*, (18b), which violates CARP. Since the combination of causative and applicative does not tolerate a CARP-violation, Local Dislocation has to apply, (18c):

(18) a. after head movement in syntax:



b. after Vocabulary Insertion:

[[[-tákás-]-il-]-íts]

c. after Local Dislocation:

[[[-*tákás*-]-*its* + *-il*-]]

(17) and (18) show that in DM, suffix orders which obey the Mirror Principle directly reflect the output of syntax, while CARP-compatible suffix orders which violate the Mirror Principle are derived post-syntactically via Local Dislocation.

The fact that only Mirror Principle violations involve an additional operation in the morphology is nicely illustrated by Cook's (2013) DM analysis of reduplication in the Nguni language Ndebele (S44). In Ndebele, the applicative and the passive extension always combine with the verb root in the invariant CARP-order V-APPL-PASS (e.g. *phek-el-w-*, "to be cooked for"). When this suffix order is derived from an underlying structure in which the passive takes scope over the applicative, it obeys the Mirror Principle, (19a). However, when the applicative scopes over the passive, the Mirror Principle is violated, (19b):

(19) a. A-ba-ntwana      b-a-phek-el-w-a                      u-ku-dla      PASS > APPL  
          AUG-2-children    2.SM-PAST-COOK-APPL-PASS-FV    AUG-15-food  
          "The children were cooked food."

         b. U-ku-dla      kw-a-phek-el-w-a                      a-ba-ntwana    APPL > PASS  
          AUG-15-food    15.SM-PAST-COOK-APPL-PASS-FV    AUG-2-children  
          "The food was cooked (for) the children."

[Hyman, Inkelas & Sibanda 2009: 298; glosses adapted]

As observed by Hyman, Inkelas & Sibanda (2009), an interesting asymmetry arises when reduplication applies to the verb stem in (19). With the applicativised passive in (19b), the reduplicant can be of the form V-APPL, but also of the form V-PASS. However, when the passive scopes over the applicative, a reduplicant of the form V-PASS is not possible:<sup>3</sup>

(20) Reduplicated applicativised passive:

- a.      *phek-e* + *phek-el-w-a*    [V-APPL] + [V-APPL-PASS], or:  
 b.      *phek-wa* + *phek-el-w-a*    [V-PASS] + [V-APPL-PASS]

(21) Reduplicated passivised applicative:

- a.      *phek-e* + *phek-el-w-a*    [V-APPL] + [V-APPL-PASS], but not:  
 b.      \**phek-wa* + *phek-el-w-a*    \*[V-PASS] + [V-APPL-PASS]

According to Cook (2013), the two possible alternatives in (20) are the result of reduplication applying either before or after Local Dislocation. With

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<sup>3</sup> A third option, which exists with both (20) and (21), is that the reduplicant copies the verbal root plus the final vowel. I have ignored this option here for ease of exposition; but see Hyman, Inkelas & Sibanda (2009) and Cook (2013) for details.

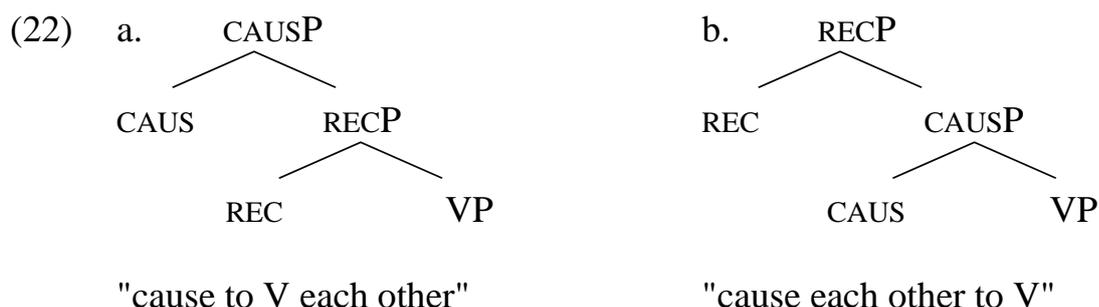
applicativised passives, the output of syntax is the structure [[[V] PASS] APPL], so Local Dislocation must apply to derive the CARP order. After Vocabulary Insertion, reduplication copies the first two syllables of the verb stem. When this happens *before* Local Dislocation, the form of the reduplicant will be V-PASS, but when reduplication applies *after* Local Dislocation, it is V-APPL. The impossibility of a V-PASS reduplicant in (21) now follows from the fact that with a passivised applicative, the passive morpheme is never adjacent to the verb root at any stage of the derivation. This is because the CARP-compatible order V-APPL-PASS is already derived in the syntax, via head movement. Therefore, Local Dislocation does not apply, and consequently, only one reduplicant with the form V-APPL is licensed. The contrast between (20) and (21) hence demonstrates that in DM, only the derivation of suffix orders which violate the Mirror Principle involves Local Dislocation.

To sum up this section, we have seen that both theories of syntactic word formation introduced in section 2 can account for the derivation of suffix orders which violate the Mirror Principle. In both approaches, these violations are ultimately a consequence of the CARP template, which regulates the relative order of derivational suffixes in Bantu. In the PMA, CARP determines the nature of the syntactic movement operations that can or cannot apply in a syntactic configuration based on particular affixes. In the DM approach, syntactic word formation is more restricted, as affix orders derived by head movement always observe the Mirror Principle. The CARP template then takes effect in morphology, where the order of affixes derived by head movement can be reversed via Local Dislocation.

#### 4. ASYMMETRIC COMPOSITIONALITY

In this section, I discuss a phenomenon which Hyman (2003) labels "asymmetric compositionality", and I show that it provides evidence against the phrasal movement analysis of Mirror Principle violations presented in section 3.1.

Recall from section 2 that Bemba licenses two scope relations between the reciprocal and the causative suffix, which are represented by two different syntactic structures:



The order of the causative and the reciprocal suffix in Bemba is flexible; both the affix order V-CAUS-REC and the order V-REC-CAUS are attested. Each order corresponds to one of the structures in (22) in a manner which obeys the Mirror Principle.

Hyman & Mchombo (1992) and Hyman (2003) show that the causative and reciprocal extensions in Chicheŵa behave like their Bemba counterparts. Both suffix orders are possible, and each order corresponds to a different scope relation between the two categories. However, there is an important asymmetry. As observed by Hyman and Mchombo, the V-REC-CAUS order in Chicheŵa only has the compositional meaning based on (22a), in which the causative takes scope over the reciprocal. In contrast, the order V-CAUS-REC can be associated with *two different interpretations* – one where the reciprocal scopes over the causative, but also one in which the causative scopes over the reciprocal:

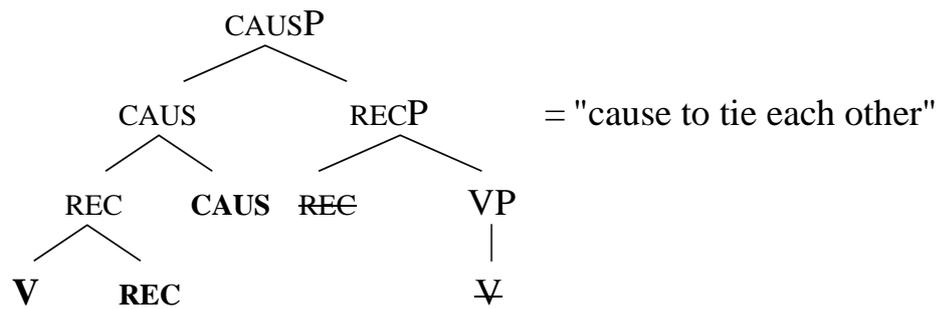
- (23) a. mang-its-an            "cause each other to tie; cause to tie each other"  
          V-CAUS-REC  
      b. mang-an-its        "cause to tie each other" (\*cause each other to tie")  
          V- REC-CAUS

[Hyman & Mchombo 1992: 360]

The asymmetry illustrated by (23) follows from the DM analysis of Mirror Principle violations that I presented in section 3.2. Consider first the fact that both suffix orders in (23) allow for an interpretation in which the causative takes scope over the reciprocal ("cause to tie each other"). Since unique scope relations are represented by unique syntactic structures, this implies that the structure in (22a), which corresponds to this interpretation, can produce both affix orders V-CAUS-REC and V-REC-CAUS.

This possibility follows from the interaction of head movement, which produces Mirror Principle-compatible affix orders, and Local Dislocation, which can override these orders to satisfy CARP. When the verb in (22a) moves to REC, and the complex REC-head subsequently adjoins to CAUS, the resulting order of the terminal nodes inside the complex head is V-REC-CAUS (see (24a)). After Vocabulary Insertion, there are now two options. Given that CARP is relaxed with the reciprocal suffix, the affix order *mang-an-its* is legitimate, and no post-syntactic operations need to apply. However, we have seen that Local Dislocation can change the order of affixes at PF to derive an affix order compatible with CARP. If this happens, then the order of the affixes is reversed, and the order V-CAUS-REC (*mang-its-an*) is derived:

(24) a. after head movement in syntax:



b. after Vocabulary Insertion:

[[[-mang-]-an-]-its] → possible PF-output

c. after Local Dislocation (optional with the reciprocal suffix):

[[[-mang-]-its + -an-]] → possible PF-output

In contrast, (23) shows that the structure in (22b), where the reciprocal takes scope over the causative, is only compatible with one affix order, namely V-CAUS-REC. Again, this is a direct consequence of the DM-analysis. Based on (22b), head movement derives a complex head with the morpheme order V-CAUS-REC. This order of affixes is already in accordance with CARP, and therefore Local Dislocation cannot apply, since this operation is only licensed when the outcome is a CARP-compatible suffix order (see section 3.2). When this suffix order is already produced by the syntax, no post-syntactic operations can take place after Vocabulary Insertion. Therefore, the affix order V-REC-CAUS cannot be associated with the syntax in (22b), in which the reciprocal scopes over the causative.

This DM analysis captures the spirit of the analysis of asymmetric compositionality put forward in Hyman (2003). Hyman's proposal is formalised in the framework of Optimality Theory (OT; Prince & Smolensky 2004). He assumes that the order of suffixes in Bantu is governed by two violable constraints which may impose incompatible requirements on the output. In the case of conflict, it is the relative ranking of the two constraints which determines the order of affixes in a particular language. The first constraint (called TEMPLATE) is determined by the CARP-template. The second constraint postulated by Hyman is called MIRROR, which requires that a particular affix order respects compositionality.<sup>4</sup> According to Hyman (2003), TEMPLATE is usually ranked higher than MIRROR in Bantu, but in the case of CAUS and REC, both constraints are freely ranked with respect to each other. This means that

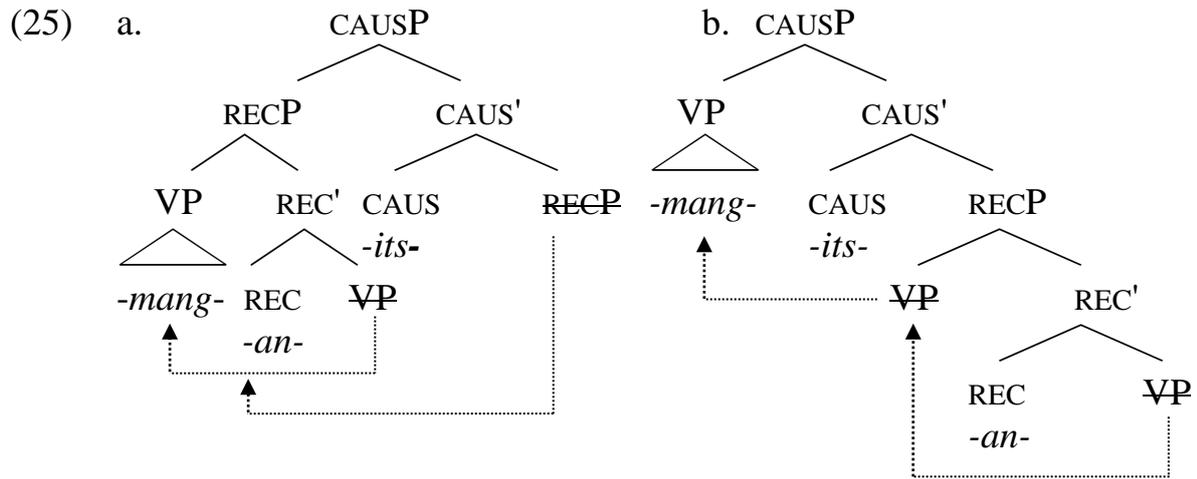
<sup>4</sup> Hyman's MIRROR-constraint is related to, but not equivalent to, the Mirror Principle, as Hyman does not assume that the correspondence between linear order in morphology and scope relations in semantics is established via the syntax. See also Alsina (1999) for a purely lexical analysis of Mirror Principle effects.

affix orders which violate MIRROR in favour of TEMPLATE are licensed, but so are affix orders that violate TEMPLATE in favour of MIRROR. The only scenario that is disallowed is one where both constraints are violated. This scenario would be realised by a V-REC-CAUS order corresponding to a reciprocalised causative.

Both the DM account and Hyman's (2003) OT analysis recognise that the ordering of suffixes in Bantu reflects "a basic tension between two competing pressures" (Hyman 2003: 246), viz. the Mirror Principle and the CARP-template. In the DM analysis outlined above, this tension arises at PF, when the default structure produced by the syntax (which always complies with the Mirror Principle) does not correspond to the default order of affixes required by CARP. In the case of the reciprocal and the causative, where both "competing pressures" have equal strength, the output of syntax can remain unchanged (the Mirror Principle wins), or the order of affixes is changed in the morphology (and CARP takes the upper hand).

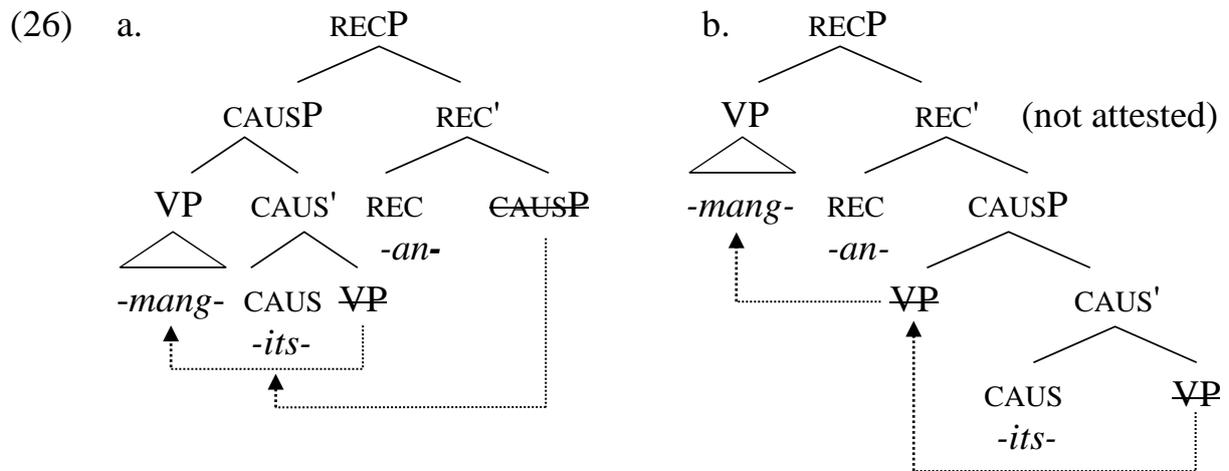
Note the parallel between asymmetric compositionality in Chicheŵa and the Ndebele reduplication patterns discussed in section 3.2, which is revealed by the DM analyses of these phenomena. In both cases, the two relevant extensions (the causative and the reciprocal in the former case, the applicative and the passive in the latter) can be syntactically combined in two ways, deriving two structures which express different scope relations. In one of these structures, head movement derives a CARP-incompatible order, and in this case, Local Dislocation applies, either optionally (as with CAUS and REC) or obligatorily (with APPL and PASS). Consequently, with this structure, we find morphological variation: when the applicative takes scope over the passive, reduplication can apply before or after Local Dislocation, giving rise to two possible reduplicants. With the causative and the reciprocal, Local Dislocation itself is optional, and hence we find two possible affix orders corresponding to the syntax in which the causative scopes over the reciprocal. In the second structure, however, the CARP-compatible affix order is already derived via head movement. Therefore, Local Dislocation cannot apply, and so there is no variation: as we have seen, when the passive scopes over the applicative, only one type of reduplicant (V-APPL) is possible, and only one order of affixes (V-CAUS-REC) is licensed when the reciprocal scopes over the causative. In both cases, the asymmetry follows from the fact that according to the DM analysis, Local Dislocation can only apply at PF when the output of syntax violates CARP.

Let me now turn to the question of how the PMA would explain asymmetric compositionality. We have seen that the structure in (22a), with the interpretation "cause to tie each other", can give rise to both affix orders. This possibility can easily be explained by the PMA, because the PMA postulates two types of syntactic derivation that can derive complex words: roll-up movement and cyclic VP-movement. We can see in (25) that the former derives the order V-REC-CAUS, while the latter derives the order V-CAUS-REC:



Since CARP is relaxed with reciprocals, it follows that both affix orders can be derived from a syntax in which the causative takes scope over the reciprocal.

However, the problem for the phrasal approach arises with the structure in (22b), where the reciprocal scopes over the causative. Since both syntactic derivations in (25) are again available, and given that CARP is not obligatory with the reciprocal, the PMA predicts that both affix orders can also be derived from this structure, as shown in (26):



Both affix orders in (26) represent a reciprocalised causative "cause each other to V". As shown in (23a), this scope relation can be expressed by the suffix order V-CAUS-REC, which is derived via roll-up movement, illustrated in (26a). However, this scope relation cannot be expressed by the suffix order V-REC-CAUS. The problem is that the PMA predicts this to be a possible order with this interpretation, given the availability of cyclic VP-movement, as shown in (26b).

In order to explain why the suffix order V-REC-CAUS in Chicheŵa cannot express the reciprocalised causative reading, cyclic VP-movement in (26b) would have to be ruled out. But it is not clear how this could be achieved: as we have seen in (25b), cyclic VP-movement is licensed (and in fact required) to derive the order V-CAUS-REC from the structure in (22a), where CAUS

asymmetrically c-commands REC, so one would expect this operation also to be available when REC scopes over CAUS. Note that cyclic VP-movement in (26b) cannot be ruled out on the grounds that it derives the CARP-incompatible order V-REC-CAUS, because CARP-violations are in fact tolerated with the reciprocal and the causative (the affix order V-REC-CAUS is legitimately derived in (25a) via roll-up movement). The PMA therefore overgenerates; it is not restrictive enough to explain asymmetric compositionality.

The problem is that any account of asymmetric compositionality must recognise the Mirror Principle as a condition governing affix orders in Bantu, but this is something that the PMA does not do. Compare the illegitimate derivation of the affix order V-REC-CAUS in (26b) to the legitimate derivation of the same affix order in (25a), which is based on a syntax in which the causative takes scope over the reciprocal. The important difference between these two derivations is that the one in (26b) violates the Mirror Principle, while the one in (25a) does not – the order V-REC-CAUS in Chicheŵa, which violates CARP, is only possible when it is based on a syntax which complies with the Mirror Principle. In Hyman's OT account, this follows from the idea that the order of affixes cannot simultaneously violate both TEMPLATE and MIRROR. In the DM analysis, it follows from the fact that affix orders that observe the Mirror Principle are the output of syntactic head movement operations, while Mirror Principle violations are the result of Local Dislocation. Since Local Dislocation is at the same time a morphological "last resort" operation that can only apply if it produces a CARP-compatible affix order, an affix order which simultaneously violates CARP and the Mirror Principle can simply not be generated. The problem for the PMA is that the Mirror Principle has no special status in this theory. From the point of view of the PMA, affix orders that comply with the Mirror Principle are as unremarkable as affix orders that violate the Mirror Principle, because both roll-up and cyclic phrasal movement are entirely regular syntactic operations that are frequently attested in other areas of grammar.<sup>5</sup> This aspect of the PMA leads to the prediction that suffixes that tolerate violations of CARP can be freely ordered with respect to one another, but also that each ordering can be associated with two scope interpretations. However, the discussion of asymmetric compositionality has shown that the second part of this prediction is not borne out. Therefore, asymmetric compositionality represents an argument against the PMA as a way of deriving suffix orders in Bantu.

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<sup>5</sup> In his phrasal movement-analysis of DP-internal word order, Cinque (2005: 325) argues that the option of cyclic NP-movement is "more marked" than roll-up movement (though he also notes that he knows "of no clear independent reason" why this should be so). In Cinque's analysis, cyclic NP-movement is considered more marked, because word orders derived by cyclic NP-movement are attested in fewer languages than word orders derived via roll-up movement. Importantly, however, the syntactic process of cyclic NP-movement itself is syntactically unmarked in the languages which allow it, and no potential DP-internal order is ruled out in Cinque's analysis simply because its derivation involves cyclic NP-movement.

## 5. CONCLUSION

In section 2 of this paper, I presented an argument based on idiomatic V-suffix combinations in Bantu in support of the view that semantic relations between suffixes are reflected by the structural configuration of the corresponding nodes in the syntax. Section 3 discussed examples of suffix orders in Bantu that do not respect the Mirror Principle. In section 4, I demonstrated that the Mirror Principle (or its OT variant, Hyman's (2003) MIRROR-constraint) is nevertheless needed in order to explain under what conditions the order of particular suffixes in Bantu is allowed to violate the CARP-template.

I conclude that, taken together, these results provide support for the theory of DM. In DM, affix orders that conform to the Mirror Principle represent the default outcome of syntactic head movement. At the same time, DM postulates the existence of post-syntactic operations that can change the default order produced by the syntax in order to satisfy morpho-phonological conditions such as those imposed by the default CARP-template. Because word formation in DM involves both syntactic and morphological (post-syntactic) processes, which together determine the order of extensions in the verb stem, this theory is better equipped to account for the properties of suffixation in Bantu than a theory that relies on syntax alone.

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