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The Syntax of Mirror Principle Violations in Wolof

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Introduction

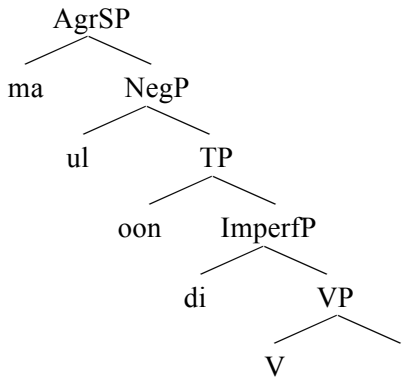
This paper presents a syntactic analysis of affix orders in verbal complexes in Wolof, an Atlantic language of Senegal. In our analysis of the verbal affix orders, we focus on two properties of the verbal morphology. First, Wolof displays morpheme reorderings inside of the verbal complex. In (1)a the past tense (*-oon*) precedes negation (*-u(l)*) and the subject agreement marker (*-ma*). In contrast, in (1)b, past tense follows both negation and the subject agreement marker.

(1) a. D-**oon**-u-ma lekk. IMPERF-**TENSE**-NEG-AGRS
IMPERF-PAST-NEG-1SG eat
'I was not eating.'

b. %D-u-ma **woon** lekk. IMPERF-NEG-AGRS-**TENSE**
IMPERF-NEG-1SG PAST eat
'I was not eating.'

These examples manifest the basic problem, namely that these affix order alternations appear to violate the Mirror Principle (Baker 1985). To see why this is so, assume that the hierarchical order of heads is as in (2) (We motivate our syntactic structures in Sections 5, 6, and 7):

(2)



If something like (2) is correct, then the order of the affixes in (1)a is unproblematic. That is, head movement of *di* 'IMPERF' up the tree will produce the (correct) surface order of morphemes. However, given a single underlying hierarchy of heads such as (2), (1)b is a problem because the morpheme order IMPERF-NEG-AGRS…T^0 cannot be derived by head movement. Thus, (1)b represents a Mirror Principle violation because the surface order of affixes is not a mirror image of the underlying hierarchy of functional heads. Us-

ing Wolof, we show that there are a number of mismatches between the syntactic structure and the affix orders that surface on the verb and elsewhere in the clause. We argue that though these mismatches are real violations of the Mirror Principle, they do not however constitute evidence against a syntactic account of affix/morpheme order. On the contrary, the pattern of Mirror Principle violations provide strong support for a syntactic approach to complex word formation as they will be shown to arise as a result of syntactic phrasal movement. We argue against pure head movement as well as templatic analyses, as they are untenable in the face of the Wolof data.

We also examine 'transitivity failures', in which a head *x* c-commands a head *y*, and *y* c-commands *z*. However, *z* also seems to c-command *x*. This is a contradiction given standard assumptions about relations on tree structures and therefore constitutes a transitivity failure because *z* should not c-command *x*. We reserve concrete examples of transitivity failure until Section 5. We argue that the affix order variation in (1) does not violate the Mirror Principle, but follows from syntactic phrasal movement, not head movement of V.

Since Baker (1985), head movement has been widely exploited in analyses of complex word formation. The Wolof data that we present point to the crucial importance of (remnant) XP movement in word formation. This line of research follows that of Koopman and Szabolcsi (2000) and Koopman (2002), who argue for the centrality of phrasal movement in word formation, specifically, remnant XP movement. Globally, we argue that the surface affix orders result from pied piping and stranding of pieces of the clausal structure. Wolof therefore provides strong evidence that complex word formation is syntactic in nature. Our data is drawn from both the inflectional (i.e. 'high') and valence-changing (i.e. 'low') domains of the clause. This shows that the Mirror Principle violations we discuss are pervasive in Wolof grammar.

The paper is organized as follows. In Section 1, we provide relevant background on Wolof. Section 2 continues the Wolof background, but focuses on the valence-changing morphology. The analytical assumptions we make in our analysis are introduced in Section 3. In Section 4, we establish the hierarchy of valence-changing heads in the clause. Section 5 examines Mirror Principle violations in the higher region of the clause. Our analysis is presented in Section 6, with further supporting data. Section 7 is summary and conclusions.

1 Background on Wolof

Wolof belongs to the Senegambian group of the Northern branch in Atlantic (Sapir 1971, Doneaux 1978). Wolof verb morphology is almost exclusively suffixing (although overall Wolof displays mixed head-initial and head-final characteristics), with basic SVO word order. As the cases in (3) attest, the verb complex can be quite large, with valence-changing affixes and markers of finiteness (*-na*), for example:

(3) a. Gàllaay bind-**ló-ól-**në gan g-i xale b-i taalif.[1]
gallaay write-CAUS-BEN-FIN visitor CL-the child CL-the poem
'Gallaay made the child write the visitor a poem.'

b. Faatu ak Yusëfë dóór-**ënté-waat-ëg**-u-ñu.
faatu and yusafa hit-RECIP-REP-yet-NEG-3PL
'Faatu and Yusafa had not hit each other again yet.'

[1] Adapted from Buell and Sy (2004), number (15).

Wolof is a noun class language with fifteen noun classes (Sy 2003). Class membership is typically expressed on 'dependents' of the noun, such as determiners. Thus, in (3)a, the definite determiner for the noun *gan* 'visitor' is *g-i* 'the' (= noun class marker + determiner), while that for *axle* 'child' is *b-i*. As noun class plays no role in our analysis, we gloss determiners from different noun classes as 'the', for example, and do not note their class membership.

Wolof possesses an aspectual system in which 'perfective' and 'imperfective' form the basic opposition (Church 1981, Robert 1991). There is no overt morphological marker of perfectivity, but imperfective clauses are indicated by the presence of the auxiliary *di* (or its post-vowel, clitic form *-y*):

(4) a. Lekk-na-a ceeb bi. Perfective
eat-FIN-1SG rice the
'I ate/have eaten the rice'

b. **Di**-na-a lekk ceeb bi. Imperfective
IMPERF-FIN-1SG eat rice the
'I will eat the rice.'

There are two past tense affixes:

(5) a. Lekk-**oon**-na-a. Definite Past
eat-PAST-FIN-1SG
'I ate/had eaten.'

b. D-**aan**-na-a lekk. Habitual Past
IMPERF-HAB.PAST-FIN-1SG eat
'I used to eat.'

The definite past *-oon* refers to a situation which is completely finished and has no present relevance. The habitual past indicates that a situation or state that held habitually in the past, but does not hold in the present. In the present paper, we focus only on the distribution of the definite past suffix *-oon*.

2 Wolof Valence-changing Morphology

Wolof, like many other Atlantic languages, has very rich verbal morphology, both inflectional and derivational (Mangold 1977, Church 1981, Ka 1981, Voisin 2002). Across the family, causative, applicative, and reversive affixes are the most common affixes. Morphological processes include suffixation ((6)b-e), and reduplication ((6)f). Wolof has approximately 30 distinct verbal affixes encoding a number of notions, including applicative, instrumental, reversive, and causative.

(6) a. Xale yi sàcc-na-ñu gato bi.
child the.PL steal-FIN-3PL cake the
'The children stole the cake.'

b. Xale yi sàcc-**i**-na-ñu gato bi. **-i** Allative
child the.PL steal-ALLATIVE-FIN-3PL cake the
'The children went and stole the cake.'

c. Xale yi sàcc-**si**-na-ñu gato bi. **-si** Illative
child the.PL steal-ILLATIVE-FIN-3PL cake the
'The children came and stole the cake.'

d. Xale yi sàcc-**ante**-na-ñu. **-ante** Reciprocal
child the.PL steal-RECIP-FIN-3PL
'The children stole from each other.'

e. Xale yi sàcc-**aat**-na-ñu gato. **-aat** Repetitive
child the.PL steal-REP-FIN-3PL cake
'The children stole cake again.

f. Xale yi **sàcc-sàcc**-lu-na-ñu gato. Reduplication
child the.PL steal-steal-*lu*-FIN-3PL cake
'The children pretended to steal a cake.'

Ka (1981), Torrence (2003), Buell and Sy (2006a, 2006b) and Koopman (2006) look at the ordering of verb affixes in Wolof. Ka (1981) identifies twenty-five distinct verbal affixes, formulates descriptive generalizations concerning them, gives meanings for each, and provides a template of the verbal complex with twelve slots or affix positions:

(7) Table 1: Template of Verbal Suffixes[2]

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
ar	e_1 i_1 i_2 ali anti andi at aan	u oo	adi antu ante	andoo	aale	i_3 si	al_1	le lu	e_2	al_2	aat ati

At least some of the homophonous affixes in Table 1 are distinguishable by the fact that they select for different stem forms. For example, Ndiaye (2004)[3] notes the difference between al_1, the causative stative, and al_2, the benefactive:

(8) a. xonq 'be red'
b. xonq-al 'redden (cause to be red)'/ 'be red for (someone)'
c. togg-al 'cook for (someone)'/*'cause to cook'
d. so**nn** 'be tired'
e. so**nn**-al 'be tired for (someone)'
f. so**n**-al 'tire (cause to be tired)'

[2] Adapted from Ka (1981) and Torrence (2005). The abbreviations in Table 1 are adapted from Ka (1981, p.8). We have changed some of the names in the translations: *ar* = effort, e_1/*te* = verbalizer, i_1 = inversive, i_2 = vebalizer, *ali* = achievement, *andi* = meanwhile, *at* = intensive, *aan* = discontinuative, *u* = middle/reflexive/passive, *oo* = together, *adi* = privative, *antu* = depreciative, *ante* = reciprocal, *andoo* = collective, *aale* = associative, i_3 = go , *si* = come, al_1 = causative stative, *le* = indirect causative/assistive, *lu* = causative benefactive reflexive, e_2 = locative/instrumental/objective, al_2 = benefactive, *aat* = iterative, *ati* = iterative).

[3] Ndiaye does not describe these stems alternations in the terms that we use here.

The causative stative *-al* only combines with stative predicates ((8)b versus (8)c). The benefactive *al* occurs with stative and non-statives ((8)b,c). When the benefactive combines with *sonn* 'be tired', it selects for the 'long' stem, which ends in a geminate consonant, *-nn* ((8)e). The causative stative selects for the 'short' stem, which ends in a single consonant, *-n* ((8)f).

Wolof valence changing affixes do not simply have the effect of increasing or decreasing the number of arguments of a predicate. These affixes interact with the linear order of constituents, i.e. the syntax:

(9) a. Togg-(**e**)-na-a yaasa bi **ak kuddu gi**.
cook-INSTR-FIN-1SG yaasa the with spoon the
'I cooked the yaasa with the spoon.'

b. *Togg-**e**-na-a **ak kuddu gi** yaasa bi.
cook-INSTR-FIN-1SG with spoon the yaasa the
'I cooked with the spoon the yaasa.'

c. Togg-**e**-na-a yaasa bi **kuddu gi**.
cook-INSTR-FIN-1SG yaasa the spoon the
'I cooked the yaasa with the spoon.'

d. Togg-**e**-na-a **kuddu gi** yaasa bi.
cook-INSTR-FIN-1SG spoon the yaasa the
'I cooked the yaasa with the spoon.'

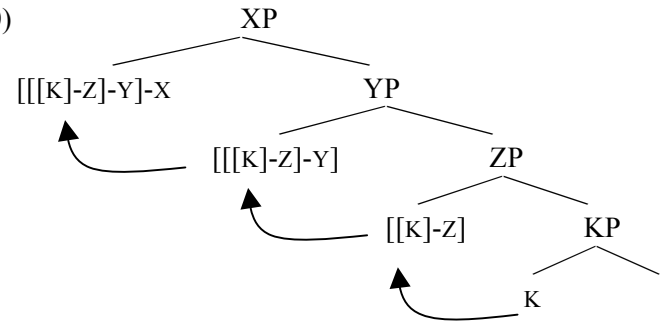
(9)a shows that an instrument can be introduced by a preposition, *ak*, with an optional instrumental suffix on the verb, *-e*. The contrast with(9)b shows that the PP containing the instrument must appear on the right edge of CP. (9)c-d show that when the instrumental suffix alone is present on the verb, the instrument is free to intervene between the verb and the object.[4] Note that under a templatic view of Wolof verb morphology, such interactions are simply mysterious. Thus, when *-e* is present the potential grammatical word orders are different depending on whether the instrument is a DP or PP. If the verbal morphology is described solely in terms of slots in a template, it is not clear how such interactions can be captured. However, if the derivational affixes are part of the syntactic component, dependencies and interactions like those in (9) are expected.

3 Analytical Background

Baker (1985) argues that affix orders directly mirror the syntactic derivations from which they arise, the 'Mirror Principle'. In Baker's system, complex words are built up through syntactic head movement, constrained by the Head Movement Constraint (HMC) (Travis 1984). Given his assumptions about the mechanisms of head movement, the result is that in a complex word, the innermost affixes must be merged lower in the structure than the outermost affixes:

[4] Ordinarily, a PP can intervene between a verb and a definite object.

(10)



In (10), assume that the heads of XP, YP, and ZP are affixes. Successive head movement of *K* up the tree yields a rigid and predictable order of affixes/heads. Given that *-Z* is the innermost affix, we predict that it is lower in the syntactic structure than *-X*, the outermost affix. A number of analysts have argued against this purely 'syntactic' approach to word formation (Sells 1995, Alsina 1999, Hyman 2003, Stiebels 2003, among others), because of the existence of affix orders that violate the Mirror Principle.

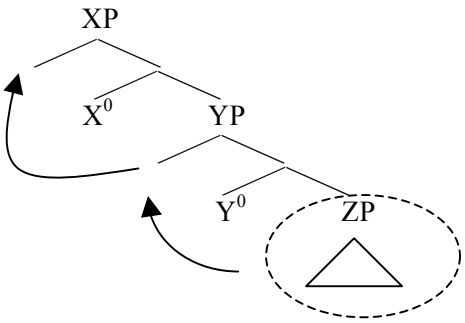
Koopman (2003), (2005), and (2006) attempt to construct a typology of the general form of Mirror Principle violations and the syntactic mechanisms that yield them. Koopman argues that the Mirror Principle violations, such as those in verbal complexes (Koopman and Szabolcsi 2000), adverbs (Cinque 1999, Nilsen 2004), and DPs (Cinque 2004) all exhibit the same pattern. Thus, the pattern in each of these domains should follow from the mechanism that puts together complex words, namely phrasal movement. (In fact, Koopman argues that only phrasal movement is involved, not head movement.)

Koopman (2005), a response to Sells (1995), lays out the predictions of a syntactic approach to morphology. One property of syntactic derivations is that a specifier can be attracted to a higher specifier, as in both A- and A′-movement:

(11) a. John$_i$ seems ~~John$_i$~~ to be ~~John$_i$~~ likely ~~John$_i$~~ to ~~John$_i$~~ become ~~John$_i$~~ an artist[5]
b. Who$_i$ do you think ~~who$_i$~~ that Mary wrote an e-mail to ~~who$_i$~~

Under a syntactic approach to word formation we expect to find similar cases of Spec-to-Spec movement in morphology. More specifically, Koopman points to cases in which an XP specifier is attracted to a higher specifier, moving through a lower specifier.

(12)



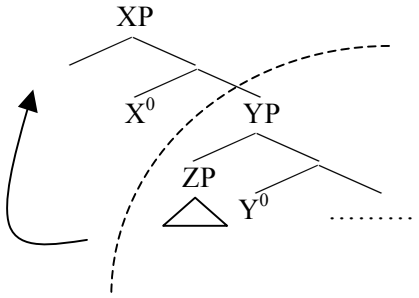
In (12), where X^0 and Y^0 are bound elements (i.e., affixes), if ZP is attracted to Spec-YP and then to SpecXP, the surface order of morphemes will be:

[5] These examples are from Koopman (2005): (6)a–b.

(13) ZP-X^0-Y^0

Koopman points out that such an order is not a mirror of the underlying syntactic hierarchy. This is because the outermost affix, Y^0, is not higher in the structure than X^0. Cases like (12) would constitute Mirror Principle violations. Along the same lines, from a syntactic perspective, another expected case would arise when a phrase in a specifier pied pipes its containing phrase:

(14)



If the specifier of YP, ZP, pied pipes YP to the specifier of XP, this yields the expected mirror order:

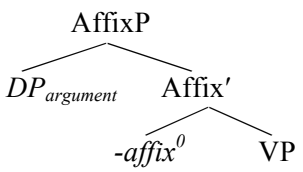
(15) ZP-Y^0-X^0

Thus, under a syntactic view, the interaction of stranding ((12)) and pied piping ((14)) with the syntactic hierarchy determines the affix orders. The present paper supports the syntactic view of word formation by showing that the affix orders in the verbal complex in Wolof are determined by syntactic processes such as head movement, pied piping, and stranding. Further, the paper supports Koopman's observations on the general typology of Mirror Principle violations, namely, that they arise as the (expected) result of syntactic phrasal movement.

In arguing for a syntactic analysis of affix orders in Wolof and for understanding the need for phrasal movement, we must make certain assumptions about how head movement works. We follow the standard assumptions about head movement (Travis 1984, Kayne 1994). First, we assume that head movement is restricted to a c-commanding position (i.e., there is no lowering). Second, head movement adjoins a lower head to the left of the next highest head. Thus, head movement cannot skip over an intervening head. Finally, we assume that a head cannot excorporate once it has incorporated into another head.

We assume, following Pylkkänen (2002) and others, that the valence-changing affixes are merged above VP and that the argument introduced by the affix is merged as the specifier of that affix. That is, like Baker (1985) and Koopman (2005, 2006), we take the valence-changing affixes to be syntactic heads that assign theta-roles and project ordinary XP structures:

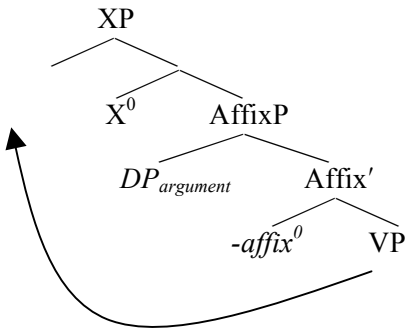
(16)



In our analysis, we argue that VPs move to a projection above AffixP. In (16), if the DP argument is merged in the specifier of affixP, VP cannot literally occupy SpecAffixP.

Thus, in discussing derivations, we describe them in terms of movement to the specifier of AffixP, with the understanding that the VP really occupies some position higher than AffixP, and the structure must be enriched. This can be implemented in a number of ways. For example, it could be that the structure of affixal heads is more complex and there is always some type of licensing head higher than AffixP. That is, AffixP always occurs with a higher head that attracts VP:

(17)



Alternatively, AffixP could project multiple specifiers. We set aside such technical implementation here. Our goal is to establish the need for phrasal movement. From this, it follows that there must be suitable landing sites for the moved VP.

4 The Hierarchy of Valence-changing Heads

In this section, we show that the ordering of causative, benefactive, and instrumental affixes cannot be derived from a single hierarchy of functional heads and HMC-compliant head movement. In making the case for phrasal movement, we first present the Wolof data and examine the consequences of a head movement account.

(18) shows a basic transitive verb *togg* 'cook':

(18) Faatu togg-na jën wi.
Faatu cook-FIN fish the
'Faatu cooked the fish.'

The benefactive, instrumental, and causative affixes introduce obligatory arguments, thus increasing the valence of the verb:

(19) a. Benefactive
Faatu togg-**al**-na Gàllaay jën wi.
Faatu cook-BEN-FIN Gallaay fish the
'Faatu cooked the fish for Gallaay.'

b. Instrumental
Faatu togg-**e**-na jën wi (ag) diwtiir.
Faatu cook-INSTR-FIN fish the with palm.oil
'Faatu cookd the fish with palm oil.'

c. Causative
Faatu toog-**loo**-na Gàllaay jën wi.
Faatu cook-CAUS-FIN Gallaay fish the
'Faatu had/made Gallaay cook the fish.'

Consider first the order of the instrumental and causative affixes:

(20) a. ✓INSTR > CAUS
Gàllaay dóór-**e-loo**-na Faatu xeer bi (ag) bant.
Gallaay hit-INSTR-CAUS-FIN Faatu stone the with stick
'Gallaay made Faatu hit the stone with a stick.'

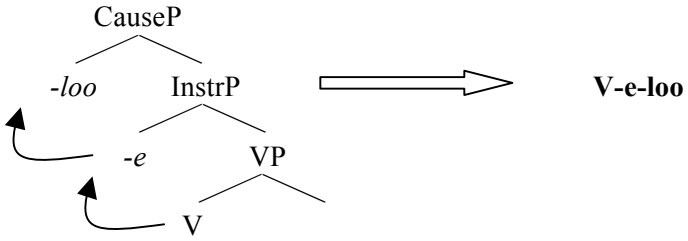
b. *CAUS > INSTR
*Gàllaay door-**loo-e**-na Faatu xeer bi (ag) bant.
Gallaay hit-CAUS-INSTR-FIN Faatu stone the with stick

The instrumental affix must precede the causative affix. Assume that the order of the causative and instrumental affixes in (20)a is derived by head movement. Given the surface affix order, CausP must be higher than InstrP, following the Mirror Principle:

(21) CausP > InstrP > VP

The order in (20)a arises because the verb headmoves to Instr^0, then the complex head raises to Caus^0:

(22)



A head movement analysis predicts correctly that the order in (20)b should not arise because it would require that the head V skip over the intervening head, Instr^0 *-e*, violating the HMC.

The benefactive and instrumental affixes display a strict linear ordering:

(23) a. Gàllaay togg-**al-e**-na Faatu yàpp diwtiir. ✓BEN > INSTR
Gallaay cook-BEN-INSTR-FIN Faatu meat palm.oil
'Gallaay cooked Faatu some meat with palm oil.'

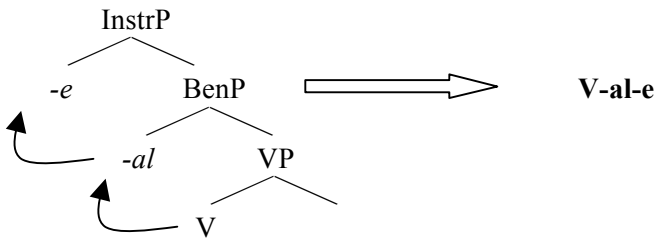
b. *Gàllaay togg-**e-al**-na Faatu yàpp diwtiir *INSTR…BEN
Gallaay cook-INSTR-BEN-FIN Faatu meat palm.oil

As the contrast in (23)a-b shows, BEN must precede INSTR and the opposite ordering is ungrammatical. Again, assuming head movement and the Mirror Principle, the ordering of the affixes indicates that Instr^0 must be higher than Ben^0.

(24) InstrP > BenP > VP

As before, the verb first head raises to Ben^0, yielding *V-al*. This is followed by movement of the complex head to Instr^0, yielding the grammatical order.

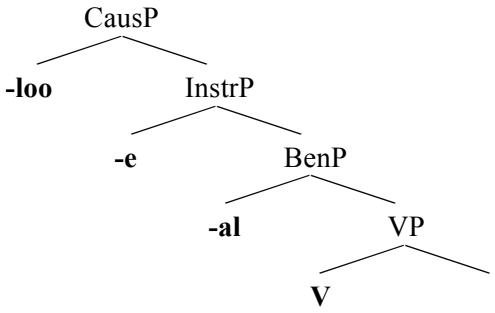
(25)



Thus, *V-al-e* displays the expected mirror order of affixes.

Based on the surface affix orderings we have presented to this point, we can deduce the following hierarchy of low functional heads:

(26)



The tree in (26) results from reasoning by transitivity. CAUS is higher than INST and INST is higher than BEN. Therefore, CAUS must be higher than BEN. We thus predict that if CAUS and BEN are affixes on a single verb, the order will be: V-BEN-CAUS, the mirror order. However, this is *not* the observed order of affixes:

(27) a. Gàllaay bind-**loo-al**-na gan gi xale y-i taalif. ✓CAUS > BEN
Gallaay write-CAUS-BEN-FIN guest the child the poem
'Gallaay made the children write the visitor a poem.'

b. *Gàllaay bind-**al-loo**-na gan gi xale yi taalif. *BEN > CAUS
Gallaay write-BEN-CAUS-FIN guest the child the.PL poem

Given the grammatical affix order and our earlier reasoning, we deduce that BEN is higher than CAUS:

(28) BenP > CausP > VP

However, there is a problem. It has been established in (26) that CausP is higher than BenP, which contradicts (28). A similar problem arises if the partial hierarchies in (21) and (28) are assumed. In that case, the ordering in (23)a and the resulting hierarchy in (24) constitute a contradiction.

The Wolof affix order data is strongly reminiscent of the so-called 'transitivity failures' discussed in Van Craenenbroeck (2006) and Zwart (2007). Canonically, a transitivity failure is said to occur when it is established that A precedes B and B precedes C, but A cannot linearly precede C. This is a failure in the sense that, by transitivity, we expect A to precede C.

In looking at transitivity failure, Van Craenenbroeck (2006) first shows that in Venetian *wh*-words precede the complementizer *che*:[6]

(29) Venetian

a. Me domando **chi che** Nane ga visto al marcà.[7]
me I.ask who that Nane has seen at.the market
'I wonder who Nane saw at the market.'

b. *Me domando **che chi** Nane ga visto al marcà.
me I.ask that who Nane has seen at.the market

As the contrast between (29)a and (29)b shows, the only grammatical order is one in which the *wh*-word precedes the complementizer. Van Craenenbroeck then shows the ordering between *wh*-words and clitic left dislocated XPs:

(30) Venetian

a. Me dispiase **che a Marco** i ghe gabia ditto cussi.[8]
me is.sorry that to Marco they to.him have.SUBJ told so
'I am sorry that they said so to Marco.'

b. *Me dispiase **a Marco che** i ghe gabia ditto cussi.
me is.sorry to Marco that they to.him have.SUBJ told so

The contrast between (30)a and (30)b shows that the complementizer *che* must precede CLLDed XP. Putting the facts together, if wh > *che* and *che* > CLLD, the expectation is that wh precedes CLLD, by transitivity. However, this expectation is not borne out:

wh *che* CLLD

(31) *Me domando **a chi** che **el premio Nobel** che i ghe lo podarìa dar[9]
me I.ask to who that the prize Nobel that they to.him it could give

Thus, the Venetian cases represent a transitivity failure because the linear orders expected by transitivity are not attested.

Bobaljik (1999), and Nilsen (2004) report on similar failures of transitivity in the domain of adverbs. Nilsen shows that 'possibly' must precede 'not' in Norwegian:

[6] He also notes that in Venetian, like many other northern Italian dialects, the Doubly Filled Comp Filter is not active, as seen in (29)a.

[7] These correspond to van Craenenbroeck (1) and (2).

[8] These correspond to van Craenenbroeck (3) and (4).

[9] This is van Craenenbroeck (6). Van Craenenbroeck shows that, surprisingly, both the CLLDed XP and *wh* item must precede the complementizer, in that order:

(i) Me domando **el premio Nobel a chi** che i ghe lo podarìa dar.
me I.ask the prize Nobel to who that they to.him it could give
'I wonder to whome they could give the Nobel Prize' (= van Craenenbroeck (7))

(ii) *Me domando **a chi el premio Nobel** che i ghe lo podarìa dar
me I.ask to who the prize Nobel that they to.him it could give
(= van Craenenbroeck (5))

(32) a. ståle har **muligens ikke** spist hvetekakene sine (= Nilsen (4a))
S has possibly not eaten the.wheaties his
'Stanley possibly hasn't eaten his wheaties'

b. *ståle har **ikke muligens** spist hvetekakene sine (= Nilsen (4b))
S has not possibly eaten the.wheaties his

He then establishes that 'not' must precede the adverb 'always':

(33) a. ståle hadde **ikke alltid** spist hvetekakene sine (= Nilsen (5a))
S had not always eaten the.wheaties his
'Stanley hadn't always eaten his wheaties'

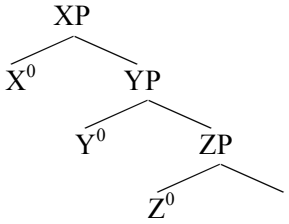
b. *ståle hadde **alltid ikke** spist hvetekakene sine (= Nilsen (5b))
S had always not eaten the.wheaties his

Given the orders *possibly* > *not* and *not* > *always*, by transitivity, we expect that *possibly* must precede *always*. However, Nilsen shows that it is possible for *always* to precede *possibly*:

(34) dette er et morsomt, gratis spill hvor spillerne **alltid muligens** er et klikk fra å vinne $1000! (= Nilsen (6a) and (7a))
'This is a fun, free game where you're **always possibly** a click away from winning $1000!'[10]

Zwart (2007) surveys cases of transitivity failures in the CP and DP domains cross-linguistically. For Zwart, the transitivity failures are a (negative) consequence of the view that the clause contains dedicated positions for adverbs, for example (Cinque 1999). Transitivity failures are therefore often taken as evidence against a 'cartographic' approach to syntactic structure, with dedicated positions for Topics, Focus, adverbs, etc. (pro: Cinque 2002, Rizzi 2004 and contra: Bobaljik 1999, van Craenenbroeck 2006, Zwart 2007). Thus, there are transitivity failures in terms of word order (in Venetian and Norwegian) and in cases like Wolof there are transitivity failures inside of words. Consider the underlying tree below, with a rigid hierarchy of heads and phrases:

(35)

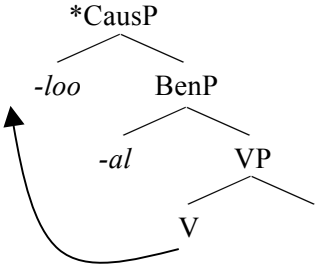


A Mirror Principle violation is said to occur when, for example, Z^0-X^0-Y^0 surfaces. Analogously, the cases of transitivity failure arise when the surface word order is, ZP XP YP. For example, this is why in the Wolof cases presented, the Mirror Principle violations we have seen look like word-internal transitivity failures. This parallelism suggests that the mechanism that yields Mirror Principle violations inside of words is also the source of transitivity failures across words.

[10] Nilsen says that "*muligens* does not have to precede *alltid*" (p.10). He does not give an example where *muligens* precedes *alltid*, nor does he discuss if there is an interpretive difference between the two orders.

Turning back to Wolof, (26) and (28) represent transitivity failures in the affix ordering. If (26) is correct, then (27)a is a Mirror Principle violation. This can be seen in a tree taking the hierarchy in (26) as correct:

(36)

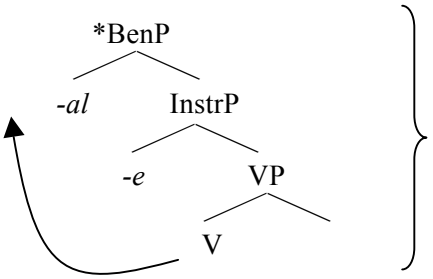


(= (26))

V-loo-al

In order to derive the affix orders on V, the head V must skip over the lower BEN^0, *-al*, violating the HMC. Similarly, if the alternative hierarchy in (28) is correct, having established that CAUS is higher than INSTR (as in (20)) then (23)a is a Mirror Principle Violation:

(37)



V-al-e

In (37), in order to derive the affix order by head movement, V must skip over the intervening INSTR head, again violating the HMC.

In summary, the surface orderings of Benefactive, Causative, and Instrumental morphemes in Wolof display multiple Mirror Principle violations. A head movement analysis is untenable because it requires violations of the HMC.

5 Mirror Principle violations in the higher functional domain of Wolof

In the previous section, we established the existence of Mirror Principle violations in the lower argument domain in Wolof. Here, we show that in the higher functional domain similar problems arise with respect to the Mirror Principle. Thus, Mirror Principle violations are pervasive in the verb morphology. As Wolof verb morphology is quite complex, we examine here only a subset of the forms that display Mirror Principle violations. Wolof has a large number of morphosyntactically distinct clause types. These are distinguishable by the forms of the subject markers and the form of negation, among others:

(38) a. Xale bi l-a-**a** dóór-**ul**. Non-Subject Cleft
child the XPL-COP-1SG hit-NEG
'It's not the child that I hit.'

b. Bëgg-na-ñu [**ma bañ**-a dóór xale bi]. Subjunctive
want-FIN-3PL 1SG NEG-*a* hit child the
'They want me to not hit the child.'

In (38)a, the non-subject cleft, the subject marker *-a* follows an expletive *l-* and a copular-like predicate *-a-*. The negative morpheme, *-ul*, obligatorily occurs as an affix on the verb. These contrast with a subjunctive clause, as in (38)b. In the subjunctive, the subject marker is *ma* and the negative morpheme is the independent negative verbal auxiliary *bañ*. The affixal negative *-ul* cannot occur in (38)b, and the auxiliary negation cannot occur in (38)a.[11] In looking at Mirror Principle violations in the higher functional domain, we focus on data from one clause type, neutral *na*-clauses, in which there is no single constituent in focus.

(39) a. lekk-**oon**-na-**a**. V-T^0-FIN-AgrS
eat-PAST-FIN-1SG
'I ate/had eaten.'

b. lekk-u-**ma** **woon**.[12] V-Neg-AgrS T
eat-NEG-1SG PAST
'I did not eat.'

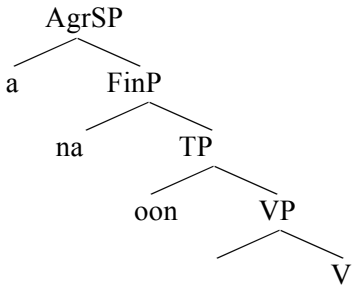
In (39)a, the affirmative, the past tense marker *-oon* precedes the subject marker *-a*. However, surprisingly, in the negative in (39)b, past tense obligatorily follows the subject marker *-ma*. It is this morpheme ordering inversion that we focus on.

We follow Zribi-Hertz and Diagne (2002) and Koopman (2006) in taking *na* to be an instantiation of Fin^0, in an exploded CP (Rizzi 1997). In Rizzi (1997), FinP is the lowest head in the CP domain. The fact that the verb (and past tense *-oon*) precede *na-* in (39)a indicates that the verbal complex has moved into the left periphery of the clause. In comparing (39)a to (39)b, it can be seen that *na-* does not co-occur with negation. We will assume that FinP is still present for consistency, but this does not affect the argumentation. Note also that the verbal complexes in (39) are domains of ATR vowel harmony, which spreads progressively from the verb root, a point to which we return in discussing (60).[13]

As before, the basic problem is to account for the surface ordering of the morphemes given a single underlying hierarchy of functional heads.

By undoing the morphology in (39)a, the underlying hierarchy of heads is:

(40)



[11] If *bañ* does occur in (38)a, preceding the verb *dóór* 'hit', as in (38)b, it has only the distinct meaning of 'hate' or 'refuse' (i.e. *bañ-a dóór* in (38)a would mean 'hate/refuse to hit'). It cannot be clausal negation.

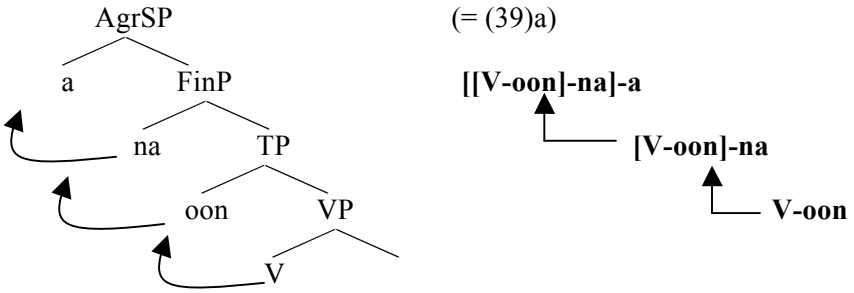
[12] The full form of the affixal negative marker is *-ul* or *-ut*. The *-l/t* drops in certain phonologically and morphologically determined contexts. We write the full form in syntactic trees.

[13] The situation is, in fact, more complex than this, as there is both progressive and regressive vowel harmony. See Sy (in progress) for a detailed analysis of the vowel harmony patterns.

Note first that the tree in (40) is odd because the subject marker, which we take to be an instantiation of $AgrS^0$, is higher than FinP, the lowest head in the C-domain (Rizzi 1997).[14]

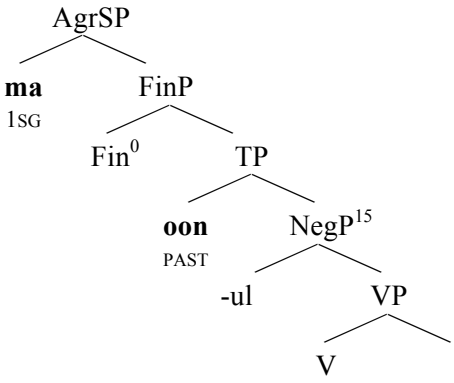
However, head movement of V in (40) does yield the correct surface order for (39)a:

(41)



The hierarchy in (40) immediately runs into problems in the negative:

(42)



Head movement of V in (42) yields an ungrammatical result:

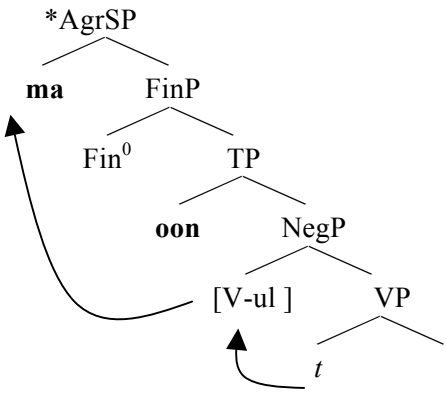
(43) *lekk-ul-woon-ma *V-Neg-T-AgrS
eat-NEG-PAST-1SG

Given the hierarchy in (40), the negative in (39)b represents a Mirror Principle violation. This is because the affix order is not a mirror image of the hierarchy of heads in the syntactic structure. Specifically, the hierarchical relation between Tense and the subject marker ($AgrS^0$) is the problem with (42). In (42), if V head moves to Neg^0, then this complex head must skip over T^0 in order to derive the correct surface order:

[14] There are languages which have been argued to have subject markers in the left periphery. See Poletto (2000) for Italian dialects.

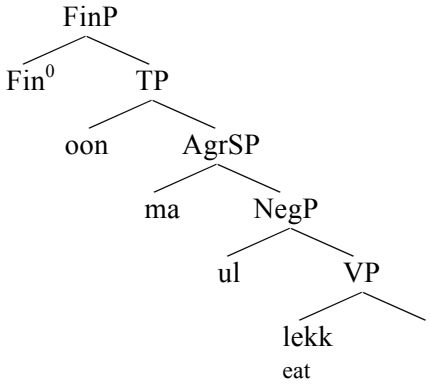
[15] It could be that NEG is higher than AgrSP. This type of high negation is attested in a number of languages, such as Italian dialects (Zanuttini 1997) and San Lucas Quiavini Zapotec (Lee 2007). However, in other constructions, NEG appears to be lower in the structure. Here, we put NEG low, as it is not germane to the main point, which is the ordering of the subject marker and tense.

(44)



An alternative is to take the negative forms in (39)b as displaying the underlying hierarchy. Undoing the morphology in (39)b yields:

(45)



(= (39)b)

Head movement in (45) does in fact give the correct ordering of affixes for the negative:

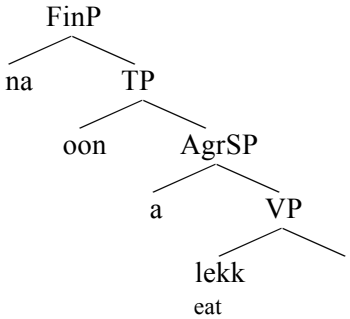
(46) V-Neg-AgrS T
lekk-u-ma woon

However, a problem arises if the hierarchy in (45) is assumed for the affirmative perfective:

(47) Lekk-oon-na-a. Affirmative Perfective (= (39)a)
eat-PAST-FIN-1SG
'I ate.'

Inserting the morphemes for (47) in the hierarchy from (45) gives the structure in (48):

(48)



However, given the structure in (48), the result of simple head movement of the verb is ungrammatical:

(49) *V-AgrS-T-FIN
*lekk-a-woon-na
Intended: 'I ate.'

If (48) is the underlying tree, then the affirmative can only be derived by head movement of V to T, skipping over AgrSP. This would be followed by the complex head [V+*oon*] moving to Fin^0. In this way, the affirmative form in (39)a represents a Mirror Principle violation.

In summary, the ordering of tense, negation, and subject markers display multiple Mirror Principle violations in Wolof. A constrained head movement account of these ordering variations is not possible with a single underlying hierarchy of functional heads. Further, in Wolof, both the 'low' valence-changing morphology and the 'higher' tense and agreement morphology exhibit Mirror Principle violations. Wolof is therefore an interesting case because mirror violations are pervasive in both the derivational and inflectional morphology.

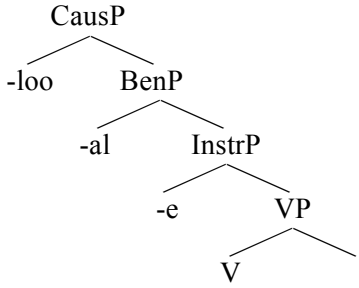
6 The solution: syntactic processes determine affix ordering

The main thrust of our analysis of Mirror Principle violations in Wolof contains two components. First, we propose that there is a single underlying hierarchy of heads in the clause. That is, we adopt a cartographic approach to the structure. Second, we argue that the surface affix orders result from *syntactic* XP movement interacting with the functional hierarchy. With these ingredients, the result is that the Mirror Principle violations are illusory.

6.1 XP movement in the valence-changing domain

We propose the following as the underlying hierarchy of functional heads in the valence-changing domain (i.e., low in the clause):

(50)

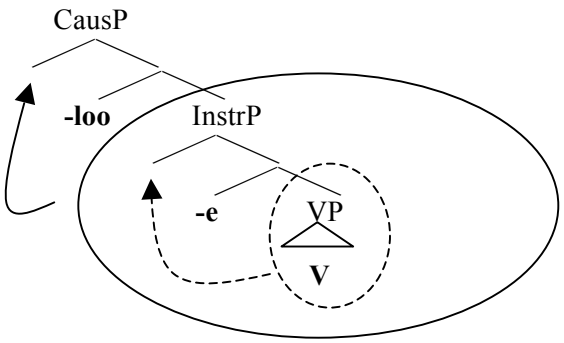


Recall that INST and CAUS display a strict ordering:

(51) Gàllaay dóór-**e-loo**-na Faatu xeer bi (ag) bant. ✓INSTR > CAUS
Gallaay hit-INSTR-CAUS-FIN Faatu stone the with stick
'Gallaay made Faatu hit the stone with a stick.'

Under an XP movement analysis, the derivation of (51)/(20)a is:

(52)



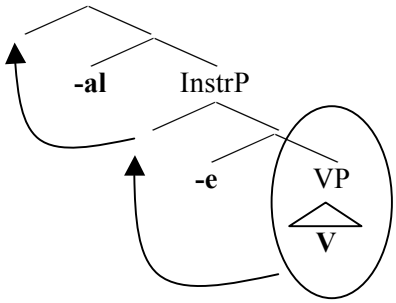
In (52), the VP remnant raises to SpecInstrP. This yields *V-Instr* order. VP is attracted to CausP and pied pipes InstrP. This yields a surface affix order of *V-Instr-Caus*. The fact that **V-Caus-Instr* is ungrammatical follows if (52) is an obligatory pied piping configuration. The pied piping of InstrP is what yields the mirror order.

BEN and INSTR also display a strict ordering:

(53) Gàllaay togg-**al-e**-na Faatu yàpp diwtiir ✓BEN > INSTR
Gallaay cook-BEN-INST-FIN Faatu meat palm.oil
'Gallaay cooked Faatu some meat with palm oil.'

Taking the hierarchy in (50) as basic, the affixes in (53)/(23)a do not reflect the mirror order of the hierarchy. We take this to indicate that stranding, as opposed to pied piping has occurred:

(54)



In (54), the VP remnant raises to SpecInstrP. This yields *V-Instr*, the mirror order. However, the mirror order is destroyed when VP is attracted to SpecBenP and strands InstrP. Stranding under phrasal movement is therefore the source of the Mirror Principle violation. The fact that **V-Instr-Ben* is ungrammatical follows if (54) is an obligatory *stranding* configuration. One question that immediately arises is why InstP must be stranded in this case. This is surprising given that in (52) we claim that VP had to pied pipe InstP. There are two issues. First, under the phrasal movement approach that we argue for, it is in general difficult to determine exactly what triggers pied piping versus stranding. As for the pied piping contrast in (52) versus (54), we propose that this difference is potentially related to the properties of CausP and BenP. Specifically, we appeal to *complexity filters*, which restrict the size of phrasal material in the specifier of a given XP. Koopman and Szabolcsi (2000) and Koopman (2002) analyze complex verb formation in Hungarian, Dutch, and German. These analyses make use only of overt remnant XP movement. However, not all of the expected verbal patterns are attested. For example, in V-to-C movement in Dutch, the finite verb cannot be fronted with particles or

small clause predicates. Thus, one finds the contrast between (55)a and (55)b. In (55)a, where the non-finite complex verb *op-bell-en* is low in the clause, the particle *op* immediately precedes the verb. In (55)b however, where the verb has undergone V-to-C movement (yielding V2), the particle must be stranded.

(55) Dutch
a. Lexical verb in situ
Zij wil hem **op-bell**-en.
she wants him up-ring-INF
'She wants to telephone him.'

b. *V-to-C + Particle Stranding*
Zij **bel**-de hem **op**.
she ring-PAST him up
'She telephoned him.'

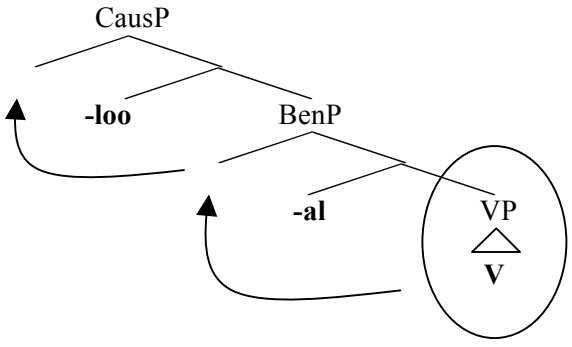
Koopman (2002) analyzes V-to-C as remnant VP movement to SpecCP and assumes that separable particles, like *op*, take VP complements. The particle/small clause restriction can be explained in terms of a complexity filter on SpecCP. C attracts the VP to SpecCP, but the complexity filter active in SpecCP forces VP to strand the particle.

The data which showed that a head movement analysis was untenable for the valence-changing affixes comes from the ordering of CAUS and BEN:

(56) Gàllaay bind-**loo-al**-na gan gi xale yi taalif (= (27)a)
Gallaay write-CAUS-BEN-FIN guest the child the.PL poem
'Gallaay made the children write the visitor a poem.'

(56) presents a Mirror Principle violation. The affix order CAUS-BEN is unexpected under a head movement analysis, but, is predicted to occur given the typology of Mirror Principle violations developed in Koopman (2005, 2006). As in (54), the Mirror Principle violations result from stranding:

(57)



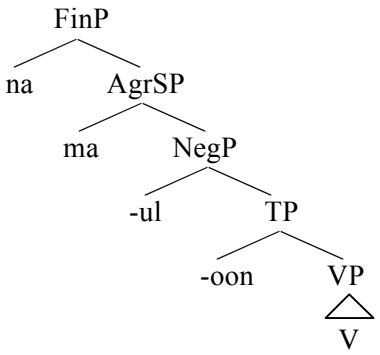
The VP remnant raises to SpecBenP. This yields the order *V-Ben*. As with BEN and INSTR, the mirror order is destroyed when VP strands BenP and raises to SpecCausP. Here too, syntactic stranding is the source of the Mirror Principle violation. The fact that **V-al-loo* is ungrammatical follows from (57) being an obligatory stranding configuration.

In summary, we have argued that the Mirror Principle violations in valence-changing morphemes follow from phrasal movement and a single underlying hierarchy of functional heads. In two of the three cases that we have looked at, Wolof displays the predicted results of XP movement followed by stranding.

6.2 XP movement in the higher functional domain

We propose that the surface affix orders in the higher functional domain in (39) are derived from a single hierarchy of functional heads:

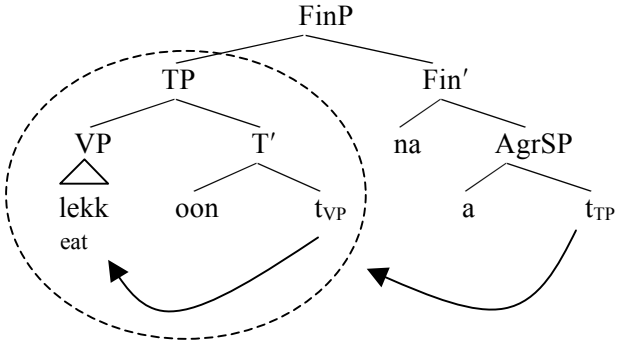
(58)



The affirmative perfective in (59)a is derived as in (59)b:

(59) a. Lekk-oon-na-a.
eat-PAST-FIN-1SG
'I ate/had eaten.'

b.

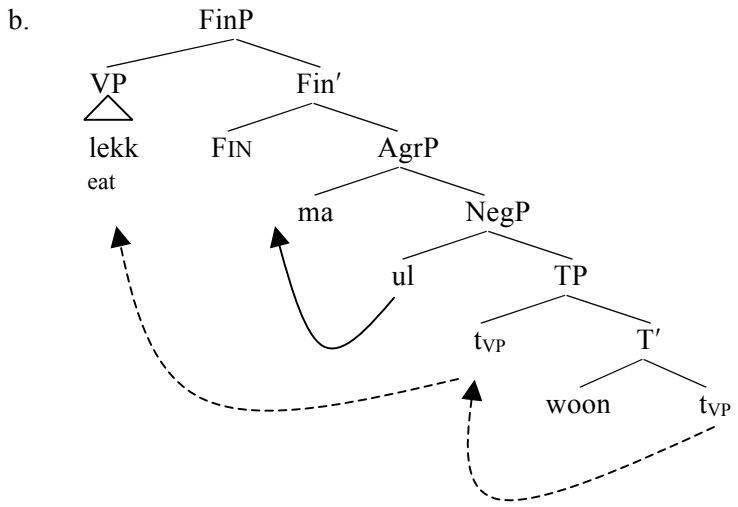


In (59)b, VP has raised to SpecTP. VP pied pipes TP to SpecFinP, headed by *na-*. The result of TP movement to SpecFinP yields the observed surface order. The affirmative perfective therefore displays the expected mirror order.

Under an XP movement analysis, the negative in (60)a is derived as in (60)b:

(60) a. Lekk-u-ma woon.
eat-NEG-1SG PAST
'I had not eaten.'

b.



The derivation of the negative involves XP movement (and head movement of Neg^0). VP raises to SpecTP and then to SpecFinP, stranding TP.

The analysis that we give in (60)b has an interesting consequence for the relation between phonological words and syntactic structures. Recall that the entire verbal complex in (60)a, from V to *-oon* is a domain of ATR vowel harmony. As observed by Ka (1987), functional morphemes in Wolof do not trigger vowel harmony. Thus, the negative morpheme *-ul*, although it is composed of a +ATR vowel, is 'inert' with respect to vowel harmony. Therefore, past tense, *-oon*, which is to the right of NEG, is -ATR. When the verb root is changed from -ATR, as in (60), to a +ATR verb root, past tense (and all other verbal affixes) have +ATR vowels:

(61) Gis-u-m**ë** w**óó**n.
see-NEG-1SG PAST
'I had not seen.'

Given the tree in (60)b, the entire span from FinP to T is treated as a single phonological unit for vowel harmony, even though they do not form a complex syntactic head. Thus, there is a mismatch between the syntactic constituency and the phonological 'constituency'. That is, a string that forms a phonological word (or better: a domain of phonological rule application) need not correspond to a single syntactic unit.

The fact that **V-T-AgrS-Neg* is ungrammatical follows if (60)b is an obligatory stranding configuration. That is, if TP cannot be pied piped, when VP is attracted to SpecFinP, TP will remain low in the clausal structure. One possible reason for the obligatory stranding is that the silent FIN in the negative construction has a complexity filter (See Koopman (2006) for an alternative). Analogous to the Dutch case above (where VP movement to SpecCP must strand the particle), this forces the VP to strand TP. Another possibility has to do with the properties of negation. Although not well understood, it is known that negation often has the property of blocking movement. This is well documented in the case of imperatives cross-linguistically, where many languages that have true imperatives lack true negative imperative verb forms (Han 2001, Zanuttini 2001, Zeijlstra 2006). The fact that TP cannot move in the negative construction might be related to the cross-linguistic tendency for negation to block movement. In summary, under the phrasal analysis we propose, either a TP (in the affirmative) or VP (in the negative) raises into the left periphery. We leave it as an open question as to why TP cannot be pied

piped in the negative. However, it is clear that a smaller constituent raises into the left periphery in the negative perfective.

Dialectal variation in the position of the tense morpheme provides support for our conclusions about phrasal movement, word formation, and affix ordering. Two dialects of Wolof, the St. Louis and Dakar dialects, differ in the possible morpheme orderings in the affirmative. The affirmative perfective in (62)a, with T (*-oon*) preceding AgrS (*-a*) is grammatical in both dialects (and is the form that has been used up to this point). The Dakar dialect however, also allows (62)b (although it is not common):

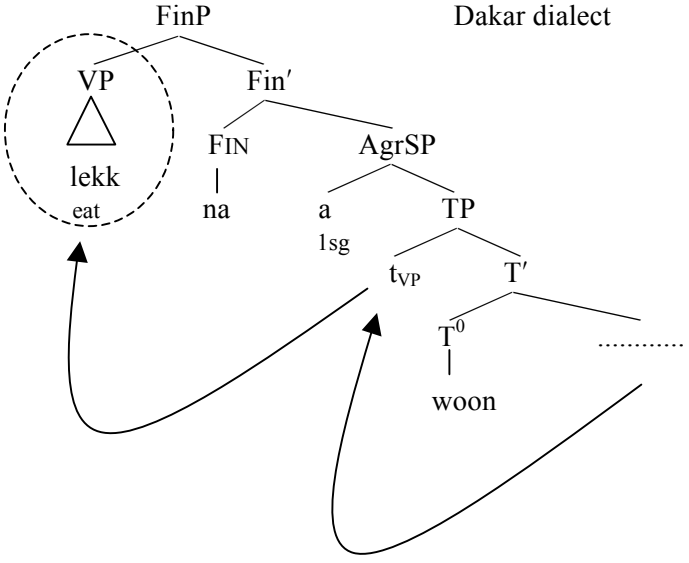
(62) a. Lekk-**oon**-na-a. ✓St. Louis, ✓Dakar
eat-PAST-FIN-1SG
'I ate.'

b. %Lekk-na-a **woon**. *St. Louis, ✓Dakar
eat-FIN-1SG PAST
'I ate.'

Note that in (62)b Tense *follows* both *na-* and the subject marker. That is, TP is left low in the structure.

Under the analysis of perfective *na-* clauses we propose, (62)b represents an instance of VP movement into the left periphery which has failed to pied pipe TP, thereby stranding it in its base position, lower than AgrSP:

(63) Dakar dialect



The affix ordering differences across the dialects therefore reduce to variation in how much material can or must be pied piped into the left periphery. In both dialects, VP ends up in the left periphery in affirmative perfective *na*-CPs. In the St. Louis dialect, TP is obligatorily pied piped in the affirmative. However, in the Dakar dialect, TP is optionally stranded in the affirmative. It is not clear why in the St. Louis dialect TP must be pied piped in the affirmative, while pied piping is optional in the affirmative in the Dakar dialect. This is precisely the kind of difference that we expect to see if the morpheme orders are the results of the interaction of pied piping and stranding with the hierarchy of syntactic heads.

Interestingly, the two dialects pattern identically in the negative, where TP must be stranded. That is, neither dialect allows:

(64) *V-T-Neg-AgrS
*Lekk-oon-u-ma.
Intended: 'I did not eat.'

It remains to be seen if other dialects of Wolof allow for TP pied piping in the negative, or if this is a general ban in the language.

Further evidence for the proposed XP remnant movement analysis also comes from the distribution of adverbial affixes: *-andi* 'meanwhile' and *-ati* 'again'. In the St. Louis dialect, *-andi* optionally occurs with TP stranding:

(65) a. *Lekk-na-ñu **woon**. *St. Louis Dialect
eat-FIN-3PL PAST

b. Lekk-**andi**-na-ñu **woon**. ✓St. Louis Dialect
eat-INTERVAL-FIN-3PL PAST
'They ate in the meanwhile.'

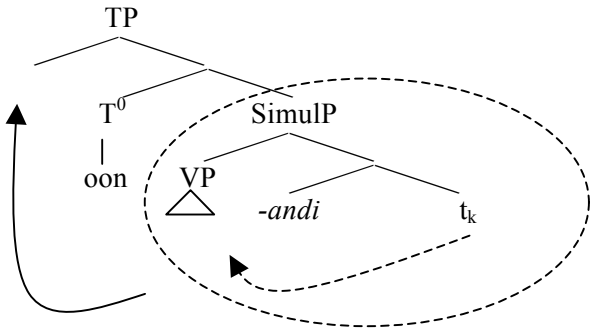
c. Lekk-**andi-woon**-na-ñu. ✓St. Louis Dialect
eat-INTERVAL-PAST-FIN-3PL
'They ate in the meanwhile.'

(65)a shows, as seen before, that TP stranding is ungrammatical in the affirmative in the St. Louis dialect. Surprisingly, (65)b and c show that TP can be stranded or pied piped when *-andi* is present. Schematically, the surface consituencies are:

(66) a. $[_{FinP}\ [_{SimulP}$ **lekk-andi**$]_k$ na $[_{AgrSP}$ ñu $[_{TP}$ **t$_k$** **-oon**]]] = (65)b
b. $[_{FinP}\ [_{TP}$ **lekk-andi-woon** $]_k$ na $[_{AgrSP}$ ñu **t$_k$**]] = (65)c

We assume that the affixal adverb *-andi* is merged higher in the clause than VP (Following Cinque 1999).[16] We take *-andi* to be the head of 'SimulP'. (65)b-c are analyzed roughly as:

(67)

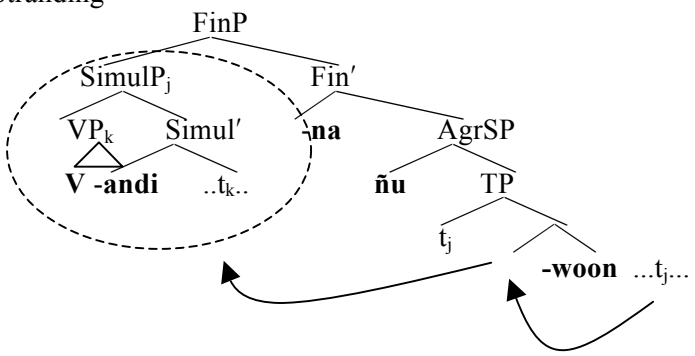


In (67), the VP raises to the specifier of SimulP. At this point, there are two pathways for the derivation. When T merges, it attracts VP. If TP is stranded when SimulP moves to FinP, (65)b is the result (as shown in (68)a below). If TP is pied piped, (65)c is the re-

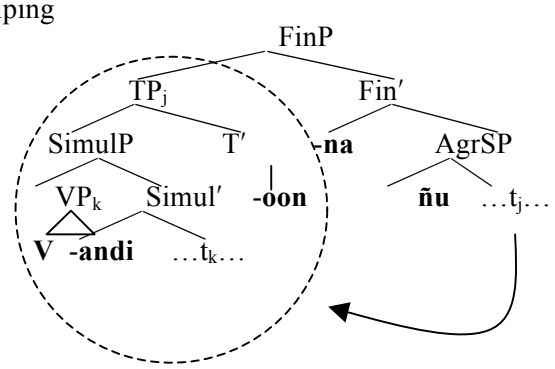
[16] In Cinque (1999), adverbs are specifiers of functional heads. We depart from this assumption here.

sult (as in (68)b below). As before, it is not possible to derive these ordering effects solely by head movement, given the number and hierarchy of heads in the structure:

(68) a. TP Stranding



b. TP Pied Piping



Thus, even in the St. Louis dialect, TP stranding is available in non-negative contexts. What must be investigated is when and why TP stranding is available, optional, or obligatory. We leave this for future research as it requires detailed analysis of morphology and syntax of the verb morphology across constructions and clause types.

The distribution of the affixal repetitive adverb *-ati* provides further support for our phrasal movement analysis of word formation and affix orders in Wolof. The affix canonically suffixes to verbs:

(69) Lekk-**ati**-woon-na-a fale.
eat-REP-PAST-FIN-1SG there
'I ate there again.'

Koopman (2006) analyzes the interaction of *-ati* 'again' with the repetitive suffix *-aat*. She shows that *-ati* can be pied piped with VP, as in (70)a, or stranded, as in (70)b:

(70) a. [Lekk-aat-**ati**]-wu-ma-ko-fa **woon**.[17]
eat-RE-REP-NEG-1SG-3SG-LOC PAST
'I did not repeat re-eating it there.'
(I.e., I ate there many times before.)

[17] Adapted from Koopman 2006: (15) and (16).

b. [Lekk-aat]-u-ma-ko-fa **woon-ati**.
eat-RE-NEG-1SG-3SG-LOC PAST-REP
'I did not repeat re-eating there again.'
(I.e., I ate there two times only.)

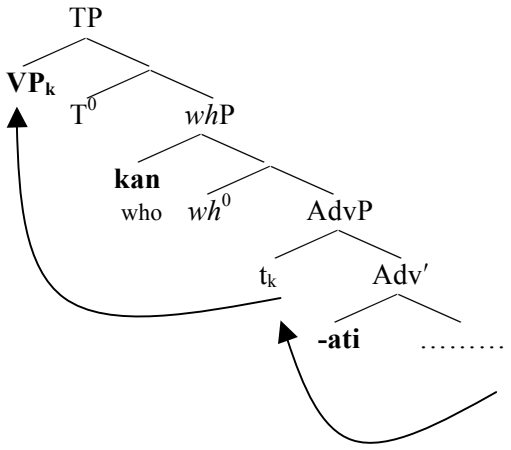
Quite surprisingly, *-ati* can surface on non-verbs under focus/wh-movement:

(71) a. [**Kan**][18] l-a xale bi dóór-**ëti**?
who XPL-COP child the hit-REP
'Who did the child hit again?'

b. [**Kan-ati**] l-a xale bi dóór?
who-REP XPL-COP child the hit
'Who did the child hit again?'

In (71)a, *-ati* is suffixed to the verb, as expected. However in (71)b, the adverb appears in the left periphery of the clause attached to *kan* 'who'. (71)b is surprising because, if *-ati* is a 'verbal' affix merged low in the structure (following Cinque (1999) and Koopman (2006)) the question arises as to why it ends up 'suffixed' to a wh-word in the left periphery of the clause. In the Wolof clefts in (71), the focused element appears in the left periphery of the clause (in brackets). It is followed by an expletive *l-*, a copula-like element *-a-*, and the subject, here *xale bi* 'the child'. It is important to note that clefted constituents in Wolof are not base generated in the cleft position, but undergo movement to focus. Evidence hat Wolof clefts are derived by movement is provided in Torrence (2005), based on reconstruction effects, for example. Therefore, the clefted string *kan-ati* in (71)b originates lower in the clause. We therefore analyze (71) as a case of pied piping of *-ati*. We provide a rough sketch of how the data in (71) follows from a phrasal movement analysis. First, the VP remnant moves to the specifier of AdvP, headed by *-ati*. Koopman's data in (70) show that AdvP can be stranded when VP remnant raises to SpecTP. We assume that there is a 'low' *wh* position which occurs between AdvP and TP and whose specifier hosts the wh-phrase:[19]

(72)

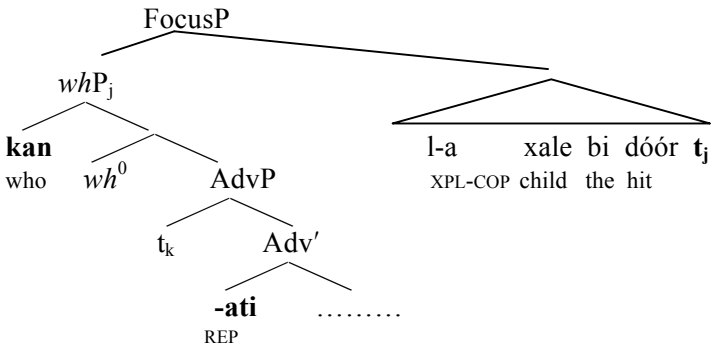


[18] The form glossed as 'who' is morphologically complex, being composed of the singular human noun class marker *k-* and the wh element *-an*.

[19] Motivation for at least one 'low' landing site for wh-expressions is also found in Chomsky (1986), Rackowki and Richards (2005), Cozier (2006) and Buell (2012).

Given the configuration in (72), if the wh-phrase strands *wh*P, then the result is pronounced [*Verb ati*], as in (71)a. However, if the wh-phrase pied pipes *wh*P, then [*kan ati*] is the expected output. This is the form seen in (71)b. This means that the derived constituent structure of the string [*kan ati*] in (71) is actually quite large. That is, the entire *wh*P has been pied piped into the left periphery of the clause to the focus position:

(73)



As with the vowel harmony facts discussed under (60)-(61), superficially, *-ati* appears to be a suffix on *kan* 'who'. However, syntactically *-ati* is simply contained in the pied piped *wh*P. There is no direct syntactic relation between *kan* and *-ati*. The Wolof facts are strongly reminiscent of other mismatches between syntactic and phonological constituency that have been noted for other languages. For example, Myers (1995), presenting cases from Shona and other Bantu languages, shows that a phonological word, i.e., the domain of phonological rules, need not correspond to a syntactic constituent. For English, if we take a case like:

(74) Who do you think**'s** a student?

The contracted form of *is*, *'s*, in (74) is phonologically 'dependent' on the matrix clause verb *think*. However, this does not entail that *think* and *'s* form a syntactic constituent of any kind.

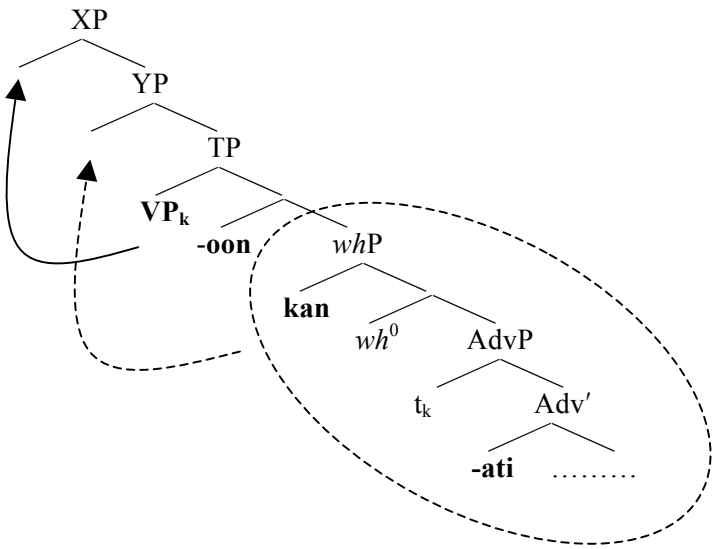
Even more dramatic cases of 'misplaced' verb morphology can be found when we look at both adverbs and past tense:

(75) a. [**Kan**]$_k$ l-a-ñu dóór-**ëti-wóón** **t$_k$**?
who XPL-COP-3PL hit-REP-past
'Who did they hit again?'

b. [**Kan-ati-woon**]$_k$ l-a-ñu dóór **t$_k$**?
who-REP-PAST XPL-COP-3PL hit
'Who did they hit again?'

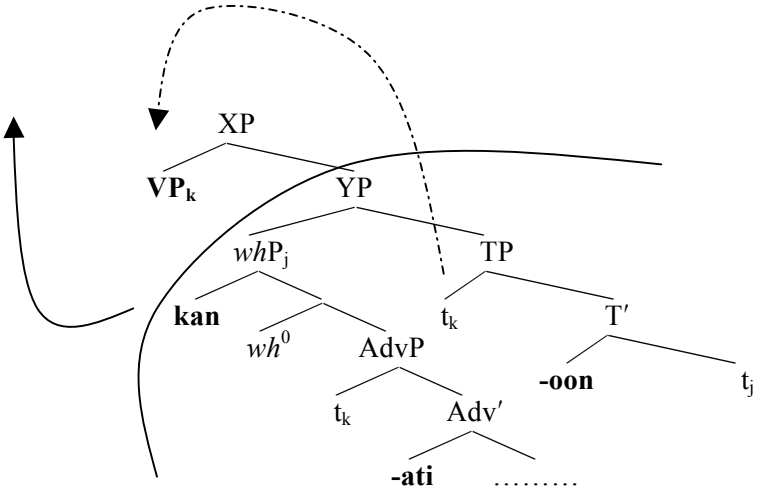
In (75)a, the verbal affixes *-ati* and *woon* 'PAST' are suffixed to the verb, as expected. However in (75)b, both of these affixes surface in the cleft position following the focused wh-word *kan* 'who'. It is important to note that within the fronted string *kan-ati-woon*, the adverb and past tense display the mirror order. (Recall that the adverb is merged lower than T). We analyze (75)b as derived from the intermediate structure in (72). The WhP must move to a position higher than TP and VP strands TP:

(76)



Recall that VP must independently be able to escape from TP, as in the negative perfective. (76) gives a configuration in which the wh-word, adverb, and past tense are contained in YP:

(77)



(75)b is derived when YP is pied piped into the left periphery of the clause (as in (77), after the verb has moved out of YP). Interestingly, the fact that the adverb and past tense surface in the mirror order is not the result of head movement. Instead, the mirror order is a consequence of *-ati* being contained in a pied piped XP. As we have seen previously, there is no direct syntactic relation between *-ati* and *-woon*. It is also important to point out that data like (71)b and (75)b are mysterious under templatic view of Wolof verb morphology. This is because there is no mechanism, aside from stipulation, to allow verbal affixes to appear on non-verbs.

7 Conclusions

In summary, we have argued for a syntactic approach to affix ordering in Wolof verbal complexes. We first showed that the Mirror Principle violations in Wolof are found in both the functional and valency-changing morphology. Specifically, we have posited phrasal movement as the principle source of the surface affix orders and the Mirror Principle violations. By looking at affix orders (both strict and variable), we showed that a restrictive head movement approach, with a single hierarchy of heads, cannot account for the affix orders in either the valency-changing or inflectional domains. Further, we have argued that a templatic approach is problematic because it does not predict the displacement of verbal affixes under syntactic movement. (In addition, under a templatic approach, there is no connection between the ordering of verbal affixes and the positioning of arguments.) However, this distribution is expected under a syntactic approach.

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