Verb phrase external arguments in Mande: New evidence for obligatory extraposition

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Mande languages are well-known for their rigid SOVX word order: verb phrases cannot accommodate postpositional phrases, and all oblique arguments must appear after the main verb. This study explores, based on data from Wan (Southeastern Mande), new evidence for syntactic constituency that is essential for developing a formal account of this typologically unusual pattern. First, I show that previously unexplored tonal evidence rules out argument raising accounts. Tone is sensitive in Wan to prosodic phrasing, which is in turn closely related to syntactic constituency; the way postpositional arguments are prosodically integrated into the clause points to their unusually high, clause-level attachment. Second, I argue against a base-generation analysis, which would require a serious modification of the Projection Principle and locality of selection. Third, an analysis based on obligatory extraposition is discussed as the remaining option in transformational frameworks.

While accounting for both semantic and tonal evidence, the extraposition account has to rely on a highly unusual kind of filter to rule out all structures where a PP argument appears clause-internally. Accounts postulating such idiosyncratic filters can hardly be considered satisfying, as they merely model constraints on surface structure, without deriving them from underlying structural properties. The obligatory argument extraposition of Mande languages receives a more elegant explanation in constraint-based, surface-oriented theories, which do not need to introduce special devices to handle the basic word order of Mande languages. I illustrate this with a sketch of an account coached in the framework of Lexical-Functional Grammar.

1   Theoretical approaches to the SOVX word order

Mande languages are famous for their typologically unusual word order (Creissels 2005; Nikitina 2009a, 2012). Subjects and objects precede their verb, but postpositional arguments and adjuncts follow it. As a result, different types of complement (direct objects vs. oblique arguments) appear on opposite sides of the verb, making it difficult to place Mande languages with respect to the verb-initial vs. verb-final dichotomy.[1] The SOVX word order is common to all languages of the family, and there is no doubt that it should be reconstructed back to Proto-Mande (Nikitina 2011a). It is also very rigid, hardly allowing for exceptions. Auxiliary-like TAM elements may intervene between the subject and the object in some (and, in some languages, in all) contexts, but their presence does not affect the placement of objects and oblique arguments with respect to the verb, cf. (1a) vs. (1b) from Wan (Southeastern Mande, Côte d'Ivoire).[2]

(1)   a.   S-O-V-PP

   è   sɔ́   klā   sógò   tā

   3SG[3] cloth   put:PAST   horse   on

   'He covered the horse with cloth (=put cloth on the horse).' (the author's field notes)

   b.   S-Aux-O-V-PP

   è   ŋ̀   sɔ́   klà   sógò   tā

   3SG   PERF cloth   put   horse   on

   'He has covered the horse with cloth.' (the author's field notes)

In the generative literature, it has been suggested that the SOVX word order of Mande languages can be derived from an underlying SVO order. In an early analysis by Hilda Koopman (1984), the peculiar structure results from conflicting directions of theta-role and case assignment: in Mande, theta-roles are assumed to be assigned to the right, while case is assumed to be assigned to the left of the verb. The structure in (2) illustrates schematically this derivational account: the underlying order is V-O-X, but the object noun phrase moves out to the beginning of the verb phrase to get its case (Koopman 1984: 127-128 on Mahou and Mande in general; Koopman 1992 on Bamana; Travis 1989 on Kpelle).

(2)   A generative analysis deriving S-O-V-X from SVO:
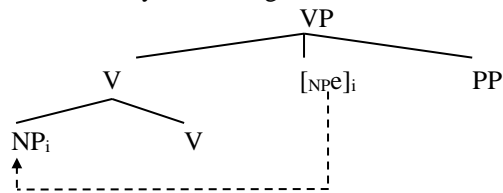
The derivational account, however, is incompatible with the way postpositional arguments behave in non-finite clauses. It predicts that oblique arguments should appear after their verb, but within the same constituent. This prediction does not hold: oblique arguments of a wide variety of non-finite verbs and nominalizations are in fact separated from the verb that selects them. Instead of remaining within the verb phrase where they were generated (on Koopman's account), they appear outside the verb phrase, after the main verb.[4]

   The unexpected placement of postpositional arguments, while rarely discussed in the theoretical literature, is widely attested across the Mande family. The examples below are drawn from a variety of sources, and come from different branches of Mande. Some of the examples involve nominalizations, others, constructions with non-finite verbs. They show that in spite of superficial syntactic differences, all Mande languages share the long-distant placement of oblique arguments.

   In Mwan (3a), oblique arguments of a nominalization do not appear next to it, but must instead follow the main verb; this is the only possibility that the language offers. A similar example from Looma (3b) involves a topicalized adverbial phrase ('because of your passing in my field'). It shows that when a nominalization is embedded in an adverbial phrase, its oblique arguments must follow that entire adverbial phrase, and again cannot appear next to the nominalization that selects for them.[5]

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[1] Cf. Greenberg's (1963:109) dubious classification of Mande languages as VO, repeated in Hawkins (1983: 332).

[2] In Mande studies, the auxiliary-like elements are traditionally referred to as predicative markers. Unlike prototypical auxiliaries, they do not share any properties with verbs, and usually do not derive from verbs.

[3] This paper uses the following abbreviations: ALN – alienable possessor; DEF – definite marker; DIMIN – diminutive marker; NEG – negation; NMLZ – nominalizer; PERF – perfect; PFV – perfective; PL – plural; POSS – possessor; PROG – progressive, PRTC – participle; RECIPR – reciprocal; REFL – reflexive; SG – singular.

[4] I use the notion "main verb" to refer both to finite verbs (in the languages that have them) and to verbs that appear with auxiliary-like elements in S-Aux-O-V structures. The two types of verb behave identically with respect to word order.

[5] Here and elsewhere I retain the original orthography of the primary sources.

(3) a. Mwan, Southeastern Mande:

ŋ́	bɔ̄-lē	dā̰ā̰	zí	sɔ̀ófàlí	tā
1SG	climb-NMLZ	learn	PROG	horse	on

'I am learning to mount a horse.' (Perekhvalskaya & Yegbé 2008: 17)

b. Looma, Southwestern Mande:

da	levegi	ma-vele-ma	nà	kpàlagave	ge	è	ghaave
2SG.ALN	pass.NMLZ	because	1SG.ALN	field.at	1SG	2SG	see.PERF

'I saw you because you went though my field.' (Prost 1967: 79)
(Lit., 'Because of your passing in my field, I saw you.')

The same structures are illustrated in (4a,b) for Bamana. In (4a), a nominalization and its object are embedded in a postpositional phrase ('for giving it'), but the nominalization's oblique argument ('to you') follows the postposition. In (4b), a nominalization is part of the noun phrase introduced by the postposition 'between' ('between now and selling it'); the object appears before the nominalization, but the oblique argument ('to butchers') is again excluded from the postpositional phrase, and follows the postposition.

(4) a. Bamana, Central Mande:

ní	í	y'	à	yé	kúma	fìla	dòn-na	à	dí-li	lá	í	mà...
if	2SG	PFV	3SG	see	word	two	enter-PFV	3SG	give-NMLZ	at	2SG	to

'If you see that two speeches were spoken in order for it to be given to you…' (Dumestre 1989: 40)

b.

… sá-ni	à	fèere-li	cé	wàyew	mà
now-and	3SG	sell-NMLZ	between	butchers	to

'… before selling it to butchers' (lit. 'between now and selling it to butchers')   (Dumestre 2003: 279)

In Tura, discontinuous placement of oblique arguments is characteristic of the periphrastic 'do'-construction. The light verb 'do' plays the role of the main verb in (5), and when the verb embedded in the construction ('arrive') takes an oblique argument ('in the dogs' field'), that argument must appear after the main verb ('do'), and cannot follow the embedded verb.

(5) Tura, Southeastern Mande:

é	waa	déê	wɔ̂.	gbéê-bò-à	bʋʋ	láà	à	gí
3SG.IA	arrive	new	do.PFV-PFV	dog-PL-POSS	field	that	3SG	in

'He arrived again at the field of the dogs.' (Bearth 1986: 101; see also Bearth 1971: 173-4)
(Lit., 'He did newly arrive in the dogs' field.')

The same structure is illustrated for Bobo with a construction with an embedded verb in (6). The oblique argument of the embedded verb 'go' is separated from its verb by the matrix verb ('be able'). Note that the negation marker appears after the oblique argument, suggesting that such arguments are well integrated into the sentence structure, and cannot be dismissed as, for example, afterthought-like elements (see Nikitina 2009a: 923 for more evidence and further discussion).

(6) Bobo, Northwestern Mande:

à	yōẁ	kpín	sáɣā	kɔ̄
3SG	go	be.able	in.the.bush	NEG

'He cannot go to the bush.' (Prost 1983: 91)

Finally, example (7), from Bamana, features a participle; the participle's oblique argument also appears after the main verb, not next to the participle that selects for it.

(7) Bamana Central Mande:

n'	y'	u	taa-tɔ	ye	kungo	la
1SG	PFV	3PL	go-PRTC	see	bush	at

'I saw them go to the bush.' (Sauvant & Molin 1956: 74)

The languages for which this pattern has been most extensively discussed are Kpelle (Konoshenko 2014), Mano (Khachaturyan 2015), and Wan (Nikitina 2009a). For Wan (Southeastern Mande), Nikitina (2009a) presents three types of word order evidence for obligatory clause-final placement of postpositional arguments, all based on constructions with non-finite verbs and nominalizations. First, non-finite complements of matrix verbs that appear in the preverbal position are obligatorily separated from their oblique arguments: in (8a), the matrix verb 'start' takes a non-finite complement 'climb on a horse', and the oblique argument of 'climb' must appear after the finite verb.

(8) a.

è	[kúnà̰	ságlā]_VP	[sógò	tā]_PP
3SG	climb	start:PAST	horse	on

'He started mounting the horse (=climbing on the horse).' (the author's field notes)

b. * è   kúnã̀   sógò   tā   ságlā
   3SG   climb   horse   on   start:PAST

Second, non-finite complements of matrix verbs that are themselves introduced by postpositions cannot accommodate a postpositional phrase. In (9a), a non-finite verb and its object are embedded in a postpositional phrase headed by *yā* 'with', but in (9b), the non-finite verb 'climb' is again separated from its oblique argument, this time by the postposition that introduces the non-finite complement. As in (9a), this is the only position in which the oblique argument can appear.

(9) a. è   sī   [ŋ̀   lèŋ]ₚₚ   [nã̀ã̀   kū-έ   dì   yā]ₚₚ
        3SG   help:PAST   1SG   to   1SG:ALN   house-DEF   build   with
        'He helped me build my house.' (the author's field notes)
    b. è   sī   [ŋ̀   lèŋ]ₚₚ   [kúnã̀   yā]ₚₚ   [sógò   tā]ₚₚ
        3SG   help:PAST   1SG   to   climb   with   horse   on
        'He helped me mount the horse.' (the author's field notes)

Third, nominalizations retaining an oblique argument cannot appear next to it, since the oblique argument must be placed in a clause-final position. In (10), the nominalization 'hunting' is embedded in the object's possessor ('showing the way of hunting'), but its argument 'with dogs' appears after the main verb, at a considerable distance from the nominalization.

(10) Dèlɔ̀tɔ́   á   [wìtέ-ŋ́   gbè   lá   lέ]ᵥₚ [gbã̄n̄ē-mú   yā]ₚₚ [lā   gbè   lèŋ]ₚₚ
     D.   PROG   hunt-NMLZ   way   show   PROG dog-PL   with 2SG   son   to
     'Deloto is showing to your son the way of hunting with dogs.' (Nikitina 2008a: 89)

In sum, all postpositional phrases, irrespective of their semantic association with predicates within the clause, appear in a clause-final position, following the main verb. They do, however, precede negation and question markers, suggesting that they have a fixed position in the clause and do not attach as some kind of clause-external adjunct.

In spite of the wide range of available data, Mande word order has remained unexplored from a formal theoretic point of view, and no derivational account has been proposed since the early account by Koopman (which, as I showed above, does not make right predictions when it comes to structures with embedded verbs). This paper sets out to explore three different options for treating the non-local placement of oblique arguments within a generative-transformational framework. First, I discuss a new, previously unnoticed source of evidence: the interaction between syntactic constituency and tone. I focus here on the tonal syntax of Wan, a Mande language for which the SOVX word order has been most thoroughly described. In Section 2, I show that the tonal syntax of Wan is not only consistent with its word order, but also helps rule out argument raising accounts that are in principle compatible with the word order evidence summarized above. I then discuss in Section 3 the possibility of base generation of oblique arguments in a verb phrase external position, and conclude that this type of account would not fit with the standard assumptions of generative-transformational frameworks. In Section 4, I outline the only remaining – yet not entirely satisfactory – option: an account relying on obligatory extraposition. I also discuss how the obligatory extraposition of PP arguments can be accounted for in a surface-oriented, constraint-based framework such as Lexical-Functional Grammar, and show that no special or unusual formal tools are needed in such a framework to deal with Mande word order.

2   Tonal evidence against argument raising
## 2.1   Argument raising accounts

The unusual behavior of oblique arguments in Mande bears some similarity to the extensively studied phenomenon attested in West Germanic: verb clustering, or verbal complexes, illustrated below for Dutch:

(11) *dat   Anne   deze film   mag   zien*
     that   A.   this movie   may   see
     'that Anne is allowed to see this movie' (Bouma 2003: 5)

The argument 'this movie' is underlyingly the object of the verb 'see', yet it appears before the modal, and is separated by the modal from its verb. Numerous accounts have been developed for the discontinuous placement of the verb and its argument, both within transformational and within constraint-based frameworks (see, for example, the papers in Seuren & Kempen 2003). One could attempt to extend some of these accounts to the superficially similar non-local placement of oblique arguments in Mande. In particular, it could be hypothesized that instead of appearing next to the verb that selects for them, oblique arguments are raised to the main verb and are realized as if they were the main verb's own argument.

Minimalist versions of argument raising accounts of verb clusters are presented in Zwart (1996) and Koopman & Szabolcsi (2000). Lexical items are assumed to select arguments but not license them; the arguments must then be licensed by functional heads that do not select them. In order to be licensed, arguments of a bare VP raise into the nearest functional structure. The surface order of the arguments depends on the hierarchy of the licensing IP shells, not on the

argument's order in the subcategorization frame.[6] The logic of this analysis is represented in (12), based on Evers (2003).[7]

(12)
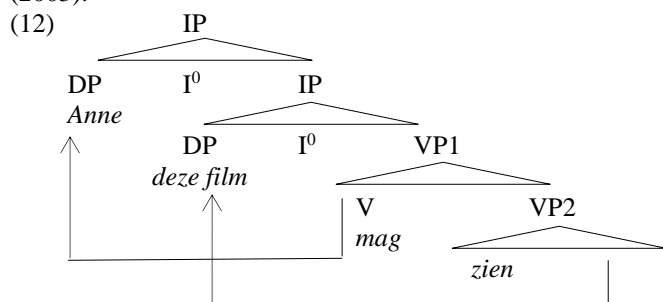
A similar idea is expressed in non-transformational lexicalist accounts of verb clusters. For example, the HPSG account by Hinrichs & Nakazawa (1989, 1994) is based on the notion of *complement inheritance*: complement inheritance verbs are allowed to combine with their verbal complement, as well as the complements of this complement.

Evers (2003) criticizes the minimalist account in (12) on theoretical grounds: the account does not predetermine the syntactic relation between the two positions of the same argument, and provides no motivation for the systematic crossing of head-argument relations. While minimalist versions of argument raising accounts have to rely on apparently unmotivated obligatory extraposition, lexicalist accounts suggest a more satisfactory solution by allowing the main verb to license not only its own complements, but also the complements of its complements. This approach could help account for the high attachment of PPs in Mande, but it would still have to address a number of challenges. For example, it would have to account for the fact that in Mande, unlike in Germanic, only PP arguments are raised, never objects. It would also have to explain why the same construction is obligatory with all verbs, not just several argument inheritance verbs. I will not address these particular challenges, but will instead argue against argument raising accounts in general. While such accounts are fully compatible with the word-order evidence, they are not compatible, as I show in the rest of this section, with the evidence of prosodic phrasing.

2.2 Lexical tones and their realization
2.2.1 Overview

Wan has three underlying tones, and they are realized by three surface tones as described in (13). L and M are always realized as [L] and [M], respectively. H can be realized as [H] or [L]. Lexically toneless TBUs can be realized as [H], [L] or [M] depending on context.

(13) Underlying tones and their realization:

L	[L]
M	[M]
H	[H] or [L]
0 (toneless TBUs)	[H] [M] or [L]

In (14), I illustrate differences in the surface realization of the underlying tones before L, M, and H tone within the same "inalienable possession" construction (literally, "long (one) of lizard", "one of lizard", "a lot of lizard"). The purpose of this illustration is to show that the four nouns indeed behave differently; the details will be explained later in this section. As described above, L and M are realized consistently as [L] and [M] in all three contexts. H is realized as [H] in all three contexts (but note that the H tone on the construction's head – 'a lot of' – becomes L when following H). The toneless TBU is realized as [H] before L and M, and as [M] before H. This shows that each example is characterized by a unique tonal behavior, justifying the positing of four underlying tones in (13).

(14) Different realizations of the four tones in select environments:

L:	zò	'lizard'	[zò blɔ̀]	'long lizard'	[zò dō]	'one lizard'	[zò tí]	'a lot of lizards'
M:	mī	'person'	[mī blɔ̀]	'long person'	[mī dō]	'one person'	[mī tí]	'a lot of people'
H:	kpɔ́	'fish'	[kpɔ́ blɔ̀]	'long fish'	[kpɔ́ dō]	'one fish'	[kpɔ́ tì]	'a lot of fish'
0:	ku	'house'	[kú blɔ̀]	'long house'	[kú dō]	'one house'	[kū tí]	'a lot of houses'

---

[6] In generative frameworks, subcategorization frames are used to specify the number and types of a word's argument.

[7] I cannot discuss here whether argument raising accounts work well for Germanic verb clusters (for alternative approaches and further discussion, see Bresnan et al. 1982; Zaenen & Kaplan 1995; Evers 2003, inter alia).

The underlying tone is determined lexically, but there are also tones that have grammatical meaning; for example, the past tense is marked by M on the verb's last syllable, as in (8a) or (9a,b) above. Words with toneless syllables are relatively rare, so examples must be constructed carefully to reveal the tonal rules described below.

Of crucial importance for this study are rules that determine the realization of H and the assignment of tone to lexically toneless syllables. These rules refer to prosodic constituency, which is closely related in Wan to syntactic structure. The intimate relation between prosodic phrasing and syntax can be used to test for syntactic constituency in cases where it is not clear from word order alone.[8] The rules are summarized in (15); brackets indicate phonological phrasing, and a curly bracket is used to indicate the right edge of an intonational phrase.

(15) Tonal rules

i. assignment of H	0 → H / __L, M, }	a lexically toneless TBU receives a H tone before either a L or a M, or at the end of an intonational phrase
ii. assignment of L	0 → L / (H, L__)	a lexically toneless TBU receives a L tone after a H or a L within the same phonological phrase
iii. dissimilation	(HH) → (HL)	H becomes L after a H within the same phonological phrase
iv. default realization	0 → [M]	a lexically toneless TBU is realized as [M]

Two of the rules treat the H tone in a special way: rule (i) applies before L and M, but not before H, i.e. it is blocked by H, and rule (iii) is a dissimilation rule that repairs sequences of H tones. Both these rules can be viewed as different instantiations of the Obligatory Contour Principle (Myers 1997).[9]

The tonal rules normally apply in the order in which they are presented in (15), although some variation is attested which suggests that rules (i) and (ii) are unordered for some speakers; such speakers allow for two different realizations of certain tonal combinations. I cannot treat that variation in this study, and rely instead on the preferred realizations which are accepted by all the speakers I consulted.

As in a number of other Mande languages, tonal realization is sensitive in Wan to prosodic phrasing. Yet Wan differs from, for example, Bamana, in that the relevant domain is much broader than the prosodic word (cf. Creissels 1988; Green 2013, 2015; Vydrin 2016), and is more conveniently described as the phonological *phrase* (Hyman 1987).[10] Constructions that behave as phonological phrases in Wan can be described in strictly syntactic terms. Structurally, phonological phrases correspond to intermediate lexical projections, i.e. combinations of a lexical head with its (internal) argument. I list and discuss constructions forming phonological phrases in Section 2.3, after explaining and illustrating the tonal rules stated in (15).

2.2.2 Rule (i): assignment of H

Rule (i) assigns H to toneless units before either a L or a M, or at the end of an intonational phrase. In (16a,b), the lexically toneless word /ku/ 'house' is assigned a H before M and L. No other rule applies in this case.[11]

(16) a. (ku dō) → [kú dō] 'one house' rule (i)
     b. (ku blɔ̀) → [kú blɔ̀] 'long house' rule (i)

Lexically toneless units also receive a H at the end of an intonational phrase. Phonological phrases combine in Wan into intonational phrases; the ends of intonational phrases are commonly marked by pauses, and they behave like M or L with respect to rule (i).[12] Structural units that behave as separate intonational phrases are clauses, constituents uttered in isolation, and left- and right-dislocated constituents. In constructions with auxiliaries, subjects behave prosodically as separate intonational phrases, as do transitive subjects followed by a lexical object. Example (17a) illustrates the tonal effect of topicalization: the left-dislocated noun phrase 'his child' ends in a lexically toneless word, which is assigned a H because it is located at the right edge of an intonational phrase. The same effect is observed when a toneless word is pronounced in isolation, in answer to a question (17b). Intonational phrasing is indicated by curly brackets; it is discussed in more detail in the next subsection.

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[8] This is the first time the relation between tone and syntax is described for Wan, and I do not adopt any particular theory of the correspondence between syntactic and prosodic constituency (for a recent theoretical overview, see Selkirk 2011; for a recent analysis of mismatches between syntactic and prosodic constituency, based on Irish, see Bennett et al. 2016).

[9] For an influential treatment of OCP-related effects in another Mande language, Mende, see Leben (1978), and Singler 1980, Conteh et el. 1983 for alternative accounts.

[10] The structure of prosodic words also plays a role in tonal realization; in particular, it is relevant to dissimilation (rule iii). I cannot go into the details, as they are orthogonal to the purposes of this study.

[11] The phonological phrasing indicated by brackets is not important in these examples (since rule i is not restricted to phonological phrases), but it will be very important later.

[12] I leave open the question of whether rule (i) should actually be viewed as two separate rules; my unified treatment is based on the assumption that intonational phrases end in a phrasal tone that produces an effect similar to L and M.

(17) a.　{àà　　**nɛ**},　　{Pálē　à　ē}　→　[àà　**nɛ́**　Pálē　à　ē]　rule (i)
　　　　3SG.ALN　child　　P.　3SG saw
　　　　'His child, Pale saw him.' (the author's field notes)
　　b.　(in answer to a question)　{ku} →　[kú] 'house'　　　rule (i)
　　　　　　　　　　　　　　　　　{nɛ} →　[nɛ́] 'child'　　　rule (i)

Rule (i) does not apply before H, so as to avoid producing adjacent H tones. In (18), the word /ku/ 'house' is not assigned a H. Rules (ii) and (iii) do not apply in this context, so the lexically toneless TBU is realized as [M] by the rule of default realization (rule iv).

(18)　　(ku tí)　→　[kū tí]　'a lot of houses'　rule (iv)

The examples in (19a) summarize the effect of the following syllable on the realization of toneless TBUs. Examples (19b) illustrate how rule (i) applies to sequences of toneless TBUs: only the unit preceding a L or a M is affected, others are realized according to other rules (in the examples below, according to the rule of default realization). The derivations in (20a,b) show how rules (i) and (iv) determine the outcome in (19a,b).

(19) Realization of toneless TBUs depending on the following tone
　　a.　(0 H)　(ku tí)　→　[0 H]　[kū tí]　'a lot of houses'　rule (iv)
　　　　(0 M)　(ku dō)　→　[H M]　[kú dō]　'one house'　rule (i)
　　　　(0 L)　(ku blɔ̀)　→　[H L]　[kú blɔ̀]　'long house'　rule (i)
　　b.　(00 H)　(laga tí)　→　[MM H]　[lāgā tí]　'a lot of mouths'　rule (iv)
　　　　(00 M)　(laga dō)　→　[MH M]　[lāgá dō]　'one mouth'　rule (i) + rule (iv)
　　　　(00 L)　(laga blɔ̀)　→　[MH L]　[lāgá blɔ̀]　'long mouth'　rule (i) + rule (iv)

(20) a.　(ku tí) 'a lot of houses'　　　(ku dō) 'one house'　　　(ku blɔ̀) 'long house'
　　　　　(0 H)　　　　　　　　　　　(0 M)　　　　　　　　　　(0 L)
　　(i)　 ---　　　　　　　　　(i)　 (H M)　　　　　　　(i)　 (H L)
　　(ii)　 ---　　　　　　　　(ii)　 ---　　　　　　　　(ii)　 ---
　　(iii)　 ---　　　　　　　(iii)　 ---　　　　　　　(iii)　 ---
　　(iv)　[M H]　　　　　　　(iv)　 ---　　　　　　　(iv)　 ---
　　　　　[kū tí]　　　　　　　　　　[kú dō]　　　　　　　　　[kú blɔ̀]

　　b.　(laga tí) 'a lot of mouths'　　(laga dō) 'one mouth'　　(laga blɔ̀) 'long mouth'
　　　　　(00 H)　　　　　　　　　　　(00 M)　　　　　　　　　 (00 L)
　　(i)　 ---　　　　　　　　　(i)　 (0H M)　　　　　　(i)　 (0H L)
　　(ii)　 ---　　　　　　　　(ii)　 ---　　　　　　　(ii)　 ---
　　(iii)　 ---　　　　　　　(iii)　 ---　　　　　　　(iii)　 ---
　　(iv)　[MM H]　　　　　　　(iv)　 [MH M]　　　　　(iv)　 [MH L]
　　　　　[lāgā tí]　　　　　　　　　[lāgá dō]　　　　　　　　[lāgá blɔ̀]

2.2.3 Rule (ii): assignment of L

Lexically toneless TBUs following a H or a L within the same phonological phrase are assigned a L. In the examples below, the toneless word is placed before a H to avoid the application of rule (i) (the interaction of rules (i) and (ii) will be discussed later). Rule (ii) is responsible for assigning L to the lexically toneless units in (21a); note that the rule applies cyclically to sequences of toneless units. Since the rule does not apply after M or toneless TBUs, the toneless units are realized as [M] in (21b), according to rule (iv).

(21) a.　(H 0 H)　(kpɔ́ pu tí)　→　[H L H]　[kpɔ́ pù tí]　'a lot of white fishes'　rule (ii)
　　　　(L 0 H)　(zò pu tí)　→　[L L H]　[zò pù tí]　'a lot of white lizards'　rule (ii)
　　　　(H 00 H)　(kpɔ́ laga tí)　→　[H LL H]　[kpɔ́ làgà tí]　'a lot of fish mouths'　rule (ii), twice
　　　　(L 00 H)　(zò laga tí)　→　[L LL H]　[zò làgà tí]　'a lot of lizard mouths'　rule (ii), twice
　　b.　(M 0 H)　(mī pu tí)　→　[M M H]　[mī pū tí]　'a lot of white people'　rule (iv)
　　　　(0 0 H)　(ku pu tí)　→　[M M H]　[kū pū tí]　'a lot of white houses'　rule (iv)

Rule (ii) normally applies after rule (i), so that toneless TBUs to which both rules apply are assigned a H (as mentioned above, there is some interspeaker variation with respect to rule ordering). This is illustrated in (22a) below for toneless TBUs following a L. The combinations in (22b) show that both rules apply to sequences of lexically toneless TBUs: first, rule (i) assigns a H to the last unit in the sequence, and then rule (ii) assigns a L to the rest of the units. The derivations in (23) illustrate the outcomes in (22b).

(22) a.　(L 0 L)　(zò pu blɔ̀)　→　[L H L]　[zò pú blɔ̀]　'long white lizard'　rule (i)
　　　　(L 0 M)　(zò pu dō)　→　[L H M]　[zò pú dō]　'one white lizard'　rule (i)

	b.	(L 00 L)	(zò laga blɔ̀)	→	[L LH L]	[zò làgá blɔ̀]	'long lizard's mouth'	rule (i) + rule (ii)
		(L 00 M)	(zò laga dō)	→	[L LH M]	[zò làgá dō]	'one lizard's mouth'	rule (i) + rule (ii)

(23)   (zò laga blɔ̀) 'long lizard's mouth'   (zò laga dō) 'one lizard's mouth'
         (L 00 L)   (L 00 M)
   (i)   (L 0H L)   (i) (L 0H M)
   (ii) (L LH L)   (ii) (L LH M)
   (iii) ---   (iii) ---
   (iv) ---   (iv) ---
         [zò làgá blɔ̀]   [zò làgá dō]

Examples (24), with derivations in (25), show how both rules apply to sequences of toneless units following a H. Here, again, rule (i) assigns a H to the unit preceding a L or a M, and all other units are assigned a L by rule (ii).

(24)   (H 00 L)   (kpɔ́ laga blɔ̀)   →   [H LH L] [kpɔ́ làgá blɔ̀]   'long fish's mouth'   rule (i) + rule (ii)
        (H 00 M)   (kpɔ́ laga dō)   →   [H LH M] [kpɔ́ làgá dō]   'one fish's mouth'   rule (i) + rule (ii)

(25)   (kpɔ́ laga blɔ̀) 'long fish's mouth'   (kpɔ́ laga dō) 'one fish's mouth'
         (H 00 L)   (H 00 M)
   (i)   (H 0H L)   (i) (H 0H M)
   (ii) (H LH L)   (ii) (H LH M)
   (iii) ---   (iii) ---
   (iv) ---   (iv) ---
         [kpɔ́ làgá blɔ̀]   [kpɔ́ làgá dō]

2.2.4 Rule (iii): dissimilation

Rule (iii) is an instance of Meeussen's Rule (Goldsmith 1984): within phonological phrases, adjacent H tones are not tolerated; they are repaired by lowering the second H. The dissimilation rule applies both to sequences of lexical H (26a) and to sequences of H that were created by rule (i) (26b).

(26) a.   (H H)   (tɔ́ gó)   →   [H L]   [tɔ́ gò]   'in the swamp'   rule (iii)
           (tɔ́ kpɔ́)   →   [tɔ́ kpɔ̀]   'river fish'   rule (iii)
           (H H M)   (tɔ́ kpɔ́ dō)   →   [H L M]   [tɔ́ kpɔ̀ dō]   'one river fish'   rule (iii)
           (H H L)   (tɔ́ kpɔ́ blɔ̀) →   [H L L]   [tɔ́ kpɔ̀ blɔ̀]   'long river fish'   rule (iii)
     b.   (H 0 M)   (kpɔ́ pu dō)   →   [H L M]   [kpɔ́ pù dō]   'one white fish'   rule (i) + rule (iii)
           (H 0 L)   (kpɔ́ pu blɔ̀) →   [H L L]   [kpɔ́ pù blɔ̀]   'long white fish'   rule (i) + rule (iii)

The examples in (26b) show that dissimilation happens after the assignment of H to lexically toneless TBUs. If rule (iii) applied before rule (i), it would have no effect on the lexically toneless units in (26b), and these units would be then assigned a H by rule (i). In reality, they receive a L, as predicted by applying rule (iii) after rule (i), as shown in (27):

(27)   (kpɔ́ pu dō) 'one white fish'   (kpɔ́ pu blɔ̀) 'long white fish'
         (H 0 M)   (H 0 L)
   (i)   (H H M)   (i) (H H L)
   (ii) ---   (ii) ---
   (iii) (H L M)   (iii) (H L L)
   (iv) ---   (iv) ---
         [kpɔ́ pù dō]   [kpɔ́ pù blɔ̀]

2.2.5 Rule (iv): default realization

The effects of rule (iv) were already illustrated in (21b), repeated below as (28).[13]

(28)   (M 0 H)   (mī pu tí)   →   [M M H]   [mī pū tí]   'a lot of white people'   rule (iv)
        (0 0 H)   (ku pu tí)   →   [M M H]   [kū pū tí]   'a lot of white houses'   rule (iv)

---

[13] I do not have evidence that would distinguish this formulation of the rule from one that would assign M to lexically toneless TBUs. On the current version of the account, [M] is a realization associated both with M and with the absence of tone. Absence of lexical tone is distinguished from M by its variable realization in some syntactic environments, where either H or L is assigned to the toneless TBU by rule (i) or rule (ii). M is realized as [M] in all contexts.

The rule only applies in cases where the lexically toneless TBU has not received a H or a L due to rules (i) and (ii). Typical environments are at the beginning of a phonological phrase or following a M within a phonological phrase:

(29) (0 00 H) (ku laga tí) → [M MM H] [kū lāgā tí] 'a lot of house doors' rule (iv)
    (M 00 H) (mī laga tí) → [M MM H] [mī lāgā tí] 'a lot of human mouths' rule (iv)

2.2.6 Summary

To give a more complete illustration of how the tonal rules work, I summarize below tonal realizations of lexically toneless TBUs in different contexts within a phonological phrase. The combinations illustrate interactions of lexically toneless TBUs with the preceding tone. These interactions cannot be easily illustrated with two-word combinations, because whenever a toneless TBU is placed at the end of an intonational phrase, it is assigned a H by rule (i), neutralizing the effect of the preceding tone. It is therefore simpler to show the effect of preceding tones in three-word combinations, where the toneless TBU is followed by a H, and rule (i) is blocked.

(30) Summary of realizations of toneless TBUs:
    a. Depending on the combination of the following and the preceding tone

(H 0 H)	(kpɔ́ ku tí) →	[H L H]	[kpɔ́ kù tí]	'a lot of fish houses'		rule (ii)
(L 0 H)	(zò ku tí) →	[L L H]	[zò kù tí]	'a lot of lizard houses'		rule (ii)
(M 0 H)	(mī ku tí) →	[M M H]	[mī kū tí]	'a lot of human houses'		rule (iv)
(H 0 L)	(kpɔ́ ku blɔ̀) →	[H L L]	[kpɔ́ kù blɔ̀]	'long fish house'		rule (i) + rule (iii)
(L 0 L)	(zò ku blɔ̀) →	[L H L]	[zò kú blɔ̀]	'long lizard house'		rule (i)
(M 0 L)	(mī ku blɔ̀) →	[M H L]	[mī kú blɔ̀]	'long human house'		rule (i)
(H 0 M)	(kpɔ́ ku dō) →	[H L M]	[kpɔ́ kù dō]	'one fish house'		rule (i) + rule (iii)
(L 0 M)	(zò ku dō) →	[L H M]	[zò kú dō]	'one lizard house'		rule (i)
(M 0 M)	(mī ku dō) →	[M H M]	[mī kú dō]	'one human house'		rule (i)

    b. Sequences of toneless units

(0 0 H)	(ku pu tí) →	[M M H]	[kū pū tí]	'a lot of white houses'	rule (iv)
(0 0 L)	(ku pu blɔ̀) →	[M H L]	[kū pú blɔ̀]	'long white house'	rule (i) + rule (iv)
(0 0 M)	(ku pu dō) →	[M H M]	[kū pú dō]	'one white house'	rule (i) + rule (iv)
(H 00 H)	(kpɔ́ laga tí) →	[H LL H]	[kpɔ́ làgà tí]	'a lot of fish's mouths'	rule (ii), twice
(L 00 H)	(zò laga tí) →	[L LL H]	[zò làgà tí]	'a lot of lizard's mouths'	rule (ii), twice
(M 00 H)	(mī laga tí) →	[M MM H]	[mī lāgā tí]	'a lot of human mouths'	rule (iv)
(H 00 M)	(kpɔ́ laga dō) →	[H LH M]	[kpɔ́ làgá dō]	'one fish's mouth'	rule (i) + rule (ii)
(L 00 M)	(zò laga dō) →	[L LH M]	[zò làgá dō]	'one lizard's mouth'	rule (i) + rule (ii)
(M 00 M)	(mī laga dō) →	[M MH M]	[mī lāgá dō]	'one human mouth'	rule (i) + rule (iv)
(H 00 L)	(kpɔ́ laga blɔ̀) →	[H LH L]	[kpɔ́ làgá blɔ̀]	'long fish's mouth'	rule (i) + rule (ii)
(L 00 L)	(zò laga blɔ̀) →	[L LH L]	[zò làgá blɔ̀]	'long lizard's mouth'	rule (i) + rule (ii)
(M 00 L)	(mī laga blɔ̀) →	[M MH L]	[mī lāgá blɔ̀]	'long human mouth'	rule (i) + rule (iv)

The sample derivations below illustrate some of the combinations that have not yet been illustrated, including an example with a cyclic application of rule (ii):

(31)   (zò laga tí) 'a lot of lizard's mouths'   (zò laga dō) 'one lizard's mouth'
      (H 00 H)   (L 00 M)
  (i)   ---   (i)   (L 0H M)
  (ii)   (H L0 H)   (ii) (L LH M)
  (ii)   (H LL H)   (iii) ---
  (iii) ---   (iv) ---
  (iv) ---   [zò làgá dō]
     [zò làgà tí]

Finally, we can come back to the examples in (14), to review how the rules just described determine the differences in tonal realization.

(32) L: (L L)   (zò blɔ̀) → [zò blɔ̀] 'long lizard'

        (L M) (zò dō) → [zò dō] 'one lizard'

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	(L H)	(zò tí)	→	[zò tí]	'a lot of lizards'	
M:	(M L)	(mī blɔ̀)	→	[mī blɔ̀]	'long person'	
	(M M)	(mī dō)	→	[mī dō]	'one person'	
	(M H)	(mī tí)	→	[mī tí]	'a lot of people'	
H:	(H L)	(kpɔ́ blɔ̀)	→	[kpɔ́ blɔ̀]	'long fish'	
	(H M)	(kpɔ́ dō)	→	[kpɔ́ dō]	'one fish'	
	(H H)	(kpɔ́ tí)	→	[kpɔ́ tì]	'a lot of fish'	rule (iii)
0:	(0 L)	(ku blɔ̀)	→	[kú blɔ̀]	'long house'	rule (i)
	(0 M)	(ku dō)	→	[kú dō]	'one house'	rule (i)
	(0 H)	(ku tí)	→	[kū tí]	'a lot of houses'	rule (iv)

In sum, tonal realization in Wan is sensitive to syntactic constituency in two ways. First, phonological phrases are the domain of application of tonal rules (ii) and (iii). Second, intonational phrasing is relevant to the assignment of H to lexically toneless units (rule i). In the next subsection, I discuss syntactic aspects of this sensitivity.

2.3 Tone and syntactic constituency
2.3.1 Phonological phrasing

In Wan, prosodic phrasing corresponds very closely to syntactic constituency. Syntactically, phonological phrases fall into five types: (i) combinations of relational nouns – including numerals and property-denoting nouns – with their arguments (the so-called "inalienable possession construction");[14] (ii) combinations of verbs with their objects; (iii) combinations of postpositions with their arguments; (iv) combinations of heads with clitics; and (v) productive, non-lexicalized nominal compounds. The different constructions are exemplified below, illustrating once again the effect of some of the rules.

In (33a-c), a toneless relational noun combines with its argument. The noun's last syllable is assigned a H because it is at the right edge of an intonational unit (rule i). The relevant derivations are given in (34).

(33) a. {(kpɔ́ laga)} → [kpɔ́ làgá] 'mouth of a fish'   rule (i) + rule (ii)

b. {(zò laga)} → [zò làgá] 'mouth of a lizard'   rule (i) + rule (ii)

c. {(mī laga)} → [mī lāgá] 'human mouth'   rule (i) + rule (iv)

(34) {(kpɔ́ laga)} 'mouth of a fish'   {(zò laga)} 'mouth of a lizard'   {(mī laga)} 'human mouth'

	{(H 00)}			{(L 00)}			{(M 00)}
(i)	{(H 0H)}		(i)	{(L 0H)}		(i)	{(M 0H)}
(ii)	{(H LH)}		(ii)	{(L LH)}		(ii)	---
(iii)	---		(iii)	---		(iii)	---
(iv)	---		(iv)	---		(iv)	[M MH]
	[kpɔ́ làgá]			[zò làgá]			[mī lāgá]

In (35a-c), with the derivations in (36), the relevant configuration is the combination of a transitive verb with its object. Rule (i) does not apply, as in these examples the verb is followed by a H. In (35a) and (35b), rule (ii) applies cyclically, and assigns a L to the verb. In (35c), the verb remains toneless.

(35) a. {(yàá)}   {(kpɔ́   poli)   (lé)} →   [yàá kpɔ́ pòlì lé]   rule (ii), twice

3SG+PROG   fish   wash   PROG
'S/he is washing fish.'

b. {(yàá)}   {(ŋ̀   poli)   (lé)} →   [yàá ŋ̀ pòlì lé]   rule (ii), twice

3SG+PROG   1SG   wash   PROG
'S/he is washing me.'

c. {(yàá)}   {(lā   poli)   (lé)} →   [yàá lā pōlī lé]   rule (iv)

3SG+PROG   2SG   wash   PROG
'S/he is washing you.'

---

[14] Most property-denoting words behave syntactically as nouns, and appear in constructions that can be literally translated as, for example, "red of lizard" = 'red lizard'.

(36)   {(yàá)} {(kpɔ́ poli) (lé)}   {(yàá)} {(ŋ̀ poli) (lé)}   {(yàá)}{(lā poli) (lé)}
        {(LH)} {(H 00) (H)}   {(LH)} {(L 00) (H)}   {(LH)} {(M 00) (H)}
    (i)   ---   (i)   ---   (i)   ---
    (ii)   {(LH)} {(H L0) (H)}   (ii)   {(LH)} {(L L0) (H)}   (ii)   ---
    (ii)   {(LH)} {(H LL) (H)}   (ii)   {(LH)} {(L LL) (H)}   (iii) ---
    (iii) ---   (iii) ---   (iv)   [LH M MM H]
    (iv)   ---   (iv)   ---   [yàá lā pōlī lé]

        [yàá kpɔ́ pòlì lé]   [yàá ŋ̀ pòlì lé]

Examples (37a-c), with the derivations in (38), illustrate the application of the same rules to combinations of a postposition with its argument.

(37) a.   {(kpɔ́ traga)} → [kpɔ́ tràgá] 'among fish'   rule (i) + rule (ii)
      b.   {(zò traga)}   → [zò tràgá]   'among lizards'   rule (i) + rule (ii)
      c.   {(sɔ́ lé)}   → [sɔ́ lè]   'on the edge of cloth' rule (iii)
(38)   {(kpɔ́ traga)}   {(zò traga)}   {(sɔ́ lé)}
           {(H 00)}   {(L 00)}   {(H H)}
    (i)   {(H 0H)}   (i)   {(L 0H)}   (i)   ---
    (ii)   {(H LH)}   (ii)   {(L LH)}   (ii)   ---
    (iii) ---   (iii) ---   (iii) {(H L)}
    (iv)   ---   (iv)   ---   (iv)
           [kpɔ́ tràgá]   [zò tràgá]   [sɔ́ lè]

The examples in (39a-c) and (41a-c) illustrate the way tonal rules apply to clitics and to productive compounds. In (39a-c), the tone of the cliticized definite marker is determined by the preceding possessor in accord with rule (ii). The compounds in (41a-c) describe different kinds of houses ("lizard-house", "person-house", "fish-house").[15] The realization of toneless units is the same in both cases as with relational nouns (33a-c) or with transitive VPs (35a-c). The derivations for (39a-c) are given in (40).

(39) a.   {(zò-e laga)}   → [zò-è làgá]   'the lizard's mouth'   rule (i) + rule (ii), twice
      b.   {(kpɔ́-e laga)} → [kpɔ́-è làgá] 'the fish' mouth'   rule (i) + rule (ii), twice
      c.   {(mī-e laga)}   → [mī-ē lāgá]   'the person's mouth'   rule (i) + rule (iv)
(40)   {(zò-e laga)}   {(kpɔ́-e laga)}   {(mī-e laga)}
           {(L-0 00)}   {(H-0 00)}   {(M-0 00)}
    (i)   {(L-0 0H)}   (i)   {(H-0 0H)}   (i)   {(M-0 0H)}
    (ii)   {(L-L 0H)}   (ii)   {(H-L 0H)}   (ii)   ---
    (ii)   {(L-L LH)}   (ii)   {(H-L LH)}   (iii) ---
    (iii) ---   (iii) ---   (iv)   [M-M MH]
    (iv)   ---   (iv)   ---   [mī-ē lāgá]

           [zò-è làgá]   [kpɔ́-è làgá]

(41) a.   {(zò ku tí)}   → [zò kù tí]   'a lot of lizard houses' rule (ii)
     b.   {(kpɔ́ ku tí)} → [kpɔ́ kù tí] 'a lot of fish houses'   rule (ii)
     c.   {(mī ku tí)}   → [mī kū tí]   'a lot of people's houses' rule (iv)

Although the tonal phenomena are illustrated above with rather simple examples, the same rules apply to more complex constituents: it is the type of syntactic constituent rather than its length that determines its prosodic behavior. The examples in (42)-(44) show that more complex constituents within verb phrases do not form their own separate phonological phrases. In (42), a H toned verb ('show') is preceded by a complex object NP that ends on a H. If the object NP is part of the same phonological phrase with the verb, rule (iii) is expected to turn the H of the verb into L. This is in fact what happens in (42a). If the object NP were phrased separately from the verb, rule (iii) would not apply, and the verb would retain its H. This is not what normally happens (42b).

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[15] The compounds differ from the possessive construction both semantically and morphosyntactically (indefinite possessors are marked by lengthening, and pronominal possessors are encoded by a specialized set of "alienable" pronouns).

(42) a. {(yàá)} {(àà dèè sógò cɛ́ lá) (lé)} → [yàá àà dèè sógò cɛ̀ là lé] rule (iii)
    3SG+PROG 3SG.ALN father horse leg show PROG
    'He is showing his father's horse's leg.'
   b. *{(yàá)} {(àà dèè sógò cɛ́) (lá) (lé)} → *[yàá àà dèè sógò cɛ́ lá lé]
    3SG+PROG 3SG.ALN father horse leg show PROG
    'He is showing his father's horse's leg.'

Example (43) shows that rule (ii) also applies to combinations of verbs with complex objects. A toneless verb is preceded by an object NP that ends in a L. If the object NP and the verb are part of the same phonological phrase, one would expect rule (ii) to assign a L to the verb. This is what actually happens (43a). If the verb were in a different phonological phrase, rule (ii) would not apply, and the verb would be realized as [M]. This prediction does not hold.

(43) a. {(yàá)} {(àà dèè sógò ɓóŋglò lu) (lé)} → [yàá àà dèè sógò ɓóŋglò lù lé] rule (ii)
    3SG+PROG 3SG.ALN father horse head buy PROG
    'He is buying his father's horse's head.'
   b. *{(yàá)} {(àà dèè sógò ɓóŋglò) (lu) (lé)} → *[yàá àà dèè sógò ɓóŋglò lū lé] rule (iv)
    3SG+PROG 3SG.ALN father horse head buy PROG
    'He is buying his father's horse's head.'

Rule (ii) also applies in (44), where the object NP ends on a H, and rule (ii) is expected to assign a L to the verb only if the verb and the object are part of the same phonological phrase. If the verb were in a separate phonological phrase, rule (ii) would not have applied (44b).

(44) a. {(yàá)} {(àà dèè sógò cɛ́ lu) (lé)} → [yàá àà dèè sógò cɛ́ lù lé] rule (ii)
    3SG+PROG 3SG.ALN father horse leg buy PROG
    'He is buying his father's horse's leg.'
   b.. *{(yàá)} {(àà dèè sógò cɛ́) (lu) (lé)} → *[yàá àà dèè sógò cɛ́ lū lé] rule (iv)
    3SG+PROG 3SG.ALN father horse leg buy PROG
    'He is buying his father's horse's leg.'

The examples in (42)-(44) show that the same tonal rules apply to simple and complex constituents. Phonological phrasing is based on syntactic constituency, and is not sensitive to constituent length.[16]

2.3.2 Intonational phrasing

Another prosodic unit that is relevant for tone assignment is the intonational phrase. As we already saw, the right edge of an intonational phrase produces effects that are similar to the effect of L or M: H is assigned to lexically toneless TBUs at the end of an intonational phrase, just as it is assigned before L or M.[17] Among clear cases of intonational phrases are clauses (including clauses within multiclausal constructions), constituents followed by pauses,[18] and right- and left-dislocated constituents (such as the topicalized noun phrase in 17a above). When a lexically toneless TBU occurs at the right edge of such constituents, it is assigned a H tone. No indications of intonational phrasing are normally present within major lexical projections, i.e. within NPs (including modified NPs), PPs or VPs (including VPs marked by post-verbal aspectual markers).

An intonational phrase may include more than one phonological phrase. For example, relational nouns and their arguments form a phonological phrase, but a noun and its possessive modifier belong to different phonological phrases within the same intonational unit. This difference is illustrated in (45a vs. b). It reflects the difference in the syntactic structure of so-called "alienable" and "inalienable" possession constructions. In (45a), a lexically toneless relational noun is preceded by an argument; since together they form an intermediate projection, the L triggers the assignment of L to the following toneless TBU (the second toneless syllable is assigned a H by rule (i), because the phrase appears in isolation, and that syllable appears at the end of an intonational phrase). The intonational phrase consists here of a single phonological phrase. In (45b), a combination of a relational noun and its argument is modified by a possessive noun phrase; the possessive relationship is marked by lengthening. As shown in (47), combinations with a possessive modifier do not form intermediate projections (the modifier is an adjunct, not an argument). Accordingly, such combinations do

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[16] I am only concerned here with natural-sounding examples of reasonable length. It is likely that extra-long constituents will be systematically split into several prosodic phrases.

[17] This suggests the possibility of associating right edges of intonational phrases with a structural M tone. This effect is independent of utterance type, making it difficult to account for it in terms of intonational tone along the lines suggested by Hyman & Monaka (2011) or Gussenhoven (2000).

[18] As expected of prosodic units, tonal realization interacts with pauses. Pauses indicate the end of an intonational phrase, and prevent rules (ii) and (iii) from applying.

not behave as a single phonological phrase. For example, the tone of the possessor has no effect on the following toneless TBU, since it is separated from it by a phonological phrase boundary. In (45b), the lexically toneless noun 'house', as well as the following toneless TBU, are not assigned a L, i.e. rule (ii) fails to apply. They are instead realized as [M] (the last toneless syllable is assigned a H again by rule (i)); cf. the derivations in (46).

(45) a.   {(zò laga)}   →   [zò làgá]   'lizard's mouth'   rule (i) + rule (ii)
     b.   {(zòò) (ku laga)} →   [zòò kū lāgá]   'door of a lizard's house'   rule (i) + rule (iv)

(46)   {(zò laga)}   {(zòò) (ku laga)}
            {(L 00)}   {(LL) (0 00)}
     (i)   {(L 0H)}   (i)   {(LL) (0 0H)}
     (ii)   {(L LH)}   (ii)   ---
     (iii) ---   (iii)   ---
     (iv)   ---   (iv)   [LL M MH]
            [zò làgá]   [zòò kū lāgá]

(47)   a.   NP   b.   NP
              | /   \
              N'   NP   NP
            /   \   /   \ |
         NP   N   {(zòò)}   N'
        /   \ | /   \
    {(zò   laga) }   NP   N
                                            /   \ |
                                        (ku   laga)}
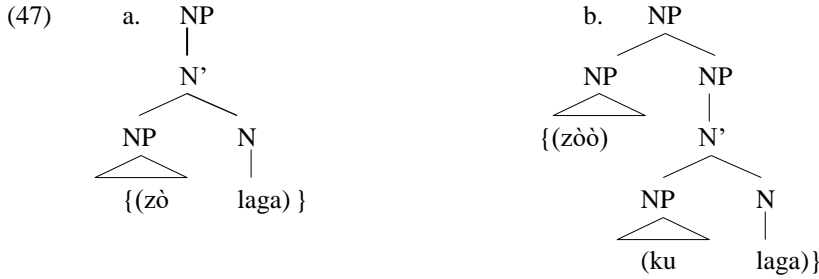
The noun phrase in (48b) therefore consists of two separate phonological phrases. Example (48) shows that the construction still behaves as a single intonational phrase. Here, the possessive modifier is also lexically toneless. If it formed an intonational phrase on its own, a H would be assigned to it as per rule (i), but this is not what actually happens (48b). The lexically toneless possessor is not assigned a H, and is realized as [M], cf. the derivations in (49).

(48) a.   {(nɛɛ) (ku laga)}   →   [nɛ̄ɛ̄ kū lāgá]   'a child's door'   rule (i) + rule (iv)
     b.   *{(nɛɛ)} {(ku laga)}   →   *[nɛ̄ɛ́ kū lāgá]

(49)   {(nɛɛ) (ku laga)}   *{(nɛɛ)} {(ku laga)}
            {(00) (0 00)}   {(00)} {(0 00)}
     (i)   {(00) (0 0H)}   (i)   {(0H)} {(0 0H)}
     (ii)   ---   (ii)   ---
     (iii) ---   (iii)   ---
     (iv)   [MM M MH]   (iv)   [MH M MH]
            [nɛ̄ɛ̄ kū lāgá]   *[nɛ̄ɛ́ kū lāgá]

Other examples of combinations of phonological phrases that behave as a single intonational phrase are combinations of verb phrases with a following aspectual marker or combinations of an auxiliary with the following verb phrase. Neither post-verbal aspectual markers nor auxiliaries form a phonological phrase with the verb phrase, yet they are normally included in the same intonational phrase (cf. examples 35a-c, 42-44).

In sum, phonological phrasing can be accurately described in terms of intermediate lexical projections. The relevant constructions are combinations of lexical heads and their argument, productive compounds, and combinations of words with clitics.[19] Intonational phrasing is also defined by syntactic constituency: clause-external constituents such as topicalized NPs and afterthought elements form separate intonational phrases; ends of intonational phrases produce effects similar to L or M. I rely on phonological and intonational phrasing in the next subsection to argue that postpositional arguments do not form a constituent with their verb. It will be shown that tonal rules that apply to phonological phrases fail to apply to combinations of verbs with oblique arguments. Moreover, it will be shown that verbs and the following PPs belong to separate intonational phrases, suggesting that they do not belong to the same lexical projection.

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[19] I leave open the question of the type of adjunction involved in productive compounding and cliticization; what is crucial for the analysis is that it allows words to be joined at a level lower than XP, i.e. within the X' domain.

2.4 Tonal evidence for verb phrase external attachment of PPs

Prosodic phrasing helps clarify syntactic constituency in cases where word order is ambiguous. In particular, it can be used to explore the syntactic relationship between the main verb and its postpositional argument. I will now show that the tonal data just introduced is incompatible with argument raising accounts.
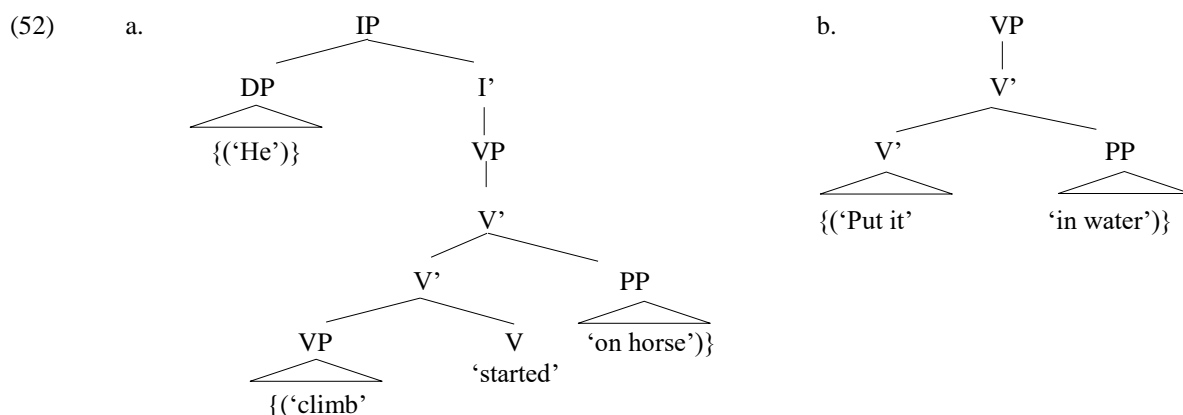
Postpositional phrases are combinations of a postpositional head and its argument; as such, they are predicted to behave as phonological phrases with respect to tone. This prediction is borne out by the data, as was shown above. Main verbs are heads of a verb phrase, which are expected to combine with their internal arguments. We already saw that transitive verbs and their objects clearly form a phonological phrase. What about verbs and their postpositional arguments? On an argument raising account, oblique arguments of embedded verbs and nominalizations are "passed up" the structure (the actual implementation varies across frameworks), so that they are actually licensed by the main, not the embedded verb. The resulting position of the PP is presented schematically in (50), for the example in (8a). The PP is represented here as a complement of the main verb.

(50)
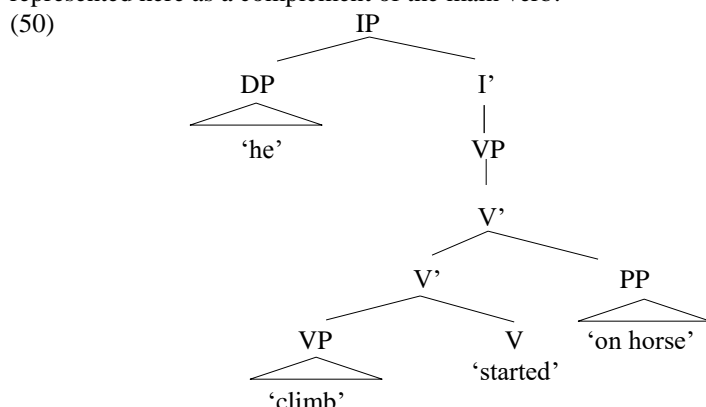
The structure in (51) illustrates predictions of the same account for sentences where the oblique argument is selected by the main verb: there is no argument raising in this case, and the oblique argument can be assumed to appear inside the verb phrase.

(51)
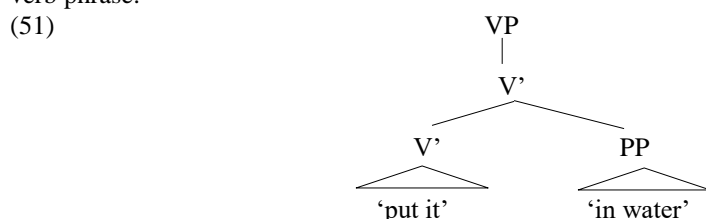
This account predicts that combinations of a main verb and its postpositional argument should behave tonally as an intermediate projection. Two situations would be in principle consistent with this account: (i) the main verb and its postpositional argument could be expected to form a phonological phrase, just as the verb does with its object (52a,b); or (ii) if the main verb and its postpositional argument do not, for some reason, form a phonological phrase, they should at least form an intonational phrase (53a,b).

(52)   a.

b.

14

(53)   a.   IP
                        ┌────────┴────────┐
                       DP   I'
                   ┌───┴───┐   │
                 {('He')}   VP
                                          │
                                          V'
                                  ┌───────┴───────┐
                                 V'   PP
                          ┌──────┴──────┐   ┌───┴───┐
                        VP   V   ('on horse')}
                    ┌───┴───┐   'started')
                  {('climb'

b.   VP
                  │
                  V'
          ┌───────┴───────┐
         V'   PP
     ┌───┴───┐   ┌───┴───┐
   {('Put it')   ('in water')}
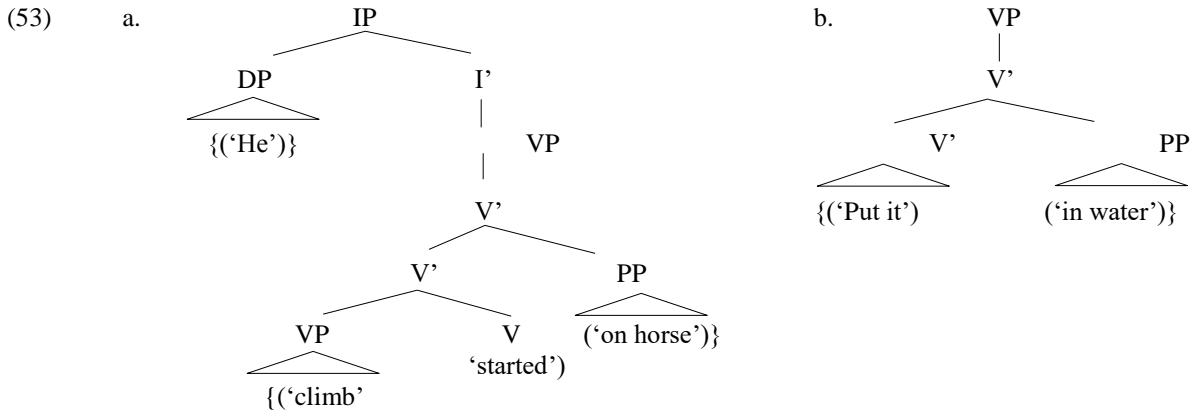
To test these predictions, one needs to consider examples where the crucial positions in the structure are filled by lexically toneless words or words with a H tone. It turns out that such examples support neither of the predictions. First, let us see whether rules (ii) and (iii) apply to combinations of the verb and the following postpositional phrase. This would be expected if they formed a phonological phrase, like all lexical projections. In (54a-c), I give hypothetical tonal realizations that one would expect to find in such examples, on the assumption that postpositional arguments are part of the verb phrase. In (54a), if two H tones were adjacent within the same phonological phrase, rule (iii) would apply, turning the second H into L. In (54b), if the toneless word 'child' were preceded by a H within the same phonological phrase, it would be assigned a L (rule ii). In (54c), if the toneless word 'house' were preceded by a L within the same phonological phrase, it would similarly be assigned a L by rule (ii). All three predictions, however, are wrong, as indicated by the stars on the outcomes of the hypothetical derivations (cf. the derivations in 55).

(54) a. *{(à tá   só   tā)}   →   *[à tá sò tā]   'Sit him on cloth.'   rule (iii)
            3SG make.sit cloth on
     b. *{(à   lá   nɛ-e   lèŋ)} → *[à lá nɛ̀-é lèŋ] 'Show it to the child!'   rule (i) + rule (ii)
            3SG   show   child -DEF to
     c. *{(è-ŋ)} {(gà ku-e   wā)}   →   *[è-ŋ gà kù-é wā] 'He went into the house.' rule (i) + rule (ii)
            3SG-PERF go house-DEF under

(55)   *{(à tá só tā)}   *{(à lá nɛ-e lèŋ)}   *{(è-ŋ)} {(gà ku-e wā)}
          {(L H H M)}   {(L H 0-0 L)}   {(L)} {(L 0-0 M)}
     (i)   ---   (i)   {(L H 0-H L)}   (i)   {(L)} {(L 0-H M)}
     (ii) ---   (ii) {(L H L-H L)}   (ii) {(L)} {(L L-H M)}
     (iii) {(L H L M)}   (iii) ---   (iii) ---
     (iv) ---   (iv) ---   (iv) ---
          *[à tá sò tā]   *[à lá nɛ̀-é lèŋ]   *[è-ŋ gà kù-é wā]

What actually happens in these examples shows that the main verb and the PP do not form a phonological phrase. Rule (iii) does not apply across the boundary between the verb and the PP in (54a), and the actual outcome is the one in (56a): no dissimilation takes place. Rule (ii) does not apply in (54b), and the actual outcome is the one in (56b): the toneless word is not assigned a L, and is instead realized as [M]. Rule (ii) also does not apply in (54c), and the actual outcome in the one in (56c). Full derivations can be found in (57). The brackets in the examples show the boundaries of phonological phrases as suggested by the data; I do not show the intonational phrasing, since it is not relevant for these examples and will be addressed below.

(56) a. (à   tá)   (só   tā)   →   [à tá só tā]   'Sit him on cloth.'
            3SG make.sit cloth on
     b. (à   lá)   (nɛ-e   lèŋ) →   [à lá nɛ̄-é lèŋ] 'Show it to the child!'   rule (i) + rule (iv)
            3SG show   child-DEF to
     c. (è   -ŋ)   (gà) (ku-e   wā) → [è-ŋ gà kū-é wā] 'He went into the house.' rule (i) + rule (iv)
            3SG PERF   go   house-DEF under

(57)   (à tá) (só tā)   (à lá)(nɛ-e lèŋ)   (è-ŋ) (gà) (ku-e wā)
          (L H) (H M)   (L H) (0-0 L)   (L) (L) (0-0 M)
     (i)   ---   (i)   (L H) (0-H L)   (i)   (L) (L) (0-H M)
     (ii) ---   (ii) ---   (ii) ---
     (iii) ---   (iii) ---   (iii) ---
     (iv) ---   (iv) [L H M-H L]   (iv) [L L M-H M]
          [à tá só tā]   [à lá nɛ̄-é lèŋ]   [è-ŋ gà kū-é wā]

Second, not only do the verb and the following postpositional phrase not form a phonological phrase; tonal realizations also suggest that they belong to different intonational phrases. Crucial evidence comes from rule (i), which assigns H to toneless units before L and M, as well as to toneless units at the end of an intonational phrase. If the verb and the following PP belonged to the same intonational phrase, rule (i) would not apply in examples (58a,b), cf. the derivations in (59):

(58) a. *{(màŋ   poli)   (tɔ́   gó)}   →   *[màŋ pòlì tɔ́ gò]   rule (ii), twice + rule (iii)
         rice   wash   swamp   inside
        'Wash rice in the swamp!'

     b. *{(à   kla)   (yi   gó)}   →   *[à klà yī gó]   rule (ii) + rule (iv)
         3SG   put   water   in
        'Put it in water!'

(59)   *{(màŋ poli) (tɔ́ gó)}   *{(à kla) (yi gó)}
         {(L 00) (H H)}   {(L 0) (0 H)}
    (i)   ---   (i)   ---
    (ii)   {(L L0) (H H)}   (ii)   {(L L) (0 H)}
    (ii)   {(L LL) (H H)}   (iii) ---
    (iii) {(L LL) (H L)}   (iv)   [L L M H]
    (iv)   ---   *[à klà yī gó]
           *[màŋ pòlì tɔ́ gò]

In both examples, the verb is lexically toneless, and it is expected to acquire a L due to rule (ii). This prediction, however, is also wrong. The actual realizations are given in (60a,b); they can only be explained by the fact that the PP is a separate intonational phrase. In (60a), the last syllable of the verb receives a H, which can only be explained by the application of rule (i). There is no reason why a H would be assigned to that verb unless it is located at the end of an intonational phrase (since it is followed by neither L nor M). In (60b), the verb also has no reason to be assigned a H, since the following tone is neither L nor M; this can only be explained by intonational phrasing: the postpositional phrase forms a separate intonational unit.

(60) a. {(màŋ   poli)}   {(tɔ́   gó)}   →   [màŋ pòlí tɔ́ gò]   rule (i) + rule (ii) + rule (iii)
         rice   wash   swamp   inside
        'Wash rice in the swamp!'

     b. {(à   kla)}   {(yi   gó)}   →   [à klá yī gó]   rule (i) + rule (iv)
         3SG   put   water   in
        'Put it in water!'

(61)   {(màŋ poli)} {(tɔ́ gó)}   {(à kla)} {(yi   gó)}
         {(L 00)} {(H H)}   {(L 0)} {(0 H)}
    (i)   {(L 0H)} {(H H)}   (i)   {(L H)} {(0 H)}
    (ii)   {(L LH)} {(H H)}   (ii)   ---
    (iii) {(L LH)} {(H L)}   (iii) ---
    (iv)   ---   (iv)   [L H M H]
           [màŋ pòlí tɔ́ gò]   [à klá yī gó]

This shows that not only do the verb phrase and the PP behave as separate phonological phrases, but they also belong to different intonational phrases. On the other hand, all elements that are part of the VP belong to the same intonational phrase, even if they do not belong to the same phonological phrase with the verb. In (62a), for example, the post-verbal progressive marker forms a separate phonological phrase: rule (iii) does not cause its H to become L after another H. Yet the marker clearly belongs to the same intonational phrase, since rule (i) does not apply in (62b), and the lexically toneless verb is not assigned a H (as would be expected if it were at the right edge of an intonational phrase). The fact that post-verbal elements related to the verb form an intonational phrase with it makes the separate phrasing of postpositional arguments even more striking.

(62) a. {yàá}   {(zò   tá)   (lé)}   →   [yàá zò tá lé]
       3SG+PROG lizard make.sit PROG
       'She will place a lizard (there).'
    b. {yàá}   {(màŋ   poli)   (lé)}   →   [yàá màŋ pòlì lé]   rule (ii), twice
       3SG+PROG rice   wash   PROG
       'She will wash rice.'

(63)   {yàà} {(zò tá) (lé)}   {yàà} {(màŋ poli) (lé)}
        {LH}{(L H) (H)}   {LH}{(L 00) (H)}
   (i) ---   (i)   ---
   (ii) ---   (ii) {LH}{(L L0) (H)}
   (iii)---   (ii) {LH}{(L LL) (H)}
   (iv) ---   (iii) ---
        [yàà zò tá lé]   (iv) ---
                                                   [yàá màŋ pòlì lé]

Given that prosodic phrasing corresponds very closely to syntactic constituency in Wan, the tonal evidence just discussed strongly suggests that postpositional arguments do not appear inside verb phrases. Verbs and their postpositional arguments appear in separate phonological and intonational phrases. Such phrasing would be surprising if postpositional phrases were assumed to be part of the verb phrase: one would have to assume that the prosodic behavior of *both* verb phrases and postpositional phrases is exceptional. VPs would have to be treated as the only lexical category that is systematically split into two intonational phrases, and PPs would have to be the only constituent that appears inside the VP yet behaves as a separate intonational phrase (while other VP-internal elements that follow the verb are included in the same intonational phrase, as expected). Both assumptions seem highly unnatural.

Evidence from prosodic phrasing does not support the structures in (52a,b) and (53a,b), which place oblique arguments within verbal projections. It is, however, easily explained if PPs appear outside the verb phrase, attached to the clause. Postpositional arguments would then be expected to be separated from the rest of the clause by a constituent break, just like dislocated constituents that appear at the clause level. This is illustrated in (64) and (65).

(64)

(65)
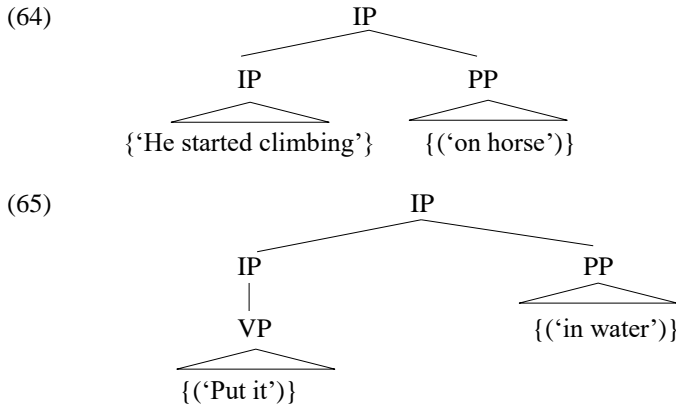
The examples discussed above involve postpositional arguments of main verbs, as they are most likely to form a constituent with them. Just like verbs and nominalizations embedded in the clause, however, the main verb does not form a prosodic constituent with its postpositional arguments.

To sum up, the tonal behavior of the verb and its PP argument is consistent with the hypothesis that postpositional arguments are attached at the clause level. Without the prosodic evidence, the exact relationship between verbs and their PP arguments could not be determined, since the two are structurally adjacent. Previously unexplored tonal behavior offers us new clues to constituency.[20]

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[20] Among recent work on phrase level tonology, Harry & Hyman (2014) discuss tonal schemas assigned by specific constructions in Kalabari; for illustrations of the intimate relationship between tone and syntactic constituency, see also Cole-Beuchat (1991); Leben & Ahoua (1997); McPherson (2013); Heath & McPherson (2013); Downing (2013); Konoshenko (2014), McPherson & Heath (2016). For a recent discussion of prosodic factors in shaping constituent order, see Bennett et al. (2016).

3 Arguments against base generation
3.1 Theta role assignment

The previous section showed that an account based on argument raising is incompatible with prosodic evidence. Tonal data clearly points to a major constituent boundary separating the verb and the following PP, even in cases where the two are related semantically. In this section I discuss the possibility of accounting for the discontinuous placement of postpositional arguments in terms of a clause-final base position.

 The major problem such an account would pose is due to a contradiction with both the Projection Principle and the principle of locality of selection adopted in one form or another by all generative-transformational frameworks.[21] Such an account would predict, essentially, that only objects can be licensed by verbs in Wan, while postpositional phrases function as adjuncts that are associated more or less freely with the main or an embedded verb. This prediction, however, does not hold. First, some of the postpositional arguments are obligatory, i.e. they must accompany a particular verb even though they do not appear next to it. Information about such arguments is naturally encoded in the verb's argument structure, bringing us back to the problem of non-locally generated arguments.

 Second, in addition to obligatory oblique arguments, it is common to have oblique arguments with idiosyncratic marking and/or idiosyncratic interpretation. The idiosyncratic ways in which particular roles are encoded with a given verb are also accounted for naturally by the verb's subcategorization frame. They cannot be captured if the verb is not associated with its arguments at some level of syntactic representation. The choice of the postposition in (66a-c), for example, cannot be predicted from the semantic role of the postpositional argument; at the same time, that choice is not free, and even arguments with similar roles cannot exchange their encoding (for example, 66b and 66c cannot exchange postpositions).[22]

(66) a.　{yàá}　　　{(bɛ̀nì)　(lé)}　　{(yr̪amu-e　　lé)}　→　[yàá bɛ̀nì lé yrāmū-ē lé]
　　　　　3SG+PROG　fear　　PROG　　children-DEF　at
　　　　　'She fears horses.' (the author's field notes)

　　　b.　{(ɲ̀　bō)}　　　　{(pɔ̄　　lɔ　yā)}　　→　[ɲ̀ bō pɔ̄ lɔ́ yā]
　　　　　1SG finish:PAST　　thing　eat　with
　　　　　'I finished eating.' (the author's field notes)

　　　c.　{(ɲ̀　dāgā)}　{(pɔ̄　　lɔ　mì)}　　→　[ɲ̀ dāgā pɔ̄ lɔ́ mì]
　　　　　1SG stop:PAST thing　　eat　by
　　　　　'I stopped eating.' (the author's field notes)

Finally, an account postulating the absence of oblique arguments in the verb's argument structure would fail to predict that the verbs in Wan fall roughly into the same classes as in other languages. Motion verbs select for goals and sources of motion, psych-verbs select for a stimulus and an experiencer, etc. This predictability makes it, once again, implausible that the way oblique arguments are licensed in Mande is radically different from other languages.

3.2 Arguments vs. adjuncts

Another important fact missed by an account not relying on argument structure is the difference in the syntactic behavior of postpositional arguments and adjuncts. While the two have identical structure (67a,b), only adjuncts can be fronted (68a,b).

(67) a.　{(à̪　yī̪)}　　　　{(kalɛ　　gó)}　　→　[à̪ yī̪ kālɛ̄ gó]
　　　　　3SG sleep:PAST　　forest　in
　　　　　'They fell asleep in the forest.' (Nikitina 2009b: 1121)　　(locative adjunct)

　　　b.　{(à̪　gō)}　　　{(kalɛ　　gó)}　　→　[à̪ gō kālɛ̄ gó]
　　　　　3SG leave:PAST　　forest　in
　　　　　'They left the forest.' (Nikitina 2009b: 1122)　　(source argument)

(68) a.　{(kalɛ　　gó)} {è} {(yí　　tɛ̄)}　　→　[kālɛ̄ gó è yí tɛ̄]
　　　　　forest　　in　3SG sleep　hit:PAST
　　　　　'In the forest s/he slept.' (the author's field notes)　　　　(locative adjunct)

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[21] The Projection Principle as formulated by Chomsky (1981: 29) states that "[r]epresentations at each syntactic level (i.e., LF, and D-and S-structure) are projected from the lexicon, in that they observe the subcategorization properties of lexical items". Various versions of locality of selection go back to Chomsky's (1965) "strict locality" and require subcategorized elements to appear within a local projection, cf. Sportiche et al. (2014): "elements entering selectional relations with a head H, H' or HP must be sisters to H, to H' or to HP".

[22] Note that the tonal realization of the lexically toneless argument of the postposition is predicted by the separate prosodic phrasing of the PP: the lexically toneless word is not assigned a L.

b.   * kālē   gó   è   gō
       forest   in   3SG leave:PAST
       'From the forest s/he went.'   (source argument)

This restriction on the fronting of postpositional arguments cannot be explained in terms of semantic roles, and it is hard to account for if postpositional arguments are assumed to be base generated in the same position as adjuncts.

3.3   Binding

Another drawback of the base generation approach is the difficulties it creates for a configurational account of binding facts. Both reflexive and reciprocal pronouns within an object noun phrase can be bound by the subject, as expected on an account relying on c-command (69a,b).

(69) a.   {(lē   nɛ   dō)} {(e   pōlī)}   {nè}   →   [lē né dō é pōlī nè]
           woman   DIMIN   one   REFL   wash:PAST   there
           'An old woman washed herself there.'[23] (the author's field notes)
      b.   {ā̰} {(ɔ̰ŋ   bīō)}   →   [ā̰ ɔ̰ŋ́ bīō]
           2PL RECIPR   beat:PAST
           'You fought each other.' (the author's field notes)

Reflexive and reciprocal pronouns that appear within a postpositional argument, however, can be bound by either the subject or the object, even though syntactically, the postpositional argument adjoins at a higher level. In (70a), the possessor of the oblique argument is co-referential with the subject: "she$_i$" – "her$_i$ village". In (70b), the head of the oblique argument is a relational noun; its argument (the "inalienable possessor") is co-referential with the object: "his knife$_i$" – "from its$_i$ sheath". (The object is also modified by a reflexive possessor, which refers back to the subject: "Deloto$_i$" – "his$_i$ knife"; but that is not relevant here.).

(70) a.   {(è gō)}   {(e: kɔ̰ŋ-e   gó)} →   [è gō éé kɔ̰ŋ-ē gó]
           3SG leave:PAST   REFL:ALN   village-DEF   in
           'She$_i$ left her$_i$ village.' (the author's field notes)
      b.   {Dèlɔ̀tɔ́} {(e: séŋgè-e   bīlā)}   {(e tōā-e gó)}   → [Dèlɔ̀tɔ́ ēē séŋgè-é bīlā é tōā-ē gó]
           D.   REFL:ALN knife-DEF pull:PAST REFL sheath-DEF in
           'Deloto$_j$ pulled his$_j$ knife$_i$ from its$_i$ sheath.' (the author's field notes)

Moreover, reflexive and reciprocal pronouns that appear within an oblique argument can be bound by the subject or the object of the embedded verb with which the oblique argument is associated. In (71a), the possessive modifier of the oblique argument refers back to the zero subject of the embedded verb, which is controlled by the main verb's subject: "SUBJ$_i$ come" – "in his$_i$ field". In (71b), the reflexive pronoun embedded in the postpositional argument of the embedded verb refers back to that verb's object: "[stopped] pulling his knife$_i$" – "from its$_i$ sheath".

(71) a.   {(è dāgā)}   {(zò   mì)} {(e: bā-e   lé)} →   [è dāgā zò mì éé bā-ē lé]
           3SG stop:PAST come   by   REFL:ALN field-DEF at
           'He$_i$ stopped coming to his$_i$ field.' (the author's field notes)
      b.   {Dèlɔ̀tɔ́} {(e: séŋgè-e   bìlà ságlā)}   {(e tōā-e   gó)} → [Dèlɔ̀tɔ́ ēē séŋgè-é bìlà ságlā ē tōā-ē gó]
           D.   REFL:ALN knife-DEF pull start:PAST REFL sheath-DEF in
           'Deloto$_j$ started pulling his$_j$ knife$_i$ from its$_i$ sheath.' (the author's field notes)

To account for this flexibility, one has to either abandon the notion of c-command as irrelevant for binding in Wan or introduce underlying argument positions that will correspond to configurations expected on a c-command account. Abandoning the notion of c-command altogether would still require additional mechanisms that could associate the pronoun inside an oblique argument with its antecedent, which may be embedded, for example, in the main verb's object. A natural way to do this is by referring to grammatical relations, but these are again not regarded as independent notions in standard versions of transformational grammar; differences between, for example, subjects and objects are derived from different underlying configurations in which the arguments are generated.

To sum up, this section discussed arguments against analyzing oblique arguments in Wan as arguments generated in a clause-level position. Although such an account seems to offer an immediate solution to the unusual position of postpositional phrases, it fails to capture important properties of oblique arguments, and requires serious modification of the locality principle of theta role assignment.

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[23] In combination with the nouns 'man' and 'woman', the diminutive marker has the meaning 'old' (Nikitina forthc.).

4. Discussion
4.1. A constraint forcing extraposition

Having ruled out the possibility of an argument raising account or of a base generation account, we are left with the option of analyzing the position of oblique arguments in terms of extraposition. The logic of such an account is represented in (72).[24] The problems discussed above disappear if verb phrase internal positions are postulated where oblique arguments originate. First, oblique arguments do not need to differ from objects in the way they are licensed, and that allows them to function in the same way as oblique arguments of other languages. Second, they can be distinguished from adjuncts in being theta-marked, which can restrict their placement options as opposed to adjuncts (they can only be extraposed to a clause-level position, but not fronted). Finally, the extraposition account leaves open the option of treating the binding properties of reflexive and reciprocal pronouns in configurational terms.

(72)
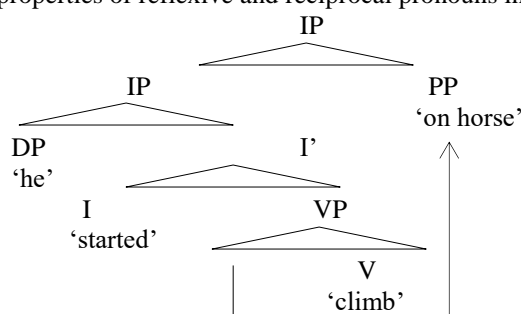
On the other hand, such an account would have to rely on a highly unnatural mechanism of unrestricted obligatory extraposition. All oblique arguments must undergo obligatory movement, landing at a site adjoined to the IP. The extraposition is also non-minimal; as discussed below, the order of PPs is not fixed (cf. 80 vs. 83). The question arises as to what could cause such movement, and why it has not been attested on the same scale outside Mande languages. It should also be noted that rightward movement is in general disfavored in some transformational models, such as Kayne (1994), reflecting the marked nature of the phenomenon we are trying to postulate.

One possible solution is to posit a filter at S-structure that would rule out all postpositional phrases that are governed by any lexical head. That would include the government domains of V and I, as well as of N and P: not only are postpositional phrases disallowed, in Wan, within verb phrases, but they also cannot occur within noun phrases, and they cannot be embedded in other postpositional phrases. A similar filter has been proposed by Büring & Hartmann (1995), who suggest that finite sentences flee from the government domain of V and I in German clauses with complementation. The constraint that is necessary for Wan, however, would have to be more general, as it covers the government domain of *all* lexical heads. It would also fail to account for the behavior of adjuncts. Like postpositional arguments, adjuncts must be precluded from appearing within lexical projections, even though they are not selected by the head.[25]

While such a solution would lead to a technically correct representation of the data, it is not entirely satisfying on theoretical grounds. By postulating a very general filter on the surface structure, it steps away from the very principles of generative-transformational grammar in modeling the effects of what looks conspicuously like a constraint-based rule. In this sense, the placement of Mande oblique arguments receives a more natural account within constraint-based syntactic frameworks such as LFG or HPSG, which aim at describing possible sets of structures in terms of surface-oriented phrase structure rules and make no reference to transformations or underlying structure. Below I describe how the Mande data can be handled within the LFG framework (Kaplan & Bresnan 1982; Bresnan 2001; Dalrymple 2001) and sketch a tentative account of the high attachment of PP arguments. The very problem of extraposition does not arise in a surface-oriented framework such as LFG, as the surface structures are not derived from underlying tree-structures. They are instead mapped onto a different type of representation, and constraints on the mapping relations help integrate lexical information coming from individual words into the overall semantic representation of a sentence.

4.2. A surface-oriented account of high attachment of PPs

In LFG, grammatical relations, including relations between predicates and their arguments, are described at an independent level of structure (called f-structure, and represented as attribute value matrices). Constraints on the surface

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[24] I assume here that oblique arguments are generated in a position preceding the verb, like objects, but nothing hinges on this, and they could also be generated in a position following the verb.

[25] Another problem this type of account would have to address is the difference in the behavior of postpositional arguments (which must be extraposed to the right) and adjuncts (which can be alternatively extraposed to the left). Additional constraints would have to be imposed to distinguish between the ways in which arguments and adjunct "flee" from the same government domains.

structure (known as c-structure constraints) are represented as phrase structure rules enriched with functional information. The phrase structure rules in (73a,b), for example, describe a possible structure of a Wan transitive verb phrase. The arrows organize information flow from the mother node to its daughters. The functional label "OBJ" refers to the object relation. The rule in (73a) licenses verb phrases headed by verbs, in which the verb is preceded by an NP corresponding to the verb's object. The functional annotation on the verb suggests that all the functional information associated with the lexical verb is also associated with the verb phrase, and vice versa. The rule in (73b) licenses noun phrases consisting of a single noun, which functions as its head.

(73) a. V' → NP V
$(\uparrow \text{OBJ}) = \downarrow$ $\uparrow = \downarrow$

b. NP → N
$\uparrow = \downarrow$

The phrase structure rules in (73a,b) license, for example, the combination 'wash fish' in (74), from example (35). The terminal nodes are annotated for the lexical information they contribute (this information comes from the lexicon in the form of feature structures and is integrated into the f-structure associated with the constituent; I only give here partial information, to illustrate how the mapping works). The value of the PRED attribute is a semantic form, which comes with a list of grammatical functions associated with the word. In (74), the head of the VP is the verb /poli/, which has the meaning 'wash' and selects for a subject and an object. The dependent NP consists of the noun kpɔ, which has the meaning 'fish' and is associated with a number of other grammatical features, of which I only list person, for illustrative purposes (albeit person does not play an important role in this particular example).

(74)
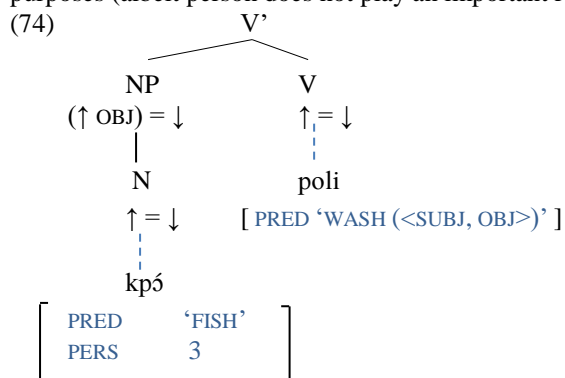
The annotated constituent structure is mapped onto an f-structure. In (75), I show the way the information contributed by the constituents is mapped onto a partial f-structure for this particular phrase. Crucial for our purposes is the way grammatical relations between the verb and its arguments are established. The verb, annotated as the head, contributes the semantic form to the f-structure associated with the entire V'. Its PRED value contains information about its arguments, indicating that SUBJ and OBJ f-structures must also be present. The VP does not contain further information about the subject, so I leave the SUBJ feature structure unspecified (it would be filled in a complete constituent structure). The OBJ feature structure, however, comes from the dependent NP (as suggested by the annotation for information flow). The NP contributes the information on the semantic value of the object and its grammatical features (only person is listed here).

(75)
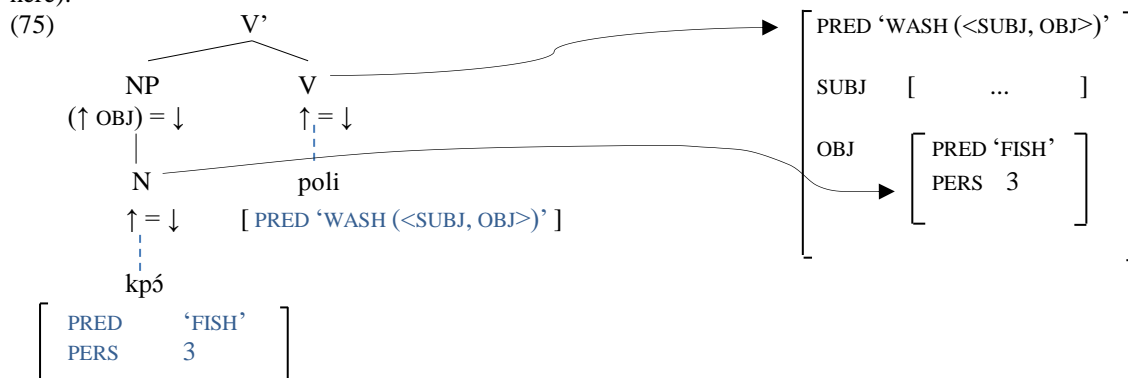
Information from lexical items is unified in the f-structure in accordance with functional annotations on the phrase structure. A set of well-formedness conditions makes sure that the resulting f-structure is interpretable (complete, coherent, and consistent).

Let us now turn to constructions with postpositional arguments. The evidence of the previous section suggests that they are selected by the verb, hence their presence in the f-structure is guaranteed by the well-formedness constraints. For example, the verb /bɛ̀nì/ 'fear' will contribute to the f-structure the PRED value 'FEAR (<SUBJ, OBL_LE>)'.

(76) è   á   bɛ̀nì lé   sógò-mù-è   lé
     3SG   PROG   fear   PROG   horse-PL-DEF   at
     'She fears horses.' (the author's field notes)

Since the verb's selectional properties are encoded directly in the f-structure, there is no need to project the corresponding c-structure from the argument structure of the verb, and phrase structure rules can allow PPs to adjoin at the clause level, rather than at the level of the VP. Their functional annotation must reflect the flexibility of their interpretation: the same structural position can correspond to an oblique argument of any verb embedded in the sentence. The phrase structure rule in (77) allows for such flexibility (Nikitina 2008a, 2011b). PPs adjoin to the clause. The phrase structure rule is recursive, so multiple PPs can adjoin to the same clause. In the functional annotation, GF stands for any grammatical function. The Kleene star allows the PP to contribute information about an oblique argument at any level of embedding. Thus, the PP in the same position can correspond in the f-structure to an oblique argument of the main verb (↑OBL), an oblique argument of the main verb's object (↑OBJ OBL), an oblique argument of the main verb's object's possessor (↑OBJ POSS OBL), etc.

(77)   IP   →   IP   PP
                     ↑ = ↓   (↑ GF*OBL) = ↓

In theory, the rule in (77) creates structures that are multiply ambiguous; most of the ambiguity is resolved, however, when well-formedness conditions are applied to the resulting f-structures. Consider the sentence in (76). Its lexical head is the verb /bɛ̀nì/ 'fear', and that verb, as discussed above, contributes the PRED value 'FEAR (<SUBJ, OBL_LE>)'. To satisfy the well-formedness conditions on f-structure, the value of OBL must be supplied, or the structure will be incomplete. This will cause the PP to be associated with the main verb, to produce an interpretable f-structure. The resulting c- and f-structures, with the resolved ambiguity, are presented below.

In (78), the c-structure is complete with the lexical information contributed by the terminal nodes. I only list the most pertinent information. The pronoun contributes the values of person and number; the auxiliary contributes tense and aspect; the post-verbal aspectual particle also contributes aspectual meaning (hence, the progressive aspect is marked by two different elements in the clause); likewise, the plural marker and the definite marker contribute their respective features. The postposition functions as a marker of an oblique argument, similar to oblique case markers; this particular verb specifies that its oblique argument should be marked by the postposition lé (Bresnan 1982; Kaplan & Bresnan 1982).

(78)
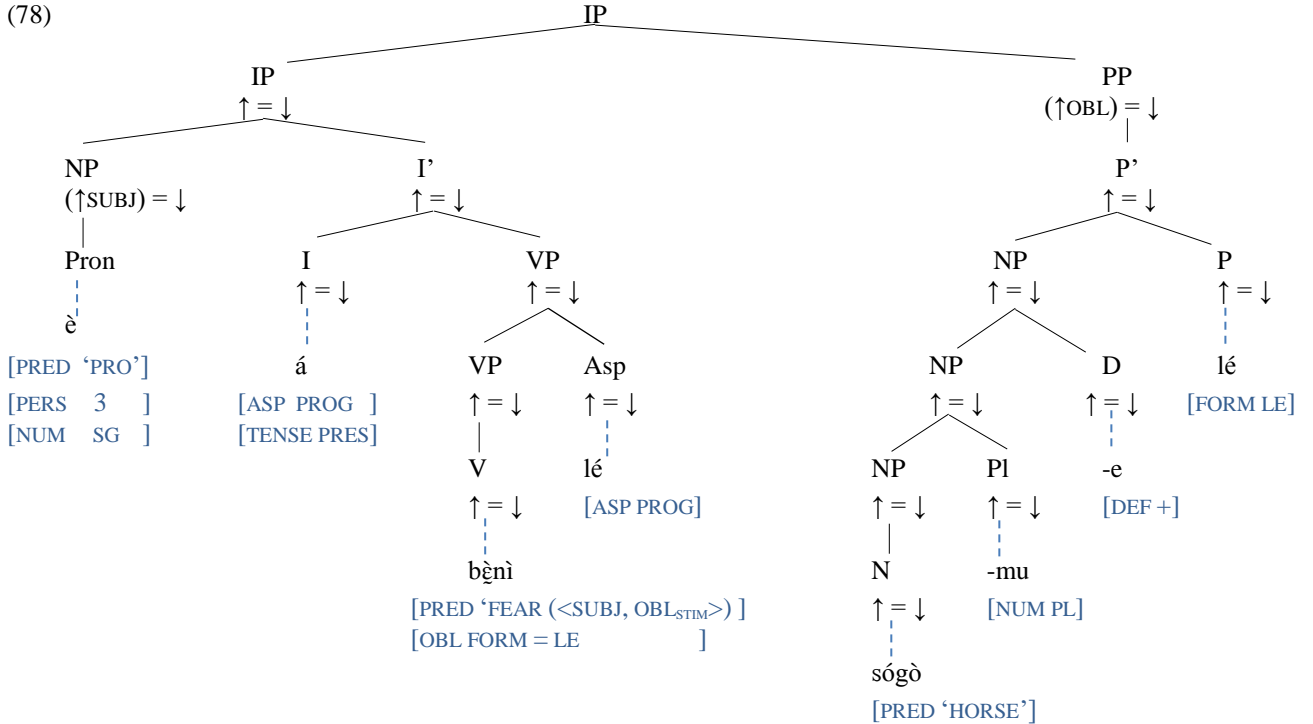
In (79), the same structure, in a simplified form, is mapped onto an f-structure, in accordance with the information flow annotations. Note that some of the values come simultaneously from different parts of the structure; for example, value FORM LE in the OBL structure in contributed by the postposition and by the verb, which selects for this type of marking for its oblique argument. If the two values were different, they could not be unified in the f-structure, and that would lead to a violation of the Consistency condition. Similarly, value ASP PROG is contributed both by the auxiliary and by the aspectual postverbal marker; if the two elements contributed different values, the f-structure would not be well-formed.

(79)

```
                    IP
          IP                    PP
        ↑ = ↓                (↑OBL) = ↓
    NP         I'           sógò mù è lé
 (↑SUBJ) = ↓   ↑ = ↓        'of the horses'
    è        á bè̱nì lé
  'she'      'is afraid'
```

$$
\begin{bmatrix}
\text{PRED} & \text{'FEAR (<SUBJ, OBL}_{\text{STIM}}\text{>)'} \\
\text{ASP} & \text{PROG} \\
\text{TENSE} & \text{PRES} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED 'PRO'} \\ \text{PERS 3} \\ \text{NUM SG} \end{bmatrix} \\
\text{OBL} & \begin{bmatrix} \text{PRED 'HORSE'} \\ \text{NUM PL} \\ \text{DEF +} \\ \text{FORM LE} \end{bmatrix}
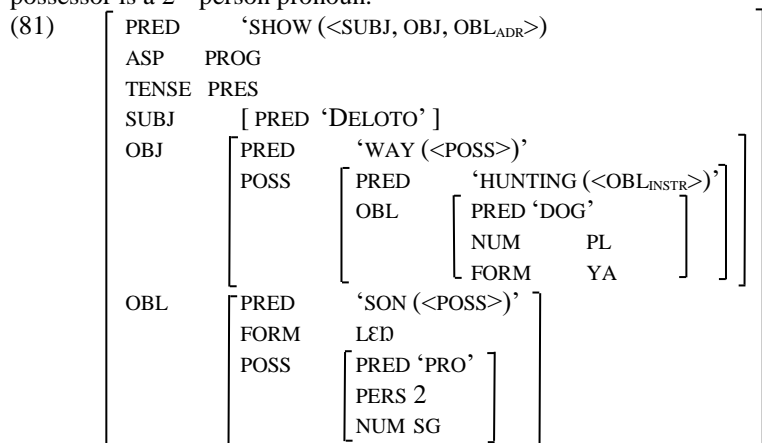\end{bmatrix}
$$
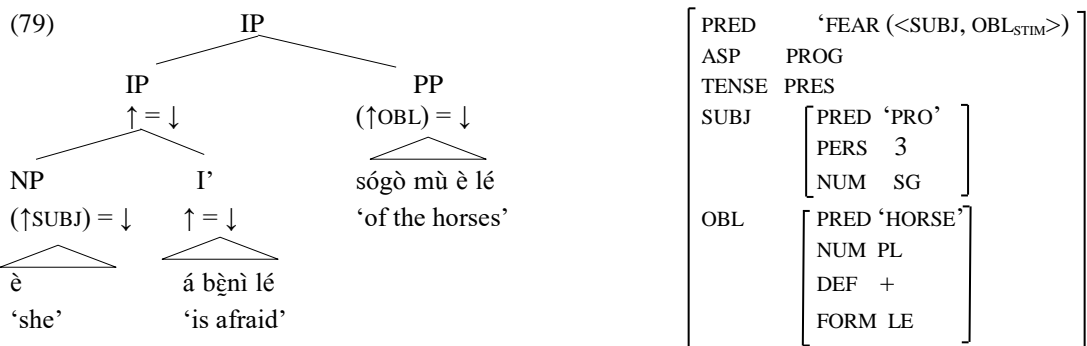
As discussed above, the PP behaves as a phonological phrase, hence the spreading of L to the lexically toneless plural and definite clitics. It also behaves as a separate intonational phrase, which is not, however, evident here, because the last syllable of the preceding intonational phrase is not lexically toneless.[26]

Let us now turn to another example, (10), repeated below as (80).

(80) Dèlɔ̀tɔ́   á   wìté-ŋ   gbè   lá   lé   [gbā̱nē̄-mú   yā]$_{PP}$ [lā gbè lèŋ]$_{PP}$
     D.   PROG   hunt-NMLZ   way   show PROG dog-PL   with   2SG son to
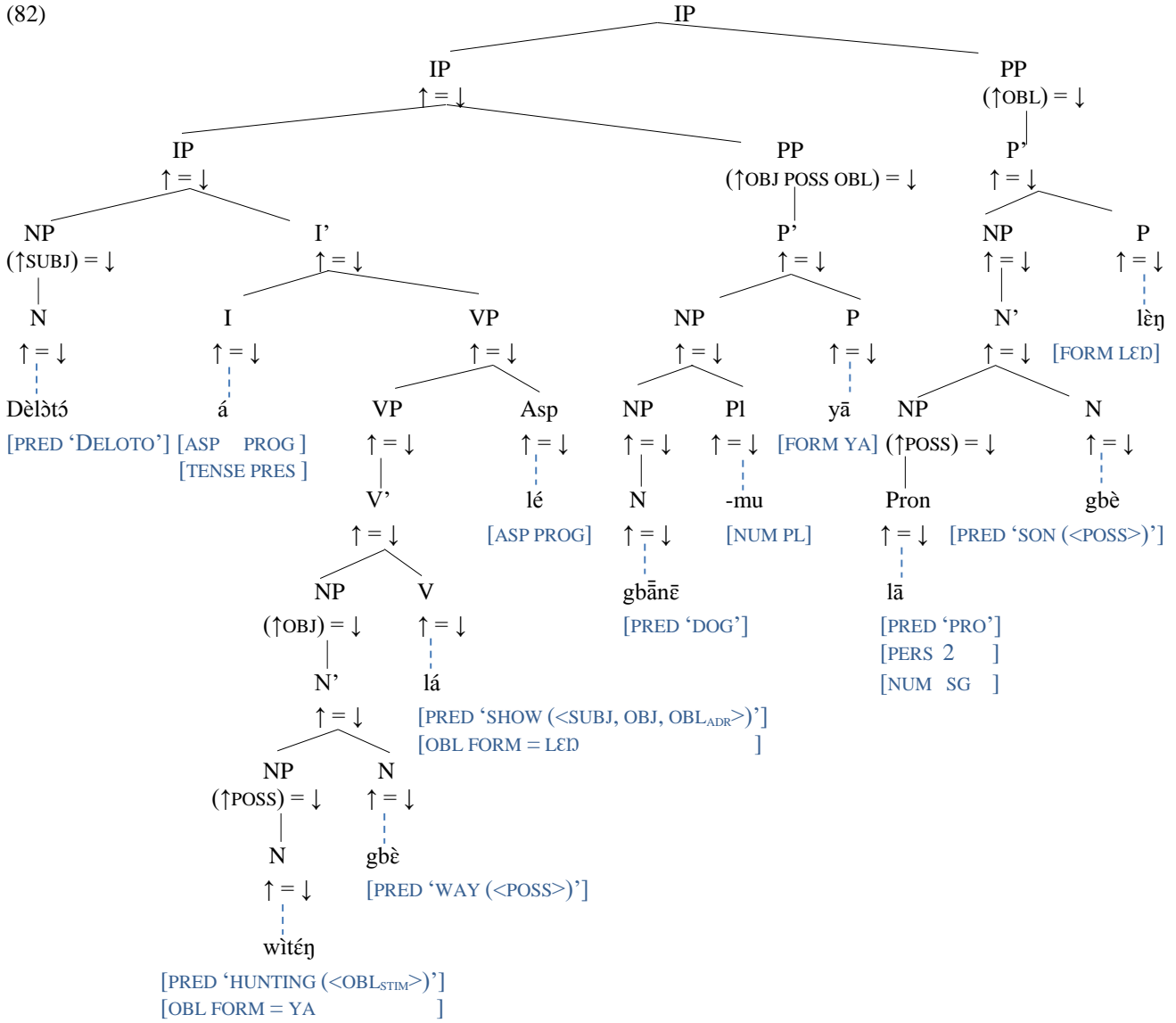   'Deloto is showing to your son the way of hunting with dogs.' (Nikitina 2008a: 89)

Here both the main verb and the embedded nominalization license an oblique argument; they are distinguished by the postpositional marker. Crucially, the f-structure for the sentence will only be interpretable if both oblique arguments are associated with a predicate. Such an f-structure is shown in (81). The main verb selects for three arguments (SUBJ, OBJ, OBL), which are all represented by their own f-structures. The subject is 'Deloto'. The object's PRED is 'WAY(<POSS>)'; it comes with its own argument – an inalienable possessor (the noun 'way' is relational). The possessor is a nominalization, which in Wan retains the internal arguments of the corresponding verb; hence, here it appears with an oblique argument 'dogs'. The oblique argument of the main verb is also a relational noun – 'son', and that noun's possessor is a 2nd person pronoun.

(81)

$$
\begin{bmatrix}
\text{PRED} & \text{'SHOW (<SUBJ, OBJ, OBL}_{\text{ADR}}\text{>)'} \\
\text{ASP} & \text{PROG} \\
\text{TENSE} & \text{PRES} \\
\text{SUBJ} & [\text{ PRED 'DELOTO' }] \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'WAY (<POSS>)'} \\ \text{POSS} & \begin{bmatrix} \text{PRED} & \text{'HUNTING (<OBL}_{\text{INSTR}}\text{>)'} \\ \text{OBL} & \begin{bmatrix} \text{PRED 'DOG'} \\ \text{NUM} & \text{PL} \\ \text{FORM} & \text{YA} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
\text{OBL} & \begin{bmatrix} \text{PRED} & \text{'SON (<POSS>)'} \\ \text{FORM} & \text{LƐŊ} \\ \text{POSS} & \begin{bmatrix} \text{PRED 'PRO'} \\ \text{PERS 2} \\ \text{NUM SG} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

The c-structure that is mapped onto that f-structure is presented below. Although the functional annotations on the two PPs are different, both satisfy the phrase structure rule in (77). One PP corresponds to the main object's oblique argument; the other, to the oblique argument of the possessor of the main verb's object. This sentence is unambiguous because both verbs specify the postposition that must introduce the oblique argument, and the postpositions are different. If the postpositions were unspecified or the same, the assignment of PPs to their verbs would be ambiguous.

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[26] As already mentioned, lexically toneless words are not very frequent in Wan, so special examples usually need to be constructed to explore the interaction of tone and syntax more efficiently.

(82)

```
                                              IP
                         ┌─────────────────────┴───────────────────┐
                        IP                                          PP
                       ↑=↓                                       (↑OBL)=↓
            ┌───────────┴──────────┐                               P'
           IP                      PP                             ↑=↓
          ↑=↓              (↑OBJ POSS OBL)=↓               ┌───────┴────┐
     ┌─────┴─────┐                 P'                      NP           P
    NP           I'               ↑=↓                    ↑=↓          ↑=↓
 (↑SUBJ)=↓      ↑=↓         ┌──────┴──────┐              N'            ┆
    │      ┌────┴────┐     NP             P             ↑=↓           lèŋ
    N      I         VP   ↑=↓            ↑=↓        ┌────┴────┐    [FORM LƐŊ]
   ↑=↓    ↑=↓       ↑=↓  ┌──┴──┐          ┆        NP         N
    │      ┆    ┌────┴──┐ NP  Pl          yā    (↑POSS)=↓    ↑=↓
  Dèlɔtɔ́   á   VP    Asp ↑=↓  ↑=↓    [FORM YA]   ↑=↓          ┆
[PRED 'DELOTO'] [ASP PROG] ↑=↓ ↑=↓  │   │              │           gbè
  [TENSE PRES]          │    ┆   N  -mu           Pron    [PRED 'SON (<POSS>)']
                        V'   lé ↑=↓ [NUM PL]       ↑=↓
                       ↑=↓  [ASP PROG] │            ┆
                   ┌────┴───┐        gbā̄nē̄        lā
                  NP        V      [PRED 'DOG']  [PRED 'PRO']
               (↑OBJ)=↓    ↑=↓                   [PERS 2]
                  │         ┆                    [NUM SG]
                  N'        lá
                 ↑=↓  [PRED 'SHOW (<SUBJ, OBJ, OBL_ADR>)']
              ┌───┴───┐  [OBL FORM = LƐŊ]
             NP       N
          (↑POSS)=↓  ↑=↓
             │        ┆
             N       gbè
            ↑=↓  [PRED 'WAY (<POSS>)']
             ┆
           wìtéŋ
        [PRED 'HUNTING (<OBL_STIM>)']
        [OBL FORM = YA]
```

Note that the mapping between c- and f-structure is independent of the order of the PPs. Both PPs are licensed by the same recursive rule, so one would expect either order to be possible. This prediction is borne out by the data: the PP arguments in (80) can be presented in either order, without a change in meaning, cf. (83).
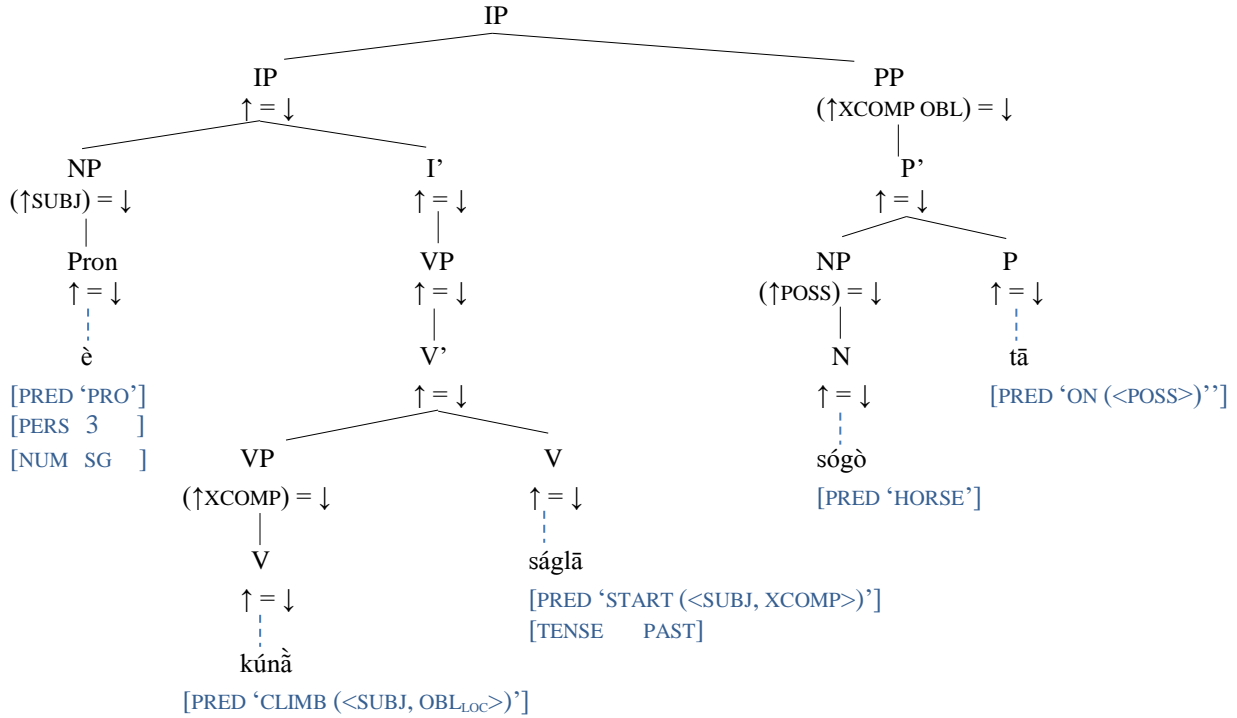
(83) Dèlɔtɔ́   á   wìté-ŋ   gbè   lá   lé   [lā gbè lèŋ̀]PP   [gbā̄nē̄-mú   yā]PP
     D.   PROG   hunt-NMLZ   way   show   PROG   2SG son to   dog-PL   with
     'Deloto is showing to your son the way of hunting with dogs.' (the author's field notes)

The last example that I can treat here is (8a), repeated below as (84). The example differs from the previous ones in that the main verb is finite, and no auxiliary is present. The PP corresponds here to the oblique argument of the main verb's non-finite complement (in LFG tradition, the XCOMP). Another difference is that the postposition is not selected by the verb; it is a spatial postposition commonly associated with locative roles. Such cases must be treated differently.
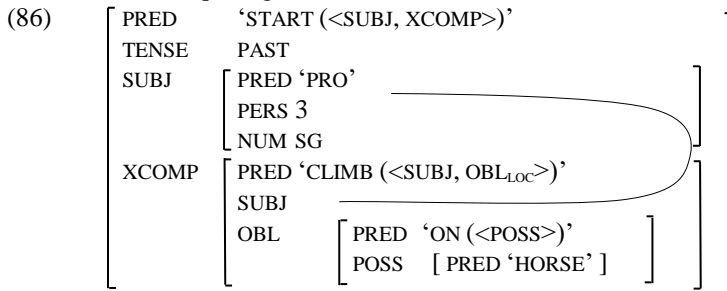
(84)   è   [kúnà̄   ságlā]VP   [sógò   tā]PP
       3SG   climb   start:PAST   horse   on
       'He started mounting the horse (=climbing on the horse).' (the author's field notes)

The c-structure of the sentence is presented in (85). Spatial postpositions share a number of properties with relational nouns, from which they derive historically (Nikitina 2008b). I will assume that spatial postpositions have lexical meaning and take an argument, which I describe tentatively in the same way as arguments of relational nouns, by means of a POSS relation.

(85)

IP
├─ IP ↑ = ↓
│   ├─ NP (↑SUBJ) = ↓
│   │   └─ Pron ↑ = ↓
│   │   └─ è
│   │   [PRED 'PRO']
│   │   [PERS 3]
│   │   [NUM SG]
│   └─ I' ↑ = ↓
│   └─ VP ↑ = ↓
│   └─ V' ↑ = ↓
│   ├─ VP (↑XCOMP) = ↓
│   │   └─ V ↑ = ↓
│   │   └─ kúnà̰
│   │   [PRED 'CLIMB (<SUBJ, OBL_LOC>)']
│   └─ V ↑ = ↓
│   └─ ságlā
│   [PRED 'START (<SUBJ, XCOMP>)']
│   [TENSE PAST]
└─ PP (↑XCOMP OBL) = ↓
     └─ P' ↑ = ↓
          ├─ NP (↑POSS) = ↓
          │   └─ N ↑ = ↓
          │   └─ sógò
          │   [PRED 'HORSE']
          └─ P ↑ = ↓
               └─ tā
                 [PRED 'ON (<POSS>)'']

The f-structure of the sentence is shown in (86). The subject of the non-finite complement is controlled by the main verb's subject; the control relation is imposed by phrase structure rules licensing non-finite complements (for details, see Bresnan 1982). Unlike in the previous examples, locative arguments need not be marked by a particular postposition; rather, the choice of the postposition is meaningful and depends on the spatial relation. Still, it is clear which of the verbs selects for an oblique argument, and a well-formed f-structure must provide a PRED value for it.[27]

(86)
$$
\begin{bmatrix}
\text{PRED} & \text{'START (<SUBJ, XCOMP>)'} \\
\text{TENSE} & \text{PAST} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED 'PRO'} \\ \text{PERS 3} \\ \text{NUM SG} \end{bmatrix} \\
\text{XCOMP} & \begin{bmatrix} \text{PRED 'CLIMB (<SUBJ, OBL_{LOC}>)'} \\ \text{SUBJ} \\ \text{OBL} \begin{bmatrix} \text{PRED 'ON (<POSS>)'} \\ \text{POSS [PRED 'HORSE']} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

4.3. Conclusion

The architecture of LFG is well equipped to capture the unusual constraints on Mande word order. Oblique arguments are only allowed in one syntactic position – as adjuncts to the IP, so the only rule that licenses them in the c-structure is the one in (77). That rule is responsible for what translates into derivational frameworks as obligatory extraposition.

The association of arguments with their verb is handled in LFG at a level of representation different from constituent structure. There is no a priori assumption that arguments must appear next to their predicate at some level of c-structure (as there is only one level, the surface structure). Still, oblique arguments end up being associated with their predicate in the f-structure, based on the information about the verb's selectional properties. This captures the intuitive notion of speakers "knowing" how to interpret PPs: if there is a predicate in the sentence selecting for the particular type of PP, it is associated with it; if there is no such predicate, the PP is interpreted as an adjunct; if there is more than one way for the association to be established, the sentence allows for two interpretations.

As discussed above, to model the same effect, the derivational alternative has to rely on an exceptional S-structure filter, treating Mande languages as an odd case requiring special formal tools. Nothing, however, suggests that the syntax of Mande languages is in any way unnatural. As already mentioned, the SOVX word order is remarkably stable and rigid: all languages of the rather diverse family retain it as the dominant, and typically the only possible order. It seems,

---

[27] If neither verb selected for an oblique argument, the spatial PP would be interpreted as an adjunct. I do not discuss PP adjuncts in this study, but they are licensed in Wan by a simple adjustment to the functional annotations in (77), allowing the PP to function as an adjunct rather than an oblique argument (Nikitina 2008a).

moreover, to have been borrowed by some of the neighboring languages (Carlson 1994). The LFG account sketched above does not rely on any special tools, and does not treat the Mande syntax as in any way exceptional. The mechanism of functional underspecification of some syntactic constituents, in particular, is basically the same as the one commonly used to account for non-configurationality (Nordlinger 1998). Just as in non-configurational languages, case marking helps identify the constituent's grammatical function, postpositional marking usually helps listeners associate the oblique argument with the right predicate. The ambiguity that remains is tolerated. The proposed account uses standard LFG tools to expresses in a simple way a pattern that presents a serious challenge for mainstream derivational frameworks.

Acknowledgements

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