On the Relation between Syntactic Phrases and Phonological Phrases

Hubert Truckenbrodt

This article argues that the relation between syntactic XPs and phonological phrases is subject to a constraint, WRAP-XP, that demands that each XP be contained in a phonological phrase. WRAP-XP is argued to interact with the constraints on edge alignment proposed by Selkirk (1986, 1995), with a constraint against recursive structure, and with a constraint aligning an edge of a focus with a phonological phrase. WRAP-XP is intended to replace, and improve on, an earlier proposal by Hale and Selkirk (1987) to the effect that lexical government plays a role in the syntax-prosody mapping. The languages discussed in more detail are Tohono O'odham, Kimatuumbi, and Chichewa.

Keywords: phonological phrase, syntax-phonology interface, prosodic structure, recursive structure, Optimality Theory

The topic of this article is the relation of syntactic XPs to prosodic structure. The starting point is provided by Selkirk's (1986, 1995) end-based theory of the syntax-prosody relation. In the formalization of Selkirk 1995, constraints demand alignment of the left or right edges of XPs with those of phonological phrases (also *p-phrases* or *P* in the following; edges of p-phrases will also be referred to as *p-boundaries*). Although Selkirk's proposal has met with considerable success in accounting for patterns of phrasing in a variety of languages, the literature on phrasing contains not a few phenomena that resist analysis in these terms alone. In this article I show that some such cases can be understood if—as argued by Selkirk (1995)—the syntax-prosody mapping is formalized in terms of ranked and violable constraints (Prince and Smolensky 1993) and if Selkirk's edge alignment crucially interacts with another constraint, here called WRAP-XP. WRAP-XP demands that each syntactic XP be contained in a phonological phrase. This constraint is a reanalysis of a proposal by Hale and Selkirk (1987), according to which lexical government may play a crucial role in the syntax-prosody mapping.

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In sections 1 and 2 I introduce relevant theoretical background and the constraint WRAP-XP, respectively.

In section 3 I present the analysis of Tohono O'odham by Hale and Selkirk (1987) and a reanalysis of their proposal in terms of WRAP-XP.

In section 4 I develop an argument for WRAP-XP from Kimatuumbi. In Kimatuumbi [*V NP NP*]$_{VP}$ is not phrased (*V NP*)$_P$ (*NP*)$_P$, where the internal p-boundary is due to right-alignment with XPs. Instead, it has the recursive structure ((*V NP*)$_P$ *NP*)$_P$, where the large p-phrase is forced by WRAP-XP, which demands that VP be contained in a single p-phrase. The recursive structure is detected by separate tests for the left edge of P and for the right edge of P.

In section 5 I develop an argument for WRAP-XP from Chichewa. In Chichewa WRAP-XP leads to a single p-phrase around a complex VP, suppressing edge alignment internal to VP: ([*V NP PP*]$_{VP}$)$_P$. When focus is placed on such a verb, the focused verb is followed by an obligatory p-boundary, neutralizing the integrating effect of WRAP-XP on the VP. With WRAP-XP neutralized, right-alignment of XPs with p-phrases inserts an additional p-boundary after the first object: (V_{FOC})$_P$ (*NP*)$_P$ (*PP*)$_P$.

Although either theory can account for the facts of Tohono O'odham, the discussion of Kimatuumbi and Chichewa demonstrates that a constraint-based analysis using WRAP-XP is empirically superior to Hale and Selkirk's parametric theory, which inspired the present proposal.

In section 6 I discuss the resulting typology, and in section 7 I sum up the results.

1 Theoretical Background

1.1 Mapping Syntactic Phrases to Phonological Phrases

The background of the discussion here is the theory of prosodic phonology. In this theory, a hierarchical, layered representation structures a string of phonological segments, grouping segments into syllables, syllables into feet, and feet into prosodic words; the layers above the prosodic word are the phonological phrase, the intonational phrase, and the utterance. Although stress is often used as the basis for postulating prosodic structure within the prosodic word, prosodic constituents above the word are typically inferred through their blocking or triggering of postlexical phonological processes.[1]

Some of these prosodic constituents, such as the prosodic word, the phonological phrase, and the intonational phrase, show systematic relations to syntactic constituent structure, though they have often been argued not to be isomorphic to syntactic constituents. The rules or constraints relating syntactic and prosodic structure are referred to as the (syntax-phonology) mapping. In this article the mapping from syntactic XPs to prosodic structure is of interest.

[1] Selkirk (1980a,b) first established the hierarchical, layered view of prosodic phonology, with a limited set of prosodic levels. Classic works that explore prosodic structure at and above the word in this theory are Selkirk 1986 and Nespor and Vogel 1986. At and below the level of the word, recent influential works such as Hayes 1995 and McCarthy and Prince 1993 are likewise built on this view of prosodic structure. See Halle and Vergnaud 1987 for a slightly different view, in which metrical structure is built with no principled upper limit on the number of levels that may be assigned in a metrical representation.

In this article I contend that any constraint that relates XPs to prosodic structure relates XPs to a single level of prosodic structure, here identified as phonological phrases (p-phrases or Ps). This contention, which draws on ideas in Selkirk 1986, 1995, is formulated in (1).

(1) *XP-to-P Mapping Condition*
Mapping constraints relate XPs to phonological phrases, but do not relate XPs to other prosodic entities.

Thus, across languages p-phrases are those prosodic entities that are derived from syntactic XPs. Many prosodic domains have been shown to be derived from syntactic XPs in the literature and will accordingly be classified as p-phrases here: Chen's (1987) ''tone groups'' in Xiamen Chinese; Hale and Selkirk's (1987) ''tonal phrases'' in Tohono O'odham; McCawley's (1965) and Selkirk and Tateishi's (1991) ''major phrases'' in Japanese, equivalent to Pierrehumbert and Beckman's (1988) ''intermediate phrases'' for Japanese; Selkirk and Shen's (1990) ''major phrases'' in Shanghai Chinese; Kisseberth and Abasheikh's (1974) ''quantity phrases'' in Chi Mwi:ni; Kanerva's (1989) ''focus phrases'' in Chichewa. By the XP-to-P Mapping Condition, these are entities of the same kind as the p-phrases postulated by Nespor and Vogel (1986) for Italian,[2] Selkirk (1986) for Chi Mwi:ni, Hayes (1989) for English, Hayes and Lahiri (1991) for Bengali, and Dresher (1994) for Tiberian Hebrew. Yet more phenomena from the literature fall in the realm of this condition when the Indirect Reference Hypothesis (Inkelas 1989) is taken into account.

(2) *Indirect Reference Hypothesis*
Phonological rules refer to only prosodic constituent structure.

The Indirect Reference Hypothesis does not allow phonological rules (or, by plausible extension, constraints) that refer to syntactic structure directly. If it is correct, then some phonological rules that have been proposed to refer to syntax must be recast in terms of prosodic constituents that mediate between syntactic structure and phonological rules. To the extent that XPs are relevant in the construction of these prosodic domains, the XP-to-P Mapping Condition asserts that those domains are also p-phrases. Below I will apply this reasoning to two phonological rules proposed by Odden (1987) for Kimatuumbi.

1.2 Aligning Syntactic Phrases and Phonological Phrases

The idea that phonological boundaries are inserted at syntactic boundaries in a way that ignores differences between syntactic categories (e.g., V vs. N) dates back to Chomsky and Halle 1968.

On the basis of tonal rules in Ewe, Clements (1978) argued at length that phonological sensitivity to syntactic edges can single out one edge—the left edge in Ewe—while ignoring the other edge. He suggested that a number of tonal rules in Ewe do not apply across a syntactic

[2] See Ghini 1993 for a reanalysis of Nespor and Vogel's proposals for Italian, in terms of Selkirk's theory of edge alignment adopted here.

''left branch,'' where a left branch in the theory he was using is equivalent to the left edge of a syntactic phrase. His suggestion can be translated into one that inserts a domain boundary at the left (but not right) edge of each syntactic phrase.

Chen (1987) similarly argues that the right edges of syntactic phrases (but, here, not the left edges) are relevant for the tonal analysis of Xiamen Chinese. In his proposal a tone group boundary is inserted after each right edge of a syntactic phrase. Chen's case will be used here to schematically exemplify the relevance of syntactic edges to the construction of p-phrases. In Xiamen Chinese final and nonfinal positions in a tone group are distinguished by a tone sandhi phenomenon. On a standard view of the phenomenon, the underlying tone of a lexical item surfaces only in tone-group-final position. In any nonfinal position of a tone group, each lexical element shows a different tone, usually referred to as sandhi tone. The arrows in the South Min tone circle in (3) point from the underlying tone of a given tonal class of lexical items to the nonfinal sandhi tone for that tonal class.[3]

(3) 24 N 22 N 21
↑ ↓
44 L 53

Chen (1987) shows that the tonal domains that are relevant for conditioning this phenomenon are assigned by inserting a tone group boundary at the right edge of XPs, as in the schematic representations in (4).

(4) *Domain boundaries at the right edge of XP in Xiamen Chinese*
a. $[YP_1 \# \ldots YP_n \# VP \#]_{CP}$
where one of $YP_1, \ldots, YP_n$ is the subject, and the others may be sentential adverbs or preposed objects
b. $[NP_2 \# N_1]_{NP_1} \#$
where NP_2 is the complement of N_1[4]
c. $[V\ NP \# YP]_{VP} \#$
where NP and YP are complements of the verb

No such boundaries are found between a head and a following complement, as in $[V\ NP]_{VP}$, in a position that does not coincide with the right edge of any XP.[5]

[3] In these phonetic approximations, 5 represents the highest tonal level, and 1 the lowest. [24], for example, is a rising tone. Short tones and neutral tone are ignored here.

[4] This structure is found for locative and temporal expressions, which Chen (1987) analyzes as either PPs or NPs—here I represent them as NP. A comparable structure is found with a noun preceded by what Chen tentatively analyzes as a relative clause CP: $[[AP \# C]_{CP}\ N]_{NP}$—with no tone group boundary after the functional CP (see section 1.3 below on functional projections).

[5] A class of adjuncts (certain adnominal adjectives and VP adverbs) is exceptional relative to this algorithm, as the thorough discussion in Chen 1987 brings out (see also Chen 1992). Similar observations about exceptional adjuncts have been made by Clements (1978) for Ewe and by Selkirk and Tateishi (1991) for Japanese. What is common to these cases is that the adjuncts in question do not introduce prosodic boundaries at their edges, as would be expected if they were full XPs. Clements (1978) and Selkirk and Tateishi (1991) both propose that these adjuncts fail to trigger boundary effects at their edges because they are syntactic heads, rather than syntactic phrases. For concreteness, I assume here that this is also the correct analysis for Taiwanese. Abney (1987) and Williams (1994) have argued on independent syntactic

Kisseberth and Abasheikh (1974) present similar data from Chi Mwi:ni, a Bantu language, arguing that a certain phenomenon of vowel length is sensitive to prosodic domains. Selkirk (1986) shows that the domains in Chi Mwi:ni can likewise be derived by alignment of right edges of XPs with prosodic boundaries. Here XPs preceding the VP are phrased separately, analogously to (4a), and a domain boundary is found between two objects following a verb, as in (4c). A verb and a following complement are phrased together, as in Xiamen. Furthermore, NPs are right-branching in Chi Mwi:ni, so that (4b) can be contrasted with the Chi Mwi:ni $[N\ YP]_{NP}$ #, where there is no domain boundary between noun and complement, as predicted by right-edge alignment.

These facts led Selkirk (1986) to propose a universal theory of phrasing based on edge alignment of p-phrases with syntactic XPs. This proposal was later also insightfully applied to Shanghai Chinese by Selkirk and Shen (1990), to Japanese by Selkirk and Tateishi (1991), and to Northern Kyungsang Korean by Kenstowicz and Sohn (1997).[6] In both languages, edges of prosodic domains (''major phrases'' and p-phrases) have been argued to be constructed by alignment with left edges of XPs.

McCarthy and Prince (1993) later generalized edge alignment to the constraint format of *Generalized Alignment*, rendered in (5). In this format, Selkirk (1995) has formulated the constraints on edge alignment of syntactic phrases with p-phrases as in (6).

(5) *Generalized Alignment*
Where Cat_1, Cat_2 are prosodic, morphological, or syntactic categories and $Edge_1$, $Edge_2$ $\in$ {Right, Left}:
ALIGN(Cat_1, $Edge_1$; Cat_2, $Edge_2$) $\Leftrightarrow$
For each Cat_1 there is a Cat_2 such that $Edge_1$ of Cat_1 and $Edge_2$ of Cat_2 coincide.

(6) a. *ALIGN-XP,R:* ALIGN(XP, R; P, R)
''For each XP there is a P such that the right edge of XP coincides with the right edge of P.''
b. *ALIGN-XP,L:* ALIGN(XP, L; P, L)
''For each XP there is a P such that the left edge of XP coincides with the left edge of P.''

1.3 The Lexical Category Condition: Lexical and Functional Projections

Refining the end-based theory, Selkirk (1995), following up on Selkirk and Shen 1990, has argued that the constraints relating syntactic and prosodic structure apply to lexical elements and their projections, but not to functional elements and their projections. A preliminary version of this restriction, which I will call the *Lexical Category Condition*, is shown in (7).

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grounds that certain classes of adverbs and adjectives do not constitute XPs on their own. A different proposal for these adjuncts in Xiamen Chinese has been developed by Lin (1994), building on the notion of lexical government in Hale and Selkirk 1987. Lin's suggestions are not compatible with the reanalysis of Hale and Selkirk's proposal in this article.

[6] See also Kim 1997 for phrasing in Northern Kyungsang Korean. See Cho 1993 and Jun 1993 for discussion and references in connection with left-alignment of XPs and p-phrases in Standard Korean.

(7) *Lexical Category Condition (LCC;* preliminary version)
Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections.

The effects of (7) are pervasive throughout the literature on phrasing. Chen (1987), for example, had observed that nonlexical items like pronouns do not trigger tone group boundaries in Xiamen Chinese. This can be analyzed using Abney's (1987) DP theory, which has become standard in the syntactic literature (see, e.g., Chomsky 1995:246). According to Abney, both pronouns and ''full NPs'' are syntactically DPs, projections of a functional head D. Pronouns head DPs with no complement ($[she_D]_{DP}$), whereas determiners head DPs with a lexical NP complement ($[the_D\ [teacher_N]_{NP}]_{DP}$). The crucial cases (4a–c), represented using the more complex DP syntax, are repeated in the left column of (8).[7] These contrast minimally with pronoun examples from Chen 1987 in the right column of (8). Although tone group boundaries are inserted after the ''full NPs'' on the left, no such tone group boundaries are found after the pronouns (DPs) on the right.

(8) a. $[[D\ NP]_{DP}\ \#\ VP\ \#]_{CP}$ $[DP\ VP\ \#]_{CP}$
b. $[[D\ NP_2]_{DP}\ \#\ N_1]_{NP_1}\ \#$ $[DP\ N]_{NP}\ \#$
c. $[V\ [D\ NP]_{DP}\ \#\ YP]_{VP}\ \#$ $[V\ DP\ YP]_{VP}\ \#$
↑
no tone group boundary after pronominal DPs

These differences in phrasing follow from the LCC in (7). Because of the LCC, ALIGN-XP,R does not apply to functional projections like the DPs on the right in (8). These are therefore not followed by tone group boundaries. Applying this reasoning to the cases on the left in (8), we now infer that the DPs in these cases also do not trigger tone group boundaries. Here, then, it is the lexical NPs within the DPs that trigger the internal tone group boundaries to their right.[8]

To simplify representations, I will sometimes treat $[D\ NP]_{DP}$ as though it were simply an NP, since the two structures are equivalent as far as ALIGN-XP,R is concerned. That constraint will demand a p-boundary following such a constituent, whether we think of it as NP or as $[D\ NP]_{DP}$ (with the embedded NP triggering the boundary in the latter case).

Summing up: The contrast in (8) shows the relevance of the LCC in (7) to ALIGN-XP,R. Later I will show that the LCC crucially applies to WRAP-XP as well.

1.4 The Lexical Category Condition and Empty Categories

Nespor and Vogel (1986:48ff.) argue that although overt syntactic categories may lead to the construction of prosodic constituents that can be detected by phonological rules, these phonologi-

[7] In Xiamen Chinese a classifier follows the determiner. A more complete structure would be $[D\ [Cl\ NP]_{ClP}]_{DP}$ (see Lin 1994). The additional functional projection ClP is omitted in some of the following structures, with no consequences for the arguments made.

[8] Lin (1994) also suggests that NP triggers a p-boundary in $[D\ NP]_{DP}$, whereas DP may fail to do so.

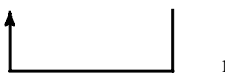
cal rules systematically ignore empty syntactic elements. To capture this, I extend the LCC in (7) as in (9).

(9) *Lexical Category Condition* (*LCC;* still preliminary)
Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, *or to empty syntactic elements.*

As Nespor and Vogel observe, the irrelevance of empty syntactic elements to the mapping can be observed across languages. Chen (1987) independently makes this point for Xiamen Chinese. Consider the structures in (10) and (11). In (10) the object of the verb is in its D-Structure position. The IP following it is a purpose clause, which Chen analyzes as being inside the VP. In (11) the object has moved leftward (it is topicalized). Chomsky (1995:202ff.) explores a theory in which moved elements leave behind a silent copy of themselves at S-Structure (the input to the syntax-prosody mapping). The structure in (11) shows such a copy of the moved object, here stricken through to indicate that it is phonetically empty, though syntactically present at S-Structure.

(10) $[V\ [D\ NP]_{DP}\ \#\ IP]_{VP}$

(11) $[D\ NP]_{DP}\ \#\ [V\ \sout{[D\ NP]}_{DP}\ \ IP]_{VP}$

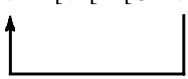


no tone group boundary at the right edge of the silent copy

The overt NP in the object in (10) triggers a tone group boundary to its right, as expected. Likewise, the overt NP in the object in (11) triggers a tone group boundary to its right after movement of the object to initial position. Crucially, however, the silent NP in the silent copy of the object in (11) does not trigger such a tone group boundary to its right. In this example such a tone group boundary would be detectable, since it would lead to separate tone groups for the verb and the purpose clause IP. However, the verb and the purpose clause are phrased together in examples with this structure. Here, then, the empty NP is ignored by the mapping constraint that leads to the insertion of a prosodic boundary after overt NPs. This now follows from the revised LCC in (9), which has the consequence that ALIGN-XP,R does not apply to empty elements, like the phonetically empty NP in (11).

Consider also the structure in (12), from Lin 1994:244.

(12) $NP\ \#\ [V\ [D\ [Cl\ \sout{NP}]_{ClP}]_{DP}\ IP]_{VP}$



no tone group boundary

Here only NP is dislocated, with an overt determiner and a classifier stranded in the VP. The phrasing of this case can be understood in terms of the revised LCC. Notice first that the NP on the left triggers a tone group boundary to its right, confirming that NP alone (without DP) will trigger such a boundary. Notice then the crucial fact that no tone group boundary separates the classifier Cl from the following IP. This confirms both the first formulation of the LCC in (7)

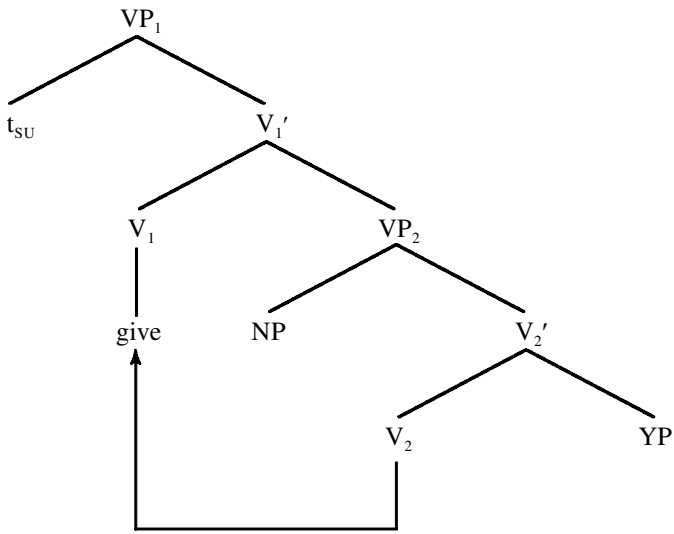
and the extension added in (9). Thus, the first formulation correctly predicts that the functional projections DP and ClP do not, on their own, trigger tone group boundaries on the right. If they did, a tone group boundary would separate the classifier from the IP. Furthermore, this case confirms that empty categories do not invoke the mapping constraints. The empty NP would otherwise lead to the insertion of a tone group boundary to its right.[9]

As I will show, there is also some indication that in the case of head movement, the *projection* of an empty head is not taken into account by the mapping constraints. This motivates the final formulation of the LCC.

(13) *Lexical Category Condition* (*LCC;* final version)
Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements *and their projections.*

The evidence for extending Nespor and Vogel's proposal about empty categories to the projections of empty elements relates to complex VPs. Larson (1988) and other syntacticians have proposed a complex VP-internal structure for verbs with more than one complement. Many syntacticians, including Chomsky (1995:179ff., 329ff.), adopt one or another version of this proposal. According to Larson, universal restrictions on phrase structure force an analysis of at least the complexity in (14) on a verb that precedes more than one object.

(14)



[9] Lin (1994) offers a different analysis of this case, though one that does not carry over to the suggestions developed later in this article.

Here the two complements of the verb, NP and YP, are in the specifier and complement position of an additional VP_2. The verb moves from the position of the head of VP_2 up to the head of VP_1. At D-Structure the subject is in the specifier of VP_1, but it moves out of VP_1 to the specifier of a functional projection in which it receives nominative Case. Its D-Structure position is indicated by t_{SU} (''trace of the subject'') in (14).

VP_1 is a lexically headed projection in the relevant sense. I follow Larson's suggestion that it is headed by the moved verb *give* in (14). This is crucial in the syntax, where, under Larson's restrictive suggestions about the assignment of thematic roles, the moved verb has to become the head of VP_1 in order to assign a thematic role to the subject in the specifier of VP_1.[10] VP_1 thus being overtly and lexically headed, the mapping constraints will apply to it.

However, the formulation of the LCC in (13) exempts VP_2 from invoking any mapping constraints: VP_2 has an empty head after movement of the verb in (14), and the extended formulation of the LCC makes the projection of this empty head irrelevant for the mapping constraints. This will be crucial in the analysis of Chichewa below.

To simplify representations, I will usually abbreviate the complex structure in (14) as $[V\ NP\ YP]_{VP}$ (with YP = NP or PP), indicating only those elements that are relevant to the syntax-prosody mapping: the overt verb and its two objects, as well as the VP that contains verb and objects (equivalent to VP_1 in (14)). Omitted here are the subject trace and the projection of V_2 of (14), neither of which invokes the mapping constraints owing to the LCC in (13). The simplified representation is thus equivalent to the full representation in (14), as far as the mapping is concerned.

*1.5 Further Background Assumptions: EXHAUSTIVITY and *P-PHRASE*

Assume that ALIGN-XP,R applies to the structure in (15), triggering the p-boundaries indicated in (15a). Is this structure completed as in (15b), as in (15c), or as in (15d)?

(15)	[V NP PP]$_{VP}$	
a.	))	edges due to ALIGN-XP,R
b.	( ) ( )	desired phrasing
c.	( ) ( )	nonexhaustive phrasing
d.	( ) ( ) ( )	phrasing with additional structure

The standard assumption, adopted here, is that (15b) would be the resulting structure. The phrasing in (15c) is excluded by a requirement that parsing on every prosodic level be exhaustive, called *EXHAUSTIVITY* in Selkirk 1995:443. This requirement is violated in (15c), since the phonological representation of the verb is not parsed on the level of the p-phrase.

The phrasing in (15d) with the additional p-phrase not required by ALIGN-XP,R can be ruled

[10] In Chomsky 1995:331, 334, the raised verb is assumed to adjoin to the empty head of VP_1.

out by a constraint *P-PHRASE that seeks to avoid p-phrases altogether. This constraint is a member of the family of constraints *STRUC (see Prince and Smolensky 1993:25, fn. 13).

*P-PHRASE also plays a role in rendering an edge alignment constraint ''inactive'' in a given language. Thus, in earlier work on edge alignment, the choice of left versus right edges was conceived of as a parametric choice (see Selkirk 1986, Selkirk and Shen 1990). In Optimality Theory, where ALIGN-XP,R and ALIGN-XP,L are universal like all other constraints, this choice can be expressed by ranking an ''active'' alignment constraint above *P-PHRASE, and an ''inactive'' one below *P-PHRASE. In the example in (15), high-ranking ALIGN-XP,R can compel the violations of *P-PHRASE incurred by (15b). Notice then that ALIGN-XP,L would actually favor the phrasing in (15d), where the left edge of NP is aligned with a p-boundary. However, if ALIGN-XP,L is ranked below *P-PHRASE, the phrasing in (15b) will be preferred over the better left-aligned one in (15d), as desired. More generally, an alignment constraint can be made ''inactive'' for most purposes, if it is ranked below *P-PHRASE.[11]

It so happens that in the languages discussed in detail in this article, right-alignment plays a crucial role, whereas left-alignment is not in evidence. For these languages, then, the ranking is ALIGN-XP,R $\gg$ *P-PHRASE $\gg$ ALIGN-XP,L. Furthermore, there is no indication of nonexhaustive parsing in the languages discussed here. EXHAUSTIVITY may thus be thought of as being undominated throughout.

To simplify the presentation, the constraints EXHAUSTIVITY, *P-PHRASE, and the ''inactive'' ALIGN-XP,L will sometimes be omitted in the discussion below. Phrasing candidates that are eliminated only because they introduce nonexhaustive parsing, or only because they introduce p-phrases that are not called for, will often not be considered.

2 The Claim: WRAP-XP

In this article I defend the claim that besides Selkirk's constraints on edge alignment, another constraint, formulated in (16), determines the syntax-prosody relation on the level of the phrase.

(16) *WRAP-XP*
Each XP is contained in a phonological phrase.

WRAP-XP will come into conflict with some (though not all) boundaries demanded by ALIGN-XP,R. (17) shows the four syntactic configurations of primary interest here, along with the phrasing that would be derived by ALIGN-XP,R alone. The stars indicate which of these structures violate WRAP-XP.

[11] This analysis predicts the existence of languages with ALIGN-XP,R, ALIGN-XP,L $\gg$ *P-PHRASE, with both left and right edges of lexical XPs triggering p-boundaries. On standard assumptions about syntactic phrase structure, such a language would build a separate p-phrase around each lexical word. For example, both left-headed structures like $[X_1\ XP_2]_{XP_1}$ and right-headed structures like $[XP_2\ X_1]_{XP_1}$ will be phrased separately in such a language, owing to the internal left/right edge of XP_2. Analogously for further structure inside of XP_2. Such domains will not easily be distinguished from postlexical prosodic words, which share at least this general characteristic. To my knowledge, no cases are on record where p-phrases with this distribution have been argued to be distinct from prosodic words. I believe that this state of affairs may well reflect the additional difficulties in isolating such a case, rather than a problem with the predicted typology.

(17) *Reaction of* WRAP-XP *to structures derived by* ALIGN-XP,R

a. * $(\quad)_P\ (\quad)_P$ b. √ $(\qquad)_P$
$[XP_2 \quad X_1]_{XP_1}$ $[X_1\ XP_2]_{XP_1}$

c. * $(\qquad)_P\ (\quad)_P$ d. √ $(\quad)_P\ (\qquad)_P$
$[X_1\ XP_2 \quad XP_3]_{XP_1}$ $[XP_1 \quad Fct\ XP_2]_{FctP}$

The phrasing of the left-branching structure in (17a) violates WRAP-XP. The boundary inserted to the right of XP_2 is favored by ALIGN-XP,R. Though XP_2 itself is wrapped in this structure, the larger XP_1 is not: it is not contained in a single p-phrase.

A symmetrical right-branching structure as in (17b) does not lead to this conflict between ALIGN-XP,R and WRAP-XP. Here a single p-phrase around both head and following complement allows both XP_1 and XP_2 to be right-aligned with a p-phrase, while XP_1 is contained in a single p-phrase, and XP_2 is contained in a single p-phrase (the fact that this is the same p-phrase for both is of no detrimental consequence).

For present purposes, right-branching syntactic structures will lead to conflict between ALIGN-XP,R and WRAP-XP only in cases of a head with multiple complements, as in (17c). Here ALIGN-XP,R favors the internal p-boundary after the first complement. However, the resulting phrasing in two separate p-phrases conflicts with WRAP-XP, since the larger projection XP_1 is not wrapped in a p-phrase in this structure.

Finally, when two lexical XPs are contained in a higher functional projection, as in (17d), ALIGN-XP,R wants an inner p-boundary after XP_1. The resulting prosodic structure wraps each of XP_1 and XP_2 in a single p-phrase. Crucially, the fact that the higher projection FctP is not contained in a single p-phrase is not a violation of WRAP-XP. This follows from the LCC in (13): functional projections do not invoke the mapping constraints. Earlier I showed how this is justified for the application of ALIGN-XP,R. (17d) now is the case that shows the consequences of this provision for WRAP-XP. Because of the LCC, FctP, being a functional projection, does not invoke WRAP-XP. Consequently, FctP need not be contained in a single p-phrase. Here, then, the phrasing demanded by ALIGN-XP,R does not conflict with WRAP-XP.

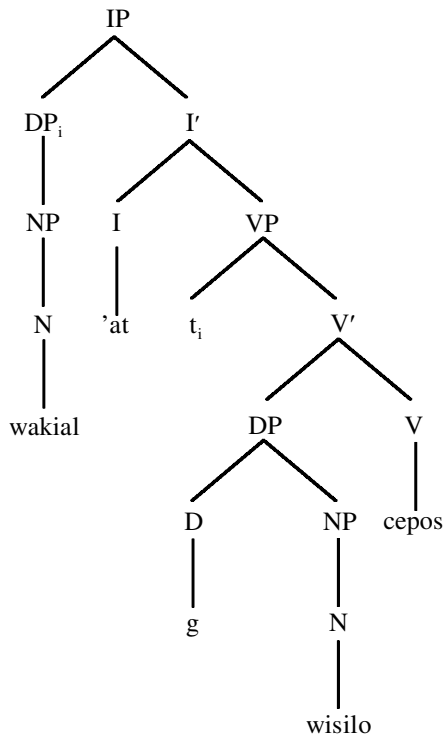
Thus, WRAP-XP is a force that wants lexical projections to be phrased together, while allowing functional projections to be split up freely. WRAP-XP punishes separate p-phrasing within lexical projections, as in the structures in (17a,c). No conflict arises between ALIGN-XP,R and WRAP-XP in (17b), where ALIGN-XP,R does not demand p-boundaries internal to a lexical projection, or in (17d), where multiple p-phrases lead to separate phrasing of a higher functional projection, not affected by WRAP-XP.

Notice that WRAP-XP shares with *P-PHRASE that both are potential ''boundary-preventers.'' However, whereas *P-PHRASE prefers fewer and larger p-phrases in all cases, WRAP-XP selectively prefers large p-phrases around lexical projections, but not around functional ones. Thus, where one sees a phrasing as in (17d), one can infer that ALIGN-XP,R $\gg$ *P-PHRASE—ALIGN-XP,R is ''active,'' and *P-PHRASE is ranked so low as not to be able to prevent ALIGN-XP,R from applying. All languages discussed in this article have the phrasing in (17d). When in such a language another force prevents p-boundaries internal to a lexical XP, such as the p-boundaries in (17a,c), the boundary preventer cannot be *P-PHRASE, but must be another constraint—here WRAP-XP.

3.1 Hale and Selkirk's (1987) Analysis of Tohono O'odham

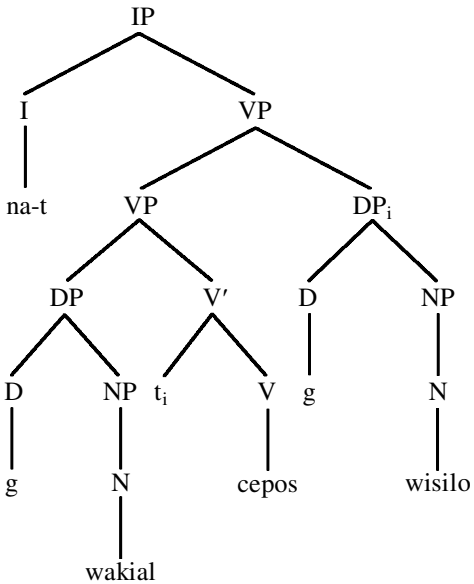
In their work on Tohono O'odham (earlier this Uto-Aztecan language was called Papago), Hale and Selkirk (1987) found a pattern of phrasing that did not fully fit the pattern of edge alignment of such languages as Xiamen Chinese and Chi Mwi:ni. In Tohono O'odham each sentence consists of one or more tonal domains that Hale and Selkirk called ''tonal phrases.'' In accord with the XP-to-P Mapping Condition, the tonal phrases are analyzed as p-phrases because of their dependency on XP syntax. Each p-phrase is characterized by a $L_0\, H_1\, L_1$ tonal pattern, with zero or more L-toned vowels followed by one or more H-toned vowels, followed, in turn, by one or more L-toned vowels. The stretch of H-toned vowels begins with the first vowel bearing word stress in the p-phrase and ends with the last vowel bearing word stress in the p-phrase. It is followed by a L tone, and any remaining vowels are also assigned L tones. Examples are shown in (18) and (19).

(18) a.



b. (H LL)$_P$ (L H HH H L)$_P$
Wákial 'at g wísilo cépos.
cowboy AUX DET calf branded
'The cowboy branded the calf.'

(19) a.



b. (L HHH H L)$_P$ (H LL)$_P$
Na-t g wákial cépos g wísilo?
Q-AUX DET cowboy branded DET calf
'Did the cowboy brand the calf?'

In the first p-phrase in (18), there is but one stressed vowel, the first vowel of *wákial*. This vowel receives a H tone. In the second p-phrase in (18), the stretch of H-toned vowels begins with the stressed vowel of *wísilo* and ends with the stressed vowel of *cépos*. L tones are assigned to all other vowels.

(18) and (19) illustrate the two places in which p-phrase boundaries are regularly assigned. First, a clause-initial position, preceding the auxiliary, is analyzed as empty at syntactic D-Structure. It can be filled by movement of an XP (such as the subject, an object, or an adjunct) in declarative main clauses during the syntactic derivation.[12] In (18) the subject has moved to this position. The clause-initial XP is regularly followed by a tone group boundary, shown in (18b). Second, Tohono O'odham has a very productive pattern of complement extraposition and right-adjunction to XPs across categories.[13] In these cases of right-adjunction, the adjoined XP is separated from the XP it is adjoined to by a tone group boundary. This is shown in (19), where the object is right-adjoined to VP and assigned to a separate tone group.

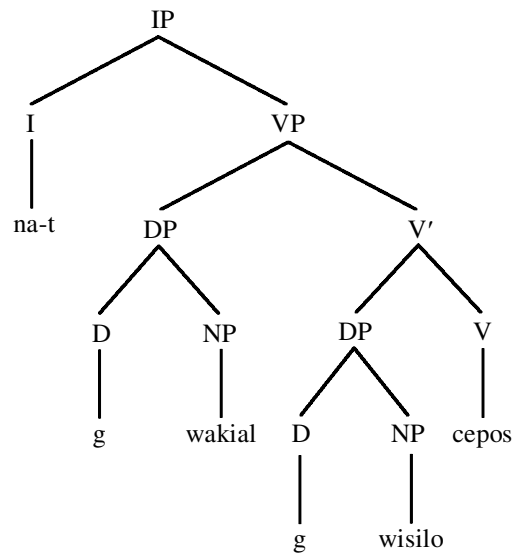
[12] For the purposes of the present discussion, it does not matter if this position is the specifier of IP or CP. What is crucial is that it is the specifier of a functional projection. For concreteness, I follow Hale and Selkirk (1987) in assuming that the main clause is IP in cases like (18).

[13] See Hale and Selkirk 1987 for syntactic arguments for this analysis; see also Hale, Jeanne, and Platero 1977 for discussion of the syntax and phrasing of extraposition in Tohono O'odham. No difference in meaning is reported to be associated with the extraposed structures.

Hale and Selkirk argue that alignment of right edges is relevant in this language. Thus, the right edge of the initial XP triggers a p-boundary in (18).[14] In (19) the p-boundary is triggered by the right edge of the lower VP node (I will return to the details of adjunction structures below).

However, Hale and Selkirk observe that not all right edges actually trigger tone group boundaries. Thus, VPs are head-final, but none of the arguments of the verb triggers a boundary to its right (or to its left). In (18), for example, there is no p-boundary separating the object and the verb. In (19) there is no p-boundary separating the subject and the verb. (20) is an example where both subject and object occur between the auxiliary and the verb. I follow the analysis of Hale and Selkirk (1987), in which both subject and object are inside VP. Neither subject nor object triggers a p-boundary at its left or right edge. Head-final NPs and lexical head-final PPs likewise do not have a boundary between an argument of N or P and the following head, as exemplified in (21), which contrasts with the Xiamen Chinese phrasing in (4b).

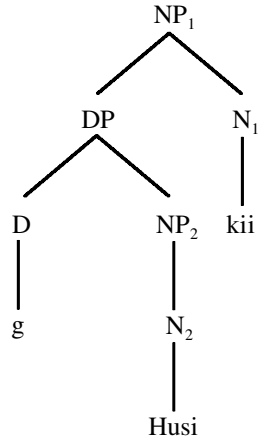
(20) a.



b. (L HHH H HH H L)$_P$
Na-t g wákial g wísilo cépos?
Q-AUX DET cowboy DET calf brand
'Did the cowboy brand the calf?'

[14] One argument for the relevance of right as opposed to left edges in Tohono O'odham comes from constructions in which the auxiliary is preceded not by an XP but by a syntactic head. Here there is no p-boundary between the initial head and the auxiliary. Thus, the presence of the p-boundary before the auxiliary is tied to the presence of an initial XP, at the right edge of which the p-boundary occurs. See Hale and Selkirk 1987:165 for discussion and examples.

(21) a.



b. (HH HL)$_P$
g Húsi kíi
DET Joe house
'Joe's house'

Hale and Selkirk therefore suggest that not every XP triggers a tone group boundary to its right in Tohono O'odham. Rather, those XPs that are lexically governed are exempt from triggering boundaries to their right. The part of the definition of lexical government that is relevant here is that being ''lexically governed'' requires being contained in the maximal projection of a lexical head.[15] The object of the verb in (18) is lexically governed by the verb and thus exempt from triggering a boundary to its right. The subject is likewise lexically governed by the verb in (19), thus invoking the exemption, and both subject and object are exempt for the same reason in (20). In (21), finally, N_1 lexically governs DP/NP_2, thus exempting it from triggering a boundary to its right.

As Hale and Selkirk point out, the exemption has to be limited to elements governed by a *lexical* head. Thus, the functional head I in (18)–(20) governs the initial XP and the VP, which do trigger boundaries to their right. The crucial distinction here is that I does not *lexically* govern these phrases, not being a lexical element in the relevant sense. Thus, if the exemption is limited to lexically governed elements, then the initial NP in (18) and the lower VP node in (19) (both not lexically governed) are not exempt from triggering boundaries to their right.

Hale and Selkirk suggest that exempting lexically governed elements from triggering boundaries is a parametric choice. Their proposal is given in (22) (my wording; see Selkirk and Shen 1990 for a full formulation of the parametric theory of phrasing).

[15] The full definitions adopted in Hale and Selkirk 1987:159 from Chomsky 1986 are as follows: ''A governs B iff A m-commands B and every barrier for B dominates A,'' where A m-commands B ''iff A does not dominate B and every maximal projection M that dominates A dominates B.'' Lexical government is then construed as government by a lexical head.

(22) *Hale and Selkirk 1987: phrasing is sensitive to lexical government*
Align the {left/right} edge of each syntactic category SCat with a prosodic category PCat, where a language may choose
a. SCat = XP, or
b. SCat = XP so long as it is not lexically governed,
(other options for SCat omitted here)
and PCat = p-phrase
(other options for PCat omitted here)

Tohono O'odham would choose the right edge, and the exemption for lexically governed elements in (22b).

3.2 An Analysis of Tohono O'odham Using WRAP-XP

The analysis I am proposing replaces the parameter in (22) with the constraint WRAP-XP, repeated here.

(23) *WRAP-XP*
Each XP is contained in a phonological phrase.

In Tohono O'odham WRAP-XP prevents ALIGN-XP,R from inserting p-boundaries internal to lexical XPs. Thus, WRAP-XP demands that the VP in (18)–(20) be contained in a single p-phrase. This is the case in the actual phrasings shown above. It would not be the case if ALIGN-XP,R were to split the VP into two p-phrases after the object in (18) and after the subject in (19), and into three p-phrases after the subject and after the object in (20). Likewise, in (21) WRAP-XP demands that NP_1 be contained in a single p-phrase, as in the actual phrasing. ALIGN-XP,R thus cannot split NP_1 into two p-phrases. The derivation of the structure in (20) is shown in tableau (24).

(24)

	n-at [g [wakial]$_{NP_1}$ g [wisilo]$_{NP_2}$ cepos]$_{VP}$	WRAP-XP	ALIGN-XP,R
a. ☞	( )$_P$		NP_1 NP_2
b.	( )$_P$ ( )$_P$	VP!	NP_2
c.	( )$_P$ ( )$_P$	VP!	NP_1
d.	( )$_P$ ( )$_P$ ( )$_P$	VP!	

In candidates (b)–(d) the presence of p-boundaries avoids violations of ALIGN-XP,R. However, these phrasings trigger violations of WRAP-XP. Ranking WRAP-XP above ALIGN-XP,R in Tohono O'odham correctly rules these phrasings out.

Next consider the case of the clause-initial XP in (18). The p-boundary after this XP is triggered by ALIGN-XP,R. Why is this not blocked by WRAP-XP, assuming that WRAP-XP might apply to IP? Hale and Selkirk's distinction between lexically and functionally governed elements is reduced to the more general LCC in (13) in the present account. As was shown earlier, the consequence of the LCC for WRAP-XP is that WRAP-XP does not apply to functional projections

like IP. Not applying to IP, WRAP-XP does not prevent ALIGN-XP,R from inserting a boundary after the initial XP, as shown in tableau (25).

(25)

[[wakial]$_{NP_1}$'at g [wisilo]$_{NP_2}$ cepos]$_{VP}$]$_{IP}$	WRAP-XP	ALIGN-XP,R
a. ( )$_P$		NP_1! NP_2
b. ☞ ( )$_P$ ( )$_P$		NP_2

The final case to be considered is that of extraposed elements as in (19). This case is shown in tableau (26).

(26)

n-at [[g [wakial]$_{NP_1}$ cepos]$_{VP}$ g [wisilo]$_{NP_2}$]$_{VP}$	WRAP-XP	ALIGN-XP,R
a. ( )$_P$		VP! NP_1
b. ☞ ( )$_P$ ( )$_P$		NP_1

Here a technical question arises with regard to the interpretation of adjunction structures by the mapping constraints. Consider the two VP nodes in the structure in tableau (26) (or in the more transparent (19)). Notice that the higher VP node contains the adjunct, whereas the lower VP node does not. Which of the two VP nodes is relevant for ALIGN-XP and WRAP-XP? I maintain that the lower VP node, but not the upper one, is seen by the mapping constraints. Thus, when ALIGN-XP,R applies to the lower VP node, the insertion of the boundary in candidate (b) of tableau (26) is called for. This is not blocked by WRAP-XP, so long as WRAP-XP also applies only to the lower VP node: the lower VP node is wrapped in the resulting structure. If the upper VP node had to be wrapped, it would wrongly block the insertion of the p-boundary before the extraposed element.

This assumption about the interpretation of adjunction structures is put on a more principled footing in Truckenbrodt 1995, to which I refer the reader for details. There I suggest that the mapping constraints themselves refer to syntactic *categories*, not syntactic *segments*, in accord with Chomsky's proposal (class lectures, fall 1994) that interface constraints generally make reference to syntactic categories, not syntactic segments. In the case of (19)/tableau (26), each VP node is called a syntactic *segment* of VP, and the *category* VP is an abstract entity, not itself represented by a single node. It can be thought of as the set of the two syntactic VP segments. The mapping constraints are claimed to apply to all material that is *dominated by* that category, where *domination by a syntactic category* requires *domination by all syntactic segments* of the category (Chomsky 1995:177). Thus, the abstract category VP (abstractly) dominates all and only the material dominated by both its VP segments, hence the material under the lowest VP node. Since the mapping constraints then care only about what the category VP dominates, they treat this category as though it was the lowest syntactic segment of VP (the lowest VP node). The higher segment of VP that includes the adjunct is thus irrelevant to the syntax-prosody mapping.[16]

[16] Next to the notion of domination, used here, Chomsky (1995:177) introduces the more inclusive notion *containment*: adjuncts are contained in (though not dominated by) the category they adjoin to. Domination and containment are relevant

In Tohono O'odham WRAP-XP allows a reanalysis of Hale and Selkirk's government parameter. In the remainder of the article I present cases of phrasing that can be analyzed in terms of WRAP-XP in a theory of ranked and violable constraints, but cannot be reduced to Hale and Selkirk's government parameter.

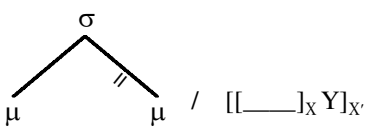
4 Kimatuumbi: WRAP-XP and Recursive Structure

In this section I draw on Odden's (1987, 1990, 1996) thorough discussion of the Bantu language Kimatuumbi. Two phonological phenomena discussed by Odden—Shortening and Phrasal Tone Insertion—are analyzed here in terms of phonological phrases. The two phenomena have similar domains, though these domains differ precisely where ALIGN-XP,R interacts with WRAP-XP in the right-branching structure of Kimatuumbi: the case of a syntactic head with two complements. In the present analysis, Shortening is sensitive to right edges of P, and Phrasal Tone Insertion is sensitive to left edges of P. The one mismatch between their domains is accounted for by letting ALIGN-XP,R and WRAP-XP jointly derive a recursive prosodic structure, phrasing $[V\ NP\ NP]_{VP}$ as $((V\ NP)_P\ NP)_P$. Here WRAP-XP demands the larger p-phrase that wraps the VP. ALIGN-XP in addition demands the inner p-phrase, which allows right-edge alignment of the first object with a p-phrase. In the recursive structure, the internal right edge of P is not immediately followed by a left edge of P. This allows a complete analysis of both phenomena of Kimatuumbi.

4.1 Shortening and Phrasal Tone Insertion in Kimatuumbi

According to Odden, a rule of *Shortening* applies to long stem vowels in Kimatuumbi under certain syntactic conditions. Odden formulates the rule as in (27).

(27) *Shortening* (Odden 1987)



(where Y contains phonetic material)

Shortening applies in words that are not XP-final: heads that are followed by other material in their syntactic projection. Shortening thus affects the long vowel of $[mpúuŋga]_{NP}$ 'rice' in $[mpuŋga\ wá\ [baándu]_{NP}]_{NP}$ 'the rice of the people', where it is not in the final position of an XP. However, the same long vowel is not shortened in $[mpuuŋgá]_{NP}\ [waabóí]_{VP}$ 'the rice has rotted', in XP-final position.

Odden's formulation of Shortening does not accord with the Indirect Reference Hypothesis, which maintains that phonological rules cannot access syntactic structure in this direct way.

for different syntactic definitions, and the fact that domination, rather than containment, gives the correct result in the case at hand is an empirical result.

Cowper and Rice (1987) propose a reanalysis of Shortening that does accord with the Indirect Reference Hypothesis. In their account, Selkirk's edge alignment (here: ALIGN-XP,R) enforces a right edge of a p-phrase at every right edge of an XP in Kimatuumbi. For the examples just considered, the p-boundaries thus derived are shown in (28).

(28) a. [mpunga wá [baándu]$_{NP}$]$_{NP}$
(mpunga wá baándu)$_{P}$
rice of people
'the rice of the people'
b. [mpuungá]$_{NP}$ [waabói]$_{VP}$
(mpuungá)$_{P}$ (waabói)$_{P}$
rice rotted
'the rice has rotted'

Since right edges of XPs and right edges of p-phrases coincide by ALIGN-XP,R, an XP-final position will become a p-phrase-final position. In Cowper and Rice's reanalysis, Shortening then applies in nonfinal position of a p-phrase (rather than in nonfinal position of an XP). I formulate this in (29).

(29) *Shortening*
Long stem vowels shorten, except in the prosodic word immediately preceding the right edge of a p-phrase.

Shortening then applies to *mpúunga* in nonfinal position of a p-phrase in (28a), but not in final position in a p-phrase as in (28b). Thus, the fact that Shortening does not apply to a word (e.g., *mpuungá* in (28b)) is evidence for the presence of an immediately following p-boundary. Likewise, the fact that Shortening does apply to a word (e.g., *mpunga* in (28a)) is evidence that this word is not immediately followed by a p-boundary.[17]

(28a) represents a more general pattern of phrasing by which a head and a following complement are phrased together. Odden shows that this pattern of Shortening is also found within VPs, APs, and PPs. The separate phrasing of subject and VP in (28b) is representative of a more general pattern of separate phrasing of adjacent lexical XPs embedded in higher functional structure. Another example given by Odden is the separate phrasing of a VP and a following VP-external adverbial phrase, indicated by the nonapplication of Shortening at the right edge of VP.

Odden discovered a second phenomenon sensitive to XP syntax in Kimatuumbi, Phrasal Tone Insertion (PTI). Odden's formulation of PTI is shown in (30).

(30) *Phrasal Tone Insertion (PTI*; Odden 1987)
$\varnothing \rightarrow$ H / [[. . .]$_{YP}$ ____ [. . .]$_{ZP}$]$_{XP}$

[17] Notice that Shortening applies to stem vowels only. It does not apply in the verbal prefix *naa-* (underlyingly /ni+a/), regardless of prosodic position. Odden (1996:225, fn. 2, and chap. 7) accounts for this by applying Shortening *before* coalescence derives these long prefix vowels. A full analysis of Kimatuumbi Shortening in Optimality Theory will have to derive the difference between these two cases in another way.

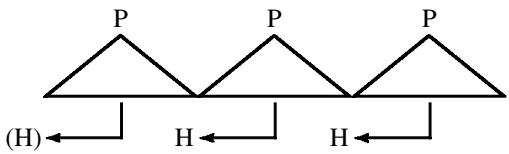
With a qualification to which I will return, PTI inserts a H tone between two syntactic phrases. The H tone then surfaces on the last vowel of the syntactic phrase preceding it (YP in (30)), as on the last vowel of *Mambóondo* in [*Mamboondó*]$_{NP}$ [*aawúle*]$_{VP}$ 'Mamboondo died'.

My reanalysis of PTI makes use of p-phrases, in accord with the Indirect Reference Hypothesis and with the XP-to-P Mapping Condition. I formulate PTI as in (31): a H tone is inserted to the left of any p-phrase.

(31) *Phrasal Tone Insertion* (reanalysis)
ALIGN(P, L; H, R)[18]
''Align the left edge of each phonological phrase with the right edge of a H tone.''
$_{P}($ N H $_{P}($

(32) demonstrates which p-phrase in a series of p-phrases triggers the insertion of a H tone in this analysis.[19]

(32)



This analysis has the advantage of explaining the core property of this continuation rise: it does not occur at the right edge of the final p-phrase. There is no p-phrase after the final p-phrase, hence no p-phrase to trigger a H tone on the final p-phrase by (31).

In the present analysis, then, PTI is a test for the *left* edge of p-phrases (the H tone is inserted preceding a left edge of a p-phrase), and Shortening is a test for the *right* edge of p-phrases (nonfinality in a p-phrase is relevant).

Next consider the application of PTI in (28). Here the domains of application for PTI are as expected, given the phrasing already motivated by Shortening. Thus, just as Shortening in (28b) showed the presence of a right edge of P between subject and VP, so PTI demonstrates the presence of a left p-boundary between subject and VP: *mpúunga* receives a final H tone by PTI. Furthermore, Shortening testified to the absence of a p-boundary between the head and its complement in (28a). Similarly, PTI does not insert a H tone at the right edge of the initial noun, giving evidence for the ''matching'' absence of a left p-boundary between this head and its PP complement. A similar example involving a verb and its complement is (*naa-kálangite chóolyá*)$_{P}$ 'I-fried food', where Shortening on the verb testifies to the absence of a right edge of a p-phrase after the verb (compare (*naa-kálaangite*)$_{P}$ 'I fried'), and the absence of a PTI H tone on the final vowel of the verb demonstrates the absence of a left p-boundary between verb and object.

[18] The formalization of *ANCHOR* in McCarthy and Prince 1995:371 raises the question whether alignment can be generally reduced to same-side edge anchoring, or whether opposite-edge alignment should also be an option for constraints on natural languages. A case that makes crucial use of opposite-edge alignment is *ALIGN-SFX* in McCarthy and Prince 1995:300. If the present analysis of Kimatuumbi is correct, PTI is another case in which opposite-edge alignment is required in the grammar.

[19] The H tone that would be triggered by the initial p-phrase is not realized: there is no tone-bearing unit preceding the initial p-phrase to which the tone might attach.

PTI, like Shortening, applies without regard to syntactic categories. For example, PTI applies not only between subject and VP as in (28b), but also between VP and a following VP-external adverbial phrase. It also applies between a preposed object NP and a following VP, or between a clause-initial adverbial phrase and a following subject NP or a following VP. Furthermore, it applies between a subject and an object in an elliptical clause in which the verb has been gapped. In all these cases, two lexical XPs are embedded in higher functional structure (in Odden's analysis, they are daughters of the sentence node S). Analogously to (28a), PTI also does not apply between other syntactic heads and a following complement.

4.2 Evidence for Recursive Structure in Kimatuumbi

In the case of a lexical head with two (or more) complements in its projection, the p-boundaries indicated by Shortening and by PTI no longer match. As shown in (33), the complements of the lexical head are separated by a right edge of a p-phrase, but not by a left edge of a p-phrase. I interpret this as the presence of the recursive prosodic structure shown in (33).

(33) $[X_1\ XP_2\quad XP_3]_{XP_1}$
$((X_1\ XP_2)_P\ XP_3)_P$
↑
right edge of a p-phrase,
with no immediately following left edge of a p-phrase

Evidence that multiple complements are separated by the right edge of a p-phrase comes from the right-edge test of Shortening. Recall that the failure of Shortening to apply is evidence for an immediately following right edge of a p-phrase. As shown in (34), the first of two complements does not undergo Shortening (otherwise, the shortened forms *kikólombe* and *cha-asikopú* would result in (34a) and (34b) instead). Thus, the failure of Shortening in the first objects in (34) is evidence that a right edge of a p-phrase occurs between the first and second complements.[20]

(34) a. [V NP NP]$_{VP}$
((naampéi kikóloombe)$_P$ Mambóondo)$_P$
I-him-gave shell Mamboondo
'I gave Mamboondo the shell.'
b. [N [P NP]$_{PP}$ AP]$_{NP}$
((kikólombe cha-asikoópu)$_P$ kikúlú)$_P$
shell of bishop large
'large shell of the bishop'

Evidence for the absence of a left edge of a p-phrase between the complements of a lexical head comes from the left-edge test PTI. Recall that PTI is triggered by an immediately following

[20] The verb in (34a) and the initial nouns in (35a–b) have long vowels that arise from morphemic concatenations in various ways. These long vowels are never subject to Shortening, and their presence in these examples is not evidence for a following right edge of a p-phrase.

left edge of a p-phrase. In (34) PTI does not apply to the final vowels of the first objects, which is evidence for the absence of a left p-boundary between the first and second complements. Further examples that show the nonapplication of PTI between multiple complements of a lexical head are given in (35).[21]

(35) a. [V NP NP AdvP]$_{VP}$
(((naampéi lí Mamboondo)$_P$ kiwikilyo)$_P$ ííjuma)$_P$
I-him-gave NEG Mamboondo cover Friday
'I didn't give Mamboondo a cover on Friday.'

b. [N AP [VP]$_{CP}$]$_{NP}$
((munduu ntepéengau)$_P$ ywaáliilé)$_P$
man wet REL-eat
'the wet man who ate'

Thus, multiple complements of a lexical head are separated by right p-boundaries, with no immediately following left p-boundaries. Such a configuration is characteristic of recursive structure. Here it is taken to be evidence for the recursive structure shown in (33).

4.3 WRAP-XP Derives the Recursive Structure in Kimatuumbi

As will be seen shortly, the recursive structure in (33) can be used to argue for the presence of WRAP-XP in the grammar. Before this argument can be made, a few remarks on recursive prosodic structure are in order.

Selkirk (1984) and Nespor and Vogel (1986) maintained that recursive prosodic structure is generally prohibited. On the other hand, Ladd (1986) argued for allowing such structure. Later Selkirk (1995) and Peperkamp (1995, 1997) provided arguments in favor of a violable constraint against recursive prosodic structure. The constraint punishes recursive structure, but violations may be forced by other constraints. That is the position I adopt here, using the following formulation of NONRECURSIVITY:[22]

(36) *NONRECURSIVITY* (*NONREC*)
Any two p-phrases that are not disjoint in extension are identical in extension.

Allowing for gradient violations of ''identical in extension,'' this definition demands that p-phrases in recursive structures be maximally alike in extension. It thus punishes recursive

[21] Odden distinguishes VP-internal and VP-external adverbial phrases. VP-external AdvPs trigger PTI to their left. However, Odden analyzes the AdvP in (35a) as VP-internal, and it does not trigger PTI.

Odden (1987, 1996) discusses the between-complements restriction on the application of PTI at some length. He adds a qualification to the rule in (30) to the effect that PTI does not apply where XP in (30) immediately dominates a lexical head. In other words (and equivalently as far as his examples go), PTI does not apply between the complements of a lexical head.

[22] Selkirk's (1995) original formulation of NONRECURSIVITY is more straightforward, punishing a prosodic constituent that contains another prosodic constituent of the same level. She proposes that recursive structure is punished at every prosodic level. Her arguments for such a violable constraint come from phenomena involving prosodic words.

structure to the extent that the two elements of the recursive structure differ in extension. This gradient formulation will be motivated shortly. An independent argument for the presence of NONRECURSIVITY in the grammar will be given in the discussion of Chichewa below.

For now, we are faced with the question of what compels the recursive structure in (33) in Kimatuumbi, despite NONRECURSIVITY. Why do we not obtain the nonrecursive structure $(X_1\ XP_2)_P$ $(XP_3)_P$ instead of the recursive $((X_1\ XP_2)_P\ XP_3)_P$? After all, both meet the demands of ALIGN-XP,R. The answer I offer is that WRAP-XP shows its impact here. Tableau (37) shows how WRAP-XP, together with ALIGN-XP,R, compels a recursive structure like (33).

(37) *Kimatuumbi: WRAP-XP and ALIGN-XP,R compel a recursive structure*

	$[X_1\,XP_2\ \ XP_3]_{XP_1}$	ALIGN-XP,R	WRAP-XP	NONREC	*P-PHRASE	ALIGN-XP,L
a.	$(\qquad\qquad)_P$	XP_2!			*	$XP_2\,XP_3$
b.	$(\qquad)_P(\quad)_P$		XP_1!		**	XP_2
c. ☞	$((\qquad)_P\quad)_P$			XP_3	**	$XP_2\,XP_3$
d.	$(\ (\quad)_P\quad)_P$			X_1! XP_3	**	XP_3
e.	$((\qquad)_P(\quad)_P)_P$			XP_3 X_1 (!) XP_2	***(!)	XP_2

ALIGN-XP,R demands a p-boundary after the first complement of the head. If this p-boundary is not present, as in candidate (a), the phrasing is ruled out by ALIGN-XP,R. The p-boundary demanded by ALIGN-XP,R is present in candidate (b), here in a standard nonrecursive phrasing that one would otherwise expect for this structure. This is now crucially ruled out by WRAP-XP: this candidate provides no p-phrase that contains the entire XP_1 headed by the lexical X_1. The other candidates, (c)–(e), are recursive structures that completely meet the requirements of both ALIGN-XP,R and WRAP-XP. Consider first candidate (c), the actual phrasing. Here the larger p-phrase meets the demands of WRAP-XP, wrapping XP_1 (as well as XP_2 and XP_3; the larger p-phrase furthermore meets the demands of ALIGN-XP,R for XP_1 and XP_3). The smaller p-phrase meets the demands of ALIGN-XP,R for the inner XP_2, allowing for a right edge of a p-phrase at the right edge of XP_2. This recursive phrasing violates NONRECURSIVITY, which therefore has to be ranked below ALIGN-XP,R and WRAP-XP, as in tableau (37).

Michael Kenstowicz (personal communication) has pointed out the competitive nature of the alternative recursive phrasing in candidate (d). It is likewise compatible with the demands of ALIGN-XP,R and WRAP-XP. It is furthermore not distinguished from candidate (c) by either EXHAUSTIVITY or *P-PHRASE (see section 1.5). In addition, it is favored over the correct candidate (c) by ALIGN-XP,L. Notice that the left internal boundary of candidate (d) would incorrectly trigger PTI to the left of XP_2: $(X_1\ \boldsymbol{H}(XP_2)\ XP_3)$.

The need to rule out this possibility motivates the gradient formulation of NONRECURSIVITY in (36). This formulation prefers the correct $((X_1\ XP_2)\ XP_3)$ over the incorrect $(X_1\ (XP_2)\ XP_3)$, since the inner and outer p-phrases are ''more alike'' in the former: they differ only with regard

to the inclusion of XP_3. In the wrong phrasing (X_1 (XP_2) XP_3), on the other hand, the inner and outer p-phrases differ with regard to the inclusion of both X_1 and XP_3. Notice that for NONRECURSIVITY to rule out candidate (d) as desired, it has to be ranked above ALIGN-XP,L.

Finally, candidate (e), pointed out by David Odden (personal communication), also needs to be ruled out. Here ALIGN-XP,R and WRAP-XP are again both met in a recursive structure, in this case with an additional internal p-phrase around XP_3. The additional p-phrase would be favored by ALIGN-XP,L and would wrongly trigger PTI to the left of the second complement XP_3. This phrasing is ruled out by *P-PHRASE or by NONRECURSIVITY (additional violations of the latter come about because of the additional recursive structure), provided that either is ranked above ALIGN-XP,L.

The analysis is completed by tableaux for the other two syntactic configurations, where the evidence for phrasing above indicated nonrecursive structure. Tableau (38) shows the case of two XPs inside a higher functional projection, as in example (28b).

(38) *Two lexical XPs inside a functional projection are phrased separately*

	$[XP_1 \quad XP_2]_{FctP}$	ALIGN-XP,R	WRAP-XP	NONREC	*P-PHRASE	ALIGN-XP,L
a.	$(\qquad)_P$	XP_1!			*	XP_2
b. ☞	$(\quad)_P\,(\quad)_P$				**	
c.	$((\quad)_P\quad)_P$			XP_2!	**	XP_2

Here ALIGN-XP,R demands a p-boundary after the first lexical projection XP_1. Candidate (a), which doesn't meet this requirement, is thus fatally punished. Candidate (b) represents the desired phrasing, with both a left and a right p-boundary between the two XPs, as was inferred earlier from the phenomena of Shortening and PTI. This phrasing meets ALIGN-XP,R. It crucially does not violate WRAP-XP: the functional projection FctP at the top of the structure need not be wrapped, as discussed in the application of the LCC in (13) to WRAP-XP in section 2. Therefore, NONRECURSIVITY can choose the correct phrasing in candidate (b) over the incorrect recursive candidate (c) with no left p-boundary between the two XPs. Notice that this is evidence that WRAP-XP does not apply to functional projections. If it did, the phrasing (b) would be incorrectly ruled out, and the recursive phrasing (c) would be chosen, much as the recursive phrasing was chosen in tableau (37). However, whereas the recursive structure is the correct one for the case derived in tableau (37), the evidence for phrasing indicates a nonrecursive structure for the case treated in tableau (38), with both a right and a left p-boundary between the two XPs.

Finally, consider the absence of a p-boundary between a head and its only complement, exemplified in (28a) and derived in tableau (39). Here a single p-phrase around both head and complement as in (a) satisfies ALIGN-XP,R, WRAP-XP, and NONRECURSIVITY. First, both XPs are right-aligned with the p-phrase in this structure. Second, both XPs are wrapped in a p-phrase. Third, the structure is not recursive. Evidence for this phrasing was shown in (28a), where Shortening and PTI testified to the absence of a right and of a left p-boundary between a head and its complement.

(39) *Head and complement are phrased together*

	$[X_1 \quad XP_2]_{XP_1}$	ALIGN-XP,R	WRAP-XP	NONREC	*P-PHRASE	ALIGN-XP,L
a. ☞	$(\quad)_P$				*	XP_2
b.	$(\quad)_P(\quad)_P$		XP_1!		**	
c.	$((\quad)_P \quad)_P$			*(!)	**(!)	XP_2

The phrasing in (b) is ruled out by WRAP-XP here, but it would otherwise also be ruled out by *P-PHRASE. The phrasing in (c) is ruled out by either NONRECURSIVITY or *P-PHRASE.

Thus, the constraints derive the attested nonrecursive phrasings where WRAP-XP plays no role. Where WRAP-XP and ALIGN-XP cannot both be met in a nonrecursive structure, they jointly compel a recursive structure, as can be inferred from the nonmatching application of Shortening and PTI in this case.

4.4 A Problem for Hale and Selkirk's Proposal

Let us then ask whether Hale and Selkirk's (1987) proposal can account for the patterns found in Kimatuumbi. First, consider the choice of their parameter (22a) for Kimatuumbi: a p-boundary is inserted after each XP, regardless of lexical government. As the analysis of Shortening from Cowper and Rice 1987 has shown, this choice of parameter would correctly derive the p-boundaries relevant for Shortening, including a p-boundary after the first of two objects. However, the domains of PTI would go unaccounted for (before now, to my knowledge, Odden's proposal for PTI has not been reanalyzed in a way compatible with the Indirect Reference Hypothesis). In particular, the fine-grained phrasing that we obtain from choice of (22a) will derive the phrasing $(X_1\ XP_2)(XP_3)$ for a head X_1 with two complements. Since, however, there is no H-tone insertion between these two complements, these fine-grained domains could not correctly condition PTI.

Consider then the choice of Hale and Selkirk's parameter (22b) for Kimatuumbi. This would result in a more coarse-grained phrasing. Thus, XPs joined in higher functional structure would still correctly be phrased separately: not being lexically governed, they would still have to have their right edges coincide with p-boundaries. However, the lexically governed objects of the verb would be exempt from triggering p-boundaries. The resulting coarse-grained phrasing would correctly condition PTI in all cases. In $([X_1\ XP_2\ XP_3]_{XP_1})_P$, in particular, there would be no boundary, hence no insertion of a H tone, between the two objects. However, although the more coarse-grained phrasing is appropriate for PTI, it does not provide the correct boundaries for conditioning Shortening: Shortening does require a right p-boundary between the two complements of a syntactic head.

Thus, choice of either parameter would allow us to account for one part of the data, while leaving the other part unaccounted for. The problem with applying Hale and Selkirk's proposal to the present case is thus that the distinction between fine-grained and coarse-grained phrasing was thought of as a parametric choice, made once and for all in a given language. In Kimatuumbi, however, Shortening provides evidence for the fine-grained phrasing, and at the same time PTI

provides evidence for the coarse-grained phrasing. The parameter cannot be set in such a way as to derive both simultaneously.

In the present proposal, by contrast, ALIGN-XP,R favors the fine-grained phrasing, and WRAP-XP favors the coarse-grained phrasing. Both can be met simultaneously in a recursive structure, allowing for a complete analysis of Kimatuumbi.

5 Chichewa: WRAP-XP and Nonrecursive Structure

Kanerva (1989) offers a detailed study of phrasing in the Bantu language Chichewa. A summary of the results on phrasing can be found in Kanerva 1990. The prosodic domains that are called ''focus phrases'' in Kanerva 1989 are tentatively named ''phonological phrases'' in Kanerva 1990. Here I follow the latter categorization, which is forced by the XP-to-P Mapping Condition, owing to the dependency of these domains on XP syntax. Kanerva's earlier terminology was motivated by the sensitivity of these domains to focus. This influence of focus on phrasing is here analyzed by a crosslinguistically motivated constraint that relates focus and p-phrases.[23]

Chichewa provides interesting evidence for both WRAP-XP and NONRECURSIVITY. As in Kimatuumbi, WRAP-XP insists on phrasing all lexical XPs together. Unlike in Kimatuumbi, however, NONRECURSIVITY prevents a recursive phrasing in Chichewa. The result is that the effects of ALIGN-XP,R are entirely suppressed within higher lexical XPs: Chichewa phrases $[V\ NP\ YP]_{VP}$ as $(V\ NP\ YP)_P$ in contrast to the recursive Kimatuumbi phrasing $((V\ NP)_P\ YP)_P$. Furthermore, focus interacts with phrasing in such a way that it may neutralize the effect of WRAP-XP on a higher lexical projection in Chichewa. When this happens, the effects of ALIGN-XP,R within the higher lexical projection reemerge.

5.1 Default Phrasing in Chichewa: WRAP-XP Overrides ALIGN-XP

Kanerva (1989, 1990) gives the following phonological tests for p-phrases in Chichewa:

(40) *Evidence for the right edge of the p-phrase in Chichewa*
- a. *Penultimate Lengthening:* A vowel in the penultimate syllable of a p-phrase is lengthened.
- b. *Retraction:* An underlying H tone is retracted from the final mora of a p-phrase to the penultimate mora.
- c. *Doubling:* A H tone is doubled (spread one mora to the right) except when the target of spreading is within the p-phrase-final foot.[24]

Thus, /ⁿjiⁿgá/ 'bicycle'—with an underlying H tone on the final mora—is pronounced with no changes when not p-phrase-final, as in *ⁿjiⁿgá yábwiino* 'good bicycle', but as *ⁿjiíⁿga* in

[23] Some earlier remarks on the influence of syntactic structure on phonological phenomena in Chichewa were made in Bresnan and Mchombo 1987, an interesting article about the syntax of Chichewa. Other interesting work on Chichewa syntax includes Baker 1988 and Alsina and Mchombo 1990.

[24] The exception does not apply if another H tone immediately follows the target of spreading. This formulation conflates two rules of doubling that Kanerva formulates.

p-phrase-final position, with the penultimate vowel lengthened by (40a) and the H tone retracted to the penultimate mora by (40b). Doubling in (40c) spreads the underlying H tone of /kugúla/ 'to buy' rightward to the following mora, as in *kugúlá nyaama* 'to buy meat'. Doubling is blocked, however, if the target of spreading is within the last two syllables of a p-phrase. Thus, the underlying H tone is not doubled in *kugúula* 'to buy' in p-phrase-final position.

All three tests for phrasing in Chichewa are tests for the *right* edge of p-phrases, involving a p-phrase-final trochaic foot in Kanerva's analysis. Thus, Lengthening applies to the head of that foot, Retraction pulls back a final H tone to the head of that foot, and Doubling rules out positions in that foot as targets of doubling. (41)–(43) show what phrasings these tests indicate in the three syntactic configurations of interest here.

(41) $[X_1\ XP_2]_{XP_1}$ $(\quad)_P$

$[\ V\quad NP\ ]_{VP}$
(tinabá káluúlu)$_P$
we-stole hare
'We stole the hare.'

(42) $[X_1\ XP_2\ XP_3]_{XP_1}$ $(\quad)_P$

a. $[\ V\quad NP\ [\ P\quad NP\ ]_{PP}]_{VP}$
(anaménya nyu^{m}bá ^{n}dí mwáála)$_P$
he-hit house with rock
'He hit the house with a rock.'

b. $[\ V\quad NP\quad NP\ ]_{VP}$
(tinapátsá mwaná ^{n}jíi^{n}ga)$_P$
we-gave child bicycle
'We gave the child a bicycle.'

(43) $[XP_1\quad XP_2]_{IP/CP}$ $(\quad)_P\ (\quad)_P$

$[\ NP\quad VP\ ]_{IP}$
(kagaálu)$_P$ (kanáafa)$_P$
(small) dog died
'The (small) dog died.'

In (41) there is no right p-boundary between the verbal head and its complement, as can be learned from the failure of Penultimate Lengthening and the failure of Retraction of the final H tone to apply in the verb /tinabá/.

In (42) there is no p-boundary after either the verbs or their first complements. Evidence for the absence of a p-boundary after the verbs is that the penultimate syllable of the verbs does not undergo Penultimate Lengthening and that Doubling applies in the verbs /anaménya/ and /tinapátsa/. The crucial case here is the absence of a p-boundary between the two complements in (42). The evidence for this is parallel in (42a) and (42b). The first complements do not undergo Penultimate Lengthening to become *nyuú^{m}ba* and *mwaána*, as they would if they were followed by a right p-boundary. Furthermore, the final H tone of /nyu^{m}bá/ in (42a) and of /mwaná/ in (42b) does not undergo Retraction, as it would if it were followed by a right p-boundary. Notice that this is evidence for the uninterrupted phrasing given in (42), in contrast to a fine-grained phrasing $(V\ NP)_P\ (YP)_P$, but also in contrast to the recursive phrasing $((V\ NP)_P\ YP)_P$ that was found in

Kimatuumbi. Thus, all three tests for phrasing in (40) are tests for the right edge of p-phrases. They would thus detect a right p-boundary between the first and second objects in either the fine-grained phrasing or the recursive phrasing.

In (43), finally, Penultimate Lengthening and Retraction of the final H tone have applied in /kagalú/, giving evidence for the right p-boundary after this subject NP.

The patterns of phrasing exemplified in (41)–(43) are found across syntactic constructions. As in (41), heads and following complements are generally phrased together; this is also true of prepositional heads, and of nominal heads with following PP or AP complements. The phrasing in (42) is found when either an NP or a PP is the second object (though Kanerva gives no data on the phrasings of nouns with two complements). The separate phrasing in (43) is found not only for subjects, but also for object topics. Bresnan and Mchombo (1987) argue that these occur outside of VP, where they are coindexed with an object marker that is incorporated into the verb. The presence versus absence of the incorporated object marker allows for a clear distinction between objects in fixed VP-internal positions (like those in (41), (42), and other cases below) and VP-external topics that are phrased separately, as noted for some cases by Bresnan and Mchombo (1987) and more amply demonstrated by Kanerva (1989).

The phrasing in (41) is trivially derived, with no conflicts between ALIGN-XP,R, WRAP-XP, NONRECURSIVITY, and *P-PHRASE. This can be seen by inspecting tableau (39) for this pattern in Kimatuumbi. Reranking of all constraints but ALIGN-XP,L (inactive in Chichewa as in Kimatuumbi) cannot change the phrasing of this syntactic construction.

The most interesting case is (42), with no p-boundary between the two complements of the verb, where one would otherwise expect a right p-boundary because of ALIGN-XP,R. Tableau (44) shows how WRAP-XP and NONRECURSIVITY can jointly prevent the insertion of this p-boundary, if both are ranked above ALIGN-XP,R. As in Kimatuumbi, the nonrecursive fine-grained phrasing (here candidate (a)) is ruled out by WRAP-XP, which insists on wrapping the VP. Unlike in Kimatuumbi, however, the recursive phrasing in candidate (b) must here be ruled out by NONRECURSIVITY, which therefore must be highly ranked in Chichewa. The remaining option, candidate (c), is a single large p-phrase around the entire VP, meeting the demands of WRAP-XP and NONRECURSIVITY, but violating ALIGN-XP,R.

(44) *Chichewa: low-ranking ALIGN-XP,R does not insist on the internal p-boundary*

	[V NP YP]$_{VP}$	WRAP-XP	NONREC	ALIGN-XP,R	*P-PHRASE
a.	( )$_P$ ( )$_P$	VP!			**
b.	(( )$_P$)$_P$		*!		**
c. ☞	( )$_P$			NP	*

The absence of the internal right p-boundary after the first of two objects in Chichewa is evidence not only for WRAP-XP but also for NONRECURSIVITY, which crucially rules out the recursive phrasing of this structure.

Since WRAP-XP (together with NONRECURSIVITY) can thus obliterate the effects of ALIGN-XP,R in Chichewa, it is telling that WRAP-XP does not do so when syntactic embedding in higher functional structure is considered, as in (43). As shown in tableau (45), WRAP-XP must crucially fail to apply to the higher functional projections, in order to allow the phrasing in candidate (a) with the unwrapped FctP to be derived.

(45)

[NP VP]$_{FctP}$	WRAP-XP	NONREC	ALIGN-XP,R	*P-PHRASE
a. ☞ ( )$_P$ ( )$_P$				**
b. ( )$_P$			NP!	*
c. (( )$_P$)$_P$		*!		**

This case also shows that ALIGN-XP,R is ''active'' in Chichewa and thus ranked above *P-PHRASE.

In this section I have shown that WRAP-XP and NONRECURSIVITY can together eliminate the effects of ALIGN-XP,R within a lexical projection: no right edge of a p-phrase is found after the first of two complements of a verb in the default case.

5.2 WRAP-XP and Focus in Chichewa

The present account makes the following prediction: if it were in some way possible to undo the effect of WRAP-XP in Chichewa, then ALIGN-XP,R would be expected to show its effect after the first of two objects after all, inserting a p-boundary in this place. This prediction happens to be testable in Chichewa, as follows.

In Chichewa a focused constituent is followed by a p-boundary. Thus, the patterns of phrasing discussed earlier for Chichewa hold of sentences in which narrow focus does not play a role. There, a verb and its complement are phrased together (see (41)). However, when focus is put on the verb, the verb is followed by a p-boundary, as shown in (46a). Likewise, a verb and its two objects are phrased together if narrow focus does not enter into the picture (see (42)). However, with focus on the first object, that object is followed by a p-boundary, as shown in (46b).

(46) *A p-boundary is inserted after a focused constituent in Chichewa*

a. [What did they do in Mavuto's house?]
[V_{FOC} NP]$_{VP}$ (anagóona)$_P$ (mnyu^{m}bá yá mávúuto)$_P$
( )$_P$ ( )$_P$ they-slept in-house of Mavuto
'They *slept* in the house of Mavuto.'

b. [What did he hit with the rock?]
[V NP_{FOC} PP]$_{VP}$ (anaménya nyuú^{m}ba)$_P$ (^{n}dí mwáála)$_P$
( )$_P$ ( )$_P$ he-hit house with rock
'He hit the *house* with the rock.'

In (46a) the p-boundary after the focus is shown by the lengthening of the penultimate vowel of the verb, as well as by the failure of the H tone of /anagóna/ to double rightward. In (46b)

evidence for the p-boundary after the first object is provided by the lengthening of the penultimate vowel and by the retraction of the H tone of /nyu^{m}bá/. This effect of focus on phrasing in Chichewa is accounted for here by the additional mapping constraint in (47).

(47) *ALIGN-FOC* = ALIGN(Foc, R; P, R)
''Each focused constituent is right-aligned with a p-boundary.''

This constraint is also active in Bengali (see Hayes and Lahiri 1991). Its mirror image inserts a p-boundary to the left of a focused constituent in Japanese[25] and in dialects of Korean (Jun 1993, Kenstowicz and Sohn 1997, Kim 1997). In Chichewa ALIGN-FOC has to be ranked above WRAP-XP, since it enforces violations of WRAP-XP in the examples in (46).

This allows us to test the prediction suggested earlier. ALIGN-FOC can undo the effect of WRAP-XP as follows: In a construction with a verb with two complements, in which the verb is focused, as in (48), ALIGN-FOC will require a p-boundary after the focused verb. In the nonrecursive phrasings of Chichewa, this eliminates the possibility that the VP can be wrapped, analogously to what happens in the examples in (46). With the effect of WRAP-XP on VP neutralized, it is then instructive to consider what happens between the two complements of such a focused verb. The interesting fact noticed by Kanerva is that in just this case (unlike in the default case in Chichewa), a p-boundary is found between the two objects of the verb. An example is given in (48).

(48) *The emergence of the p-boundary between two objects in Chichewa*

[What did he do to the house with the rock?]

$[V_{FOC}$ NP PP$]_{VP}$	(anaméenya)$_P$ (nyuú^{m}ba)$_P$ (^{n}dí mwáála)$_P$
( )$_P$ ( )$_P$ ( )$_P$	he-hit house with rock
↑ ↑	'He *hit* the house with the rock.'
due to ALIGN-FOC	
emerging p-boundary	

The lengthening of the penultimate vowel in both the verb and the first object is evidence for p-boundaries after the verb and after the first object. Tonal evidence for the p-boundary after the verb is the failure of the underlying H tone of *anaménya* to double rightward. Tonal evidence for the p-boundary between the objects is the retraction of the H tone on /nyu^{m}bá/. Notice that (42a), (46b), and (48) are minimally different, phonologically distinguished only by the p-boundaries and the evidence for them (Kanerva 1989:98).

[25] See Pierrehumbert and Beckman 1988, Nagahara 1994. The ''intermediate phrases'' of these authors are here classified as p-phrases in accord with the XP-to-P Mapping Condition and with the arguments in Selkirk and Tateishi 1991 to the effect that these domains are derived by left-alignment with XPs.

Tableau (49) establishes the prediction of the emerging p-boundary.

(49) *The emergence of the p-boundary between the objects*

	$[V_{FOC}$ NP PP$]_{VP}$	ALIGN-FOC	NONREC	WRAP-XP	ALIGN-XP,R	*P-PHRASE
a.	$($ $)_P$	*!			NP	*
b.	$($ $)_P$ $($ $)_P$			VP	NP!	**
c. ☞	$($ $)_P$ $($ $)_P$ $($ $)_P$			VP		***
d.	$(($ $)_P$ $)_P$		NP ! PP		NP	**
e.	$(((($ $)_P$ $)_P$ $)_P$		NP ! PP PP			

As shown by candidate (a), the default phrasing with no internal p-boundary is ruled out by ALIGN-FOC in the case of a focused verb. Candidates (b) and (c) are nonrecursive phrasings with a p-boundary after the focus, passing ALIGN-FOC. Thus, they both violate WRAP-XP, as shown. The choice between them is thus passed down to the lower-ranking ALIGN-XP,R, which rejects the phrasing candidate (b) in favor of candidate (c), with a p-boundary after the first object. The p-boundary between the two complements that is present as part of a recursive phrasing in Kimatuumbi, but is not found in the default case in Chichewa, here emerges in Chichewa as well, in the case of a focused head with two complements.[26]

To secure this result, a crucial ranking needs to be added that was not previously established for Chichewa: NONRECURSIVITY here has to outrank WRAP-XP. This can be seen by comparing candidates (c) and (d). The recursive structure in (d) allows ALIGN-FOC and WRAP-XP to be met simultaneously. However, candidate (d) must be ruled out since it does not include a right p-boundary after the first object, contrary to fact. Any constraint ruling out candidate (d) has to do so against the demands of WRAP-XP. Thus, (d) cannot be ruled out by ALIGN-XP,R, which is ranked below WRAP-XP for independent reasons (see tableau (44)). NONRECURSIVITY, then, is the only constraint at hand that can rule out the phrasing in (d). For it to do so, NONRECURSIVITY has

[26] Notice that the objects here are still VP-internal, and not VP-external topics. If they were VP-external topics, they would have to be accompanied by incorporated object markers, which are, however, not present in these examples. This is also true of the PP argument. Bresnan and Mchombo (1987:769ff.) show that PP objects with the preposition *ⁿdí,* like other objects, have a pronominal incorporated counterpart that would have to occur after the verb if the prepositional object were to be a VP-external topic. No such incorporated PP counterpart is present in the examples at hand. This is evidence that the PP, like the NP in these examples, is within VP, even where focus is on the verb as in (48).

An example from Kanerva 1989 that shows the emerging p-boundary in the structure $[V_{FOC}\ NP\ NP]_{VP}$, again without incorporated object markers, is (i).

(i) (^{n}dinaá^{n}gogúliira$_{FOC}$)$_P$ (mavúuto)$_P$ (^{m}phaása)$_P$
I-only-bought Mavuto mat
'I only *bought* Mavuto the mat.'

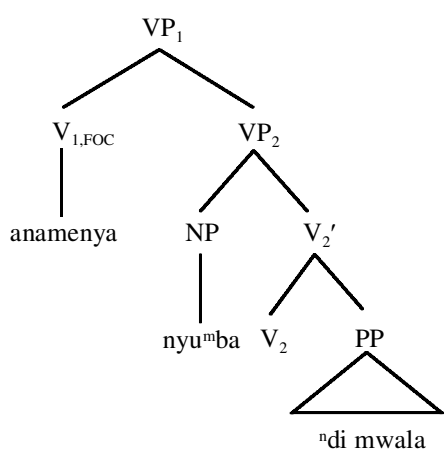
Here evidence for the p-phrases is the lengthening of the penultimate vowels of each p-phrase. In addition, doubling of the antepenultimate H tone into the p-phrase-final foot is blocked in the verb *ⁿdinaáⁿgogúliira,* and doubling of the H tone on *mavúuto* is blocked within the final foot of the second p-phrase.

to be ranked above WRAP-XP, as in tableau (49). This ranking then also eliminates other recursive candidates such as (e).

The case derived in tableau (49) bears on the formulation of the LCC in (13), in connection with the more complex VP-internal structure postulated by Larson (1988). The question is whether the internal empty-headed VP_2 in a structure like $[V_1\ [NP\ V_2\ PP]_{VP_2}]_{VP_1}$ invokes the mapping constraints, in particular WRAP-XP. Notice first that the structures previously considered do not bear on this question. Thus, in the default phrasing of both Kimatuumbi and Chichewa, there is a large p-phrase around the entire higher VP_1 that also contains all material inside of Larson's smaller VP_2: $([V_1\ [NP\ V_2\ PP]_{VP_2}]_{VP_1})_P$. Regardless of further internal phrasing (as in Kimatuumbi but not in Chichewa), this large p-phrase wraps not only VP_1, but trivially also the smaller VP_2. In those cases, therefore, the question whether VP_2 invokes WRAP-XP cannot be answered: there would not be any consequences if it did.

The Chichewa case of a focused verb with two complements, however, provides some evidence that the empty-headed VP_2 is not relevant to the mapping constraints. This is illustrated in tableau (50), which reconsiders the two crucial candidates (b) and (c) from tableau (49), with Larson's more complex syntactic structure.

(50)



		WRAP-XP	ALIGN-XP
b.	( )P ( )P	VP_1	NP(!)
c.	( )P ( )P ( )P	VP_1 (VP_2!)	

With WRAP-XP dominating ALIGN-XP in Chichewa, and with the possibility of wrapping VP_1 excluded by focus on the verb in this construction, the question of wrapping VP_2 now becomes relevant. If VP_2 had to be wrapped, the two objects would have to be phrased together, as in (b). The actual phrasing in (c) would then incorrectly be ruled out, not meeting this wrapping demand on VP_2, as shown. Thus, the correct result is obtained only if VP_2 does not invoke WRAP-XP. This supports the formulation of the LCC in (13), according to which the mapping constraints

(including WRAP-XP) do not apply to projections of empty categories, such as the empty-headed VP_2 in the present case.

5.3 Lexical Government and Phrasing in Chichewa

Let us then consider an application of Hale and Selkirk's proposal to the Chichewa case. As noted by Kanerva (1989), the default phrasing in Chichewa can also be derived by Hale and Selkirk's proposal, with the choice of parameter in (22b): XPs that are not lexically governed trigger a p-boundary at their right edge. Thus, a preverbal subject is outside of VP, hence not lexically governed, and it will therefore correctly trigger a following p-boundary under (22b). However, the complements of the verb are lexically governed by the verb and thus do not trigger p-boundaries under (22b). In particular, the first of two objects of a verb will not trigger a p-boundary to its right, so that the correct phrasing $(V\ NP\ PP)_P$ can be derived.

However, Hale and Selkirk's parameter cannot account for the p-boundary emerging under focus in Chichewa. Although their account can correctly derive the default phrasing, it also predicts that the complements of a head should never show a desire to have p-boundaries at their edges in this language, since they are lexically governed. Thus, in the case of a focused head with two complements, we would expect the default phrasing plus a p-boundary after the focus, as shown in (51).

(51) *Hale and Selkirk's prediction for Chichewa*

$[V_{FOC}$	NP	$PP]_{VP}$
$(\quad)_P$	$(\quad$	$)_P$
↑		↑
p-boundary		p-boundary
due to focus		due to ALIGN-XP,R

Again, the problem with Hale and Selkirk's theory is that phrasing differences among languages were formalized as a parameter. Thus, choice of the parameter value in (22b) in this theory exempts lexically governed XPs from triggering p-boundaries once and for all in a given language. There is therefore no means of accounting for the emerging p-boundary between the two objects. This contrasts with the theory in terms of ranked constraints, where ALIGN-XP,R applies to lexical XPs regardless of lexical government, but where its effect may be suppressed by WRAP-XP in some cases, as in the default phrasing in Chichewa. When the force of the suppressing WRAP-XP is neutralized, as in the example at hand, the effect of the subordinate ALIGN-XP,R can still be observed.

6 Typology

Next let us consider the typological possibilities that arise in connection with the constraints WRAP-XP, ALIGN-XP,R, and NONRECURSIVITY. In the analyses of Kimatuumbi and Chichewa above, I have argued that these three constraints are crucially ranked as in (52a) and (52b).

(52) a. Kimatuumbi: WRAP-XP, ALIGN-XP,R ≫ NONREC
b. Chichewa: WRAP-XP, NONREC ≫ ALIGN-XP,R
c. ??: ALIGN-XP,R, NONREC ≫ WRAP-XP

Notice that the interaction of these three constraints is normally such that two of them can be met simultaneously, and it is only when all three are considered that conflict may arise. For any ranking of the constraints, a language will thus choose the phrasing that violates the lowest of them. In standard cases this phrasing will meet the other two (higher-ranked) constraints. Typologically, three cases are thus distinguished here: one in which NONRECURSIVITY is ranked lowest, as in (52a), one in which ALIGN-XP,R is ranked lowest, as in (52b), and one in which WRAP-XP is ranked lowest, as in (52c). Of these, the first two are attested, as argued earlier. What about the third case, (52c)?

In that ranking, WRAP-XP, as the lowest-ranked constraint in (52c), does not impede either ALIGN-XP,R or NONRECURSIVITY. This case, then, predicts the phrasing one would expect in a theory without WRAP-XP—the standard end-based theory of Selkirk (1986, 1995): a nonrecursive phrasing is determined by edge alignment of XPs and p-phrases. (53c) schematically shows a structure derived by this ranking (here with right-alignment) in comparison with the other two cases of (52).

(53)	NP [V NP NP]$_{VP}$	*Violated constraint*	*Represented by*
a.	( )$_P$ (( )$_P$)$_P$	NONRECURSIVITY	Kimatuumbi
b.	( )$_P$ ( )$_P$	ALIGN-XP	Chichewa
c.	( )$_P$ ( )$_P$ ( )$_P$	WRAP-XP	??

Since this third case was taken to be the norm in much earlier literature, there are a number of languages that might, for all we know, represent it. However, given the additional typological possibilities of the present theory, it turns out that the evidence for phrasing that is available in those languages is compatible with their being phrased as in (53c) or as in the recursive (53a). Thus, their ranking might be that shown in (52c) or (52a).

Examples of such cases are Xiamen Chinese (Chen 1987), used at the beginning of this article to illustrate edge alignment, and Chi Mwi:ni (Kisseberth and Abasheikh 1974, Selkirk 1986, Hayes 1989), used by Selkirk (1986) to argue for a universal theory of phrasing in terms of edge alignment. In both languages there is a test for the right edge of p-phrases. In a syntactic structure like that of (53), these right-edge tests give evidence of the right p-boundaries in (54).

(54) NP [V NP XP]$_{VP}$
)$_P$)$_P$)$_P$

This is compatible with both the pattern in (53a) and the one in (53c). Further evidence about the phrasing in these languages (such as an independent left-edge test) would be required to determine whether they have the ranking in (52a) or the one in (52c).

The situation is comparable in languages that show left-edge alignment. The evidence for phrasing in Ewe (Clements 1978), Shanghai Chinese (Selkirk and Shen 1990), and Japanese (Pierrehumbert and Beckman 1988, Selkirk and Tateishi 1991, Nagahara 1994) is compatible with an interpretation of the tests of phrasing as diagnoses of left edges of p-phrases. In those cases in which WRAP-XP might force a recursive structure, we do not know whether there is a recursive structure or a nonrecursive one; the indeterminacy here is analogous to that of right-edge alignment in connection with (53) and (54).

A similar ranking indeterminacy can be found in Tohono O'odham, for which the earlier discussion did not consider recursive structure. If indeed Tohono O'odham does not have recursive p-phrases, the account above is completed by including NONRECURSIVITY with a high ranking: NONRECURSIVITY, WRAP-XP ≫ ALIGN-XP,R. On such an account, Tohono O'odham would share the ranking relations in (52b) with Chichewa. This would rest on the plausible assumption that a string of H-toned vowels in Tohono O'odham is not interrupted by p-boundaries that have no effect on the tonal representation. However, such further p-boundaries, satisfying ALIGN-XP,R, might in principle be part of the representation in a recursive structure, as shown in (55).

(55) *Hypothetical recursive phrasing for Tohono O'odham*

(L H HH H HH H L)$_P$

(( )$_P$)$_P$ additional recursive phrasing?

Na-t g wákial g wísilo cépos?

Q -AUX DET cowboy DET calf brand

'Did the cowboy brand the calf?'

Though there is no evidence for such additional internal p-boundaries, their existence cannot be excluded altogether. The tonal distribution in such a representation would be sensitive only to the outermost p-phrase in the recursive structure, the one forced by WRAP-XP and assumed above to be the only one present. The additional internal p-phrases of such a recursive structure, which would be due to ALIGN-XP,R, could be derived by the ranking of Kimatuumbi in (52a): ALIGN-XP,R and WRAP-XP, ranked above NONRECURSIVITY, would jointly force the recursive structure in (55). At this point there is no evidence for or against such additional internal p-phrases with no phonological consequences in Tohono O'odham. Hence, one cannot be sure whether the ranking of the constraints in this language is (52a) or (52b).

7 Summary

In this article I have argued that syntactic XPs and phonological phrases are related not only by Selkirk's (1986, 1995) constraints of edge alignment, but also by a constraint WRAP-XP, requiring that each XP be contained in a phonological phrase. WRAP-XP was seen to be in part a reanalysis of a proposal by Hale and Selkirk (1987) about the role of lexical government in phrasing. Like Hale and Selkirk's proposal, WRAP-XP can account for coarse-grained patterns of phrasing in Tohono O'odham and Chichewa, as well as the coarse-grained domains of PTI in Kimatuumbi.

However, neither the recursive structure of Kimatuumbi nor the emerging p-boundaries in the string after a focus in Chichewa can be derived from Hale and Selkirk's proposal. By contrast, these phenomena are correctly predicted in a theory in which WRAP-XP is one of a number of ranked and violable constraints that relate syntactic XPs to phonological phrases.

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Department of Linguistics
Rutgers University
18 Seminary Place
New Brunswick, New Jersey 08901-1184

hubertt@ruccs.rutgers.edu