Phonological Phrases:
Their Relation to Syntax, Focus, and Prominence

by

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ABSTRACT

This thesis investigates how phonological phrases are related to the syntactic representation, to focus, and to the representation of prominence.
The proposal that is defended here is that among the three relevant basic entities represented by the grammar, syntactic constituency, prosodic constituency, and prominence, the grammar places a simple demand on each pair:
(a) Syntactic phrases must be contained in phonological phrases.
(b) Phonological phrases must have edgemost phrasal prominence.
(c) Syntactic phrases must contain phrasal prominence.
These demands are taken to interact with one another as ranked and violable constraints, where variation among languages is expressed in terms of constraint reranking.
Each relation is argued for separately.
The effects of (a) (previously described as the role of government in phonological phrasing) are investigated on patterns of phrasing in the three Bantu languages Chi Mwi:ni, Chichewa, and Kimatuumbi.
The effects of (b), it is argued, can be seen most clearly in the effects of focus on phrasing, where Chichewa and Japanese will be discussed as examples.
The effects of (c), finally, which have been discussed in different contexts as either a directionality parameter or the role of depth of embedding in the assignment of stress, will be argued to have desirable typological consequences that set (c) apart from some of its competitors.
Jointly the constraints will be seen to derive an end-based typology of the kind familiar from work by Lisa Selkirk.

Thesis advisors: Dr. Noam Chomsky, Institute Professor,
and Dr. David Pesetsky, Professor of Linguistics.

TABLE OF CONTENTS

1. OVERVIEW OF THE THESIS 9

1.1. Overall structure 9
1.2. Chapter 3 10
1.3. Chapter 4 11
1.4. Chapter 5 12
1.5. Chapter 6 13

2. THEORETICAL BACKGROUND 15

2.1. The prosodic representation 15
2.1.1. Phonological rules and syntax: an example 15
2.1.2. Direct access vs. phonological structure 20
2.1.3 The Prosodic Hierarchy 24
2.1.4. The hierarchical organization of prosodic constituents 29
2.1.5. Constraints on domination 31
2.1.6 The theory of metrical structure: prominence 32

2.2. Optimality theory 38

2.3. Two theories of the phonological phrase 45
2.3.1. Selkirk's end-based theory and Chi Mwi:ni 45
2.3.1.1. Vowel length, prominence, and phonological phrases 46
2.3.1.2. Phrasing in Chi Mwi:ni 50
2.3.2. Nespor and Vogel' relation-based theory and Italian 53
2.3.2.1. Phrasing in Italian 53
2.3.2.2. Ghini (1993) 59
2.3.2.3. Adnominal adjectives 61
2.3.2.4. An argument in favour of Unif/AW 70

3. ON THE ROLE OF GOVERNMENT AND CONTAINMENT IN THE SYNTAX-PHONOLOGY MAPPING 73

3.1. Government and Alignment in Tohono 'O'odham 74
3.1.1. Background 74
3.1.2. Where lexical government makes a difference 78
3.1.3. Lexical vs. functional projections 83
3.1.4. Left-right asymmetries in Tohono 'O'odham, and the catgory-segment distinction 85

3.2. Three Bantu languages. 91
3.2.1. Chichewa. 94
3.2.1.1. The phonological rules sensitive to Øs in Chichewa 95
3.2.1.2. Phrasing in Chichewa 98
3.2.1.3. Analysis in terms of constraint-ranking 101
3.2.2. Recursion in Kimatuumbi 104
3.2.2.1. The domain of *Shortening* 105
3.2.2.2. The domain of *Phrasal Tone Insertion* 110
3.2.2.3. An account in terms of recursion 115
3.2.3. The effects of focus on phrasing in Chichewa 123
3.2.4. Nonrecursivity in Chichewa 129
3.2.5. The typology of recursion 135
3.2.6. Summary: Wrap-XP vs. government 136

3.3. Appendix 137
3.3.1. Alignment 137
3.3.2. Categories, segments, and domination 140
3.3.3. Align-XP and adjunction 143
3.3.4. Wrap-XP and adjunction 146

4. THE DOMAIN OF THE FOCUS 149

4.1. The forces in the phonology of focus. 150
4.2. The domain of a focus 156
4.3. The phonology of the scope 159
4.4. Maximizing the background 163
4.4.1. Minimal focus 164
4.4.2. Maximal domain 168

5. FOCUS, PROMINENCE AND PHRASING 175

5.1. The idea 175
5.1.1. Introduction 175
5.1.2. Boundary-insertion by focus: the basic idea 180
5.1.3. Deletion by focus: the basic idea 181
5.1.4 Insertion by focus: deriving a typology 187
5.1.5. Deletion by focus: deriving a typology 192
5.1.6. What may not occur on this approach 197

5.2. Chichewa 199

5.3. Japanese 204
5.3.1. The intonational pattern 204
5.3.2. Focus and Phrasing in Japanese 208
5.3.2.1.. Left edges of Ø preceding a focus 209
5.3.2.2. Deletion of Øs after the last focus 211
5.3.3. Analysis 214
5.3.3.1. Focus and the left intermediate phrase boundary 215
5.3.3.2. Focus and the deletion of following intermediate phrases. 216

6. PROMINENCE AND SYNTAX 221

6.1. Two problems 221

6.2. Stress-XP 225
6.2.1. Stress-XP; formulation and place in the mapping 225
6.2.2. The basic configuration 227
6.2.3. Edge-effects on a single XP 229
6.2.4. Solving the problem 231
6.2.5. XP inside of XP 233
6.2.6. XP outside of XP 235
6.2.7. The ranking of Wrap-XP and Stress-XP:
More than one XP inside of XP 238
6.2.8 Focus and phrasing in Chichewa under the reformulation 241

6.3. Stress-XP and the second problem 245

CHAPTER 1:

OVERVIEW OF THE THESIS

1.1. Overall structure

The present work is concerned with phonological phrases in their relation to syntax and stress (or, more generally, prominence) as well as focus. The phonological phrase is one level of a fairly articulated hieriarchical prosodic representation that spans utterances, and that was argued for in much previous literature. Chapter 2 will introduce the core ideas of that research.

The discussion in later chapters (as well as in the present overview) is couched in the framework of Selkirk 1995, according to which the mapping of syntactic to prosodic structure is achieved by ranked and violable constraints. The theory of ranked and violable constraints (works by McCarthy, Prince, Smolensky) will likewise be briefly introduced in Chapter 2.

After the introduction of some theoretical background in Chapter 2, Chapters 3 to 6 discuss the forces that determine the construction of phonological phrases.

1.2. Chapter 3

In Chapter 3, the role of *syntactic government* in the construction of phonological phrases will be discussed (brought in the discussion by Hale and Selkirk 1987). It is argued that the correct way of representing the relevant phenomena is by way of a constraint in the syntax-prosody mapping that is not sensitive to syntactic government. The constraint I argue for instead is given in (1).

(1) Wrap-XP: Each syntactic XP must be contained in a phonological phrase.

Thus phonological phrases wrap around syntactic phrases. Evidence for this understanding of the relevant phenomena will come from a comparison of a number of Bantu languages, Chi Mwi:ni, Chichewa and Kimatuumbi, and the differences in phrasing they exhibit. It will be shown that these differences are insightfully accounted for if (1) is a constraint that interacts with the constraints of edge-alignment argued for by Selkirk (1986, 1995). Different rankings of the relevant constraints will allow us to derive the relevant spectrum of differences among these languages. Additional evidence will be provided on the basis of the interaction of phrasing with focus in Chichewa. The distinction between arguments and adjuncts, and the impact of this distinction on the syntax-prosody mapping will be discussed at some length in this connection.

1.3. Chapter 4

Chapter 4 is concerned with the proper formulation of the impact of focus on prominence. Many researchers have followed Jackendoff 1972 in the assumption that the semantic and phonological domain of a focus is the sentence. (The semantic domain of a focus is its formal scope; the phonological domain is the domain within which the focus must be the most prominent element.) Rooth 1992 has shown that a focus may also have a smaller semantic domain than the sentence. Chapter 4 explores some of the phonological and pragmatic consequences of this new element in the theory of focus. It is argued that the choice of a smaller semantic domain of a focus necessarily entails a smaller phonological domain. The domain of the focus that is shown to be common to its semantic and phonological interpretation will be called DF. The relevant phonological constraint argued for is (2).

(2) Focus: If F is a focus and DF is its domain, then the highest prominence in DF will be within F.

A focus, in other words, need not be the most prominent element in its sentence. Rather, it is the most prominent element in its domain (equivalent to its semantic scope). The pragmatically determined choice of the scope is clarified, leaning on a proposal by Schwarzschild 1992. Unlike the rest of the thesis, Chapter 4 is not directly concerned with prosodic constituency. It is infixed into the discussion of prosodic structure at this point, since it provides useful background to the discussion of focus and phonological phrasing in Chapter 5.

1.4. Chapter 5

Chapter 5 discusses the effects of focus on prosodic constituent structure that have been observed some of languages. I explore the hypothesis that (2) is all we need to say about the phonology of focus. The idea is that focus changes prominence, and that changed prominence may in turn change prosodic constituency. How do prominence and phonological constituency interact for this to be possible? Here I draw on an insight shared - in one form or another - by almost all researchers in the field: Each grid-mark of prominence owes its existence to it being a head of a phonological constituent. Furthermore, the grid-mark likes to be at the left/right edge of the phonological constituent that it heads. The formulation of this insight that I end up arguing for is given in (3).

(3)(a) Each grid-mark in the metrical representation of prominence is the unique head of a constituent in the prosodic representation.

(b) If Pros is a prosodic constituent, let Head(Pros) be the grid-mark that heads Pros in accord with (a). Then:

Align(Pros, L, Head(Pros), L) or Align(Pros, R, Head(Pros), R)

I.e. Align the left/right edge of each prosodic constituent Pros with the left/right edge of its head Head(Pros). (McCarthy and Prince 1993)

The hypothesis of this chapter is thus that focus will change prominence due to (2), and that (3)(a) and (b) then trigger some "adjustments" to the changed prominence in the prosodic representation.

1.5. Chapter 6

In Chapter 6, the issue of the relation of syntax to prominence will be taken up: Is stress assigned by the constraint-family in (3) alone, or is there *also* a more direct link between syntax and prominence on the higher levels of the prosodic representation? This question will be approached by considering the effects that directionality in syntax appears to have on directionality in phonology - both as far as the assignment of prominence, and the assignment of phonological constituency is concerned. I end up suggesting that we do acknowledge a direct effect of syntax on prominence, formulated by the constraint in (4).

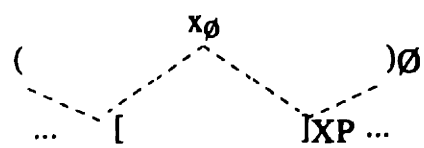
(4) Stress-XP: Each XP must contain a *phrasal stress.*
(where 'phrasal stress' is the head of a phonological phrase)

The formulation in (4), which incorporates an aspect of a proposal by Cinque (1993) is compared with Cinque's original proposal.
(4) allows us to capture crosslinguistic tendencies in the relation between syntactic branchingness and the assignment of stress.

I will show that the conjunction of (1), (3) and (4) will allow us to derive the effects of edge-alignment of syntactic with prosodic categories that have been amply demonstrated in Selkirk's work. In the resulting theory, then, there will be no constraints that enforce edge-alignment directly. The indirect way of deriving edge-alignment will also allow us to formulate a hypothesis about the effects of syntactic branchingness on edge-alignment, where the interaction of (1), (3) and (4) can be held responsible for these effects.

The theory of the syntax-prosody mapping at the level of the phonological phrase is then made up of (1) and (4). This theory is 'stratal' in the sense that one "level" of the syntactic representation (syntactic phrases) is alone relevant for the construction of one 'level' of the prosodic representation (phonological phrases (1) and their heads (4)). The emphasis in the syntax-prosody mapping is on containment, rather than on alignment. Thus (1) requires that a syntactic XP be contained inside a phonological phrase. (4) requires that the syntactic XP contain the head of a phonological phrase. The joint effect of these two constraints on a single XP is shown in (5), where Ø, a phonological phrase, contains XP, which in turn contains $x_{Ø}$, the grid-mark that heads a Ø.

(5)



This exhausts the contribution of the syntax-prosody mapping to the construction of phonological phrases, according to the present theory. More complex patterns result when more complex structures of syntactic embedding interact with these two constraints. Everything else is due to constraints such as (3) that interact with (1) and (4), but that are independent of the syntactic structure.

CHAPTER 2:

THEORETICAL BACKGROUND

2.1. The prosodic representation

2.1.1. Phonological rules and syntax: an example

Research on prosodic phonology has unearthed a variety of phonological phenomena that appear to be sensitive to syntactic structure in one way or another. One classical case of such a phonological rule, presented by Nespor and Vogel (1982, 1986), is Raddopiamento Sintattico (RS) in Italian.

RS is a process of gemination across words. In Tuscan Italian, the dialect in which RS has primarily been studied, RS lengthens (geminates) the initial consonant of a word w_2 if w_2 is preceded by a word w_1 under certain phonological conditions (leaving the syntactic conditions aside for the moment).

(1)

w_1 w_2		
caffè caldo	-> caffè [cc]aldo	'warm coffee'
tè freddo	-> tè [ff]reddo	'cold tee'

One phonological condition is that the preceding word, w_1, ends in a stressed vowel. This is the case in (1), as shown by the accent grave that marks final stressed vowels in Italian orthography. RS, however, does not apply in (2), where main stress is on a non-final syllable (mólto).

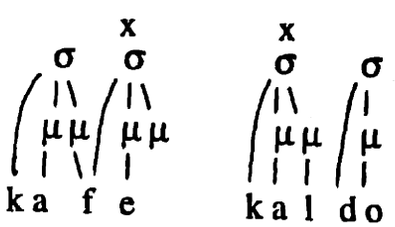
(2) molto caldo -> molto [c]aldo 'very warm'

Another phonological condition on RS is that it will not apply to the first member of a word-initial obstruent cluster, /s/ in /s + [-son]/, as in (3).

(3) città sporca -> città [s]porca 'dirty city'

Modifying minimally the analysis of Chierchia (1986), who draws on Saltarelli (1970) and Vogel (1977)[1], these phonological restrictions are here accounted for as follows: (a) Vowels with word-stress must be bimoraic in Italian[2]. (b) Word-internally, the second mora is filled by a coda consonant, or, in the case of open syllables, by gemination of the vowel. (c) In word-final position, however, gemination of the vowel is blocked: Word-final stressed vowels are pronounced with a short, nongeminated vowel. This leaves an empty mora as in [kaffe] in (4).

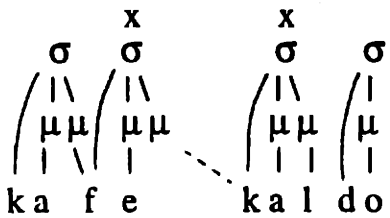
(4)



The initial consonant of the second word then geminates in order to fill the final empty mora in the first word. This is shown in (5).

[1] See also Marotta (1983), and Esposito and Truckenbrodt (1995) for experimental studies that suggest that two varieties of this phenomenon should be distinguished.
[2] Chierchia's account uses X-slots rather than moras.

(5)

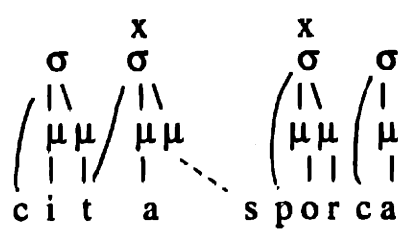


Like other geminates, the doubly linked consonant is then pronounced long.

The condition that the final syllable of w_1 must be stressed is thus accounted for: If it is not stressed, it need not be bimoraic, and there will be no stray mora that triggers gemination across words.

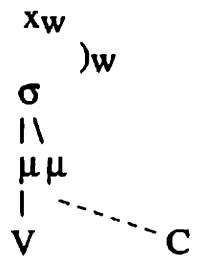
Chierchia accounts for the failure of initial /s/ in /s + [-son]/ clusters to undergo lenghthening by an appeal to the special status of consonants in initial clusters argued for in Steriade (1982) for other languages. Chierchia argues that /s/ in initial /s + [-son]/ clusters is not syllabified at the level of representation at which RS applies. In these cases, initial /s/ will therefore fill the empty mora that otherwise triggers RS, as shown in (6). However, since /s/ has no link to the following syllable, it will not surface as lengthened.

(6)



The relevant core of the phenomenon thus has the geometry in (7), where x_W here stands for word-stress and $)_W$ for the word-boundary.

(7)



where the word-final mora is stray, but C may be syllabified or not

Now let us turn to the impact of syntax on this phonological phenomenon. RS may apply if w_1 and w_2 stand to one another in certain syntactic configurations, as in (1). It may systematically not apply in other syntactic configurations of w_1 and w_2. According to the accounts of Nespor and Vogel (1982, 1986), and Ghini (1993), RS may never apply if w_1 belongs to a syntactic XP that excludes w_2, as in (8). This can be seen in the examples in (9) from Ghini (1993) that involve a preverbal subject NP and a verb.

(8) no RS in ... w_1 $]_{XP}$ w_2 ...

(9)

	w_1 $]_{NP}$	w_2	
	Papà	[m]angia	'Daddy is eating'
	La verità	[v]ince	'The truth wins'
	La solidarietà	[c]resce	'Solidarity is increasing'

Here the phonological conditions of RS are met: Word-stress on w_1 is on the final vowel, and the initial consonant of w_2 is not part of an obstruent-cluster. Nevertheless RS fails to apply.

A minimal pair from Ghini (1993) that exemplifies the same restriction with a VP is given in (10).

(10)(a) [ ]$_{VP}$

correrà [nn]aturalmente

'he will run in a natural way'

(b) [ ]$_{VP}$

correrà [n]aturalmente

'he will run, of course'

In (10)(a), *naturalmente* is a VP-adverb, meaning *in a natural way*, RS may apply between the verb and the adverb. However, when *naturalmente* is a sentential adverb, meaning *of course*, a in (10)(b), RS is blocked: here a right boundary of VP intervenes between the verb and the adverb.

This restriction does not exhaust the environments in which RS is blocked; it does, however, represent a core case on which different authors who have written about RS agree; there are also certain issues of optional vs. obligatory application of RS. For now, let us take the restriction in (8) is a starting-point. Note that (8) will correctly distinguish the cases in (1) from those in (9). In (1), all maximal projections that contain w_1 also contain w_2, as shown in (11).

(11) [w_1 [w_2]$_{AP}$]$_{NP}$

caffè [cc]aldo

Thus, even though w_2 is contained in an AP that excludes w_1, all projections including w_1 (only NP in this case) also include w_2. In other words, an intervening left edge of XP appears not to block RS[3], as the left edge of AP in (11). It is only an intervening right edge of XP, as in (9) and (10)(b) that will systematically block RS.

2.1.2. Direct access vs. phonological structure

How then, should syntactic restrictions on phonological rules be handled in the grammar?

Two lines of thinking about phenomena like these have been pursued in the literature. Some authors (Cooper and Paccia-Cooper (1980), Kaisse (1985), Odden (1987, 1990), Rizzi and Savoia (1993)) have suggested to allow phonological rules to look at syntactic structure directly. On such an approach, one would add a syntactic condition to the rule in question; this is sketched for RS in (12).

(12)

```
xw
    )w1(    ...    )w2
σ
|\
μμ
|  - - - - - -
V          C
```

If all XPs that contain w_1 also contain w_2.

[3] at least not systematically; see the more detailed discussion in later sections.

On the other hand, it has been suggested that phenomena like RS are indicative of abstract phonological structure, such that the non-application of a rule between two syntactic morphemes suggests the presence of an abstract phonological boundary of some sort: phonological boundaries would then block a rule from applying. On this view, the relation between syntactic structure and phonological changes such as RS is more indirect, as shown in (13).

(13) syntactic structure ⟶ boundary symbols or constituent boundaries ⟷ phonological changes

This line of thinking goes back to Chomsky and Halle (1968), where an algorithm was proposed to derive word boundaries that are relevant to phonology from the syntactic structure. There # and ## marked different kinds of word-boundaries, with #(#) standing for either. Since the present phenomenon is sensitive to syntactic structure higher than the word, let us use the arbitrary boundary symbol $ for illustration. An account in terms of bounary symbols would involve two things: First, a statement that accounts for the distribution of boundaries, relating this distribution to the syntax, as in (14).

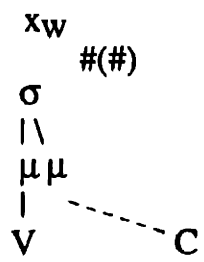
(14) Insert a $-boundary in the phonological representation to the right of each XP.

Second, RS would then have to be formulated so as not to apply across this boundary.

Chomsky and Halle (1968) adopt a convention on rule application according to which a rules is blocked by # or ## unless these symbols are mentioned in the rule. Extending this to $, we might write RS as in (15). This formulation would allow the rule to apply across # or ## (and in fact require either of these

boundaries to be present), but (15) would be blocked from applying by a $ boundary, a boundary not mentioned in the rule.

(15)



Consider the application of (13) and (15) to the relevant examples in ($15) (ignoring here the question how the word-boundaries # and ## are derived). (13) inserts no $ boundary between the noun and the adjective in (16)(a), but it does insert a $ boundary between the noun and the verb in (16)(b). Consequently, RS in (15) will apply in (16)(a) but it is blocked by the intervening $ boundary in (16)(b).

(16)(a) [[ ]AP]NP
caffè ## [cc]aldo ## $$

(b) [w1]NP[w2]VP
papa # $ # [m]angia $

McCawley (1968), Basbøll (1978), Selkirk (1980a,b) and Nespor and Vogel (1982) argued that these boundaries are best construed as the edges of actual phonological constituents. In the case of RS, these phonological constituents have come to be called *phonological phrases*, here abbreviated Ø. Much like in the case of the boundaries, an account in terms of phonological constituents involves (a) a way of deriving phonological constituents from syntactic

constituents, and (b) a way of making phonological rules sensitive to phonological constituents. Different ways of constructing phonological phrases in Italian have been argued for by Nespor and Vogel (1982, 1986) and by Ghini (1993). For illustration, I here adopt the proposal of Ghini, who builds on work by Selkirk (1986). A comparison with Nespor and Vogel's suggestions will be offered below.

According to Ghini, one crucial step in constructing phonological phrases is by way of ensuring that the right edge of each XP coincides with the right edge of a phonological phrase, as stated in (17) and shown in (18).

(17) Align the right edge of each syntactic XP with the right edge of a phonological phrase.

(18)(a)	[w_1 [w_2]$_{AP}$]$_{NP}$			(b)	[w_1]$_{NP}$[w_2]$_{VP}$			syntax
	caffè [cc]aldo				papa [m]angia			
		)ø				)ø	)ø	edges by (17)
	(	)ø			(	)ø(	)ø	result

RS, then, would be sensitive to boundaries of phonological phrases. The description in (19) requires that RS can apply between two words within a phonological phrase, but not between two words separated by a phonological phrase boundary. It will thus correctly apply in (18)(a), but not in (18)(b).

(19) (... x_w)ø

)w

σ

|\

μ μ

| - - - - - -

V C

It is this latter theory, the theory that postulates prosodic constituents where phonological rules are blocked, that I will pursue in this thesis. I will now lay out some aspects of and restrictions on the proposed prosodic representation that have been discussed in the literature.

2.1.3. The Prosodic Hierarchy

It was clear early on (as in the distinction between # and ## in SPE) that there would be phonological boundaries of different strength. With the transition from boundaries to constituents, this translated into there being constituents of different size (see Selkirk (1980a)). I illustrate this here with another Italian example from Nespor and Vogel (1986).

In the Tuscan dialect of Italian, the rule of Gorgia Toscana (GT), turns the voiceless stops /p, t, k/ into the fricatives [ø, θ, h] between two [-consonantal] segments within and across words[4]. Nespor an Vogel (1986, p.207), state the rule as in (20).

(20) *Gorgia Toscana*

[-cont, -voice, -del rel] -> [+cont] | [I ... [-cons] ___ [-cons] ...]I

This rule applies in the domain of the intonational phrase, abbreviated I - a domain that is larger than the phonological phrase. Applications of GT are shown in (21),

[4] with some surface variation in the actual output; /k/, for example, might also become [x], [kx], or be deleted by GT, instead of becoming [h].

where underlying /k/s that undergo GT are underlined. As can be seen in (21)(b) and (c), GT applies between a subject and a following verb, an environment that blocks RS, as was seen in the preceding section. This showns that the domain of GT is larger than the domain of RS.

(21)(a) [Hanno catturato sette canguri appena nati]I
(they) have captured seven cangaroos just borne
'They have captured seven newly borne cangaroos'

(b)]NP
[I canari congolesi costano molto cari in America]I
the canaries Congolese cost very dear in America
'Congolese canaries are very expensive in America'

(c)]NP
[Gli struzzi corrono velocemente]I
the austriches run quickly
'Austriches run quickly'

However, even though GT applies across the boundary between subject and verb in Italian, it does not apply across two words if one of them is in a parenthetical, and the other one part of the corresponding main clause. This can be seen in the examples in (22).

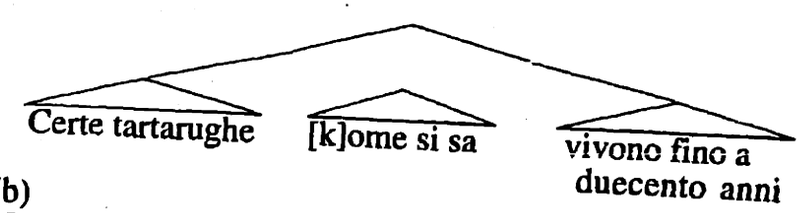
(22)(a) [Certe tartarughe]I [[k]ome si sa]I [vivono fino a duecento anni]I
certain turtles as one knows live up to twohundred years

(b) [Almerico]I [[k]uando dorme solo]I [[k]ade spesso dall'amaca]I
Almerico when (he) sleeps alone falls often from-the hammock
'Almerico, when he sleeps alone, often falls out of the hammock'

Parentheticals, appositive relatives, vocatives and various similar elements are separated from the matrix clause by intonational phrase boundaries (see Downing (1970), Bing (1979), Pierrehumbert (1980)). It is these intonational phrase boundaries that block the application of GT in Tuscan Italian. (In English, they are characterized by boundary tones, see Bing (1979), Pierrehumbert (1980)).

Why are these syntactic constituents, but not others, always separated off by intonational phrase boundaries? One member of this class of elements, appositive relatives, have been argued not to be syntactically attached in the tree in the place where they seem to be, but to be attached to the root node (Ross (1967), Emonds (1979)), or to be floating freely as far as the syntax is concerned (Safir (1986), see also Rotenberg (1979)). It has been suggested by Bing (1979) and Nespor and Vogel (1986), that, if this kind of syntax generalizes from appositive relatives to the other members of this class, it will allow for a straightforward way of deriving intonational phrase boundaries: All elements that are not dominated by any higher element in the syntax (except maybe by the root node) are set off by intonational phrase boundaries. On such a proposal, the example in (22)(a) would have a syntactic structure like in (23)(a), with the parenthetical floating.

(23)(a)



(b)

[ ]I[ ]I[ ]I

On Nespor and Vogel's proposal about I-formation in (24), the structure in (23)(a) will then be mapped into intonational phrases as in (23)(b). The floating status of the parenthetical here triggers its separation by intonational phrases from the matrix clause.

(24) *I domain*

An I domain may consist of

a. all the Øs in a string that is not structurally attached to the sentence tree at the level of s-structure, or

b. any remaining sequences of adjacent Øs in a root sentence.

The intonational phrase boundaries in (23)(b) then block the application of GT in Italian (or condition the insertion of boundary tones in English).

Studying different phonological rules and their prosodic domains of application across languages, researchers in prosodic phonology have isolated a number of domains. Of these, the ones originally suggested by Selkirk (1980a) are uncontroversial within prosodic phonology. They are given in (25).

(25) Prosodic Hierarchy

Utterance
Intonational Phrase
Phonological Phrase
Phonological Word

There are some controversies ranking around the prosodic hierarchy that are of subordinate interest in the context of the present work. One of them is whether or not feet, syllables, and moras are part of the same hierarchy (Selkirk (1980b), Inkelas (1989)). Other issues under debate are whether there are levels in addition to those in (25). Thus, Nespor and Vogel (1986) make use of a level of the Clitic Group between the Phonological Word and the Phonological Phrase. On the

other hand, Selkirk (1986, 1995), Zec (1988), Kanerva (1989), Peperkamp (1995) and others maintain that the clitic-group is but the postlexical version of the Phonological Word. Similarly, there appears to be a level of prosodic representation between the prosodic word and the phonological phrase, the Minor Phrase in Japanese (McCawley (1965), Poser (1984), Selkirk and Tateishi (1988, 1991)).

For concreteness, I make the following assumptions:

(a) moras and syllables are not members of the prosodic hierarchy (even though they are phonological constituents). The representation under discussion here begins with the elements of which we know that they have a head that represents their internal prominence: the foot.

(b) There may be other levels between and below the ones listed in (25), and languages may differ with regard to their presence or absence. However, the syntax-prosody mapping may mention only the levels in (25). Other levels of prosodic structure, such as the foot, the cola (Halle and Clements (1983), Hammond (1987), Hayes (1995)), or the minor phrase (McCawley (1965), Poser (1984), Selkirk and Tateishi (1988, 1991)) appear to be part of the same representation but not subject to any constraints that directly relate them to syntactic structure. In other words, there are rules or constraints that relate syntactic-semantic utterances (however that will be defined) to prosodic utterances, clauses and root-elements to intonational phrases, syntactic XPs to phonological phrases, and syntactic X^0s to prosodic words. This is schematically represented in (26).

(26)

Syntax		Prosodic Hierarchy
Utterance	$\longrightarrow$	Prosodic Utterance
		...
(Root) clause	$\longrightarrow$	Intonational Phrase
		...
XP	$\longrightarrow$	Phonological Phrase
		...
X^0	$\longrightarrow$	Phonological Word
		...

However, no constraint relates syntactic structure directly to feet, cola, or the minor phrase.

2.1.4. The hierarchical organization of prosodic constituents

An early observation was that the presence of a stronger boundary implies the presence of a weaker boundary[5]. With the suggestion that boundaries not be represented by boundary-symbols, but be understood as the edges of constituents in the phonological representation, the hierarchy of boundaries translated into the assumption of a hierarchical representation of the phonological constituents (Selkrik (1980a), Hayes (1989)). The hierarchical representation is taken to obey a restriction that I formulate in (27)[6].

(27) For any two constituents α and β in the prosodic hierarchy, where α is higher than β in the prosodic hierarchy: If α contains a part of β, then α contains all of β.

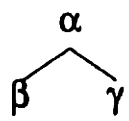
---

[5]See SPE, p.371, where, however, the hierarchy of boundaries included morphological boundaries.
[6]See Nespor and Vogel 1986, p.7, 'Principle 2' for a similar formulation; this aspect of the prosodic organization is often written more informally.

Thus consider the bracketed representations in (28). α contains both β and γ completely and thus meets (27). In (29) and (30), on the other hand, β contains a part of δ but not does not contain all of δ, These representations are ruled out by (27).

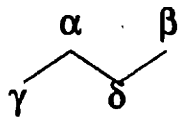
(28)

```
(        )α
(   )β(  )γ
```



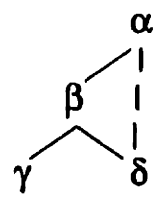
(29) *

```
(        )α(   )β
(   )γ(        )δ
```



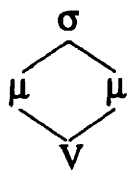
(30) *

```
(              )α
(        )β
(   )γ(        )δ
```



(27) amounts to saying that the prosodic representation has the organization of a syntactic tree. The representations on the right in (28) - (30) are what one might take to be syntactic representations analogous to the structures on the left, and that are analogously allowed or ruled out in the syntax. It will be noted that (27) is not a trivial claim, in particular since other representations in phonology are organized in a way that is not allowed in syntax:

(31)



2.1.5. Constraints on domination

Selkirk (1984) has proposed further constraints on the prosodic representation. In Selkirk (1995) these are formulated as follows:

(32) Layeredness No C^i dominates a C^j, $j > i$,
e.g. "No σ dominates a Ft."

Headedness Any C^i must dominate a C^{i-1} (except if $C^i = \sigma$)[7],
e.g. "A PWd must dominate a Ft."

Exhaustivity No C^i immediately dominates a constituent C^j, $j < i-1$,
e.g. "No PWd immediately dominates a σ."

Nonrecursitity No C^i dominates C^j, $j = i$,
e.g. "No Ft dominates a Ft."

To the extent that these all hold, each level of the prosodic representation exhaustively parses the string as schematically represented in (33).

(33)

```
(                    )u
(        )(          )I
(        )(    )(    )ø
(    )(  )(  )(  )(  )w
....
```

[7]on the assumption that the syllable is the lowest member of the prosodic hierarchy.

2.1.6. The theory of metrical structure: prominence

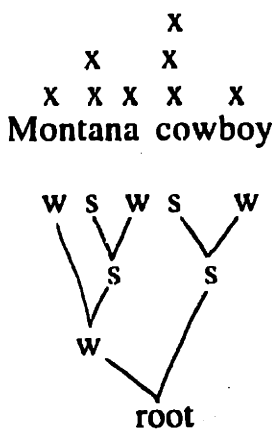
In this section, I will discuss contacts and differences among the theory of *prosodic phonology* (by which I here mean the theory developed, among others, in the work of Selkirk as well as Nespor and Vogel, a theory that adheres to the Prosodic Hierarchy and the Strict Layer Hypothesis) and the theory of *metrical phonology*, as developed, among others, in the works of Liberman (1975), Liberman and Prince (1977), Prince (1983), Halle and Vergnaud (1987), Hayes (1981, 1984, 1995). My intention here is to filter into the picture stress, or, more abstractly, prominence, - a domain of research most prominently represented by metrical phonology. This notwithstanding, advocates of prosodic phonology have, in one way or another, pointed out and explained dependencies between stress and prosodic structure as well, and postulated connections between prosodic structure and metrical structure, as will be seen.

The primary concern of the theory of prosodic phonology is with phonological constituents that define domains of rule-application, as seen in the examples above. By contrast, the primary concern of metrical theory is with stress (or prominence): primary and secondary stress in words, stress among the members of a compound, and, occasionally, stress in larger syntactic constituents, up to the sentence.

This much, I think, is fair to say at least historically. Yet, having said it, we must immediately make it clear that metrical theory is *also* concerned with constituents, and prosodic phonology is *also* concerned with prominence.

Let us first review the role of constituents in metrical theory. Liberman and Prince (1977), drawing on Liberman (1975), proposed two representations relevant for prominence: One in terms of metrical trees (bottom in (34)), and another one in terms of a metrical grid (top in (34)). They also supplied a principle that mediates between the two, the *Relative Prominence Projection Rule* (Liberman and Prince (1977, p.316).

(34)



The two aspects of the representation that we will see throughout are already present here: constituents (in the metrical tree) and prominence (reprented in the grid, where more stress/prominence corresponds to a higher grid-column).

Prince (1983) and Selkirk (1984) have explored the possibility of abandoning the metrical tree in favour of a metrical representation in terms of the grid alone.

However, while the metrical trees have been abandoned within metrical theory, the notion of constituency was soon reintroduced in metrical theory and is, as far as I can see, universally accepted there since. A representation of constituency used by many people in the field is that of Halle and Vergnaud (1987): the

bracketed grid. In this representation, grid-marks and constituents are integrated into a single representation. Consituency is indicated by brackets in the grid. Crucially, each grid-mark is the unique head of a prosodic constituent. In the proposal of Halle and Vergnaud, the head of a constituent is represented on the line above the constituent. This is shown for a single constituent and its head in (35). (36) shows a slightly more complex representation, where constituents and their heads are coindexed for clarity.

(35)

```
    x
(     )
```

(36)

```
      xk
(   xi      xj  )k        line n + 1
(     )i (     )j          line n
```

Metrical theory, then, does have constituents as part of its representation, as does prosodic phonology. The reader is referred to Halle and Vergnaud (1987, pp.28ff) for convincing arguments in favour of including the notion of constituency in the metrical representation of prominence.

Prosodic phonology, in turn, knows a notion of prominence. In fact, even though its primary concern is with prosodic constituents, it has been tied up with prominence from the very beginning. Thus Selkirk (1980b) has argued to label the constituents in the metrical grid representation of Liberman and Prince (1977) with the prosodic constituents (syllable,) foot, and prosodic word[8]. Nespor and Vogel (1982, 1986, 1989) adopt this proposal also for higher levels in the prosodic representation, and likewise identify prosodic constituents with constituents in the metrical tree representation of Liberman and Prince. For Nespor and Vogel (1986), in fact, the rules for constructing prosodic constituents from the syntax

[8]Selkirk (1980) allowed for the possibility that there be constituents in the metrical representation not thus labelled.

are formulated as rules that construct a metrical tree. To see this, consider the rules for building prosodic structure on the level of the phonological phrase. After defining the notion of a *Ø domain* with regard to the syntax (we return to this below), the construction of a phonological phrase, and the prominence with regard to this are stated as follows (p.168).

(37) *ø construction*

Join into an n-ary branching ø all Cs included in a string delimited by the definition of the domain of ø.

[Cs here are Clitic-Groups, the next lower level of representation in the Prosodic Hierarchy on Nespor and Vogel's assumptions. H.T.]

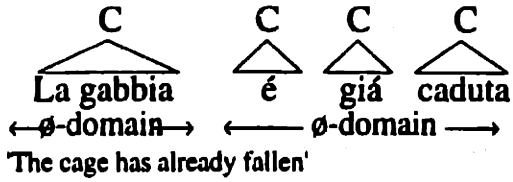
(38) *ø relative prominence*

In languages whose syntactic trees are right-branching, the rightmost node of ø is labelled *s*; in languages whose syntactic trees are left-branching, the leftmost node in ø is labelled *s*. All other nodes are labeled *w*.

[*s* and *w* stand for *strong* and *weak*. H.T.]

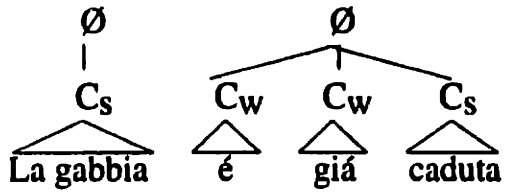
These rules would then assign Ø-structure to the example in (39) as indicated. In particular, prominence in the complex phonological phrase is assigned rightmost by (38) (Italian being right-branching). According to Nespor and Vogel, prominence is always on the rightmost constituent within the phonological phrase in Italian

(39)



'The cage has already fallen'

=>



In terms of the bracketed grid notation of Halle and Vergnaud (1987), we will represent this proposal as in (40) - the prominence tnat is assigned righmost with regard to the phonological phrase is a grid-mark that heads the phonological phrase.

(40)

x x
(La gabbia)$_{ø}$ (é giá caduta)$_{ø}$

Selkirk (1986) similarly made an argument in favour of prominence being assigned (rightmost) with regard to the phonological phrase in Chi Mwi:ni, as will be discussed later in this chapter.

Building on these proposals, we may formulate a hypothesis about the relation of prosodic and metrical structure. If we adopt the representation of bracketed grids from Halle and Vergnaud, we can formulate this hypothesis as in (41).

(41) Hypothesis about the Identity of Metrical and Prosodic Structure (HIMP)
Metrical structure and prosodic structure are part of the same representation. The representation consists of constituents, with a grid-mark representing the head of each constituent. It is hierarchically organized and subject to the constraints on domination of the Strict Layer Hypothesis.

Since I do not define how metrical constituents and prosodic constituents differ a priori, (41) is a theoretical principle only insofar it excludes two independent representations, a metrical one, and a prosodic one. Beyond that, the HIMP has consequences for the lower levels of representation that are taken for granted by many linguists. Thus, if we want to think of the foot as a metrical constituent and the prosodic word as a prosodic constituent (due to its alignment with syntactic structure) (41) maintains that they are in the same representation, with feet being contained inside of prosodic words due to the Strict Layer Hypothesis. For the higher levels of phrasing, the HIMP implies that prominence above the word is represented by the heads of a set of constituents, a set which includes the phonological phrase, the intonational phrase, and the utterance. This is then a way of saying that Nepor and Vogel are essentially correct in that prominence is assigned with regard to prosodic constituents. The HIMP, however, leaves some room for additional levels of representation of prominence between the ones that are asigned with regard to the syntax. Such additional levels, however, are predicted to respect the demands of the Strict Layer Hypothesis in relation to other levels of the representation.

2.2. Optimality theory

This theses is concerned with the relation between the elements introduced above: prosodic structure, syntactic structure, prominence, and with the relation of these elements to focus. It concentrates on the level of the phonological phrase. What is the relation, on this level, between phonological constituency and syntactic constituency? How do phonological phrases relate to prominence? And how do phonological constituency and prominence relate to focus?

In order to be able to ask and tentatively anser these questions, we must have a notion of what kind of answers we are looking for: What are the terms within which we want to develop and discuss our hypotheses?
Here I have chosen a framework of ranked constraints, as developed by Prince and Smolenky (1993), McCarthy and Prince (1993a,b).

In this theory, violable constraints, rather than rules, govern the transition from underlying phonological forms to surface forms. The violable constraints are ranked in a hierarchy of importance in each language, such that the violation of a less highly ranked constraint is preferred to the violation of a more highly ranked constraint. The interaction of the constraints is evaluated with the aid of tableaus. I demonstrate with an example from McCarthy and Prince (1993b). Infixation of Tagalog *-um-* results in the surface-forms shown in (42).

(42)	*u.m*a.ral		'teach'
	s*u.m*u.lat	* *um*.sulat	'write'
	gr*u.m*ad.wet	* *um*.grad.wet	'graduate'

Intuitively, *-um-* likes to be close to the left edge of the stem, but it will move further into the word if this results in a better syllable structure, where a better syllable structure is one that avoids codas. Thus *-um-* is word-initial in *u.ma.ral* where no coda is created by its word-initial position. In combination with *sulat*, initial *-um-* would create a coda, as in *um.su.lat*. This is avoided by *-um-* moving further into the word, as in the surface form *su.mu.lat*. Analogously in combination with the stem *gradwet*, where *um* has to move two segments far into the stem to avoid the creation of a coda.

The theory of ranked constraints now allows us to avoid writing rules that bring about these effects. Instead, we can formulate the deeper principles that appear to be at work here, and let them do the work of deriving the surface-forms directly. For this to be possible, however, the 'deeper principles' must be violable: *-um* wants to be at the left edge of the stem, but this is not absolutely enforced, since *-um-* moves further into the word, if need be. Likewise, the avoidance of codas in Tagalog is not an absolute requirement, but a tendency, as can be told from the surface form *grad.wet*.

The two forces that are at work in the present case are given by McCarthy and Prince as in (43): No-coda wants for syllables to be open; Align-um wants for *-um-* to be at the left edge of the stem.

(43)	No-coda	Syllables are open
	Align-um	ALIGN($[um]_{Af}$,L,Stem,L)

No-coda is more important than Align-um, since *-um-* moves away from the edge (despite Align-um) in order to satisfy No-coda. Formally, then, No-coda is ranked above Align-um: No-coda >> Align-um.

The output is determined by a tablau as in (44). Higher ranked constraints are represented to the left of lower ones.

(44) um + aral: No-coda >> Align-um

$	*um*.aral	*	
	a*um*.ral	**!	a
	a.r*u*.*m*al	*	a!r
	...		

Violations of the constraints are indicated in the columns of the constraints: by a star in the case of No-coda or by indicating the segments that are in the way of perfect alignment with the left edge in the case of Align-um. The winning candidate is then determined by scanning the tableau from left to right: in each column, a candidate that induces more violatios than another candidate is ruled out. Thus in (44), in the column of No-coda, each candidate has at least one star, since each has a violation of No-coda due to the coda of *aral*. However, the second candidate is ruled out at this point, since it induces an additional violation of No-coda, due to the position of the infix in this candidate. The two winners in this round, the first and third candidate, are then evluated against the next higher constraint, here Align-um. In this column, more symbols represent a greater distance from the optimal location of *-um-*, the left edge of the stem. The best candidate is the first one, since it is closest to the left edge, and does not induce

any violations of Align-um in this column. The points at which a candidate is thrown out is marked by an exclamation mark where the fatal violation is incurred. The dollar-sign on the left indicates the winning candidate.

(45) shows the tableau for the stem *gradwet*.

(45)	um + gradwet	No-coda >>	Align-um
	um.grad.wet	***!	
	g*um*.rad.wet	***!	g
$	gr*u.m*ad.wet	**	gr
	grad.w*u.m*et	**	gradw!

In the first column, each candidate induces two violations of No-coda due to the two codas in the stem itself. The first and the second candidate, even though they are closest to the left edge, are ruled out at this point of the evaluation, since they induce an additional violation of No-coda due to the position of *-um-* in these candidates. The third and fouth candidate pass No-coda and are then evaluated against Align-um. Align-um chooses the third candidate, since *-um-* is still closer to the left edge in this candidate, than it is in the fourth one.

Intuitively, the higher ranked No-Coda rules out all possibilities that are less than optimal with regard to it. The remaining possibilities are then evaluated by the lower ranked Align-um.

The candidate-set is, by assumption, generated freely, with additional constraints, not relevant here, ruling out more remote candidates.

The account of language-variation in the theory of ranked constraints is this: The constraints are, by assumption, universal (setting aside here constraints tied to language-specific morphemes such as Align-um), but their ranking may vary from one language to another, which derives differences in the phonology of languages.

I have chosen to use this framework largely for a priori reasons. It is my impression that reasoning in terms of ranked and violable constraints allows us to think about the deeper causes of things in a formal way instead of capturing their effects in a set of rules. More than one language can be brought to bear on the proper formulation of these deeper causes, since a claim about a particular formulation of a constraint in one language has consequences in the next language over, even if the constraint might be ranked differently in that other language.

Selkirk (1995) explores extending the domain of application of ranked and violable constraints to the syntax-prosody mapping. In her theory, the mapping is controlled by the constraints on domination, repeated here. Layeredness and Headedness are by assumption unviolated universally, whereas Exhaustivity and Nonrecursivity have been argued to be violable (see the references there).

(32) Layeredness No C^i dominates a C^j, $j > i$,
e.g. "No σ dominates a Ft."

Headedness Any C^i must dominate a C^{i-1} (except if $C^i = \sigma$)[9],
e.g. "A PWd must dominate a Ft."

Exhaustivity No C^i immediately dominates a constituent C^j, $j < i-1$,
e.g. "No PWd immediately dominates a σ."

Nonrecursitity No C^i dominates C^j, $j = i$,
e.g. "No Ft dominates a Ft."

The constraints that crucially determine the syntax-prosody mapping on the level of the phonological phrase in her theory are given in (46).

(46) Align(XP, R, Ø, R)
'Align the right edge of every XP with the right edge of a phonological phrase.'

Align(XP, L, Ø, L)
'Align the left edge of every XP with the left edge of a phonological phrase.'

These go back to theories in earlier work (Selkirk (1986), Hale and Selkirk (1987), Selkirk and Chen (1990), Selkirk and Tateishi (1991)). They are couched in a more general theory of alignment of edges in McCarthy and Prince (1993) to which we will return in Chapter 3. The constraints in (46) will be discussed at length below.

Another pair of constraints that will be relevant relate prosodic constituents and their prominence heads. McCarthy and Prince (1993, p.10,Fn.6, p.17) propose to represent the relation between prosodic constituents and their edgemost heads in term of alignment as in (47), where H(P) stands for the head of prosodic constituent P.

[9]on the assumption that the syllable is the lowest member of the prosodic hierarchy.

(47)	Align(Ft, L, H(Ft), L)	defines trochees
	Align(Ft, R, H(Ft), R)	defines iambs
	Align(PWd, edge, H(PWd), edge)	defines edge-most prominence within the phonological word

The proposal by Nespor & Vogel to the effect that prominence is likewise assigned edgemost in higher level prosodic constituents can then be expressed in the same fashion:

(48)	Align-Ø = Align(Ø, edge, H(Ø), edge)	edge-most "phrasal stress"
	Align-I = Align(I, edge, H(I), edge)	edge-most prominence within the intonational phrase
	Align-U = Align(U, edge, H(U), edge)	edge-most prominence within the phonological utterance

McCarthy and Prince (1993GA, p.17) notice that this formulation of the constituent-head relation has two consequences. First, the constraints require that a constituent have a head in the first place; second, they require that that head be edge-most with regard to the constituent. This view will be adopted here.

As for the phonological phenomena that indicate prosodic structure, I will not propose reanalyses of these in terms of ranked constraints here. The focus of the present work is on the construction of phonological phrases, and on the forces that play a role there. It should be clear that if a phenomenon, such as RS in

Italian, is sensitive to Ø-boundaries as captured by a Ø-sensitive rule, this sensitivity to Ø will not go away in a constraint-based reanalysis. Instead of the rule, one of the constraints involved would then be sensitive to Ø-structure.

2.3. Two theories of the phonological phrase

In this section I will introduce two of the prominent theories of phonological phrase formation - the one proposed by Selkirk (1986), and the one proposed by Nespor and Vogel (1982, 1986). The link between them will be provided by a suggestion by Ghini (1993), who argues for a reanalysis of Nespor and Vogel's data in terms of Selkirk's theory plus an additional factor, a factor recognized by Nespor and Vogel in a different way. It is Selkirk's (1986) theory that I will then lean on in this thesis.

2.3.1. Selkirk's end-based theory and Chi Mwi:ni

Selkirk's theory will here be exemplified with Chi Mwi:ni, one of the languages Selkirk (1986) used to motivate her proposal. The case of Chi Mwi:ni will also be crucial in Chapter 3, where phrasing in Chi Mwi:ni will be compared with phrasing in the other Bantu languages Chichewa and Kimatuumbi.

2.3.1.1. Vowel length, prominence, and phonological phrases

Chi Mwi:ni vowel lenght and phonological phrasing has been discussed by Goodman (1967), Kisseberth and Abasheikh (1974), Kenstowicz and Kisseberth (1977), Selkirk (1986), Nepor and Vogel (1986), and Hayes (1989). Later discussions usually draw on the paper by Kisseberth and Abasheikh (1974).

Kisseberth and Abasheikh (1974) discuss a variety of factors that enter into determining vowel-length in Chi Mwi:ni. First, vowels may be long for a variety of reasons. Thus vowels may be underlyingly long as an idiosyncratic lexical property. This can be seen in the minimal pair in (49)(a). Another factor is that a vowel will be lengthened when it immediately precedes one of a number of suffixes. Thus in (49)(b), the locative particle *ni* triggers such lengthening, whereas the interrogative particle *pi* does not. Further, long vowels can be derived by vowel coalescence under certain conditions ((49)(c)). Also, a rule lengthens vowels in word-final position (no examples given here).

(49)(a)	xtufa	'to spit'	xtu:fa	'to go around the *ka'aba*'
(b)	chili	'bed'	chili:-ni	bed-LOC
	madrasa	'school'	madrasa:-ni	school-LOC
	but			
	ołoshełe	'he went'	ołoshełe-pi	'where did he go'
(c)	so:wé	bathe (sg.neg.imperative)	from /si + owá/	
	su:łe	buy (sg.neg.imperative)	from /si + ułá/	

The vowel-length from any of these sources, however, will not surface unless the relevant vowel occupies one of a small class of possible positions that are defined relative to the phonological phrase. These positions are:

(50)(a) the penultimate syllable in Ø

(b) the antepenultimate syllable in Ø if the penult is short (i.e. neither long by any of the factors above, nor closed)

To give two examples: The penultimate vowel in *ma:yi* in (51)(a) is underlyingly long. This length surfaces when *ma:yi* is final in a Ø, such that its first vowel is the penultimate vowel of a Ø. However, the vowel length does not surface when another element with two or more syllables follows within the same Ø, in which case the vowel is no longer in one of the positions described by (50). Similarly in (51)(b): The underlyingly long vowel surfaces as long in antepenultimate position. However, it does not surface as long when another suffix is added and the relevant vowel comes to be in pre-antepenultimate position.

(51)(a)	(ma:yi)$_{ø}$	'water'	(mayi malada)$_{ø}$	'fresh water'
(b)	(ku-wa:fiq-a)$_{ø}$	'to agree'	(ku-wafiq-an-a)$_{ø}$	'to agree with one another'

Selkirk (1986) suggested to capture these regularities by postulating a stress-system such as the Latin one for Chi Mwi:ni: The final syllable is extrametrical, the penultimate syllable is stressed, if heavy, and the antepenultimate syllable is stressed otherwise. Hayes' (1995 account of Latin is given in (52); the rules derive the abstract forms in (53).[10]

[10]The representation is different from that in Hayes (1995). I have indicated the moras, and I represent the grid-mark representing the prominence head of a constituent on the line above that constituent, as in the representation from Halle and Vergnaud (1987) adopted throughout this work; Hayes represents the prominence for each constituent on the same line with the constituent.

(52)(a)	Syllable Extrametricality	$\sigma \longrightarrow \langle\sigma\rangle \mid ___\ ]_{word}$
(b)	Foot Construction	(i) Form a moraic trochee, going from right to left
		(ii) Degenerate feet are banned absolutely
(c)	Word Layer Construction	End Rule Right

```
(53)(a)      x          (b)      x          (c)      x
        ( ...  x  )w            ( ...  x   )w            ( ...  x     )w
          ... ( μμ )Ft            ... (μ   μ)Ft            ... (μμ)Ft: μ

          ...  σ  <σ>             ...  σ  σ<σ>             ...  σ   σ  <σ>
```

On Selkirk's suggestion, such prosodic structure is constructed similarly in Chi Mwi:ni, except that there, unlike in Latin, it is postlexically present only in Ø-final position. The representation of the two forms in (3)(a) would then be as in (55).[11]

```
(55)(a)      x          (b)            x
        (   x  )w                (   x    )w
        (  μμ )Ft                μ  μ    (μ   μ)Ft
           V                     |  |     |   |
        m  a   <yi>              m a y i   m a l a <da>
```

Selkirk's suggestion in terms of prominence allows for a simple and motivated statement of the environments in which potential vowel-length can surface: It can surface in a position of prominence. The prominent syllables derived by (52), shown in (53), are exactly those in which potential vowel-length can surface in Chi Mwi:ni, according to (50).

[11]These representations violate the requirement that prosodic structure be exhaustive, in line with Selkirk's (1995) proposal that exhaustivity be a violable requirement on prosodic representation. The reader is referred to that paper for arguments and references on exhaustivity.

(54) Chi Mwi:ni:

Vowel-length is neutralized on the surface, except in a position of prominence.

In (55), for example, the underlyingly long vowel in *ma:yi* then surfaces in a position of prominence in (55)(a), but not otherwise, as in (55)(b).

Note that the rules for foot-construction go across syntactic words in Chi Mwi:ni: they care about the phonological phrase only. In (56)(b), for example, the antepenultimate syllable of the phonological phrase realizes vowel length, whence it would be prominent in the relevant sense. This is derived by the rules of foot-construction in (52), but only on the assumption that they are allowed to go across words: In the present example, the syllable with the long vowel on the surface is in a non-final word.[12]

```
(56)(a)        x                    (b)          x
     (       x  )w                      (        x       )w
        (  μμ )Ft                          μ  μ (μμ     μ)Ft
           V                               |  |  V      |
     s o m a  <ni>                       s o m a n i   chu <wo>
```

soma:ni
' (pl.) read!'

somani: chuwo
'(pl.) read the books!'

We must assume, then, that no corellation between syntactic words and prosodic words is not enforced in these cases.

Let us then turn to the patterns of phrasing that Kisseberth and Abasheikh have observed.

[12]It is therefore also unclear where the boundaries of the word-constituents would fall, if that prosodic domain exists in Chi Mwi:ni. It is included in the representation here on the assumption that they it is required by the principles of prosodic representation, in particular Selkirk's (1995) 'Headedness'.

2.3.1.2. Phrasing in Chi Mwi:ni

Selkirk proposes to derive phonological phrases in Chi Mwi:ni by requiring that the right edge of each syntactic XP coincide with the right edge of a phonological phrase. This is one case of a more general theory by which phonological structure is created by aligning the edges of syntactic constituents with the edges of phonological constituents. In the terms adopted from Selkirk (1995), the relevant constraint in Chi Mwi:ni is Align(XP, R, Ø, R) or Align-XP,R for short: The right edge of each XP must be aligned with the right edge of a phonological phrase.

Let us consider some of the case that motivate this constraint in Chi Mwi;ni. First, a head is always phrased together with a following complement or other element within the projection of the head. This is shown for VPs and NP in (57). Here and in the following, double underlining will mark potentially long vowels of which the surface length (short of long) is crucial for the discussion.

The fact that the potentially long vowels in the verb in (57)(a) and in the initial noun in (b) are not realized as long indicates that there is no Ø-boundary after these constituents. In (57)(c), the final vowel in the noun could not be realized as long if the noun were final within a Ø, However, its length is correctly predicted if it is antepenultimate in a larger Ø (with no heavy penultimate vowel) as indicated.

(57)(a)	[V NP]	x	
	( )ø	... (ingiłe mtana:ni)ø	'... entered the room'
(b)	[V PP]	x	
	( )ø	(mapendo ya maski:ni)ø	'the love of a poor man'
(c)	[N AP]	x	
	( )ø	(nthi: ˜khavu)ø	'dry land'

No Ø-boundary is expected in these cases, since there is no right edge of an XP between a head and a following compement.

On the other hand, whenever there is a right edge of an XP in a clause, a Ø-boundary is found. In particular, there is a Ø-boundary after a subject-NP as in (58)(a) and (b), and after the first of two coordinated NPs as in (58)(c) and (d). In each case, a vowel of which the potential lenght has been realized gives evidence of a following Ø-boundary. In (d), furthermore, the realized vowel-length in word-final position of *kampa:* and *na:* is evidence that there is no Ø-boundary immediately following these words. This means that the coordinating particle *na* is phrased with the second, rather than with the first conjunct. The Ø-boundary between two coordinated NPs thus immediately follows the first NP, as predicted by Align-XP,R.

(58)(a) [NP V]
( )ø( )ø

x x
(maski:ni)ø (ha:tali)ø 'a poor man does not choose' (a proverb)

(b) [NP V NP]
( )ø( )ø

x x
(Ja:ma)ø (ingiłe mtana:ni)ø 'Jama entered the room'
[= complete version of (57)(a)]

(c) [NP & NP]
( )ø( )ø

x x
(ta:jiri)ø (na ma:łiyé)ø ,
x x
(maski:ni)ø (na mwa:nawé)ø
'a rich man and his money (are like) a poor man and his son' (a proverb)

(d) [X [NP & NP]$_{NP}$]
( )ø( )ø

x x
(kampa: mp^{h}aka)ø (na: mp^{h}ana)ø
'like a cat and a rat' (a proverb)

Further cases in which a Ø-boundary is found right after an XP involve a verb with two objects, as in (59). There is no Ø-break between the verb and the first object, analogously to the cases in (57). However, a Ø-boundary is found after the first object, as predicted by Align-XP,R. Evidence for this in the realization of vowel-length can be seen as follows. In (59)(a) the two long vowels are evidence for a Ø-boundary between them, i.e. after the first object. The fact that the potential vowel-length in the verb is not realized, on the other hand, indicates that there is no Ø-break between the verb and the first object. In (b), the fact that the first, rather than the second of the two potentially long vowels is realized shows that there must be a Ø-boundary between the two objects. If there were not, the second vowel of Nuru would surface as long, being the antepenultimate vowel from the end of the expression. In (59)(c), finally, the two occurrences of vowel-length in word-final position show that there must be two Øs. The edges of these Øs, however, cannot immediately follow the long vowel, for final vowels never surface as long. The phrasing must therefore be as indicated, with the antepenultimate vowel in each Ø lengthened.

(59)(a) [V NP NP]
( )ø( )ø

x x
(panzize cho:mbo)ø (mwa:la)ø
'he ran the vessel onto the rock'

(b)

x x
(nimwandikilile Nu:ru)ø (xati)ø
'I wrote Nuru a letter'

(c) [V NP NP]
( )ø( )ø

x x
(nthinziłe: nama)ø (ka: chisú)ø
'I cut the meat with a knife'

Let us now turn to the theory of Nespor and Vogel (1982, 1986), to then compare the two theories.

2.3.2. Nespor and Vogel's relation-based theory and Italian

2.3.2.1. Phrasing in Italian

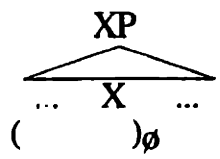
Nespor and Vogel, taking Italian as a starting point, propose the following definition of a *ø domain* - a notion that defines what will be grouped into a phonological phrase in Nespor and Vogel's terminology.

(60) *ø domain*

The domain of ø consists of a C [Clitic-group, H.T.] which contains a lexical head (X) and all Cs on its nonrecursive side up to the C that contains another head outside of the maximal projection of X.

The clitic-group is the element below the phonological phrase in the version of the prosodic hierarchy that Nespor and Vogel use. The formulation of Ø-formation in terms of clitic-groups in (60) is a way of ensuring the hierarchical structure of the resulting representation in a specific way. Leaving this aspect of (60) aside for the purposes of the present discussion, (60) says that a head X and all material within XP to the left of the head are grouped into a Ø:

(61)



This definition is amended by a rule of optional Ø-restructuring:

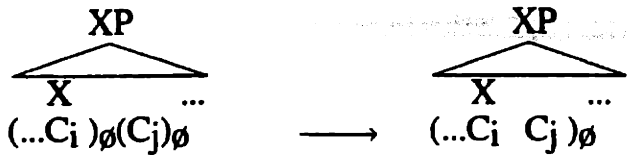
(62) *ø restructuring (optional)*

A nonbranching ø which is the first complement of X on its recursive side is joined into the ø that contains X.

A branching Ø is a Ø that dominates more than one clitic-group. A non-branching Ø dominates a single clitic-group.

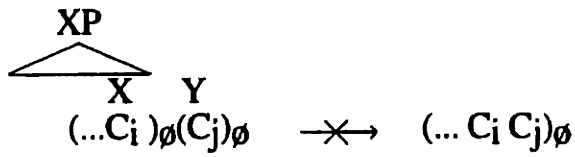
Ø restructuring will optionally integrate a non-branching Ø into the preceding Ø as in (63)(a). It will not integrate a branching Ø as in (63)(b). Nor will it integrate an element that is not the first complement of X (here: the first thing to the right of X that is inside of XP). This is shown in (63)(c).

(63)(a)



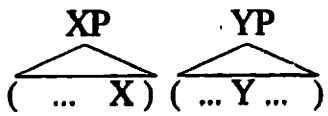
(b) (... C_i)ø(C_j C_k)ø ⟶⟵ (... C_i C_j C_k)ø
⟶⟵ (... C_i C_j)ø(C_k)ø

(c)



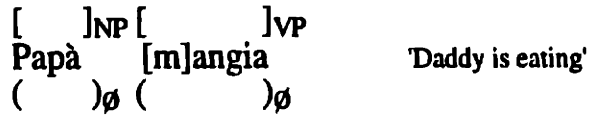
Let us inspect the patterns of phrasing that this algorithm derives in three syntactic configurations, beginning with (64).

(64)



If an XP precedes a YP with no higher head containing both, *ø domain* will assign them separate phonological phrases, and *ø* restructuring may not apply. An example of this is the pattern of preverbal subject and verb that we saw above.

(65)

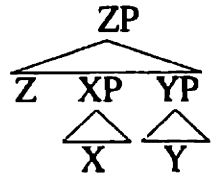


'Daddy is eating'

Here RS did not apply across subject and verb due to the intervening hypothesized Ø-boundary. The Ø-boundary is derived according to (60) and (62): the head of the noun-phrase and the head of the verb-phrase each form a Ø by (60). Restructuring may not apply, since the VP is not the complement of the NP (cf. the formulation of (62).

A similar result is obtained if XP precedes YP, but both are 'complements' inside of a higher projection with an overt head, say ZP.

(66)



( )( )( )ø by (60) - ignoring additional structure within XP and YP

( )( )ø by (62) - if XP is short

As shown, *ø domain* will assign separate Øs to Z, X, and Y. Z and X may be restructured according to *ø restructuring*, but YP may never be restructured: It may not be restructured with X, since YP is not the complement of X, Furthermore, YP may not be restructured with Z, even though YP is a complement of Z; this is because Y is not the *first* complement of Z.

These restrictions can be exemplified within VP with the sentence in ($69) from Ghini (1993, p.74).

(67)

[V	NP	NP]$_{VP}$
(dáro	un libro)ø	(a Gianni)ø
I-will-give	a book	to Gianni

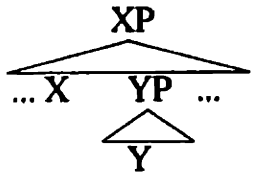
Here the first object of the verb is retructured with the verb, but the second object is not.

In the configurations in (64) and (66) then, Nespor and Vogel's theory makes the same predictions as the end-based theory of Selkirk as far as right edges of XP are concerned: Each right edge of XP will coincide with a Ø-boundary. Neither (60)

nor (62) can assign phonological phrases that go across the right edge of XP in these configurations.

One case, then, in which the two theories differ, is that of the first (or single) complement of an higher head. As was seen in connection with (66), Nespor and Vogel's analysis allows reanalysis of X and Y into a larger Ø here, but (a) this is optinal, and (b) it happens only under certain conditions. The relevant aspect of this configuration is repeated in (68).

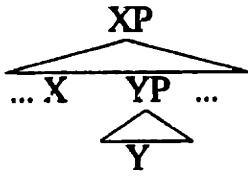
(68) Nespor and Vogel:



( )( )ø	by (60)
( )ø	by (62) - if YP forms a nonbranching Ø

In this regard, then, the end-based theory makes a different prediction: When YP is the first or single complement of X, the end-based theory, without further ado, will predict that X and YP *always* form a single phonological phrase:

(69) End-based theory (Selkirk (1986), Ghini (1993) for Italian):



)ø)ø	right edge of XP/YP coincides with right edge of Ø
( )ø ...	resulting phrasing

Nespor and Vogel, of course, had good reasons for their particular suggestion. Some of the relevant data are given in (70).

(70)(a)

```
 x          x
peschera granchi        almeno, se no aragoste
(he)-will-fish  crabs   at least,   if not lobsters
[        [        ]NP]VP

(  C   )ø(  C   )ø                    ø domain
(  C        C   )ø                    ø restructuring
```

(b)

```
        x      x       x
peschera qualque granchio        almeno, se no aragoste
(he)-will-fish  some     crabs   at least,   if not lobsters
[          [                  ]NP]VP

(  C  )ø(   C        C    )ø        ø domain
                                    ø restructuring: d.n.a.
```

Thus in (70)(a), ø restructuring applies to the non-branching *(granchi)ø* , creating a larger Ø that spans the entire subject. The absence of a Ø-boundary within the subject (in the resulting representation) can be seen from the application of SR to the verb, which would otherwise be stressed on the final syllable.

In (70)(b), on the other hand, ø restructuring does not apply - *qualque granchio* consists of two clitic-groups. There is, then, a ø-boundary between the verb and the following NP. In this case, then SR cannot apply to the verb to shift the stress from the last to the first syllable.

In (70)(a), then, the predictions of Selkirk's end-based theory and Nespor and Vogel's relation-based theory are comparable: both would derive a boundary between subject and verb, and both would allow the noun and the adjective within the subject to form a single phonological phrase.

In (70), however the end-based theory would only derive a Ø-boundary between subject and verb phrase, whereas the relation-based theory correctly derives an additional Ø-boundary within the VP. Since there appears to be no right edge of

XP at that point, the relation-based theory would appear to have nothing to say about this case.

The reader is referred to Nespor and Vogel (1986, p.172ff) for more examples of this kind.

2.3.2.2. Ghini (1993)

Ghini (1993), who argues for a reanalysis of Nespor and Vogel's account of Ø-formation in Italian, argues that the patterns of Ø-formation in Italian come about by two independent factors: one is the alignment of right edges of XPs with right edges of phonological phrases from Selkirk's end-based theory. This guarantees the Ø-boundaries to the right of XPs, of which we have seen that both accounts agree upon them. Ghini then argues that a second factor enters into Ø-formation in Italian: In cases in which edge-alignment derives Øs that are phonologically very long, Italian prefers to break them up into binary Øs, each consisting of two clitic-groups. More precisely, Ghini offers the following formulation of this tendency:

(71) *uniformity and average weight*

(from Ghini (1993,p.56) - henceforth *Unif/AW*)[13]

A string is ideally parsed into <u>same length</u> Øs; the average weight of the Øs depends on tempo: at an average rate of speech (moderato), a Ø contains two phonological words; the number of Ws within a Ø increases or decreases by one by speeding up or slowing down the rate of speech.

Unif/AW then derives two possibilities of phrasing for the example in (70)(b):

(72)

		x	x	x			
		peschera	qualque	granchio		almeno,	se no aragoste
		(he)-will-fish	some	crabs		at least,	if not lobsters
		[	[		]NP]VP		
		C	C	C	)ø		right edge of XP
(i)	(	C	)ø(C	C	)ø		Unif/AW
(ii)	(	C	C	)ø(C	)ø		Unif/AW

Of these, only (i) represents the correct phrasing. According to Ghini, the decision in favour of (i) is made by yet another factor, *Increasing Units*. This factor disfavours a phrasing that groups an decreasing number of clitic-groups (Prosodic words for Ghini) at the end of the sequence. Thus the grouping 1 + 2 in (i) is preferred over 2 + 1 in (ii).

The notion of branching Øs in Nespor and Vogel's Ø-restructuring here comes in through Unif/AW: binary (i.e. branching) Øs are preferred.

In Ghini's account, then, the additional Ø-boundaries that in part distinguish between the end-based and the relation-based theory, are introduced by purely

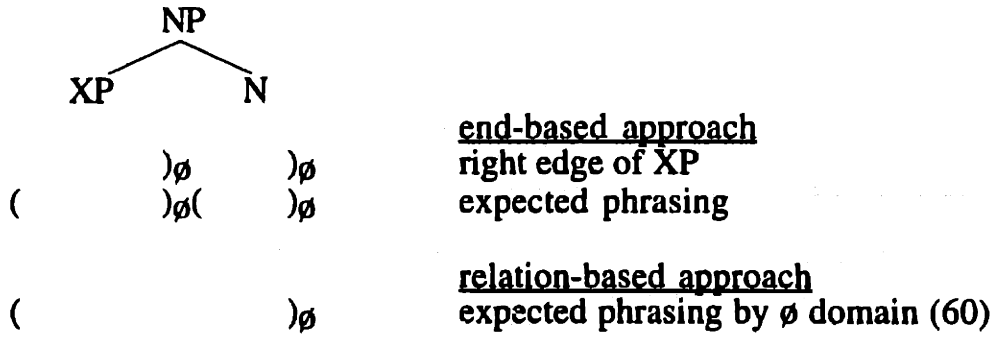
[13]See Inkelas and Zec (1995) for proposals that likewise relate the size of prosodic constituents to the number of their daughters - preferably two - in the prosody.

phonological factors of phrasing that do not make reference to syntax: the tendency to have binary phonological phrases, and the tendency not to have decreasing phonological weight at the end of a sequence. For an analysis of the effect of Unif/AW on longer sequences of prosodic words the reader is referred to Ghini (1993).

2.3.2.3 Adnominal adjectives

One case that one might hope will distinguish between Nespor and Vogel's proposal and Selkirk's proposal is that of prenominal XPs within the projection of the noun:

(73)



I am aware of a single candidate for this structure in Italian, which is with XP = AP, i.e. prenominal adjectives. (Italian does not have prenominal possessors.) Here the end-based theory appears to make the wrong prediction, as shown: we would expect a phonological phrase-boundary at the right edge of the AP, as shown in (73) (with XP=AP). The relation-based proposal by Nespor and Vogel, on the other hand, correctly predicts that prenominal adjectives and following nouns will typically phrase together. We do not see, here the effect of other right edges of XPs, which *obligatorily* introduce a Ø-boundary on either account.

Thus RS applies between the numeral and the noun in (74)(a) from Nespor and Vogel (1986), indicating the absence of a Ø-boundary. Likewise Ghini (1993) reports the absence of Ø-boundaries in examples like (74)(b) between the adjective and the noun.

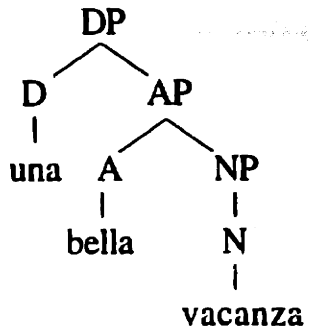
(74)(a) [NUM N]$_{NP}$
È appena passato con tre [kk]ani — Nespor and Vogel (1986, p.167)
(he) is just passed with three dogs
'He has just passed by with three dogs'

(b) [A N]$_{NP}$
(ho fatto)$_{Ø}$(una bella vacanza)$_{Ø}$ — Ghini (1993, p.60)
(I) have made a nice vacation
'I had a nice vacation'

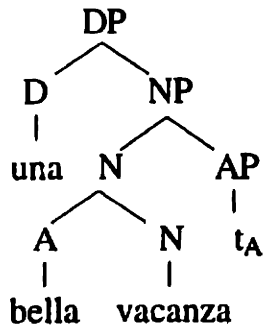
It has been noted since Clements (1978) that adnominal adjectives do not always behave as full XPs in an end-based approach to phrasing. Selkirk and Tateishi (1991) have likewise pointed this out for Japanese.

One way out of this problem for end-based theories has been proposed by Clements (1978), and later by Selkirk and Tateishi (1991): certain adnominal adjectives, in some way, are heads rather than maximal projections. Not being XPs, they will therefore not trigger a Ø-boundary to their right. But what exactly might we mean by this syntactically? In any theory of phrase-structure it is obligatorily the case that if there is a head, there is also a maximal projection to it. This comes out particularly clearly in the theory of phrase-structure in Chomsky (1994). This then leaves two ways of executing the idea of Clements and Selkirk & Tateishi: Either the adjective heads a projection that contains the noun and its projection, as in (75). Or the adjective originates elsewhere and incorporates into the noun, as in (76).

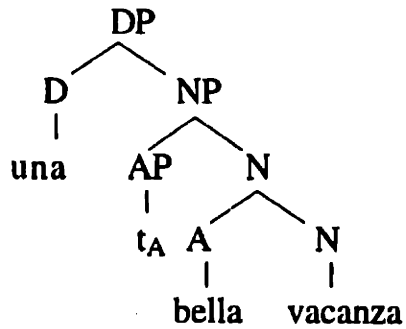
(75)



(76)(a)



(b)



Both of these structures make use of Abney's (1986) insight that what used to be called noun phrases are really projections of the determiner, containing a projection of the noun. I will make this assumption throughout this work, but I will often omit the DP in the representation since, being a functinal projection, the DP has no impact on prosodic structure (see the remarks on functional projections in Chapter 3).

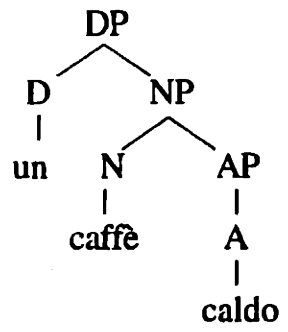
The structure of prenominal adjectives in English that Abney (p.322ff) argued for is in fact (75). The reader is referred there for arguments and discussion.

The structures in (76) represent an alternative possibility, according to which adnominal adjectives are (or may be) incorporated into the noun. In (76)(a), the adjective would have a postnominal AP as its source position, in (76)(b) a prenominal AP.

Any of these structures, if tenable, will solve the problem for the edge-based approach on phrasing: The prenominal adjective in (75) and (76) does not head an AP of which the right boundary separates the adjective and the noun. No Ø-boundary between the adjective and the noun would therefore be expected.

Whichever of (75) and (76) might be preferable, it is worth mentioning that there are reason to *also* allow a more 'ordinary' structure for adjectives as in (77).

(77)



Abney (1986, p.326) implies that this would seem to be the correct representation for postnominal APs in English (*the man proud of his son, a fish this big*). In Italian, where prenominal APs would have to be represented as in (75) or (76), postnominal APs may in fact extrapose:

(78)(a) Ho letto un libro molto interessante ieri
(I) have read a book very interesting yesterday
'I have read a very interesting book yesterday'

(b) Ho letto un libro ieri molto interessante
(I) have read a book yesterday very interesting
'I have read a very interesting book yesterday'

Extraposed elements are adjoined to VP or IP according to Culicover and Rochemont (1990). The structure-preserving properties of movement thus require that the extraposed element, adjoining to a maximal projection, be itsself a maximal projection, rather than a head alone (see Chomsky (1994) for discussion). The possibility of extraposition for *molto interessante* in (78)(b) therefore

suggests that *molto interessante* is an AP in (78)(b), as well as in (78)(a), the source of that extraposition.

Similarly, postnominal APs in Italian need not be adjacent to the head noun even if they are not extraposed. Thus the example in (79), from Napoli and Nespor (1979, p.827). may have the two meanings indicated.

(79) Voglio una broca d'acqua rossa.
(I) want a pitcher of water red
(a) 'I want a pitcher of red water'
(b) 'I want a red pitcher of water'

In the reading in (b), the adjective *rossa* is separated from the noun *broca* that it modifies by the intervening PP *d'acqua*. This shows once more that postnominal adjectives allow a structure in which the adjective is not incorporated into the noun.

Below, postnominal adjectives in Kimatuumbi will be discusssed (data from Odden (1987, 1990)). These, like Italian postnominal adjectives, may be separated from the noun they modify:

(80) [kikólombe [ya-asikoópu]$_{PP}$ [kikúlú]$_{AP}$]$_{NP}$
shell of bishop large
'large shell of the bishop'

Postnominal adjectives in Kimatuumbi, then, seem to likewise be phrasal syntactically (as indicated): the intervening PP suggests that they are not incorporated into the noun. It will not come as a surprise, then, that postnominal APs in Kimatuumbi also act as XPs for the purposes of phonological phrasing. Thus, we will see that for the purposes at hand, each right edge of XP is aligned

with the right edge of a Ø in Kimatuumbi. Postnominal APs will also be seen to trigger such a Ø-boundary, as in the example in (81).

(81) [kikólombe [kikeéle]$_{AP}$ [chaángu]$_{PossP}$]$_{NP}$ 'my red shell'
shell red mine
)ø)ø brackets due to right-alignment

In summary, the end-based approach to phrasing forces us to acknowledge a syntactic distinction between a more ordinary structure for adjectives, as in (77), and a more 'exotic' structure for adjectives, as in (75) or (76). Given such assumptions about the syntactic structure, the facts of phrasing in connection with the adjectives are captured correctly by the end-based approach.

Even if the details of the structure of adjectives are maybe less then well-understood, such a distinction appears to be plausible on independent grounds syntactically (see again Abney's discussion).

Having spelled out possible assumptions about syntax that would be required for the edge-based approach, let us then ask the following question. Is there evidence from the phrasing of adjectives across languages that would distinguish between these two possibilities: (a) maintaining a simpler syntax for adjectives (i.e. (77) and its mirror image) and attributing their properties of phrasing to the relation-based definition of Nespor and Vogel in (60); (b) allowing for the complications in the syntax of adjectives (i.e. allowing either (75) or (76) in addition to (77)) and adopting the end-based approach. - I believe that the phrasing in Japanese offers such a case.

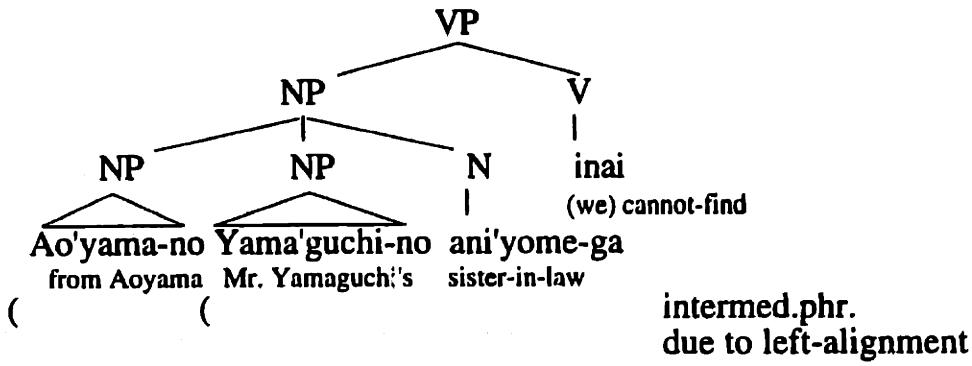
In Tokyo Japanese (see McCawley (1965), Haraguchi (1977), Poser (1984), Pierrehumbert and Beckman (1988)), a HL tone associates with the accent on accented lexical items. This tone will trigger catathesis on following L and H tones. This catathesis will only affect tones that follow the HL accent tone *within the same intermediate phrase.* The effects of catathesis are suspended for tones belonging to other (following) intermediate phrases. This is schematically shown in (82).

(82) (.... HL ↓ ....)$_{\text{intermed.P}}$(...)$_{\text{intermed.P}}$

tones affected by catathesis	tones not affected by catathesis

Selkirk and Tateishi (1991 have studied the relation of intermediate phrases to syntax, and have argued that intermediate phrases are built by aligning the left edge of each XP with the left edge of an intermediate phrase. Thus, in their example in (83) an intermediate phrase boundary is found to the left of each of the NP complements of the object noun. No other left edges of XPs interrupt the string, and no other Ø-boundaries were found in this example.

(83)



'We cannot find Mr. Yamaguchi's sister-in-law from Aoyama'

Since Japanese intermediate phrases are derived by edge-alignment with syntactic phrases, they will here be treated as equivalent to phonological phrases in other languages.

Let us then turn to the syntax and phrasing of adjectives, crucial for the present point. Adjectives, which are prenominal in Japanese, show the peculiar phrasing of prenominal adjectives in Italian: they do not behave as XPs for the purposes of phrasing. Thus Pierrehumbert and Beckman (1988) investigated sentence like (84)(b), and Selkirk and Tateishi (1991) studied the phrasing in the similar sentence in (84)(c). The relevant part of the syntactic structure for both is given in (84)(a). These studies converge in that they showed that there is no intermediate phrase boundary between the two prenominal adjectives.

(84)(a) [A A N]$_{NP}$

(b) ... Kono boro'i ori'mono-no ama'gu
this ragged woven raincoat

(c) Soko-ni uma'i niga'i nori'-ga oite a't-ta
there tasty bitter seaweed was put
'A tasty bitter seaweed was put there'

(85) [[uma'i]$_A$ [niga'i]$_A$ [nori'-ga]$_N$]$_{NP}$

(a) <u>relation-based approach</u>
( )ø( )ø( )ø ø domain
( )ø( )ø ø restructuring

(b) <u>end-based approach</u>
ø(left edge of XP (NP)

Here Nespor and Vogel's suggestion about Italian does not carry over, as shown in (85)(a). Japanese is strictly head-final. The recursive side is therefore the left in Japanese. By (60), then, a head and elements within its projection on the right are grouped together into a ø domain. In Japanese, however, prenominal adjectives are on the recursive side and are thus not integrated with the noun by (60). This

is unlike Italian, where prenominal adjectives are on the non-recursive side and phrased with the noun by (60). Furthermore, ø restructuring in (62) will allow the first adjective to be phrased with the noun as shown, but it will not allow further adjectives (which would be complements in Nespor and Vogel's terminology) to be restructured with the remainder of the NP: the leftmost adjective is not the first complement of the noun.

In this case, then, it appears that we need to appeal to the special syntax of adjectives no matter what the phrasing algorithm. If, in some way, these adjectives behave as heads, as suggested by Selkirk and Tateishi (1991, they will not trigger an intermediate phrase-boundary in the edge-based approach, as shown in (85)(b).

The moral to be drawn from this case is that Nespor and Vogel's definition of ø domain does not appear to get to the bottom the peculiar phrasing of adjectives, since it does not generalize from the right-branching Italian to the left-branching Japanese. It appears to be the case that the properties of phrasing of certain adjectives go back to their special (i.e. non-phrasal) status in the syntax, as first proposed by Clements (1978). Once we allow for provisions in the syntax to this effect, the end-based theory will derive the correct phrasing for them.

2.3.2.4. An argument in favour of Unif/AW

With the issue of the phrasing of adjectives out of the way, let us turn to one of the arguments of Ghini (1993) in favour of his reanalysis of the relational approach. Consider the Italian examples in (86), taken from a series of analogous structures in Ghini (1993, p.60).

(86)(a) (ho-fatto)$_{ø}$ (una-bella vacanza)$_{ø}$
(I) have made a nice vacation 'I had a nice vacation'
(b) (ho-fatto una-bella)$_{ø}$ (vacanza di-mare)$_{ø}$
of sea

In these examples, there is no right edge of XP within the string. This is shown for (86)(b) in (87). The end-based approach will then not require any internal boundaries in this case. Subdivisions of these examples, however, will come about through the rhythmic considerations of *Uniformity and Average Weight* as well as *Increasing Units*. These will lead to a subdivision of the string in (76)(a) into 1+2 proodic words, and the string in (76)(b) into 2+2 prosodic words (the count of prosodic words can be inferred from the representation in (86), where functional elements that jointly form a prosodic word with the following lexical word are followed by a hyphen).

(87) ho [fatto una [bella]$_{A}$ [vacanza di [mare]$_{NP}$]$_{NP}$]]$_{VP}$
)ø boundaries due to alignment with XP
( )ø( )ø subdivision in terms of uniform weight
W W W W

Nespor and Vogel's approach, on the other hand, is able to derive (86)(a), but not (86)(b). The derivation of (86)(a) is shown in (88).

(88) ho-fatto una-bella vacanza

```
[    V  [     A      N    ]NP]VP
(        )ø(              )ø          ø domain
                                      ø restructuring d.n.a.
```

ø domain groups together each head X with the elements on its left, up to the next clitic-group that contains an element outside of XP, the maximal projection of X. Thus it groups the noun together with the preceding adjective within the NP, but it does not include the verb in this ø domain, since the verb is outside of the NP. The clitic-group (phonological word) of the verb will then be grouped together with everything on its left within VP (here: nothing else) into a separate Ø.

Ø restructuring then fails, since the complement that might be restructured is branching - it consists of two phonological words.

This is the correct result. In Ghini's approach it is likewise the count of prosodic words that will require the Ø-subdivision in (73), but for Ghini this is not tied to the internal syntax of the string.

In (86)(b), then, the two theories make different predictions. In Ghini's analysis, where the subdivision is not tied to syntactic structure directly, the 2+2 pattern can be correctly derived, as shown in (87). Nespor and Vogel's analysis, on the other hand, cannot derive this particular binary pattern, as shown in (89).

(89) ho-fatto una-bella vacanza di-mare

```
[   V   [     A       N     [  N    ]NP]NP]]VP
(       )ø(                )ø(       )ø      Ø domain
(       )ø(                          )ø      Ø restructuring
```

The phrasing in (87), then, cannot be derived by Nespor and Vogel's proposal. The relation-based approach here fails in two regards: first, the prenominal

adjective is initially phrased with the noun. Once such phrasing is established, it cannt be broked up again in Nespor and Vogel's account. Second, even if the initial phrasing could be rearranged, the adjective would still not qualify for restructuring with the verb, since the adjective is not a complement of that verb. Thus suggests that the ties that Nespor and Vogel establish for linking the weight-effects to syntactic structure in their restructuring-rule is not correct. The approach of Ghini, in which larger Øs are first established by edge-alignment with XPs, which are then subject to further subdivision, appears to be closer to the correct account of Italian phrasing.

I conclude the section on phrasing algorithms.
I have introduced Selkirk's end-based theory as well as Nespor and Vogel's relation-based theory. Ghini's proposal, which reanalyses the core case of the latter in terms of the former, allowed us to compare the two approaches. The discussion also allowed me to bring up the issue of weight in prosodic structure as well as the syntax and phrasing of adjectives.

In the remainder of this thesis, I build on Selkirk's end-based approach.

CHAPTER 3:

ON THE ROLE OF GOVERNMENT AND CONTAINMENT IN THE SYNTAX-PHONOLOGY MAPPING

Introduction

In this chapter, I argue for a reanalysis of a proposal by Hale and Selkirk (1987) for the construction of phonological phrases. I argue that the factor that Hale and Selkirk identified as 'government' in the construction of phonological phrases should be represented as a separate constraint in a conflict-driven theory of the syntax-prosody mapping: Each lexically headed XP must be contained inside of a Ø.

I proceed as follows: I first present the issue, introduce Hale and Selkirk's suggestion for the construction of phonological phrases, and my modification thereof. I demonstrate how the modified proposal retains Hale and Selkirk's results in the analysis of Tohono 'O'odham (Papago).

In the bulk of the paper I discuss the differences in phrasing between three Bantu languages, Chi Mwi:ni, Chichewa, and Kimatuumbi. An analysis of the differences in terms of the proposed constraint is offered, and arguments against an analysis in terms of Hale and Selkirk's government parameter are given.

3.1. Government and alignment in Tohono 'O'odham

3.1.1. Background

Sellkirk's end-based theory of phrasing introduced in Chapter 2 (see Selkirk (1986), Hale and Selkirk (1987), Selkirk and Tateishi (1988), Selkirk and Shen (1990)) was formulated in Selkirk and Shen (1990) as in (1).

(1) The Syntax-Phonology Mapping

For each category C^n of the prosodic structure of a language there is a two-part parameter of the form

C^n: {Right/Left; X^m}

where X^m is a category type in the X-bar hierarchy.

A syntactic structure - prosodic structure pair satisfies the set of syntax-phonology parameters for a language iff the Right (or Left) end of each constituent of type X^m in syntactic structure coincides with the edge of constituent(s) of type C^n in prosodic structure.

Thus languages may construct a level of constituents C^n of the prosodic hierarchy by inserting a C^n-boundary to the Right or Left of each syntactic category X^m. Consider some examples where C^n is the phonological phrase (Ø). In Chi Mwi:ni, discussed in Chapter 2, a boundary of a phonological phrase must coincide with the *right* of each X^m = XP in the proposal of Selkirk (1986). This is reviewed in the example (2).

(2) Chi Mwi:ni

[[nimwan<u>d</u>ikilile]$_V$ [Nu:ru]$_{NP}$ [xati]$_{NP}$]$_{VP}$

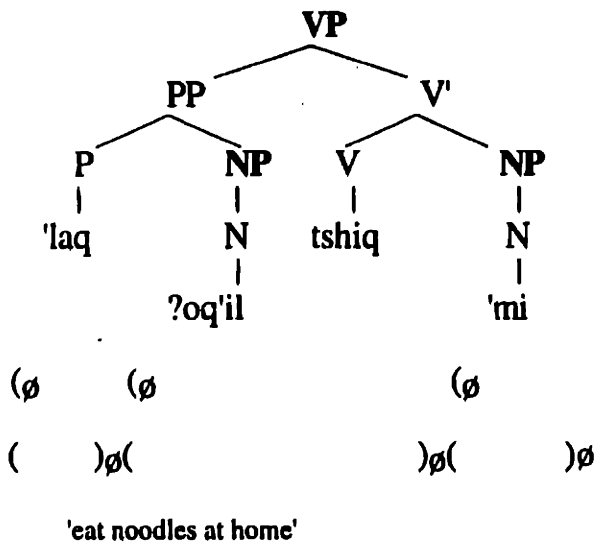
)ø)ø right Ø-boundaries coincide with right XP-boundaries

( )ø( )ø resulting Ø-structure

'I wrote Nuru a letter'

In Shanghai, on the other hand, where certain tonal phenomena indicate phonological phrase boundaries, the *left* of each *lexically headed* XP must coincide with the edge of a phonological phrase, as argued by Selkirk and Shen (1990). The example in (3) is taken from their discussion.

(3) Shanghai



In the framework of (1), the following parameters have been proposed for phonological constituents derived from XPs (with no claim to exhaustivity):

(4)	{Right, XP}	Chi Mwi:ni Italian	(Selkirk 1986) (Ghini 1993)
	{Left, XP}	Japanese Korean	(Selkirk and Tateishi 1991) (Silva 1989)
	{Left, XP - where X is lexical}	Shanghai	(Selkirk and Shen 1990)
	{Right, XP - where XP is not lexically governed}	'O'odham (Papago)	(Hale and Selkirk 1987)

Recently, McCarthy and Prince (1993) have generalized a format such as (1) in Optimality Theory like in (5).

(5) *Generalized Alignment* [informal version]
$Align(Cat_1, Edge_1, Cat_2, Edge_2) =_{def}$
For each Cat_1 there is a Cat_2 such that $Edge_1$ of Cat_1 and $Edge_2$ of Cat_2 coincide.

Where Cat_1, Cat_2 are prosodic, morphological or syntactic categories and
$Edge_1, Edge_2 \in \{Right, Left\}$

Selkirk (1995) adopts and further develops this proposal. Among the constraints she proposes are the ones in (6).

(6)(a) Phonological word (PWd)
Align(Lex, L, PWd, L)
Align(Lex, R, PWd, R)

(b) Phonological phrase (Ø)
Align(Lex^{max}, L, Ø, L)
Align(Lex^{max}, R, Ø, R)

I will refer to the two constraints in (6)(b) as *Align-XP,L* and *Align-XP,R*, or *Align-XP* when both are jointly talked about.

In this modified theory, the parametrizations of (1) in (4) find their place as follows.

Left/Right. This parameter is retained, built into the general format in (5).[1]

Specifications of X^m in (1)/(4):

X^m must be lexical. Selkirk (1995) proposes that the constraints of the syntax-phonology mapping *generally* see lexical categories only, and do not see functional categories. Thus *Lex* in (6)(a) stands for the head of a lexical category, and *Lex^{max}* in (6)(b) for the maximal projection of a lexical category. In other words, X^m in (1) must be lexical universally in the new proposal, and there is no parameter left in this regard.

---

[1]This raises certain questions in the framework of Optimality Theory where, by assumption, constraints are universal, and languages only differ with respect to their ranking. Given what we know so far, it appears that languages will have left-alignment or right-alignment of XP with Ø, but not both. One might therefore object to the proposal discussed here that it predicts that there should be languages with both Align-XP,R and Align-XP,L ranked significantly high. In these languages, alignment of XPs with Øs of both left and right edges should be found. It turns out that this apparently undesirable prediction of Align-XP disappears on the reanalysis of Align-XP proposed later in this thesis. However, our knowledge of Ø-formation across languages appears to me to be too limited at present to say with any certainty if this is really a problem for the theory using Align-XP.

Level of projection. An assumption that is already present in Selkirk (1986) is made principled in Selkirk (1995): Syntactic heads are relevant for the construction of phonological words, whereas syntactic maximal projections are relevant for the construction of phonological phrases. There are no parameters left in this regard.

In the present work, I take (6)(b) (or the alternatives to it developed below) to *define* the notion of the *phonological phrase*: The phonological phrase is that entity of the prosodic representation that is derived in a systematic way from syntactic phrases.

This reformulation of (1) in (6) leaves one of the parameters in (4) stranded: What happens to the role of government in the characterization of X^m? That is the topic of the present chapter.

3.1.2. Where lexical government makes a difference

To see the government parameter, let us look at Tohono 'O'odham (Papago[2]), the language that Hale and Selkirk (1987) use to demonstrate the role of government on phonological phrasing (see also Hale (1976) and Hale, Jeanne and Platero (1979) and Pranka (1993) on phonological phrasing in 'O'odham). In 'O'odham, evidence for the relevant domain comes from the distribution of tones. Hale and Selkirk call this domain the 'tonal phrase'. Each tonal phrase is characterized by a

[2]The Tohono 'O'odham, literally 'desert people', have recently decided to abandon the name 'Papago', given to them by the white people, back to their original name for themselves. In the following, I will sometimes use the short form 'O'odham, as do the 'O'odham people themselves, .

(L)HL contour. According to Hale and Selkirk (1987), this contour is associated as follows:

(7) Association of (L)HL contours to tonal phrases
(Hale and Selkirk 1987, p.152f)

a. Associate H to each stressed vowel and to all vowels in between. [a 'stressed' vowel here is a vowel with word-stress, H.T.]
b. Associate the lefthand L to each unstressed vowel preceding the first stress in the tonal phrase, otherwise delete it.
c. Associate L to each unstressed vowel following the last stress in the tonal phrase.
d. Associatee L to the last stressed vowel in the tonal phrase, if that is also the last vowel.

This is shown in the example in (8) with two tonal phrases, each characterized by the (L)HL tonal pattern. As stated in (7), the H in the first tonal phrase stretches from the first syllable with word-stress (*wa* in *wakial*) to the last syllable with word-stress in the same tonal phrase (*ce* in *cepos*).

(8)

```
(          xw     xw    )tp(    xw )tp
 Na-t g wakial cepos    g wisilo
  |      \  |  /  |       | V
  L        H     L       H L
```

Q-AUX$_{PERF-3.SG}$ DET cowboy brand$_{PERF-SG}$ DET calf
'Did the cowboy brand the calf?'

The 'tonal group' of Hale and Selkirk is derived from syntactic XPs, as will be seen momentarily. I will therefore call it 'phonological phrase' in the following, in accord with the terminological stipulation of the preceding section that phonological domains constructed on the basis of syntactic XPs are phonological

phrases. Let us then turn to the way in which these phonological phrases are constructed from the syntax. Consider first the 'O'odham examples in (9)[3].

```
(9)(a)        Húsi    mí:stol-ga
              Joe's   cat-POSS                    'Joe's cat'
            [ [     ]NP N      ]NP

      ok:   (  H H    H L   L )ø
      not:  (  H L)ø( H  L   L )ø

(b)           N-at        g wákial     g wísilo    cépos
              Q-AUXPERF-3.SG DET cowboy  DET calf    brandPERF-SG
                        [[          ]NP [        ]NP V        ]VP

      ok:   (  L          H H        H HH   H L )ø
      not:  (  L          H L  )ø(   H HH   H L )ø
      not:  (  L          H L  )ø(   H LL )ø(H  L )ø

            'Did the cowboy brand the calf?'

(c)           N-o         g gógs       g Húsi   mí:stol-ga   húhu'id
              Q-AUXIMPERF-3. DET dog     DET Husi's  cat-POSS    chaseIMPERF
                        [[       ]NP [[       ]NP N       ]NP   V    ]VP
      ok:   ( L           H          H H   H H   H    H LL  )ø
      not:  ( L           HL )ø (    H H   H H   H    H LL  )ø
      not:  ( L           HL )ø (    H H   H L   L)ø( H LL  )ø
      not:  ( L           HL )ø (    H L)ø(H L   L)ø( H LL  )ø
                                  'Is the dog chasing Husi's cat?'
```

The Ø-boundaries in these examples are placed neither consistently to the right, nor consistently to the left of maximal projections. If Ø-boundaries would be placed to the right of every XP, there should be one at the right edge of each NP, as in the last unatteted phrasings in (9)(a), (b) and (c). If Ø-boundaries were placed to the left of each XP, there should be Ø-boundaries between the first and the second NP in (9)(b) and (c), as shown in the first unattested phrasings in these examples. Yet the strings in (9)(a), (b), and (c) are not interrupted by Ø-

[3]Here and in the following word-stress is indicated on the vowels by an accent egu [´].

boundaries in 'O'odham. In this regard the 'O'odham patterns in (9) contrast with the ones shown for Chi Mwi:ni and Shanghai in (2) and (3) above.

Hale and Selkirk propose that this is due to the impact of lexical government on phrasing in 'O'odham: the embedded NPs are governed by lexical heads: by N in (9)(a), and by V in (9)(b) and by N or V in (9)(c). Hale and Selkirk thus propose the phrasing-algorithm in (10) to account for this peculiarity of phrasing in 'O'odham. Further evidence for that proposal will be reviewed in the next pages.

(10) *Tohono 'O'odham*: The right edge of each maximal projection *XP that is not lexically governed* must coincide with the boundary of a tonal group (here: Ø-boundary).[4]

(10) accounts for there not being Ø-boundaries to the right or left of the embedded NPs in (9), for these NPs are lexically governed by a higher N or V, and thus do not trigger Ø-boundaries by (10).

The purpose of this chapter is to argue that the role of government in (10) should be captured by the constraint in (11).

(11) **Wrap-XP**: Each lexically headed XP must be contained inside a Ø

A formal definition of (11) is given in (12).

---

[4]The wording is adpted from the original, preserving the content of Hale and Selkirk's proposal.

(12) **Wrap-XP** ⇔

for every XP, XP a projection of a lexical category,

there is a phonological phrase Ø,

such that all terminal elements that are dominated by XP
are also dominated by Ø.[5]

(12) and thus (11) is violated if, say, a *VP* dominating *V* and *NP* is split up by a Ø-boundary in a non-recursive structure such as $(V)_{\emptyset}(NP)_{\emptyset}$, for in that case there is no Ø that dominates (contains) all the terminals of the *VP*. On the other hand, if *V* and *NP* are both in the same Ø, such as in $(V\ NP)_{\emptyset}$ or $(...V\ NP...)_{\emptyset}$, then (12) and thus (11) is met, for there is a Ø that contains all elements dominated by VP in the syntax.

How does (11) handle the cases in (9)?
In languages in which 'government' matters for the formation of Øs, Wrap-XP in (11) is ranked above Align-XP in (6)(b). Thus in Tohono 'O'odham, the two constraints in (13), ranked as indicated, are at work (preserving Hale and Selkirk's suggestion that right edges rather than left ones matter in 'O'odham).

(13) Tohono 'O'odham (Papago): Wrap-XP >> Align-XP,R

These constraints will be in conflict when one XP is inside another one, as in the cases in (9): The embedded NPs in (9) would like to have a Ø-boundary to the

---

[5]For a given XP, the constraint can be violated only once: Either an XP is contained inside of a Ø, or it is not. However, Wrap-XP can be violated by more than one XP in a single structure that undergoes the syntax-prosody mapping, if more than one XP fails to be contained inside of a Ø.

right of them, by Align-XP,R. If they did, however, there would be a Ø-boundary within a higher XP, the upper NP in (9)(a), the VP in (9)(b), or both in (9)(c). This would violate Wrap-XP by splitting up the higher XP into multiple Øs. Since the latter constraint is ranked higher than the former in 'O'odham, no Ø-boundary will be created to the right of the embedded NPs. This is shown in (14).

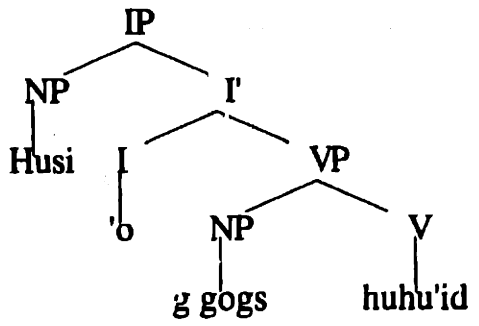
(14)	$[_{NP_1}$ NP_2	N_1]	Wrap-XP	Align-XP,R	
	(Husi)ø(mi:stol-ga)ø		*!		(NP_1 split up)
$	(Husi	mi:stol-ga)ø		*	(NP_2 has no r. edge)

3.1.3. Lexical vs. functional projections

One piece of evidence that lexical government is indeed crucial in 'O'odham phrasing comes from the phrasing of clause-initial constituents.

Every 'O'odham clause contains a finite auxiliary, analysed as I(nfl) by Hale and Selkirk. In matrix declaratives, the auxiliary is preceded by an XP, either the subject as in (15), or another maximal projection from within the clause.

(15)



Husi AUX$_{IMPERF-3}$ DET dog chase$_{IMPERF-3}$
'Husi is chasing the dog'

This initial XP is in SPEC,IP in Hale and Selkirk's analysis. There it is governed by Infl on the assumptions about government that Hale and Selkirk adopt from Chomsky (1986), but crucially not *lexically* governed. Infl, the governor, is a functional element. The government-parameter in (10) correctly predicts that this initial XP is always phrased separately in the prosody: Not being lexically governed, XP triggers a Ø-boundary to its right. This is shown for the present example in (16).

(16) H L L L H H LL
(x)(x x)
Husi 'o g gogs huhu'id

In the reanalysis defended here, this distinction is expressed by the assumption in (11) that (11) only apply to lexically headed XPs. It follows that Wrap-XP does not apply to the functional projection IP in (15). Therefore Align-XP,R can introduce a Ø-boundary to the right of the initial XP, without thereby splitting up a higher *lexical* XP: the IP, containing the initial XP, is not a lexical projection. The tableau for this case is given in (17).

(17)	[$_{IP}$ XP Aux ...]	Wrap-XP	Align-XP,R	
$	(Husi)ø('o g gogs huhu'id)ø			
	(Husi 'o g gogs huhu'id)ø		*!	(XP has no r.edge)

In the framework of Selkirk (1995), adopted here, the asumption that Wrap-XP only applies to lexical projections goes back to the same principled assumption that restricts the application of Align-XP to lexical projections: the syntax-prosody mapping sees lexical projections but ignores functional ones.[6]

---

[6]But see also the remarks on intonational phrases at the end of this chapter.

On this account, then, the constraints for Ø-construction that we looked at so far are summed up in (18).

(18) Constraints for Ø-construction (for XP a lexical maximal projection)

(a)	Align-XP,R	Align(XP,R,Ø,R)
(b)	Align-XP,L	Align(XP,L,Ø,L)
(c)	Wrap-XP:	Wrap(XP,Ø): Each XP must be contained inside a Ø.

3.1.4. Left-right asymmetries in Tohono 'O'odham, and the category-segment distinction

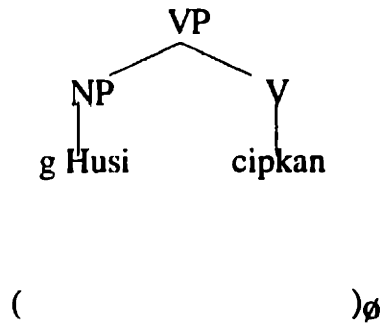
Another piece of evidence for the role of lexical government in phrasing comes from left-right asymmetries in 'O'odham. In the cases we derived so far, the embedded element was always to the left of the higher head. In these cases the embedded element is not phrased separately, as we have seen. However, when the dependent element occurs to the right of the higher head, it is systematically phrased separately. Thus we find the contrasts in (19).

(19)

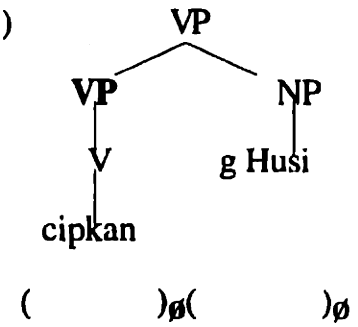
(a)	(b)
H H H L (Husi mi:stol-ga)ø Joe's cat-POSS	H L H L (mi:stol-ga)(g Husi)ø
L H H H L (No g Husi cipkan)ø Q-AUX DET Joe work	L H L H L (No cipkan)(g Husi)ø
L H H H L ('am do'ag we:gaj)ø LOC mountain behind	L H L H L ('am we:gaj)('g do'ag)ø

Hale and Selkirk relate this asymmetry to the different phrase-structure in the two cases. They give syntactic arguments that in (19)(a), the embedded NPs are inside of the higher projections and governed by their heads, as shown in (20)(a). The examples in (19)(b), on the other hand, arguably involve right-adjunction of the NPs, as shown in (20)(b).

(20)(a)



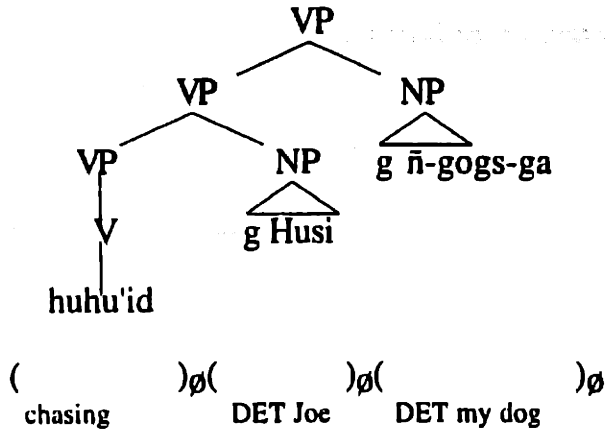
(b)



In Hale and Selkirk's account, then, the lower segment of VP in (20)(b), boldfaced there, will trigger a phonological boundary to its right.

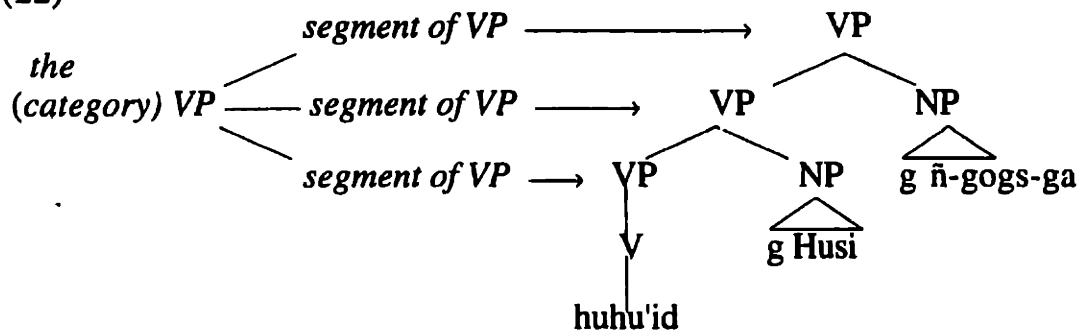
When more than one constituent is extraposed, as in (21), they are each separated by Ø-boundaries. The boundaries between extraposed constituents, such as the one between *g Husi* and *g ñ-gogs-ga* in (21) are triggered in two ways in Hale and Selkirk's account: first, by the higher segments of the category adjoined to (VP in (21)), and second, by the extraposed constituents themselves, which are not governed and thus trigger a Ø-boundary to their right.

(21)



Before I turn to the reanalysis of these cases in terms of Wrap-XP, let me pause to clarify the syntactic terminology of adjunction structures. When an element is adjoined to another one, as the NPs in (20)(b) and (21) are adjoined to VP, the structure of adjunction, called Chomsky-adjunction, involves one *category* that consists of more than one *segment*. Thus in (21), repeated with annotations in (22), there are *three segments* of VP (three nodes in the tree-representation) which jointly constitute *a single category* VP (the maximal projection of the verb *huhu'id*, in this case). When we sloppily talk about 'the VP', what we mean is 'the category VP', even though, confusingly, the category VP consists of three segments, each represented by a VP-node in the tree.

(22)

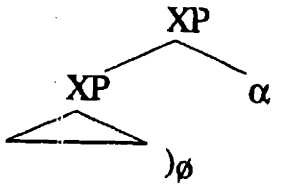


The question arises, in this configuration, whether the elements that are adjoined to VP (the NPs in (20)(b) and in (21)) are inside of the (category) VP or not, i.e. if

they are dominated by the (category) VP or not. Pretheoretically, either possibility might seem plauxible: The adjoined elements in (22) might be said to be within the category VP since they are each dominated by at least one segment of the category VP. On the other hand, the adjoined elements might be said to not be inside of the category VP, since they are not dominated by *every* segment of that category VP. Thus, in (22), the NP *g ñ-gogs-ga* is dominated by the highest segment of VP, but not by the two other segments of VP. Likewise, the NP *g Husi* in (22) is dominated by the higher two segments of VP, but not by the third segment of VP.

May (1985) and Chomsky (1986) have argued that adjoined elements are not contained in the category that they are adjoined to for certain purposes of the syntax. I will demonstrate formally in the appendix to this chapter the proposal by May and Chomsky generalizes to the syntax-prosody mapping on natural assumptions. These will have the consequence that elements that are adjoined to XP are treated as though they were outside of XP. Wrap-XP and Align-XP will thus treat adjuncts to XP as elements not belonging to VP. By consequence, Align-XP,R will trigger a Ø-boundary to the right of what is genuinely inside of XP, as sketched in (23).

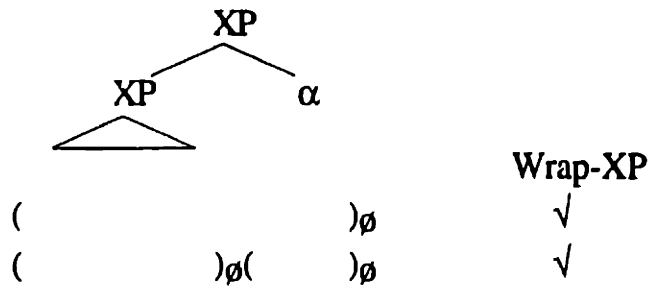
(23) Application of Align-XP,R to XP in a structure of adjunction



Similarly, Wrap-XP demands that elements genuinely inside of an XP are wrapped into a single Ø, but doesn't care whether elements adjoined to XP (and outside of

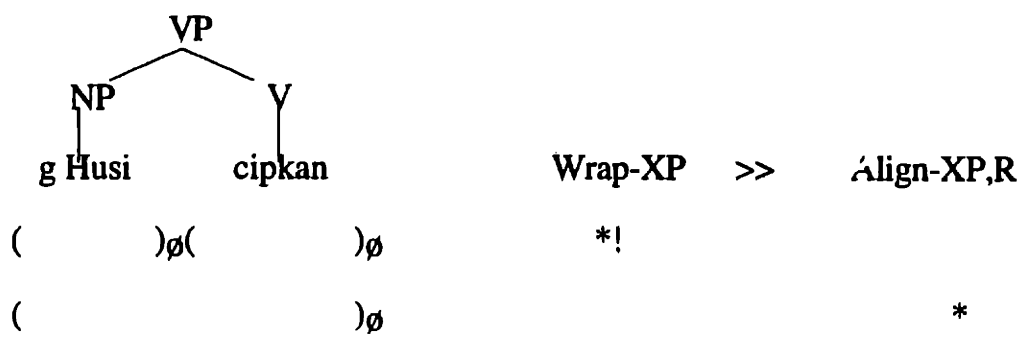
XP in the relevant sense) are wrapped in with the material genuinely inside of XP. Thus Wrap-XP will tolerate either phrasing in (24).

(24)



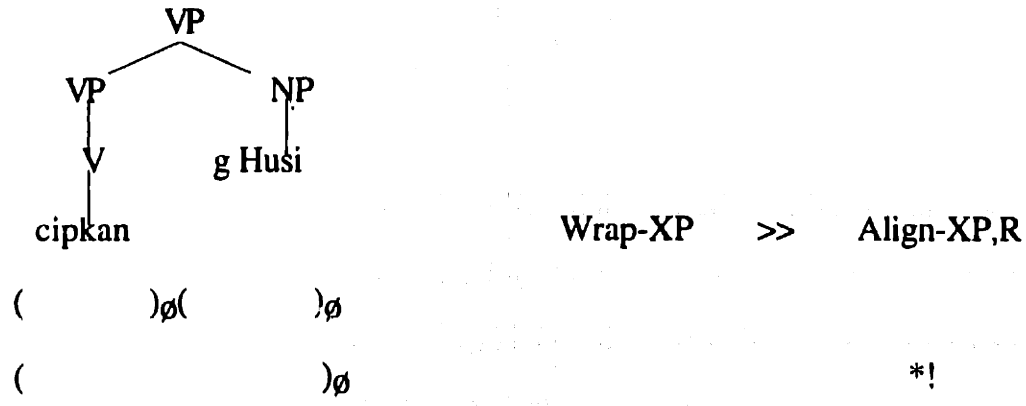
On these assumptions, then, which will be formally derived in the appendix, Wrap-XP draws the correct distinction between the structures in (20)(a) and (20)(b). Thus in (20)(a), where the NP is genuinely inside of VP, Wrap-XP will demand that NP and are phrased together, as shown in the tablea in (25) (this is analogous to (14) above). Insertion of a right edge after the NP is thus suppressed by the superordinate Wrap-XP in these structures.

(25)



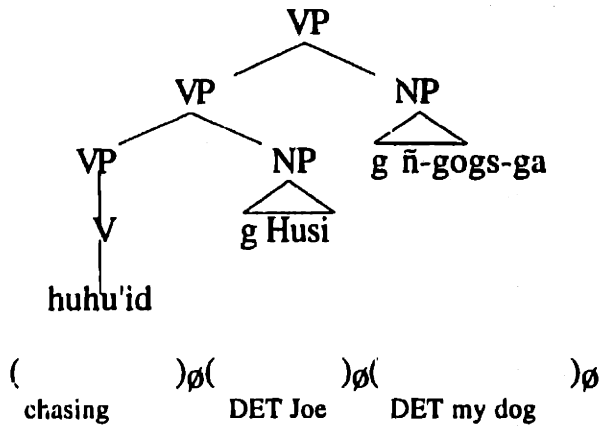
In the adjunction-structure in (20)(b), on the other hand, Wrap-XP doesn't care if the adjoined element is phrased separatel (see (24)), and Align-XP,R will trigger the insertion of a Ø-bounary to the right of the lower segment of VP (see (23)). In the resulting structure, V and NP are thus phrased separately.

(26)



In this account, then, the VP will be represented, informally, by its lowest segment. In a structure like (21), repeated here, the Ø-boundary between the adjuncts is then triggered by the first adjunct, an XP which wants to have its right edge coincide with a Ø-boundary by Align-XP,R.

(21)



This concludes the discussion of the crucial cases that Hale and Selkirk used to motivate the role of government in phonological phrasing. In the present

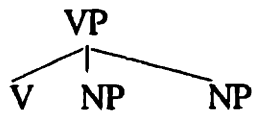
reanalysis, the constraint Wrap-XP derives the government-effects: The overriding effects of Wrap-XP prevent Align-XP from inserting a Ø-boundary after every XP. It is only in cases in which Wrap-XP does not prevent Align-XP from triggering a Ø-boundary, as in the case of initial XPs under IP (as in (17)), or in the case of adjoined structures (as in (26)) that Align-XP ends up actually triggering a Ø-boundary at the right edge of an XP.

I will now turn to independent evidence for the constraint Wrap-XP as opposed to the government parameter in phonological phrasing.

3.2. Three Bantu languages

I will argue that there are three kinds of languages with regard to the conflicting demands of Align-XP and Wrap-XP. These are here exemplified with the three Bantu languages Chi Mwi:ni, Chichewa, and Kimatuumbi. I will argue that these show the respective phrasing-patterns in (27) in a configuration of a syntactic head with two complements.

(27)



Chi Mwi:ni	(	)ø(	)ø
Chichewa	(		)ø
Kimatuumbi	((	)ø	)ø

Chi Mwi:ni has the ordinary edge-alignment pattern due to Align-XP,R. Chichewa, on the other hand, is a 'government'-kind language, akin to 'O'odham.

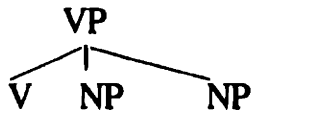
The existence of languages of these two types is predicted by both the government-theory and by the theory using Wrap-XP:

In the government-theory, languages may choose to align the (right) edges of all XPs with Øs, as in Chi Mwi:ni, or only the (right) edges of not lexically governed XPs, as in 'O'odham and Chichewa: the objects in (27) are lexically governed, and therefore would not trigger Ø-boundaries.

In the theory developed here, the constraints Align-XP and Wrap-XP are in conflict in the configuration of a head with two arguments: Align-XP demands a Ø-boundary between the arguments, but Wrap-XP demands for the projection of the head (VP in (27)) to be wrapped into a single Ø. Language-specific ranking will determine the outcome: If Align-XP wins, as in Chi Mwi:ni, there will be a Ø-boundary between the objects. If Wrap-XP wins, as in Chichewa, there will be no Ø-boundary between the objects, and the whole VP will be contained inside of a single Ø.

It turns out, however, that we find yet another way in which natural languages solve the conflict between Wrap-XP and Align-XP. This is exemplified by Kimatuumbi. Here both Align-XP and Wrap-XP get what they want, as shown in (27). Align-XP is met in this structure, since the smaller Ø has its right edge aligned with the right edge of the first object. Wrap-XP is simultaneously met since there is a large Ø that contains the whole VP. Kimatuumbi, in a sense, has both the structure of Chi Mwi:ni and the structure of Chichewa combined. This, however, is possible only in a recursive structure. We can integrate this additional case into the typology if we take the constraint Nonrecursivity from Selkirk (1995) into account: Nonrecursivity punishes recursive structure. It is met in the Chichewa and Chi Mwi:ni structures in (27), but violated in Kimatuumbi. The three languages thus each violate one of three constraints, as shown in (27').

(27')



				Wrap-XP,	Align-XP,	NonRec.
Chi Mwi:ni	(	)ø(	)ø	*		
Chichewa	(		)ø		*	
Kimatuumbi	((	)ø	)ø			*

Therefore, by ranking these constraints, we will be able to derive the observed three kinds of languages.

The argument against the theory of phrasing in terms of a government-parameter then goes as follows. In that theory, government may or may not be crucial in a given language for deriving phonological constituents from XPs. We expect, then, that government is either relevant, as in Chi Mwi:ni, or irrelevant, as in Chichewa. Kimatuumbi, however, shows us that the government-pattern and the non-government pattern can coexist within a single language. In this case, then, the two patterns cannot be derived by the parameter: Either parameter-setting (government is relevant or irrelevant) will only derive half of the facts. The theory in terms of constraints, on the other hand, does not have these problems: The relevant factors Align-XP and Wrap-XP are present in all languages. Even though in most languages, the effects of one will override the other, it can also be represented that both show their effects in a single language.

Further, it will be seen that the Ø-boundary between the objects that distinguishes Chichewa and Chi Mwi:ni emerges in Chichewa as well in a configuration involving focus. It will be shown that this follows from the account

using Wrap-XP as a ranked constraint, but is unexpected in the original formulation of the government parameter.

3.2.1. Chichewa

Since the Chi Mwi:ni facts were already presented in Chapter 2, I begin by outlining the facts of phrasing in Chichewa. These will then be contrasted with Chi Mwi:ni and the difference between the two will be accounted for in terms of the ranking of Align-XP and Wrap-XP.

Kanerva (1989), see also Kanerva (1990) as well as Bresnan and Mchombo (1987), Bresnan and Kanerva (1989) discusses a level of phonological phrasing in Chichewa that is intermediate between the phonological word (subsuming the clitic group) on the one hand, and the intonational phrase on the other. Given the prosodic hierarchy, this level of phrasing would be a natural candidate for the phonological phrase, as Kanerva notes himself. Kanerva, however, is reluctant to identify this level with the phonological phrase, since he takes into account how focus can manipulate this level of phrasing in Chichewa. Since none of the theories of phrasing suggested in the literature can predict these focus-effects, Kanerva calls the relevant constituents 'focal phrases' and suggests an algorithm for their construction that takes the sensitivity to focus into account.

Here I will take this level of prosodic structure to be the phonological phrase - for one thing because of Kanerva's observations about how it fits into the prosodic hierarchy, for another, since we can derive its configurations (focus apart) with one of the theories that accounts for the 'O'odham patterns of phrasing. Kanerva (1989) observed himself that - if it were not for the focus - the Chichewa phrasing

could be derived by Hale and Selkirk's (1987) theory of government in phonological phrasing.

The effects of focus on phrasing in Chichewa, which I believe should be handled separately, will be discussed later in this chapter, as well as in Chapter 5.

3.2.1.1. The phonological rules sensitive to Øs in Chichewa

Kanerva discusses four phonological rules sensitive to Øs in Chichewa.

The first, Lengthening, lengthens the penultimate vowel in the phonological phrase.

(28) Lengthening $0 \rightarrow V \mid __ \sigma)_{\emptyset}$

(29)(a)	mteéndo	'visitor'	mlendó uuwu	'this visitor'
(b)	mtéengo	'tree'	mténgó uuwu	'this tree'

In a more motivated formulation of this process, one would like to relate it to prominence. Thus, even though phrase-final lengthening is also attested phoneticaly as a boundary-phenomenon, this latter process lengthens material genuinely at the end of a phrase and does not skip a syllable at the end to lengthen just the penultimate vowel (see Klatt 1975, 1976, 1979, Whightman et.al. 1992).

Kanerva indeed motivates the existence of a word-final trochee in Chichewa on indepedent grounds. This trochee thus can be connected to prominence in penultimate position. However, not any kind of prominence will do for the purpose of Lengthening. Thus Kanerva (1989) argues that lexical words generally end in a word-final trochee. Furthermore, Kanerva argues, lexical word structure is generally assigned, such that a verb and a following noun will each be a separate Prosodic Word.

(30)

```
      x          x
(     x   )W ( x    )W
   (      )Ft (      )Ft
ku-lúma     fúupa
```

'to bite the bone'

These phonological words would thus generally have penultimate prominence. Yet not all prominent (penultimate) syllables are lengthened, but only the ones on the final word in the phonological phrase. This suggests that the trigger for Lengthening is not just any prominence, but in fact specifically phrasal prominence - the head of a phonological phrase. We derive this by the constraint Align(Ø, R, $x_{ø}$, R), 'Align the right edge of every Ø with the right edge of a $x_{ø}$'. This constraint assigns phrasal prominence rightmost within Ø. If word-stress falls on the word-final trochee, phrasal stress in the last word in Ø then likewise falls on that syllable, as in (31).

(31)

```
                  xø
(     x          x    )ø
(     x   )W ( x    )W
   (      )Ft (      )Ft
ku-lúma     fúupa
```

'to bite the bone'

This then allows for a plausible and motivated statement of the environment of Lengthening in terms of phrasal stress: Lengthening applies in the environment of phrasal stress:

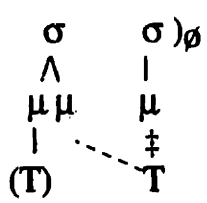
(32) Lengthening

$$0 \rightarrow \mu \mid \underset{__}{\overset{x_{\emptyset}}{}}$$

Lengthening then correctly applies in the second, but not the first word in (31). Since, by assumption, phrasal stress is assigned with regard to the phonological phrase, Lengthening can still serve as a test for Ø-structure, even if it is not itself sensitive to the boundary, but to the head of Ø-constituents.

Kanerva's second rule is tonal Retraction. The lengthened penultimate syllable attracts the tone of the final syllable. The geometry of this process is given in (33).

(33) Retraction

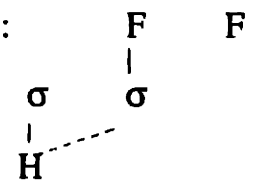


Thus in (29)(a) above, *mlendó* has an underlying final H tone which surfaces in word-final position so long as this is not also the phrase-final position. In phrase-final position, the H tone is retracted to the preceding long syllable, triggering a rising LH tonal pattern on that syllable.

Another rule sensitive to Øs in Chichewa is Nonfinal Doubling. It spreads a H tone onto the following syllable, unless the target syllable is within the Ø-final

trochee. Thus in (29)(b) above, the underlying H tone on *mténgo* spreads to the following syllable in *mténgó uuwu*. Doubling is blocked, however, within the Ø-final foot as in *mtéengo*. It is also blocked from outside of the domain-final foot into the domain-final foot. Thus even though Nonfinal Doubling goes freely across words, as in *tinabá chíkwaa^{n}je* from *tinabá chikwaa^{n}je*, 'we stole the bush knife', it does not spread the H of *mlendó* in (29)(a) onto the following syllable in *mlendó uuwu*, since the following syllable here is within the Ø-final foot. Kanerva's formulation of Nonfinal Doubling is given in (34).

(34) Nonfinal Doubling:



The fourth rule, Pre-High Doubling, will be omitted here, since its sensitivity to Øs is not clear and turns on certain assumptions about simplicity in rule-application.

3.2.1.2. Phrasing in Chichewa

The Ø-sensitive rules in Chichewa then diagnose the following domains. A head is phrased together with a following complement or other element within the same projection, as shown in (35).

(35)(a)	[N PP]$_{NP}$	x
	( )$_{ø}$	(^{n}jingá yá nqáána)$_{ø}$
		'bicycle of child'
(b)	[N AP]$_{NP}$	x
	( )$_{ø}$	(^{n}jingá yábwiino)$_{ø}$
		'good bicycle'
(c)	[P NP]$_{PP}$	x
	( )$_{ø}$	(^{m}páká máana)$_{ø}$
		'until tomorrow'
(d)	[V NP]$_{VP}$	x
	( )$_{ø}$	(tinabá gáálu)$_{ø}$
		'We stole the dog'

Subject and VP, as well as coordinated NPs, on the other hand, are phrased separately.

(36)(a)	[NP VP]	x	x
	( )$_{ø}$( )$_{ø}$	(fíisi)$_{ø}$	(anadyá ´m-káa^{n}go)$_{ø}$
		'The hyena ate the lion'	
(b)	[NP & NP]	x	x
	( )$_{ø}$( )$_{ø}$	(miléeme)$_{ø}$	(^{n}di ^{n}júuchi)$_{ø}$
		'bats and bees'	

This much, then, is analogous to what we saw about Chi Mwi:ni in Chapter 2, and one would want to account for it in an analogous way: Align-XP,R is reponsible for the Ø-boundaries in these cases. Thus, there is no right edge of XP between a head and a following complement as in (35), therefore no Ø-boundary is found in this position. There is, however, a right edge of XP in the place where a Ø-boundary is found in (36), and this could be correctly derived by Align-XP, R. Note that left-edge alignment is not an alternative here, since Align-XP,L would wrongly predict Ø-boundaries in (35): even though no right edge of an XP separates a head and a following complement, there is certainly a left edge of XP between the two: the left edge of the complement.

However, as Kanerva notes, the end-based approach with no further addition does not correctly derive other patterns of phrasing in Chichewa. Thus in Chichewa, a head with two complements enters into a single phonological phrase.

(37)(a) Chichewa

[$_{VP}$ V NP NP]
( )ø

x
(anaménya nyumbá ndí mwáála)ø
1-REC.PST-hit 9.house with 3-rock
'He hit the house with a rock'

(b) [$_{VP}$ V [$_{NP}$ N NP] NP]
( )ø

x
(a-dzá-ónetsa mfúmú y-á á-lenje gaálu)ø
1-Fut-show 9.chief 9-ASC 2-hunter 1.dog
'He will show the chief of the hunters the dog'

Here Align-XP,R would wrongly derive a Ø-boudary after the first object.

In this regard Chichewa differs from Chi Mwi:ni where the predicted Ø-boundary after the first of two objects was found. The relevant examples from Chi Mwi:ni are repeated here.

(38) Chi Mwi:ni

(a) [V NP NP]
( )ø( )ø

x x
(panzize cho:mbo)ø (mwa:la)ø
'he ran the vessel onto the rock'

(b)

x x
(nimwandikilile Nu:ru)ø (xati)ø
'I wrote Nuru a letter'

(c) [V NP PP]
( )ø( )ø

x x
(nthinzile: nama)ø (ka: chisú)ø
'I cut the meat with a knife'

Kanerva notes that invoking the government-parameter would correctly account for the Chichewa pattern. Recall that in the theory of Hale and Selkirk (1987) a language may choose to align the edges of XPs with Ø only for those XPs that are not lexically governed. The NP objects in (37) are lexically governed by the verb. The first object would therefore not trigger a Ø-boundary following it if government is relevant in this way in Chichewa. The difference between Chichewa and Chi Mwi:ni would then be accounted for by whether or not government is relevant to the formation of phonological phrases:

(39) Align the right edge of these XPs with Øs:

		[V NP NP]
Chi Mwi:ni:	any (lexically headed) XP	( )ø( )ø
Chichewa:	any (lexically headed) XP that is not lexically governed	( )ø

3.2.1.3. Analysis in terms of constraint-ranking

In the present analysis in term of Wrap-XP, this difference would be accounted for by constraint-ranking.

Wrap-XP demands that an XP be contained inside of a phonological phrase as a whole. Align-XP requires the insertion of a Ø-boundary after each XP. The two constraints are not in conflict in those configurations where Chi Mwi:ni and Chichewa show analogous phrasing-patterns. In the case of a head with a following complement, for example, head and complement can jointly be wrapped, and the Ø-boundary to the right of the complement, which is also the Ø-boundary to the right of the larger projection, does not interfere with the wrapping. This is shown in the following tableau: The winning candidate does not violate any of the two constraints.

(40)	[X YP]	Wrap-XP,	Align-XP
$	( )ø	√	√
	( )ø( )ø	*!	√

Likewise in the case of subjects and VPs. I here make the assumption that the subjects in these cases are outside of VP, such that any higher projection that contains the subject and the VP is functional, such as IP or CP. Functional projections are irrelevant to the mapping and in particular to Wrap-XP, as discussed in connection with 'O'odham earlier. Therefore Wrap-XP will not demand that NP and VP in this case are inside of a single phonological phrase. When Align-XP,R then demands a Ø-boundary after the subject, no conflict with Wrap-XP arises. Here, as in the preceding case, the winning candidate meets both constraints, and no variation among languages is expected in this regard.[7]

(41)	[NP VP]$_{IP}$	Wrap-XP,	Align-XP
	( )ø	√	*!
$	( )ø( )ø	√	√

The case in which the two constraints conflict is precisely the one with more than one complement inside of a higher lexical projection. Here Wrap-XP demands that the higher lexical projection be contained inside a single Ø, whereas Align-XP demands that there be a Ø-boundary after the first complement, and thus within the higher projection. Thus either phrasing will result in constraint-violation.

[7]Language-variation might of course arise independently due to different syntactic structures.

(42)	[V NP NP]	Wrap-XP,	Align-XP
	( )ø( )ø	*	√
	( )ø	√	*

Which option is chosen will then depend on the ranking of the two constraints. If Wrap-XP is ranked above Align-XP, the Chichewa pattern results, as in (43).

(43) Chichewa

	[VP V NP PP]	Wrap-XP	>>	Align-XP
	(anaménya nyumbá ndí mwáála)ø (x)	√		*
$	(anaménya nyuúmba) (ndí mwáála)ø (x x)	*!		√

'He hit the house with a rock'

If, on the other hand, Align-XP is ranked above Wrap-XP, we obtain the Chi Mwi:ni pattern of phrasing.

(44) Chi Mwi:ni

	[VP V NP PP]	Align-XP	>>	Wrap-XP
	(nthinziłe: nama ka: chisú)ø (x x)	*!		√
$	(nthinziłe: nama)ø (ka: chisú)ø (x x)	√		*

'I cut the meat with a knife'

Let us then turn to yet a third case, that of Kimatuumbi, where we appear to find both patterns of phrasing in the same language.

3.2.2. Recursion in Kimatuumbi

Odden (1987, see also Odden 1990) discusses two phonological rules sensitive to syntactic structure: *Shortening* and *Phrasal Tone Insertion (PTI)*[8]. Odden himself offers an account of these in which the phonological rules make direct reference to the syntax. Here I will discuss a reanalysis of Odden's data in the framework of prosodic phonology on the assumption that such rules are not sensitive to syntax directly, but only to prosodic structure, such that we can learn from them about the prosodic domains, and about the syntax-prosody mapping.

The two rules, *Shortening* and *PTI* have different domains, yet the domain of each is a natural candidate for the phonological phrase. What is interesting for the present discussion is that the domains of *Shortening* are exactly those one would derive as Øs by an edge-based algorithm if government did *not* matter for the phrasing, whereas the domains of *PTI* are exactly those one would derive as Øs if government *did* matter for phonological phrasing in Kimatuumbi. I will propose that the dilemma of the different domains of the two rules can be resolved on the assumption of recursive Ø-structure. We will then see that the government-parameter cannot derive such recursive structure, whereas the theory defended here predicts precisely the existence of such recursion in natural language.

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[8]Odden also discusses two more phrasal phonological rules, *Initial Tone Insertion (ITI)* and *Lengthening*. However, in contrast to the thorough discussion of *Shortening* and *PTI*, the discussion of these other rules is fairly short, and it is not clear to me what conclusions we can draw from it. It might be worth noting for completeness that the kind of reanalysis offered here for *Shortening* and *PTI* appears not to be easily available for *ITI* and *Lengthening*.

3.2.2.1. The domain of *Shortening*

Odden's first rule, *Shortening*, shortens underlyingly long vowels in a certain syntacitc environment. Odden offers the formulation in (45), where X, X' and Y are syntactic categories, X' being a projection of X.

(45) *Shortening*

$$\overset{\sigma}{V \quad V} \;\mid\; [\,[\,__\,]_X\ Y\,]_{X'}$$

(where Y contains phonetic material)

Thus *Shortening* applies within a syntactic head X if it is followed by an overt complement or modifier Y within its projection X'. It can be seen to apply in NPs, VP, APs and PPs in the following examples. The left column shows a head with no complement - here shortening does not apply. On the right, where the head has a complement or another element within the same projection, Shortening applies to the head. The relevant vowels are shown in italics.[9]

(46)(a) **NP**

kịkó*loo*mbe 'cleaning shell'	[$_{NP}$ N Poss]	kịkó*l*ombe chaángu 'my cleaning shell'
mịk*aá*te 'loaf'	[$_{NP}$ N A]	mịk*a*té mịkúlu mịkúlú 'large loaves'
lụk*aá*mba 'string'	[$_{NP}$ N CP_{REL}]	lụk*a*mbá lwalụ́puwáanịịké 'string which broke'
mb*oó*po 'machete'	[$_{NP}$ N Det]	mb*o*pó ye 'the machete'

[9]Underlining corresponds to a cedille in Odden's transcription.

(b)	**VP**		
	naa-kál*aa*ngite 'I fried'	[$_{VP}$ V NP]	naa-kál*a*ngite chóolyá 'I fried food'
	naan-kál*aa*ngiile 'I fried for him'	[$_{VP}$ V Neg]	naan-kál*a*ngile lí 'I didn't fry for him'
		[$_{VP}$ V $CP_{purpose}$]	naan-kál*a*ngile yóopáta eéla 'I fried for him to get money'
(c)	**AP**		
	ngalawá ng*eé*le 'red dhow'	N [$_{AP}$ A A_{redup}]	ngalawá ng*e*lé ngeéle 'red dhows'
(d)	**PP/PossP**		
	pal*uú*ngi 'at the front'	[$_{PP}$ P Det]	pal*u*ngí palyu 'at the front'
	kikólombe ch*aá*ke 'cleaning shell of him'	N [$_{PP}$ P NP]	kikólombe ch*a*ké Mambóondo 'cleaning shell of Mamboondo'

Odden argues in quite some detail that the trigger for *Shortening*, Y in (45), must be inside of the syntactic projection of X in (45). Thus if the head of some projection is immediately followed by material *outside* of its projection, Shortening fails to apply to that head. Examples are shown in (4'*i*). Shortening does not apply, for example, to the noun in the first example in (47)(a), since the material following it, the VP, is not inside of the projection of the noun.

(47)(a)	[$_S$ NP VP]	kikól*oo*mbé chaapúwaaniike shell broke	'The shell broke'
(b)	[$_S$ [$_S$ VP] VP]	k*áa*tá laísi cut easy	'To cut is easy'
(c)	[$_S$ VP Adv]	nii*m*p*éé*ndiile sáána I like him really	'I really like him'
(d)		*aa*kál*aa*nga sáána he will fry really	'He will really fry'
(e)	[$_S$ V [$_{CP}$ VP] Adv] I-heard	naayúwine *aa*kál*aa*nga liíso he'll fry yesterday 'Yesterday, I heard that he will fry'	

Cowper and Rice (1987) propose a prosodic reanalysis of Kimatuumbi *Shortening*, shown in (48).

(48)(a) *Ø-construction:*
Each right edge of XP must coincide with the right edge of a Ø.

(b) *Shortening:*
V: -> V | (...(...__...)$_W$ (...)$_W$ ...)$_ø$

On this reanalysis, *Shortening* applies to a long vowel in a word that is not final in the phonological phrase. Øs are constructed by right-edge alignment with XPs.

Cowper and Rice's reanalysis captures the distinction made by Odden shown in (49): If the element Y that follows the head is inside of the projection of X, then no right edge of XP, and thus no Ø-boundary intervenes between the head and the following material, as shown in (49)(a). With no Ø-boundary intervening between the head and following material, the head X is not final within its Ø and Shortening applies within X. If, on the other hand, the syntactic material following X is outside of the projection of X, then the right edge of the projection of X, XP, intervenes between X and Y. Here (48)(a) triggers a Ø-boundary between X and Y. In this case, X comes to be in Ø-final position, and *Shortening* does not apply to vowels within X.

(49)(a) ( )$_ø$
[$_{XP}$ X Y]
└no Ø-boundary

(b) ( )$_ø$( )$_ø$
[$_{XP}$ X] Y
└Ø-boundary

Adopting the proposal by Cowper and Rice in (48), let us assume that Align-XP,R is relevant for constructing the phonological phrases that define the domains of *Shortening* in Kimatuumbi. For the examples shown so far, this comes down to

the ordinary pattern of phonological phrasing observed in both Chi Mwi:ni and Chichewa: A head is phrased together with a following complement as in ($61), but two elements contained in a higher functional projection (IP or CP) are phrased separately.

The cases that are interesting for the purpose of the present chapter, then, are those in (50), where a head has two complements inside of its projection.

(50)(a) **VP**

[$_{VP}$ V NP NP]

naampéi kikóloombe Mambóondo
I-him-gave shell Mamboondo
'I gave Mamboondo the shell

naampéi ywaá-kaáyite eéla
I-gave REL-cut money
'I gave the one who cut money'

(b) **NP**

[$_{NP}$ N PP AP]

kikólombe ya-asikoópu kikúlú
shell of bishop large 'large shell of the bishop'

[$_{NP}$ N AP PossP]

kikólombe kikeéle chaángu
shell red mine 'my red shell'

[$_{NP}$ N PossP AP]

ikólombe yaángu yanaanchímá
shells mine many 'my many shells'

(c) **within PP**

[$_{PP}$ Prt-NP P]

pa-kikóloombe palyu
at cleaning shell LOC.DEMONSTR. 'at the cleaning shell'

ku-suúle kulyu
to school LOC.DEMONSTR. 'to the school'

Here *Shortening* applies to the initial head, but crucially fails to apply to the first complement. This is accounted for on Odden's account, since the second complement is outside of the first complement. It is likewise accounted for in Cowper and Rice's reanalysis, here adopted in the form of the constraint Align-XP,R, since right-alignment of XPs with Øs will insert a Ø-boundary at the right edge of the first complement, i.e. between the first and the second complement:

(51) $[_{VP}$ V NP NP]
( )ø( )ø (naampéi kikóloombe)ø (Mambóondo)ø
I-him-gave shell Mamboondo
'I gave Mamboondo the shell

Shortening then correctly fails to apply to the first object, which is Ø-final on this account. If there would be no Ø-boundary between the objects, Shortening would wrongly apply to the first object, which would then not be in Ø-final position.

The domain of *Shortening* in Kimatuumbi is thus analogous to the domain of vowel-shortening in Chi Mwi:ni: Align-XP,R does all the required work, and government in Hale and Selkirk's account, or Wrap-XP in the present account, do not seem to have any effect.

This is further shown by the following minimal pairs from Odden. In (52)(a), the final AP is part of the projection of the preceding N. The right edges of all XPs in this example thus coincide with the right edge of the whole expression, and there is no intermediate Ø-boundary present. The noun is thus not in Ø-final position, and therefore undergoes *Shortening*. In (52)(b), the final AP is in a separate NP with an empty head. Here Align-XP,R triggers a Ø-boundary between the NP object and the separate AP. The noun, this time in Ø-final position, fails to undergo *Shortening*.

(52)(a) $[_{VP}$ V $[_{NP}$ N AP]]
( )ø (naampéi̱ ki̱kólombe ki̱kúlú)ø
I-him-gave shell large
'I gave him a large shell'

(b) $[_{VP}$ V $[_{NP}$ N] $[_{NP}$ AP]]
( )ø( )ø naampéi̱ ki̱kólo*o*mbe ki̱kúlú
I-him-gave shell large
'I gave the large (thing) a shell'

3.2.2.2. The domain of *Phrasal Tone Insertion*

Let us then turn to the second phrasal rule relevant here, *Phrasal Tone Insertion (PTI)*. PTI inserts a H tone in certain syntactic configurations. Odden states *PTI* as follows.

(53) *Phrasal Tone Insertion*

$0 \rightarrow H \mid [YP __ ZP]_{XP}$

The reading that Odden intends for the syntactic environment of this rule is that XP *immediately* dominates YP and ZP and does not dominate anything else. The only XP that meets this condition (with one exception to which I will return at the end of the chapter) is the sentence S, which, on Odden's assumptions about syntax, immediately dominates maximal projections and nothing else. The relevant syntactic configurations are shown in (54): (a) is a configuration in which an XP precedes the VP; XP here may be the subject or a preposed object of adverb. In (b) an XP, here an adverb, follows the VP. The expressions in (c) contain two clauses, either conjoined, or with one adjoined to the other.

(54)(a) [$_S$ XP VP]
XP = Subject or preposed object or adverb

(b) [$_S$ VP AdvP]

(c) [$_S$ S S]
if S, S
when S, S

PTI inserts a H tone between the two maximal projections in these cases. In Odden's analysis, this H tone then docks on to the last syllable of the preceding word. Examples are given in (55). Anticipating the prosodic reanalysis of *PTI* as a boundary tone phenomenon, the site of the insertion of the H tone is marked by two round brackets in the examples.

(55)(a)

[$_S$ NP _ VP] Mamboondó) (aawíile 'Mamboondo died'

[$_S$ NP _ [$_{VP}$ AP]] Mamboondó) (nnaáso
Mamboondo tall 'Mamboondo is tall'

[$_S$ NP$_{obj}$ _ VP] Mamboondó) (naammwéeni
Mamboondo I saw 'I saw Mamboondo'

[$_S$ AdvP _ NP _ VP] iíjumá) (Mamboondó) (aayíii
'On Friday Mamboondo went'

[$_S$ [$_S$ VP] _ VP] télekaa ñamá) (laísi
cook meat easy 'To cook meat is easy'

(b) [$_S$ VP _ AdvP] niimpéendiilé) (píta
I like him really 'I really like him'

niimpendi kitúumbilí) (píta
I like the monkey really 'I really like the monkey'

(c) [$_S$ CP _ IP] maná naantumbilé Mamboondó) (nduwae kuunnwáaya
if I-him-fell Mamboondo I-would him-nurse
'If I had fallen on Mamboondo, I would have nursed him'

panáakalangitée ñamá) (Mamboondó) (akalangae kindoólo
when I fry meat Mamboondo he-frying-past sweet potatoe
'When I was frying meat, Mamboondo was frying a sweet potatoe'

PTI does not apply internal to NPs or VPs (or, according to Odden's description, other projections). Thus it does not apply between the N or V and a following XP within the NP or VP as shown in (56).

(56)(a) **not within NP**

[$_{NP}$ N * AP] mundu̲u̲ ntokómau̲
person sluggisch
'a sluggisch person'

[$_{NP}$ N * CP_{rel}] mundu̲ ywaáwi̲i̲lé
'the man who died'

(b) **not within VP**

[$_{VP}$ V * CP_{compl}] nyaami̲ni̲ aawí̲i̲le
I-think he-died
'I think he died'

[$_{VP}$ V * $CP_{free\text{-}rel}$] tu̲tanga ywaáwi̲i̲lé
'we know the one who died'

PTI also does not apply between two XPs within an NP or VP as shown in (57).

(57)(a) **not within NP**

[$_{NP}$ N AP * PossP] mwaanaa ntepéengau̲ waángu
child wet mine
'my wet child'

(b) **not within VP**

[$_{VP}$ V NP NP * AP] naampéi̲ lí̲ Mamboondo ki̲wikilyo i̲í̲ju̲ma
I-him-gave NEG Mamboodno cover Friday
'I didn't give Mamboondo a cover on Friday'

Odden wrestles at some length with the difference between examples like (57) and those in (55). His conclusion is: "Where PTI applies, the two phrasal nodes are members of a phrase not immediately dominating lexical material." (p.26). The

formulation in (53) is meant to capture this: if XP in (53) dominates lexical material like a noun or a verb in addition to dominating YP and ZP, then *PTI* must not apply.

A reanalysis of *PTI* without direct reference to syntax is straightforward - if we ignore, for the moment, what we said about *Shortening* in the last section. (55) - (57) present a by now familiar pattern. Thus let us think of PTI as a phenomenon of boundary-insertion as in (58).

(58) *Phrasal Tone Insertion* (preliminary version)

```
  H
  |
... σ )ø(
```

The domains of its insertion are then phonological phrases that are derived from the syntax on the assumption that lexical government matters for Ø-formation. Thus a head and its complement in (56) are phrased together, hence there is no boundary-tone between them. Elements contained in a higher functional projection, as in (55), are phrased separately, so (58) inserts a boundary-tone at the right edge of the first of them. The interesting cases are those of a head with two complements in (57). PTI does not apply between the complements in this case. This indicates that there is no Ø-boundary in the relevant sense between the two complements of a lexical head. Odden's careful account here straightforwardly translates into the present terminology: Where two elements are immediately contained inside of the projection of a lexical head as in (57), PTI does not apply. This is the configuration we saw in Chichewa: there is no Ø-boundary between two objects of a lexical head. On the other hand, where two elements are not under the immediate projection of a higher head as in (55), the

elements are phrased separately and PTI applies. Analogously in Chichewa, where a Ø-boundary is present between the subject and the VP.

There is one minor formal difference between the terminology of Odden and the one used here: Odden intends for 'lexical head' to mean 'overt head', whereas the present account, following Selkirk (1995), distinguishes lexical from functional categories, where the latter may well be overt. For the cases in (57), this distinction does not matter: Here the overt head is also a lexical (as opposed to functional) head, namely a verb or a noun. There is one case in Odden's examples that would allow us to tell which formulation is correct, if we could be sure about its syntax. This case involves a functional overt complementizer, as shown in (59).

(59) $[_{CP}$ NP C * VP] (Mamboondó)$_{ø}$(keénda akáteléka)$_{ø}$
Mamboondo if cooking
'if Mamboondo is cooking'

Telling from appearances, one might assume that the initial NP in this case is in the specifier of the projection headed by the complementizer. Assume, for the sake of discussion, that this is correct. Then Odden's formulation of PTI, by which PTI is blocked if two elements are contained inside of the projection of an overt head would predict that PTI should not apply after the NP - the complementizer is overt. On the other hand, the complementizer is a functional element. A formulation of PTI in which PTI (or the insertion of a Ø-boundary) is blocked by the presence of a lexical (as opposed to functional) head would therefore predict that the functional head will not block PTI (or the insertion of a Ø-boundary). Odden reports that PTI applies after the NP in this case - in other words, there is a Ø-boundary after NP. This would suggest that the latter approach, in terms of functional, rather than in terms of empty elements is correct.

On the whole, PTI in Kimatuumbi can be understood as a phenomenon of boundary-tone insertion. The domains of the insertion of this boundary-tone would be constructed straightforwardly if lexical goverment matters for Ø-formation in this language: The patterns of PTI are exactly analogous to those found for phonological phrasing in Chichewa.

3.2.2.3. An account in terms of recursion

This, then, is the dilemma: I have adopted Cowper and Rice's reanalysis of *Shortening* in terms of Øs, and proposed a reanalyis of *PTI* in terms of Øs. Yet the domains of these two rules are not coextensive. It appears that we need two kinds of Ø-construction for the same language: To account for the domains of *Shortening*, we need Ø-construction in terms of right-alignment *regardless of lexical government*. To account for the domain of PTI, we need Ø-construction in terms of right-alignment *that takes into account lexical government* (or Wrap-XP) for the domains of *PTI*. It is interesting to see that the domains of Shortening are parallel to the domains that were required to account for Chi Mwi:ni vowel shortening, whereas the domains of PTI are parallel to those that were relevant to account for the application Kanerva's Ø-sensitive rules. The way in which Chi Mwi:ni differed from Chichewa is parallel to the way in which the domains of Shortening and of PTI differ in Kimatuumbi. This difference concerns the structures in (57). When a (lexical) head has two complements inside of its projection, *Shortening* does not apply across the complements, as shown by the long vowels in the first complement in these examples, which indicates the presence of a Ø-boundary between the complements. Yet *PTI* does not apply between the two complements. How can this difference be reconciled?

There is one way out that one might consider, but that is in fact not available. One might hope that the larger of the two domains, the domains of *PTI*, would turn out to be the next higher level of the prosodic representation: the intonational phrase. Odden, however, shows that this cannot be the case. Syntactically, "[t]he I-Phrase is composed of major synactic clauses". Phonologically, "various phonological rules such as the Final Fall rule, H Tone Assignment and phonetic pause (...) detect the I-phrase" (p.30f). The Final Fall rule, for example, assigns a falling tone at the right edge of the intonational phrase, in contrast to the H tone that *PTI* assigns at the right edge of its domains. Furthermore *H Tone Assignment* in intonational phrases shows properties that are quite different from *PTI* in Øs. Thus compare the formulation of PTI in (53) with Odden's formulation of I-sensitive *H Tone Assignment* in (60).

(60) *H Tone Assignment*

$$0 \rightarrow H \mid [X\,[\underset{\underset{W}{|}}{__}\,H_0]_W]_I$$

This rule applies to the last word within an intonational phrase I, assigning a H tone to the second vowel of this word, if the word does not already bear a H tone elsewhere (see also Kisseberth and Odden 1980, Odden 1984). (60) would thus apply to *kiwikilyo* in (61) in I-final position.

(61) [naatwéti kiwíkilyo]$_I$[noobúutuka]$_I$
'I took the cover and ran'

Clearly, then, the domain of *PTI* cannot be the intonational phrase. For arguments that the domain of *Shortening* can likewise not be the next lower level in the prosodic hierarchy, the Clitic Group, see Odden (1987, 30ff). What, then, is one to make of this situation?

I suggest that Kimatuumbi has recursive Ø-structure in the case of a head with two complements, as shown in (62).

(62) $[_{XP}$ X YP ZP]
(( )ø)ø

How does this solve the dilemma?

The recursive structure in (62) is characterized by non-matching left and right brackets. There are two right brackets in different places, but the left brackets coincide. The idea of the following account, then, is that *Shortening* is essentially sensitive to right Ø-boundaries, whereas PTI is sensitive to left Ø-boundaries.

Before we derive the recursive Ø-structure, let us see in which way the two phenomena might be sensitive to different edges of Ø.

Consider first PTI. In the discussion above, I have glossed over the fact that PTI, even though it appears to be a boundary-tone, only inserts a H tone at the right edge *non-final* Øs. It will apply, for example, at the right edge of a subject, if the subject is followed by a VP, but it will not apply at the right edge of that VP, if the VP is not followed by another element. One way of stating this fact about PTI is to assume that PTI does not apply at right edges, but applies in fact at left edges of phonological phrases, as stated in (63).

(63) *Phrasal Tone Insertion* (final version)
Align(Ø, L, H, R)
'Align the left edge of every Ø with the right edge of a H tone.'
0 -> H | __ ø(

The alignment of opposite edges here has the effect that the H tone will not be seen within the phrase it aligns with, but one TBU further to the left: on the last syllable of the preceding Ø. This formulation has the right consequences for the application of *PTI*: First, it accounts for the fact that *PTI* only applies in non-final Øs: Only these are followed by the left edge of another Ø. PTI as formulated in (63) will thus correctly insert the H tones in (64).

(64)

```
[S AdvP     NP            VP]
(iíjumá)ø (Mamboondó)ø (aayíii)
    |                 |
    H                 H
'On Friday   Mamboondo    went'
```

On the other hand, the formulation in (63) has the desired effect in the recursive structures of a head with two complements: There is a right edge of Ø between the objects, but no left edge of a Ø. Therefore PTI, which is sensitive to left edges of Ø in the formulation in (63), does not apply here.

(65)

```
[NP N            AP          PossP]
((mwaanaa ntepéengau)ø waángu)ø

  child          wet          mine
'my wet child'
```

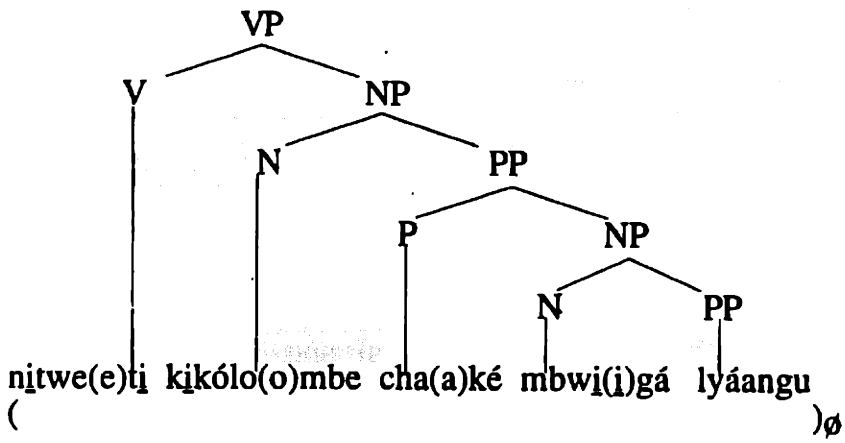
Consider then *Shortening*. *Shortening* in Kimatuumbi, not unlike in Chi Mwi:ni, neutralizes potential vowel-length. It would appear to be plausible, therefore, to analyze Shortening in Kimatuumbi as a phenomenon related to prominence, as Selkirk (1986) did for vowel shortening Chi Mwi:ni.

Recall that Shortening in Kimatuumbi applies in positions that are not Ø-final, but fails to apply in Ø-final position on Cowper and Rice's reanalysis. Their rule of Shortening is repeated here.

(48)(b) *Shortening:*
V: -> V | (...(...__...)$_W$ (...)$_W$ ...)$_\emptyset$

Odden (1987) makes it quite explicit that Shortening will apply to each of a series of heads, if they are all followed by material in their own projection. An example from his discussion that brings this out quite clearly is given in (66). Here all the bracketed vowels are deleted by Shortening.

(66)



'It took the shell of my friend'

The analysis in term of Align-XP,R derives a single large Ø for this example: There are no right edges of XPs within the string. In the reanalysis of Shortening in terms of prominence that I offer, prominence is assigned rightmost within Ø. This is done in terms of the constraint in (67).

(67) Align(Ø, R, $x_\emptyset$, R)

Align each right edge of Ø with a grid-mark that heads that Ø.

Prominence is then assigned rightmost within Ø as shown in (68).

(68)

$$\begin{array}{lcl} & & x_\emptyset \\ (& & x_w \quad)_\emptyset \\ \text{nitwe(e)ti kikólo(o)mbe cha(a)ké mbwi(i)gá lyáangu} & & \end{array}$$

Shortening in Kimatuumbi will then be understood as neutralization of potential vowel-length: The distinction between short and long vowels is neutralized on the surface, except in words that bear phrasal prominence $x_\emptyset$. It appears from Odden's description and examples that we cannot narrow down the position in which Shortening fails to apply to particular syllables in the relevant word. Any long vowel in a word that meets the syntactic requirements will surface. The description of Shortening in (69) takes this into account.

(69) Shortening

$$\begin{array}{lcccc} & \mu\mu & \mu & x_\emptyset \\ & V & | & w \\ \text{Neutralize the contrast between} & \text{[-cons]} & \text{and [-cons]} & \triangle \\ & \text{except in the environment} & & \text{...__...} \end{array}$$

Shortening as in (69) will then apply to all words in (68) except to the Ø-final one, as desired.

Turning then to the recursive structure that we are interested in here, the constraint in (67) that requires prominence-heads for phonological phrases will align one $x_\emptyset$ with each of right edge of XP as shown in (70).

(70)

$$\begin{array}{ccccc} & x_\emptyset & & x_\emptyset & \\ ((\text{ X} & \text{YP} &)_\emptyset & \text{ZP} &)_\emptyset \end{array}$$

Shortening, then, applies to the verb in the example in (71), but not to either the first, or the second object.

(71)

$[_{VP}$ V NP NP]
(( )$_{\emptyset}$)$_{\emptyset}$

((naampéi kikóloombe)$_{\emptyset}$ Mamboóndo)$_{\emptyset}$

$X_{\emptyset}$ $X_{\emptyset}$

I-him-gave shell Mamboondo
'I gave Mamboondo the shell

Shortening, then, is indirectly sensitive to right Ø-boundaries on this account, since the assignment of prominence in (67) is sensitive to right edges of Ø.

Let us now compare how the two theories under discussion - the government parameter vs. the constraint Wrap-XP fare with respect to generating the recursive Ø-structure of Kimatuumbi.

The government parameter in its original form clearly predicts that languages such as Kimatuumbi should not exist. Government parametrized precisely means that a language should either construct its Øs regardless of lexical government, or respecting lexical government. The presence of both phrasings in the same language should not occur. According to that theory, then, a language with a rule with domains like Kimatuumbi *Shortening* (government does not matter) could not also have a rule with domains like Kimatuumbi *PTI* (government is crucial) and vice versa.

The present theory, on the other hand, allows us to derive precisely the occurrence of this kind of recursion. Align-XP,R wants to see Ø-boundaries to the right of every XP, as in (72)(a). At the same time, Wrap-XP wants to see each lexical XP contained inside a Ø. For the VP in (72) to meet Wrap-XP there should then be a Ø containing the VP as in (72)(b). Both can be met simultaneously in the recursive structure in (72)(c).

(72)		[$_{VP}$ V NP NP]		
Align-XP,R	(a)		)ø	)ø
Wrap-XP	(b)	(		)ø
	(c)	((	)ø	)ø

Much of the recent literature on phonological phrasing adopted a proposal by Selkirk (1984), the *Strict Layer Hypothesis*, which rules out recursive prosodic structures alltogether. This proposal has been challenged by Ladd (1986, 1992) who argues in favour of recursive structures in the prosody. Recently, Selkirk (1995) has herself argued for a relaxation of the strict ban on recursion: a violable constraint in OT, *Nonrecursivity* (NonRec) disfavours recursive structure, but allows it under certain circumstances.

The Kimattumbi data support this move. To obtain the right results, we need to assume that NonRec is ranked below both Align-XP,R and Wrap-XP in Kimatuumbi. The tableau for the crucial recursive case is shown in (73).

(73)	[$_{VP}$ V	NP	NP]	Align-XP,R	Wrap-XP	>>	NonRec
(a) $	((	)	)				*
(b)	(	)(	)		*!		
(c)	(		)	*!			

The ranking of Align-XP,R and Wrap-XP relative to one another does not appear to matter here: If Nonrecursivity is ranked low, the recursive structure will be chosen, regardless of the ranking of these other two constraints.

The present theory predicts that we will not find recursive structures when the containing syntactic constituent is not lexically headed (such as VP in (72)), but a functionally headed sentence, as in (74).

(74)	$[_S$ NP VP]	Align-XP,R,	Wrap-XP	>>	NonRec
(a) $	( )( )				
(b)	(( ))				*!
(c)	(( )( ))				*!
(d)	( )	*!			

I will return to the role of Nonrecursivity in other languages below.

3.2.3. The effects of focus on phrasing in Chichewa

In this section, some evidence for an account of the government-effects in terms of the constraint Wrap-XP rather than syntactic government will be discussed. The evidence comes from the interaction of focus with phrasing in Chichewa.

Focus appears to have two effects on phonological phrasing in Chichewa: a primary effect, which will be represented by a constraint *Focus*, and a secondary effect, which one would like to derive as the way in which the system interacts with *Focus*. The government-theory and the theory in terms of Wrap-XP will be compared with respect to their ability to derive this secondary effect.

Recall that in Chichewa the default-phrasing was characterized by the government-effects. Thus not only is a head phrased with a following

complement, but furthermore two objects of a lexical head are both phrased together with the head, as shown in (75)(a) and (76)(a).

Kanerva now observes that narrow focus on a constituent *introduces a phonological boundary* on the level in question (here analyzed as Ø) *after the focused constituent*. This is shown for focus on the verb in (75)(b), and for focus on the first object in (76)(b).

(75)(a)		[What did they do?]
	[V OBL]	(anagóná mnyumá yá mávúuto)
	( )ø	'They slept in Mavuto's house'
(b)		[What did they do in Mavuto's house?]
	[V_{FOC} OBL]	(anagóona) (mnyumbá yá mávúuto)
	( )ø( )ø	'They *slept* in Mavuto's house'
(76)(a)		[What did he do?]
	[$_{VP}$ V NP PP]	(anaménya nyumbá ndí mwáála)
	( )ø	'He hit the house with the rock'
(b)		[What did he hit with the rock?]
	[$_{VP}$ V NP_{FOC} NP]	(anaménya nyuúmba) (ndí mwáála)
	( )ø( )ø	'He hit the *house* with the rock'

For the purposes of this chapter, this effect of focus on phrasing will be represented by the constraint in (77). The effect will be analyzed in a more general way in Chapter 5.

(77) **Focus** (Chichewa): A focused constituent is followed by a Ø-boundary

As for the ranking of the relevant constraints, it was concluded from the pattern in (76)(a) that Wrap-XP >> Align-XP in Chichewa. The constraint Focus must now be ranked above Wrap-XP since it is strong enough to introduce a subdivision of VP in (75)(b) and (76)(b), even though this induces a violation of Wrap-XP: VP is no longer contained inside a single Ø in these examples. We thus obtain the following ranking:

(78) Chichewa: Focus >> Wrap-XP >> Align-XP

Let us then come to the point that is crucial for the present discussion: focus has an interesting additional effect: When a verb which has two objects is focused, as in (79), there is not only a Ø-boundary after the focused verb, but in addition the two objects are phrased separately.

(79)(a)		[What did he do to the house with the rock?]
	[$_{VP}$ V_{FOC} NP PP]	(anaméenya)$_{ø}$ (nyuúmbá)$_{ø}$ (ndí mwáála)$_{ø}$
	( )( )( )	'He *hit* the house with the rock'
(b)		[Did you weave the mat for Mavuto?]
	[$_{VP}$ V_{FOC} NP NP]	(ndinaángogúliira)$_{ø}$ (mavúuto)$_{ø}$ (mphaása)$_{ø}$
	( )( )( )	'I only *bought* the mat for Mavuto'

While the Ø-boundary after the verb is predicted by (77), the Ø-boundary between the objects does not follow from Focus. Nor, it seems, could any

plausible reformulation of (77) predict this fact. One would therefore like to derive this from the other constraints of phonological phrasing, and from their interaction with Focus.

Consider first why Hale and Selkirk's original proposal, or a translation of it such as (5) - retaining the notion of government - makes the wrong predictions here: On such an account, (32) would not have a Ø-boundary after the first object since both objects are lexically governed by the verb and hence do not care to have their edges coincide with Ø-boundaries. In (79), however, the objects are syntactically governed just as much as the objects in (32) are.[10] By the same logic, they should therefore also not care to have their edges aligned with Ø-boundaries. The prediction of that account is therefore that the two objects in (79) should be phrased together into a single Ø as in (80).

(80) [$_{VP}$ anaméenya [$_{NP}$ nyuúmbá] [$_{NP}$ ndí mwáála]]

)ø)ø

by Focus by alignmt. w/ungoverned XP

That, however, is not the case.

The present account, on the other hand, makes the correct prediction in this case. Recall that in (32), with no focus on the verb, the NPs inside VP will not trigger

[10]Kanerva (1989) gives an argument that even when the verb is focused, the objects need not therefore be extraposed; relativization from the position of either object is possible even when the verb is focused; he concludes that the objects are governed by V even when V is focused.

Ø-boundaries because that would violate the independent constraint Wrap-XP for the higher VP. This is reviewed in (81).

(81)	[$_{VP}$ V NP PP]	Wrap-XP >> Align-XP
(a)	(anaménya nyuúmba)$_{ø}$(ndí mwáála)$_{ø}$	*!
(b) $	(anaménya nyumbá ndí mwáála)$_{ø}$	*

What is different about (79), then, is that the overriding effect of Wrap-XP for VP is neutralized by Focus: the VP will be cut up regardless of how the objects are phrased. In this case, then, giving the objects the Ø-boundary they want by Align-XP will not do any additional damage with respect to Wrap-XP. Therefore the objects will be phrased separately. (82) illustrates.

(82)	[$_{VP}$ V NP PP]	Focus >> Wrap-XP	>> Align-XP
(a) $	(anaméenya)$_{ø}$(nyuúmbá)$_{ø}$(ndí mwáála)$_{ø}$ FOC	*	
(b)	(anaméenyá)$_{ø}$(nyumbá ndí mwáála)$_{ø}$ FOC	*	*!
(c)	(anaménya nyumbá ndí mwáála)$_{ø}$ FOC	*!	*

The contrast between (81) and (82) thus supports the present account: Embedded elements in languages like 'O'odham and Chichewa are phrased with larger elements not because of their syntactic status (government), which is the

same for the objects in (81) and (82). Rather, they are phrased with higher elements so as not to cut up the higher elements. Once this overriding factor is neutralized (here: by Focus cutting up the VP in (82)), the embedded elements end up phrased separately.

At this point, let us also compare the constraint Wrap-XP with a minimally different hypothetical competitor that we might call *Cut-XP. That latter constraint might say that it is prohibited to introduce Ø-boundaries inside of lexical XPs. *Cut-XP will be different from Wrap-XP on a cumulative interpretation of *Cut-XP that punishes *each* Ø-break inside a lexical XP. Wrap-XP, by contrast, does not care about the difference between one and two Ø-breaks inside an XP: If there is one such Ø-break inside XP, then XP can no longer be inside a Ø, and no further damage can be done as far as Wrap-XP is concerned. This gives the right result in (82), since the additional Ø-break in (82)(a) does not induce an *additional* violation of Wrap-XP and thus allows this candidate to pass that constraint. Assume, however, that we replaced Wrap-XP with *Cut-XP, as in (83). *Cut-XP punishes the additional Ø-boundary in (83)(a), wrongly ruling this candidate out, as shown.

(83)	$[_{VP}$ V NP PP]	Focus >> *Cut-XP >> Align-XP		
(a)	(anaméenya)$_{ø}$(nyuúmbá)$_{ø}$(ndí mwáála)$_{ø}$		**!	
(b) $	(anaméenyá)$_{ø}$(nyumbá ndí mwáála)$_{ø}$		*	*
(c)	(anaménya nyumbá ndí mwáála)$_{ø}$	*!		*

It seems, therefore, that what is at stake in the government/containment requirement is not how badly an XP is cut up by Ø-boundaries, but whether or not an XP has a chance to be contained inside a Ø - as captured in the present proposal.

The focus-effects in Chichewa can be used to argue against a possible alternative analysis of the typology developed earlier. Thus, one might maintain that there could be two different levels of prosodic representation, one shown in the Chi Mwi:ni pattern of phrasing, the other shown in the Chichewa pattern of phrasing. Kimatuumbi, one might then maintain, would exemplify both at the same time.

The secondary effect of focus on phrasing in Chichewa suggests that this would be the wrong interpretation: Once Focus disrupts the pattern of phrasing, the Ø-boundary between the objects that we know from Chi Mwi:ni and Kimatuumbi reemerges in Chichewa as well. In Chichewa, crucially, it is the same level of phrasing, (diagnosed by the same Ø-sensitive rules) that groups the objects together with the head that governs them in one case, (76)(a), and that shows the boundary between the two objects in the focused case, (79). This suggests that we are generally dealing with one-and-the-same level of phonological structure, namely phonological phrases, whose construction is subject to different and conflicting constraints, as in the account developed here.

3.2.4. Nonrecursivity in Chichewa

The secondary effect of focus on phrasing can be used to argue that Nonrecursivity plays a crucial role in deriving phonological phrasing in Chichewa. That argument will be made in the present section.

During the discussion of 'O'odham, Chichewa and Italian, I simply did not take recursive candidate phrasings into account. If we add such candidates to our tableaus, as in the 'O'odham example in (84) (= (14) with an additional candidate).

(84)	$[_{NP_1}\ NP_2\ \ N_1\ \ ]$	Wrap-XP	Align-XP,R
(a)	$(\text{Husi})_{\emptyset}(\text{mi:stol-ga})_{\emptyset}$	*!	
(b)	$(\text{Husi}\ \ \text{mi:stol-ga}\ )_{\emptyset}$		*
(c)	$((\text{Husi})_{\emptyset}\ \ \text{mi:stol-ga}\ )_{\emptyset}$		

we immediately see that they would be the winners, without further ado. Nothing else being said, recursive structure is the optimal solution to the conflict between edge-alignment and Wrap-XP, meeting the requirements of both.

To retain the phrasings derived earlier, we have to make use of Nonrecursivity. If it is ranked high, as in (85), it will systematically rule out the recursive candidates, thus sanctioning the implicit assumption I made: that recursive Ø-structures are not possible in 'O'odham, Chichewa and Italian.

(85)	$[_{NP_1}\ NP_2\ \ N_1\ \ ]$	NonRec	Wrap-XP	Align-XP,R
	$(\text{Husi})_{\emptyset}(\text{mi:stol-ga})_{\emptyset}$		*!	
$	$(\text{Husi}\ \ \text{mi:stol-ga}\ )_{\emptyset}$			*
	$((\text{Husi})_{\emptyset}\ \ \text{mi:stol-ga}\ )_{\emptyset}$	*!		

Let us ask, however, if we really want Nonrecursivity to rule out the recursive structures. Could it not be that every language has in fact recursive Ø-structures, and that it just so happens that the phonological rules that were discovered

happened to apply to the smaller Øs in some languages, and to the larger Øs in others? As though Kimatuumbi would have been studied with respect to *Shortening* only, which would have lead us to believe that there is but one layer of Ø-structure in this language, in the construction of which government plays no role?

Indeed, for many of the languages studied in the literature, we do not know enough to tell: Are we looking at a single layer of a recursive structure, or are we looking at the only layer of Ø-structure in a language?

However, the effects of focus on phrasing in Chichewa allow us to argue against the possibility that this would be the case in this language.

Consider once more the Chichewa pattern in (76)(a).

(76)(a)					[What did he do?]			
	$[_{VP}$ V	NP	PP$]_{FOC}$		(anaménya	nyumbá	ndí	mwáála)
	(		)$_{Ø}$		'He hit	the house	with	the rock'

Here we adopted Kanerva's non-recursive Ø-structure as indicated. This was derived as in (81)

(81)	$[_{VP}$ V	NP	PP	]		Wrap-XP	Align-XP,R
(a).	(anaménya	nyuúmba)$_{Ø}$	(ndí	mwáála)$_{Ø}$		*!	
(b) $	(anaménya	nyumbá	ndí	mwáála)$_{Ø}$			*

Taking recursion into account, we could retain this result by a highly ranked *Nonrecrusivity*, that rules out the additional recursive candidate (c) in (86).

(86)	$[_{VP}$ V NP PP]	NonRec	Wrap-XP	Align-XP,R
(a)	(anaménya nyuúmba)$_{\emptyset}$(ndí mwáála)$_{\emptyset}$		*!	
(b) $	(anaménya nyumbá ndí mwáála)$_{\emptyset}$			*
(c)	((anaménya nyuúmba)$_{\emptyset}$ ndí mwáála)$_{\emptyset}$	*!		

Assume, however, that there is no ban on recursion (or a lowly ranked one). We would then derive the recursive structure in (87)(c).

(87)	$[_{VP}$ V NP PP]	Wrap-XP	Align-XP,R
(a)	(anaménya nyuúmba)$_{\emptyset}$(ndí mwáála)$_{\emptyset}$	*!	
(b)	(anaménya nyumbá ndí mwáála)$_{\emptyset}$		*!
(c) $	((anaménya nyuúmba)$_{\emptyset}$ ndí mwáála)$_{\emptyset}$		

So far, so good. Now we would have to make sure that the four phrasal phonological rules of Chichewa only apply in the outmost Ø, not in the innermost Ø, since they only apply at the right edge of VP in this example, not at the right edge of the first object. This already proves to be a tricky problem since the phonological rules of Chichewa are clearly sensitive to the right edge of Ø. We would therefore expect them to apply at both right edges of Ø in a structure like (87). Assume, however, for the sake of the argument, that this problem could be overcome. Now another, more serious problem arises: the primary and secondary focus-effects discussed above can no longer be predicted.

Consider again (79)(a) where the constraint Focus, repeated below with its ranking, introduces a Ø-boundary after the focused verb.

(79)(a) [What did he do to the house with the rock?]

$[_{VP}\ V_{FOC}\ NP\ \ PP]$	(anaméenya)$_{ø}$ (nyuúmbá)$_{ø}$ (ndí mwáála)$_{ø}$
( )$_{ø}$( )$_{ø}$( )$_{ø}$	'He *hit* the house with the rock'

(77) Focus (Chichewa): A focused constituent is followed by a Ø-boundary

(78) Chichewa: Focus >> Wrap-XP >> Align-XP,R

The further Ø-boundary between the two objects in (79) was attributed to the missing effect of Wrap-XP in this case: Wrap-XP would be violated for VP in (79) regardless, due to the overriding effect of Focus.

The relevant tableau is reproduced in (88), with an additional recursive candidate (d). In the tableau in (88), which is in keeping with the assumption that recursive structure is not possible in Chichewa, this recursive candidate is ruled out by the additional highly ranked constraint Nonrecursivity.

(88)	$[_{VP}$ V NP PP]	NonRec	Focus	Wrap-XP	Align-XP,R
(a)	$ (anaméenya)$_{ø}$(nyuúmbá)$_{ø}$(ndí mwáála)$_{ø}$ FOC			*	
(b)	(anaméenyá)$_{ø}$(nyumbá ndí mwáála)$_{ø}$ FOC			*	*!
(c)	(anaménya nyumbá ndí mwáála)$_{ø}$ FOC		*!		*
(d)	((anaméenya)$_{ø}$(nyuúmbá)$_{ø}$ ndí mwáála)$_{ø}$ FOC	*!			

Let us, however, pursue the possibility that recursive structure would be allowed in Chichewa, as in (87). Without NonRec in (88), the recursive candidate (d) would be the winner here: it does not violate any of the (other) constraints. This, however, is clearly the wrong result: the phrasal phonological rules of Chichewa,

which on this account would have to apply only in the largest Øs, would now not be sensitive to focus at all, and apply once at the right edge of the VP in (d), and nowhere else in this example. What goes wrong, on these assumptions, is that the Ø-boundary triggered by Focus after the verb no longer conflicts with the the application of Wrap-XP to the VP: in a recursive structure, lower elements may have Ø-boundaries without preventing higher ones from meeting Wrap-XP. Focus, then, should not have an effect on the application of the phrasal phonological rules of Chichewa at all: neither would it visibly cut up otherwise larger domains, nor would it lead a VP as in (88) to further fall apart. The effects of focus on phrasing should then all be within the lower layer of Øs, which, on this account,, would be ignored by the phrasal phonological rules of Chichewa.

I do not see an easy way out, that would allow one to maintain that Chichewa has recursive structure after all. Thus one cannot say that the phrasal rules apply within the smallest, rather than the largest Øs in Chichewa. For even though this would then give the right results in the structure (88)(d), it would give the wrong results in (87)(c).

Nor, it seems, can we maintain that the boundary after the focused element would in fact be an I-boundary, thus breaking up the Ø of the VP regardless of recursion: Kanerva (1989) takes the level of I into account, yet there are nor reports of an I-boundary triggered after the focused constituents.

It seems, therefore, that prosodic structure in Chichewa is indeed non-recursive. Here, then, Nonrecursivity seems to do some crucial work. The complete ranking of the constraints in Chichewa is then given in (89).

(89) Chichewa: NonRec, Focus >> Wrap-XP >> Align-XP,R

Since Nonrecursivity must thus be violated in Kimatuumbi, but unviolated in Chichewa, we have some evidence for the existence (and usefulness) of this constraint.

3.2.5. The typology of recursion

On the picture argued for here, the mapping from syntactic structure to phonological phrases is crucially determined by these three forces: Selkirk's Align-XP and Nonrecursivity, and the constraint Wrap-XP, a translation of the suggestions about the role of government in phrasing by Hale and Selkirk. Consider then the possible rankings of these forces in (90).

(90)(a) NonRec >> Align-XP >> Wrap-XP
(a') Align-XP >> NonRec >> Wrap-XP

(b) NonRec >> Wrap-XP >> Align-XP
(b') Wrap-XP >> NonRec >> Align-XP

(c) Align-XP >> Wrap-XP >> NonRec
(c') Wrap-XP >> Align-XP >> NonRec

It turns out that each pair of these rankings produces equivalent results (so long as no other constraints are involved): For each ranking, the phrasing that wins out over other possible phrasings is the one that violates the lowest ranked constraint, but meets the two others, regardless of the respective ranking of the two stronger ones. We therefore arrive at the typology in (91).

(91)(a)	NonRec, Align-XP >> Wrap-XP	non-recursive phrasing regardless of 'government': Chi Mwi:ni
(b)	NonRec, Wrap-XP >> Align-XP	non-recursive phrasing with the impact of 'governement': Chichewa
(c)	Align-XP, Wrap-XP >> NonRec	recursive phrasing, once regardless of 'government', once with the impact of 'government': Kimatuumbi.

3.2.6. Summary: Wrap-XP vs. government

I have proposed to reanalyze Hale and Selkirk's (1987) government parameter in terms of the constraint Wrap-XP, a constraint that determines phonological phrasing in conjunction with Selkirk's Align-XP and Nonrecursivity. A typology resulting from different rankings of these constraints was explored, and the three types of languages predicted appear to be attested.

The discussion of recursive structure in Kimatuumbi that satisfies both Wrap-XP and Align-XP, as well as the secondary effects of focus on phrasing in Chichewa provided arguments in favour of Wrap-XP as opposed to Hale and Selkirk's original government-parameter.

3.3. Appendix

In this appendix, I return to some formal issues revolving around the phrasing of adjoined elements, treated informally in the discussion of 'O'odham earlier in this chapter. Since it will be useful to have a formal definition of alignment, I begin by developing such a definition.

3.3.1. Alignment

The effect of the definition of alignment offered in the present section is identical to that of McCarthy and Prince (1993), and all substantial elements, such as the definition of relations among non-terminals in terms of terminals in a string, as well as the interaction of universal and existential quantification are taken from them. I prefer to use a different formal implementation of alignment, however, for two reasons. First, I find that their definition does not bring out, clearly enough, that we can talk about edges that coincide, without a special symbol that stands proxy for the edge in the string. Second, I find the definition below more handy, which will facilitate applying it to make a formal point.

The definition of alignment developed here is built on the idea of defining a point in a string by referring to all the material that follows that point in the string[11]. Thus in the string in (92),

(92) A B C D E
↑ ↑ ↑

[11]The choice of 'follows' as opposed to 'precedes' is arbitrary.

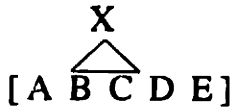
the point indicated by the first arrow is idenified with the substring [B C D E], the point indicated by the second arrow is identified with the substring [D E] and the point indicated by the third arrow will be identified as the empty string.

In this spirit, edges are defined as follows:

(93) The right edge of X, Right(X) is defined as that substring that consists of all terminal elements that X precedes in the string.
The left edge of X, Left(X) is defined as that substring that consists of all the terminals that X dominates, and all the terminals that X precedes in the string.

Thus, assume that that [A B C D E] in (94) is a string of terminals and that X is a non-terminal element dominating the substring [B C].

(94)



Then the right edge of X, Right(X), is defined as the substring [D E] by (93), since this is the substring consisting of all termals that X precedes in the string. The left edge of X, Left(X), is defined as the substring [B C D E] by (93), since it is this substring that consists of all terminals that X dominates (namely [B C]) plus all terminals that X precedes (namely [D E]).

Somewhat more formally, let us use the definition of precedence of a non-terminal element with regard to a terminal element in (95).

(95) A nonterminal element NT precedes a terminal element T, if all terminals dominated by NT precede T in the string.

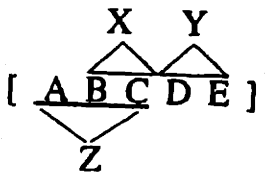
Thus the nonterminal X precedes the terminal D in (94), since all terminals dominated by X in the string, namely B and C, precede D in the string.

Having a way of referring to edges, we can write a simple definition of alignment as in (96).

(96) For all morphosyntactic or phonological types Cat1, Cat2, and for Edge1, Edge 2 ∈ {Left, Right}:
Align(Cat1, Edge1, Cat2, Edge2) ⇔
For all x of type Cat1, there is a y of type Cat2, such that
Edge1(Cat1) = Edge2(Cat2)

Consider for example the configuration in (97).

(97)



Here the right edge of X is [D E] as is the left edge of Y, and as is the right edge of Z. Thus, we correctly derive that Right(X) = Left(Y) = Right(Z): these edges are aligned. However, the left edge of Z is not aligned with either the left edge of X or the left edge of Y. Thus, the left edge of Z is [A B C D E], whereas the left edge of X is [B C D E] and the left edge of Y is [D E]. Since these are all different, the relevant edges are not aligned according to the present formalism - correctly so.

Applying this definition, then, to an example of phonological phrasing from Chi Mwi:ni, the constraint in (98) demands the Ø-structure in (99) as follows.

(98) Align-XP,R = Align(XP, Right, Ø, Right)

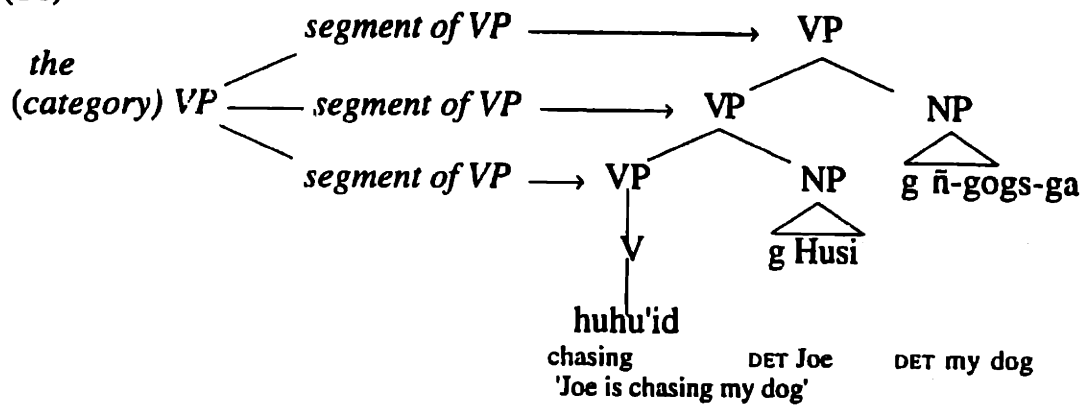
(99) [nimwandikilile [Nu:ru]$_{NP1}$ [xatí]$_{NP2}$]$_{VP}$
(93) wrote Nuru (a) letter
( )$_{ø1}$( )$_{ø2}$

Thus (98), interpreted according to (96), demands that for every XP, there is a Ø such that Right(XP) = Right(Ø). This requirement is met in (99) as follows: For NP_1, there is a Ø, namely $Ø_1$, such that Right(NP_1) = Right($Ø_1$) = [xatí], the material following these edges. Further, for both NP_2 and VP, there is a Ø, namely $Ø_2$, such that Right(NP_2) = Right($Ø_2$) and Right(VP) = Right($Ø_2$) = the empty string. Thus, for each XP in the structure, there is a properly aligned Ø, and (98) is met in (99).

3.3.2. Categories, segments, and domination

Recall that syntactic terminology distinguishes categories, (the things normally talked about in the theory), from segments of categories (the things more obvious in a tree-representation). In a structure of adjunction, such as in an 'O'odham example repeated here, a single category may consist of more than one segment.

(22)



I mentioned that May (1985) and Chomsky (1986) have argued that adjoined elements are outside of the category that they are adjoined to for certain purposes of the syntax. This is captured in a definition of domination, due to May (1985), which has been adopted by Chomsky (1986) and, in more recent work, Chomsky (1993, 11).[12] The definition is given in (100).

(100) The category α dominates β iff every segment of α dominates β.

Thus in (22), the NP *g ñ-gogs-ga* is dominated by the highest segment of VP, but not by the two lower segments of VP. Since it is not dominated by *every* segment of VP, it is not dominated by the category VP by (100). Similarly, the NP *g Husi* in (22) is dominated by the two highest segments of VP, but not by the lowest

---

[12]Chomsky (1993, 11) also defines a notion of *containment* that differs from that of domination in (24) in that adjuncts are contained in the category they are adjoined to (even though they are not dominated by the catgory they are adjoined to). The notion of containment enters into the definition of the checking-domain. Chomsky (1994, 34f), however, reviews a reason not to define the checking domain in this way, but in a more narrow way. This more narrow way that would seem to amount to doing away with the additional notion of containment and defining the checking-domain in terms of the notion of domination in (24) as well.

segment of VP. It is thus not dominated by every segment of VP, and is therefore not dominated by the category VP according to (100).

I will show, then, that the desired results with regard to Wrap-XP and Align-XP in adjunction-structures follow, given these two assumptions:

(101)(a) The syntax-prosody mapping is defined in terms of syntactic categories, not segments.

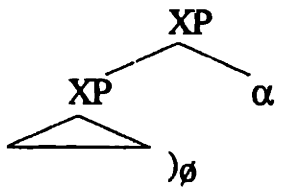
(b) The notion of domination in (100) properly defines the relation of a syntactic category to the terminal string for the purposes of the syntax-prosody mapping.

As will be seen, the net effect of (a) is that the syntax-prosody mapping will act as though the *lowest* segment of a category represents that category: All material that is contained inside of the lowest segment of a category is dominated by every segment of that category, and is thus dominated by the category. By contrast, adjoined material, not dominated by all segments of a category, is not dominated by the category. Since categories but not segments matter for the syntax-prosody mapping, the mapping will take that part of the string to represent a category that is dominated by all segments. In the tree-representation, that is the substring dominated by the lowest segment of a category.

3.3.3. Align-XP and adjunction

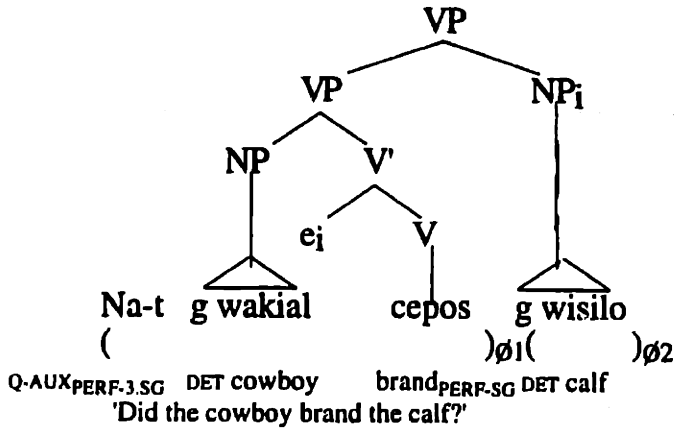
What we want to derive in this section is an assumption used earlier: Align-XP,R requires a Ø-boundary that immediately follows the lowest segment in an adjunction-struture, and thus separates the material genuinely inside of XP from material adjoined to XP. This is shown in (23), repeated here.

(23) Application of Align-XP,R to XP in a structure of adjunction



An example of this from 'Oodham is given in (102). Here *g wakial* is contained inside of VP on Hale and Selkirk's suggestions about phrase-structure, and it is phrased together with the verb. By contrast, *g wisilo*, following the verb, is adjoined to VP and phrased separately. How is the boundary between the verb and the adjoined object triggered by Align-XP,R?

(102)



According to the definition of alignment in (96), the constraint Align(XP, Right, Ø, Right) is interpreted as follows:

(103) Align(XP, Right, Ø, Right) ⇔

For all x of type XP, there is a y of type Ø, such that

Right(XP) = Right(Ø)

In the case of $Ø_1$ in (102) that interests us here, Right($Ø_1$) is *g wisilo*. What we want to bring out formally is why Right(VP) is likewise *g wisilo*, such that (103) demands a Ø boundary at this point. Why is it, formally that the VP ends with the verb, and does not include the adjoined constituent?

First, what's crucial is that, according to (101)(a), the syntax-prosody mapping is concerned with syntactic categories, not segments formally. Therefore an 'x of type XP' in (103), is a *category* x of type XP, not a segment. Thus, when we're looking for Right(VP), we are looking for the right edge of the *category* VP. This right edge is given to us by the definitions in (93) and (95), repeated here.

(93) The right edge of X, Right(X) is defined as that substring that consists of all terminal elements that X precedes in the string.

The left edge of X, Left(X) is defined as that substring that consists of all the terminals that X dominates, and all the terminals that X precedes in the string.

(95) A nonterminal element NT precedes a terminal element T, if all terminals dominated by NT precede T in the string.

According to (93), the right edge of the category VP, Right(VP), is the substring of all terminals that the category VP precedes in the string. What the catgory VP

precedes in the string is then defined by (95): it precedes all material that the terminals it dominates precede. Here, then, domination enters into the picture, and (101)(b) becomes relevant: (100), repeated here, is the relevant notion of domination.

(100) The category α dominates β iff every segment of α dominates β.

By (100), the category VP in (102) dominates *g wakial cepos*, but not *g wisilo*. This is because both segments of VP in (102) dominate *g wakial cepos*, but *g wisilo* is not dominated by every segment of the category VP: the lower segment of VP does not dominate that material.

If the category VP dominates only *g wakial cepos* by (100), then the category VP precedes all terminals after *g wakial cepos* in the string, by (95), i.e. it precedes *g wisilo*, the substring of the adjoined constituent.

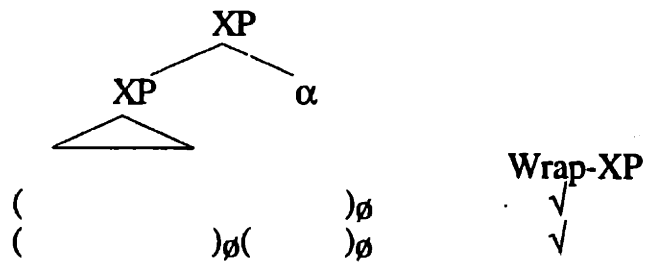
If the category VP precedes *g wisilo* in the string, then, by (93), the right edge of the category VP is defined as *g wisilo*. This is the desired result: the right edge of category VP immediately follows the verb in (102). Align(XP, R, Ø, R) thus requires a right edge of Ø at this point, with Right(VP) = Right(Ø) = *g wisilo*.

Thus, if alignment is defined in terms of categories, and if the relevant notion of domination is that in (100), then the right edge of a category will be, informally speaking, "the right edge of the category's lowest segment", as desired.

3.3.4. Wrap-XP and adjunction

What we want to derive in this section is that Wrap-XP, which otherwise requires that the material inside of an XP must be contained inside of a single Ø, is not violated if material *adjoined* to XP is in a separate Ø, as in (24), repeated here.

(24)



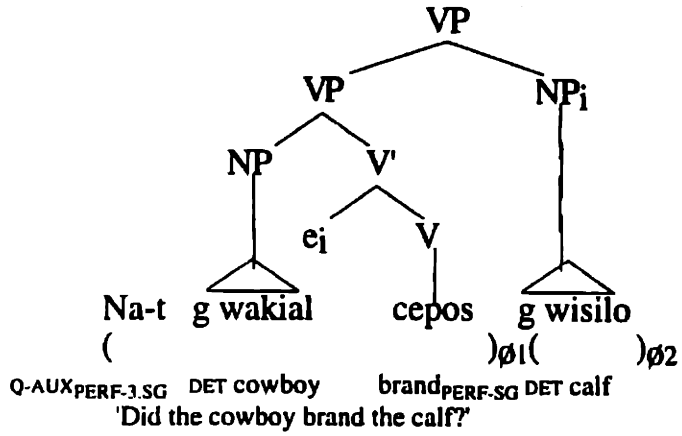
Intuitively this is because the adjoined element does not form a part of the XP in the relevant sense, which is represented by the lowest segment of XP. Now this will be derived formally. I here repeat the definition of Wrap-XP.

(12) Wrap-XP ⇔

for every XP, XP a projection of a lexical category,
there is a phonological phrase Ø,
such that all terminal elements that are dominated by XP
are also dominated by Ø.

(101) implies about the interpretation of (12) that 'XP' in (12) is to be read as 'the category XP', and that domination in (12) is to be interpreted in the general sense of domination in (100). Let us apply this to the example in (102), repeated here.

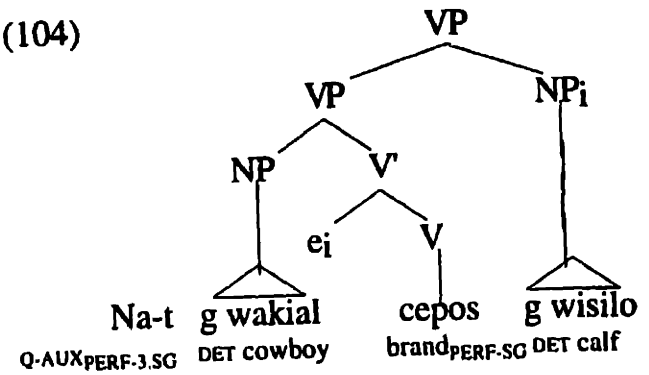
(102)



When Wrap-XP requires that every category XP be wrapped, it thus requires of the category VP that it be wrapped. For the category VP to be wrapped according to (12), it must be that all material dominated by VP is dominated by a Ø. Since, as we just saw, domination in the sense relevant for (12) is defined in (100), the category VP dominates all and only the material dominated by every segment of VP, i.e. the category VP dominates *g wakial cepos* in (102), but not the terminals of the adjunct *g wisilo*. The latter are not dominated by every segment of the category VP. (12) thus requires that *g wakial cepos* be contained inside of a Ø. This requirement is not violated if the adjunct is phrased separately - the desired result.

The consequence of the way in which Align-XP and Wrap-XP apply to an adjunction-structure is that the element adjoined to XP is phrased separately. For the example in (102), the tableau that derives this is given in (104). Align-XP requires a Ø-boundary after the verb (the end of the lowest segment of VP) and Wrap-XP does not mind a Ø-boundary there.

(104)



Wrap-XP >> Align-XP

$	(	)ø(	)ø	
	(		)ø	*!

In summary, the constraints of syntax-prosody mapping, Align-XP and Wrap-XP, define the relations between syntactic and prosodic categories by defining relations among substrings in the terminal string. This much is adopted here from the definition of alignment in McCarthy and Prince (1993). The relation between nonterminals and terminals are defined by domination. On the syntactic side, then, (101) demands that the relevant notion is domination by syntactic categories as defined in (100). This entails that the substring corresponding to a syntactic category (and thus the substring relevant for the mapping) is that string that is dominated by every segment of a category, i.e the substring below the lowest segment of a category. Informally, therefore, we can think of the lowest segment as representing a category for the purposes of the mapping. Formally, however, there is no reference to syntactic segments. The syntax-prosody mapping makes reference to syntactic categories.

CHAPTER 4:

THE DOMAIN OF THE FOCUS

Introduction.

In most discussions of focus in the literature since Jackendoff (1972), it is assumed that the clause or the sentence is the domain with regard to which focus is interpreted semantically and phonologically. Rooth (1992) has shown that this need not be so. In particular, a focus can have a domain much smaller than the clause. Rooth shows how this notion, his *scope of the focus*, enters into the computation of the meaning of a focus. The purpose of the present chapter is to explore the phonology of this addition to the theory of focus. The result is in a way unsurprising: The semantic domain of the focus is also its phonological domain: Rooth's notion of the scope enters into the computation of the phonological effects of the focus. An understanding of this will allow us to study the pragmatic principles guiding the assignment of the scope of foci. It turns out that a proposal by Schwarzschild (1992) about the pragmatics of choosing the focused constituent itself can be extended to account for the way in which the scope of a focus is chosen.

4.1. The forces in the phonology of focus.

A classical observation by Newman (1946) is rendered in (1).

(1) (Newman (1946, p.176))

"When no expressive accents disturb a sequence of heavy stresses [= word stressed, H.T.], the last heavy stress in an intonational unit takes the nuclear heavy stress."

The assignment of rightmost stress was accounted for in Chomsky and Halle (1968) (SPE) by the *Nuclear Stress Rule* (NSR) in (2). The NSR assigns rightmost stress cyclically within syntactic constituents that coincide with word-boundaries on both sides. Stress is assigned to the rightmost of those vowels that come out of previous cycles with unreduced relative prominence (*[1 stress]* in the *environment* of the rule)[1].

(2) Nuclear Stress Rule (Chomsky and Halle (1968, p.90[2]))

$$V \rightarrow [1\ \text{stress}] \ / \ [\#\#X[\overline{\phantom{1\ \text{stress}}}]\ Y\#\#]$$

where Y contains no vowel with the feature [1 stress]

---

[1]This would be primary word-stress in the case of the the first phrasal application of (2), and previously assigned phrasal stress in the case of later phrasal applications of the NSR. By a general convention in SPE, assignment of [1 stress] to a vowel in a given domain reduces all other stress in that domain relative to the newly assigend [1 stress].

[2]Chomsky and Halle (1968) collapse this rule with the rule that assigns stress in compounds later in their discussion.

This covers the second line of the quote by Newman, the default-case. Jackendoff, I believe, put the default-case and the special case (second and first line of Newman's quote) together in the right way:

(3) (Jackendoff (1972, p.237))

> If a phrase P is chosen as the focus of a sentence S, the highest stress in S will be on the syllable of P that is assigned highest stress by the regular stress rules.

The relation of focus- and default-stress is often thought of as a relation of conflicting requirements, with one (focus) overriding the other (rightmost stress).

Here I continue within the framework of assumptions adopted in the first chapter: The syntax-prosody-mapping is determined by ranked and violable constraints (see Prince and Smolensly (1993), McCarthy and Prince (1993a, b) for a theory of ranked and violable constraints, Selkirk (1995) for suggestions about the syntax-prosody mapping in this format.) In this formal frame, the interaction of overriding focus-requirement and default rightmost stress finds a natural place.

To capture the interaction of focus and rightmost stress, the constraints in (4) and (5) will be used as a starting point.

(4) NSR (Chomsky and Halle): In each syntactic constituent, the rightmost lexical element is the most prominent one.

(5) Focus (Jackendoff): If a phrase P is chosen as the focus of a sentence S, the highest stress in S will be within P.

It should be clear that these are the insights of the authors above, here put in terms of well-formedness-constraints (somewhat informally, to facilitate discussion). It was clear at least since Newman's quote above that assignment of rightmost stress is subordinate to the requirements imposed by focus. Thus in a sentence with no focus, as in Newman's example *The man walked away*, stress on the rightmost lexical word is strongest by the NSR. However, when focus comes into play, as in Newman's *it was this man who walked away*, focus may direct the stress to an earlier element in the clause, here to the word *this*, and the NSR is violated: It is no longer the rightmost element of the clause that bears the nuclear stress.

Since Haliday (1967), Chomsky (1971) and Jackendoff (1972), it is usually assumed that focus is a property of syntactic constituents. Jackendoff (1972), in particular, proposed that an abstract feature F be assigned to a focused constituent; F is then used in both the phonological and the semantic interpretation of the focus. Chomsky (1970,p.93) observed that a given stress may be compatible with focus on more than one constituent. as shown in his example in (6).

(6) {was he / he wasn't }

(warned to (look out for (an ex-convict (with (a red (SHIRT)))))))

(i) No, he was warned to expect a visit from the FBI.

(ii) No, he was simply told to be more cautious.

(iii) No, nothing was said to anyone.

Jackendoff's account of this is straightforward. In its present rendition: When the abstract feature F is assigned to any one of the bracketed constituents in (6), the requirement of Focus in (5) will require that the nuclear stress of the clause is *somewhere* within the focus, rather than outside of it. Within the focus, the NSR in (4) will make sure that stress ends up on the right (see also Jackendoff's formulation in (3)). Therefore, it so happens that focus on any of the bracketed constituents in (6) leads to the same nuclear stress on the final element.

The same logic applies when the focus is not in clause-final position as in (7). This particular stress, is compatible with contexts that allow the bracketed parts of the subject as the focus.

(7) (An ex-convict (with (a red (SHIRT)))) was looking for Mary

In the context of:

√ Who was looking for Mary? - __

√ What kind of ex-convict was looking for Mary? - ___

√ An ex-convict with a red hat was looking for Mary. - No, ___

What was all the hype about? - ___

In this example, the requirement that stress be final in syntactic constituents is systematically violated on the level of the clause: the nuclear stress of the clause is not on the final element of the clause, *Mary*. The only way in which this violation can come about is if focus is assigned to one of the bracketed constituents in (7): the requirement Focus in (5) will then force the nuclear stress of the clause to fall within the focus, rather than in sentence-final position. *Within* the focus, the effects of the NSR can still be observed for the syntactic constituent of the subject NP (and its parts): stress is assigned rightmost. Therefore focus on any of the bracketed constituents in (7) will lead to stress on *Shirt*, the righmost element of the bracketed constituents.

(7), however, does not allow focus on the whole clause alone. If only the whole clause is focused, nuclear stress have to be within the clause by (4). This much is in accord with the actual stress in (7). However, the NSR will then require for nuclear stress to be assigned rightmost, on *Mary* in (7). There is no way, then, to derive the stress-pattern in (7) with focus on the whole clause. - If stress is put on the final element of the clause as in (8), then one of the possibilities is for focus to be on the entire clause (or, equivalently, for there not to be a focus at all), as shown.

(8) (An ex-convict with a red shirt (was looking for (MARY)))

It follows correctly from Jackendoff's account that not any stress will lead to multiple possibilities of focus. In (9) and (10), for example, only one focus, focus on the stressed element itsself, is possible.

(9) An EX-CONVICT with a red shirt was looking for Mary

(10) Was he warned to look out for an ex-convict with a RED shirt?

No, he was warned to look out for an ex-convict with a BLUE shirt.

(i) # No, he was warned to expect a visit from the FBI.

(ii) # No, he was simply told to be more cautious.

(iii) # No, nothing was said to anyone.

In Jackendoff's account: If stress is not clause-final, it follows that focus on some element is responsible for the retraction. Since stress will be rightmost within that focused constituent, only such constituents are possible foci that have the nuclear stress rightmost inside of them. In (9) and (10), the only syntactic constituents that meets this requirement happen to be the stressed constituents *ex-convict* and *red*, respectively.

Later other authors, most prominently Selkirk (1984 and following work), have pointed out problems with Jackendoff's theory, and have proposed modifications. It is my impression that these additional facts will fall into place once we get a good understanding of the prosody of topics. Here the questions that arise in this connecetion will be ignored. Let us, for the purposes of the present chapter, work with Jackendoff's proposal.

4.2. The domain of a focus

Let's go back to Adam and Eve (or John and Mary). Consider the sentences in (11) and (12). These are each to be understood in separate contexts, i.e. (12) is not to be read as a contrast to (11).

(11)(a) John met Mary on Tuesday. -

(b) (No,) BILL met Mary on Tuesday.

(12) John met Bill on WEDNESDAY.

In (11) there is a sense in which *Bill* in (b) is juxtaposed to *John* in (a). A crucial element of this juxtaposition is that, as expressed by these sentences, the same thing is considered of both John and Bill: meeting Mary on Tuesday. In (12), on the other hand, John and Bill are not so juxtaposed. This, of course, is because in (12), it is not said that the same thing happened to both of them: What happened to John is meeting Bill, and what happened to Bill is being met by John, at least as far as this sentence itsself goes.

This difference between (11) and (12) is reflected in the phonology of these two utterances: The most natural way of pronouncing (11)(b) is with more prominence on *Bill* than on the sentence-final element, *Tuesday*. In (12), on the other hand, the lack of juxtaposition is reflected in the lack of a phonological distortion of the default-pronunciation: The most prominent element in the clause here is the final element, *Wednesday* (in a context that doesn't bias towards any of the elements in this clause).

This kind of juxtaposition, of course, is focus, and it is clear that it involves not only the elements to be juxtaposed (*John, Bill*) but also some *background* against which the juxtaposition takes place (*met Mary on Tuesday* in (11)). For a given focus, this background must stem from the structure of which the focused element is a part. Thus, the knowledge that John and Bill are both bachelors will not serve as a suitable background for juxtaposition of the two in (11): The sentence would still be pronounced with nuclear stress on the final element.

This division between focused element(s) and the background for juxtaposition is at the core of all semantic analyses of focus, from Chomsky (1970), Jackendoff (1972), Chomsky (1977) ('focus vs. presupposition') to the model-theoretic proposals in Rooth (1985), Kratzer (1991), Schwarzschild (1992), ('p-sets'), Rooth (1992) ('focus semantic value') as well as those by Jacobs (1984, 1988, 1989), Krifka (1985, 1991), von Stechow (1989, 1991), (*focus* and *background*, the parts of their *structured meanings*; Jacobs (1984) first used the term *background*, to my knowledge).

Jackendoff (1972) proposed to represent what I here call background by taking the sentence, and abstracting over the focus. The focus is replaced by a variable, bound by a lambda operator: $\lambda x((met(x,b,t)\&PAST(t)\ and\ Tuesday(t))$. By letting the variable range over arbitrary values, one obtains a set which is helpful in defining the semantic contribution of focus. In Rooth (1985, these sets are called *p-sets*. The p-set for (11)(b) has the form $\{(met(x,b,t)\&PAST(t)\ and\ Tuesday(t)) \mid x\ in\ D_{et}\}$. For a proposition to be a member of this p-set means, intuitively, that the proposition has a content of the form: [X met Bill on Tuesday]. Thus both (43)(b) and the sentence it contrasts with, (11)(a), would be members of the p-set. The p-

set (Jackendoff's presupposition) thus formally captures the background with regard to which a focused element is juxtaposed to another element.

In Rooth (1992), the semantic requirement of the focus in the case of contrasting utterances, as in (11), is then as follows: The utterance that serves as a contrast to the focused utterance must (i) be a member of the p-set of the focused utterance[3], i.e. it must contain the information of the background of the focused structure, and (ii) it must be different in meaning from the utterance that it contrasts with. Thus in (11), the p-set $\{(met(x,b,t)\&PAST(t) \text{ and } Tuesday(t) \mid x \text{ in } D_{et}\}$ is computed from the focused (b). (a) is an appropriate contrast since (i) it is a member of this p-set ((a) shares the relevant background with (b)) and (ii) (a) is at the same time different from (b) itself - it differs from (b) where (b) is focused.

Intuitively: the *scope* of a focus is semantically divided in two parts: the focus and the background (or presupposition etc.). An appropriate contrast for the focused structure must share the background, but differ somewhere on the focused part of the scope.

[3]p-sets are called 'focus semantic value' in Rooth (1992).

4.3. The phonology of the scope

Discussions of focus in the literature mostly concentrated on cases in which focus and background together make up a clause. Many theories of focus (Jackendoff (1972), Jacobs (1988[4])) are set up so as to only allow this case. In Jackendoff (1972), for example, the rules of interpretation take the sentence S that contains the focus as the basis for computing the background (his presupposition). Hand in hand with that, the rule that interprets focus phonologically, repeated here, has S as its domain.

(3) (Jackendoff (1972, p.237))

If a phrase P is chosen as the focus of a sentence S, the highest stress in S will be on the syllable of P that is assigned highest stress by the regular stress rules.

Rooth (1992) observes that the clause is not the only possible domain from which a background can be derived. Thus in Rooth's example in (13), here annotated with structure, the background for the contrast between *American* and *Canadian* is, informally, *[an X farmer]*.

(13) An *American farmer* was talking to [a [CANADIAN]$_F$ farmer]$_{DF}$

Once this kind of structure is recognized, examples can of course be produced at will.

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[4]In Jacob's theory, the scope of a focus is the assertion (or question etc.) unless a lower focus-sensitive element can define a smaller scope of the focus.

(14)(a) John's sister likes [[BILL's] sister]

(b) John's younger sister likes [John's [OLDER] sister]

(15)(a) A student of chemistry asked advice

from [a [PROFESSOR] of chemistry].

(b) A young student of chemistry asked advice

from an [[OLDER] student of chemistry]

(16) John entered the room and looked around. There were some Canadian students chatting in one corner. On the opposite side of the room, Mary was flirting with [a [BRASILIAN student]].

Rooth calls the domain from which the background is computed the *scope* of a focus. Here I would like to make an observations about the phonology of the scope. Essentially, it turns out that the scope, the semantically relevant domain of the focus, is also its phonologically relevant domain. Since *scope* is essentially a semantic notion, I will use the term *domain of a focus*, of *DF* instead of *scope* in the following.

I believe that the correct formulation of the contribution of the focus to the prominence-relations in a clause is as in (17), crucially using the notion of the domain of a focus.

(17) Focus: If F is a focus and DF is its domain, then the highest prominence in DF will be within F.

This is to be contrasted with theories in which focus is assigned the greatest prominence within a sentence or clause generally. Examples that distinguish between these possibilities are shown in (18) and (19).

(18)

```
                x                                  x                                  x
                                                                                      x
[An [American]F farmer]DF and [a [Canadian]F farmer]DF went to a bar.
```

(19)

```
                                                                   x
  x                          x                                     x
[[John's]F sister]DF and [[Bill's]F sister]DF get along well.
```

If the phonological domain of a focus would be the clause, regardless of the semantic domain, the clause-final default-stress in these examples could not be derived. Instead, one of the foci in each of these examples should attract the nuclear stress of the clause.

However, clause-final stress is obligatory in these cases (unless, of course, further focus-structure is introduced, see below).

These patterns straigthforwardly follow from (17) and the subordinate effects of the Nuclear Stress Rule: Within the constituents marked DF, (17) dictates that the focus must have the most prominence. Here (17) overrides the NSR. Thus *American* in (18) must be stressed more than its syntactic sister *farmer*, and likewise for *Canadian*. Outside of the constituents marked DF, however, the focus doesn't care about the prominence-relations according to (17). Here, then, the NSR enforces rightmost prominence in each constituent. Consider the effect of this on the level of the matrix clause. According to the NSR, the matrix clause wants to have the largest prominence on its rightmost element. Crucially (17)

does not get in the way of the NSR on the level of the clause - (17) only cares about the more narrow domains of the foci. Thus the NSR makes sure that the rightmost element of the clause is assigned the maximal prominence within the clause. Maximal, of course, also means more prominent than the focused elements with a small scope. This is the correct result.

The only way, then, for the nuclear stress to be retracted from utterance-final position, is if the domain of some focus extends to the end of the utterance. This is here exemplified with (20).

(20) Who gets along well?

```
                x
  x             x
[[John and Bill]F get along well]DF
```

If stress would be assigned at the right edge of the utterance in this case, it would then be in conflict with the requirement on focus in (17). Since (17) overrides (is ranked above) the NSR, stress will be within the focus, rather than utterance-final in this case. This conflict is not present on the level of the clause in (18) and (19), where rightmost stress in the clause is compatible with the requirements of focus in (17).

Dissociating the domain of the focus from the clause, we expect that there should be nothing that prevents embeddings of focus-structures within one another. This is correct, as the example in (21) shows.

(21) Who gets along well?

```
                                  x
   x                              x                                  (x)
[[John's]F sister]DF and [[Bill's]F sister]DF   get along well.
[[                                          ]F                     ]DF
```

Here the small focus-domain structures on the conjuncts will force stress within each conjunct on the genitive DP. This is unaffected by the larger focus-structure. The latter, however, entails a requirement about the prominence-relation between the subject DP and the rest of the clause: here the most prominent element must be the subject, the element that is focused in the domain of the entire clause. Thus the subject receives more stress than the VP. Among the prominence-relations thus determined, there is only one thing left for the NSR to decide: is the nuclear stress of the clause on *John* or on *Bill*? Either one would be compatible with the requirement of the large structure that the nuclear stress of the clause be within the focused subject. The NSR, of course, opts for the rightmost of the two, as shown.

4.4. Maximizing the background

How are the constituents chosen that function as focus and domain? Many possibilities are of course infelicitous in a given context, given the requirement on focus formulated above. However, it turns out that among those allowed by those requirements, there are some that are actually ok, and others that are not. This was discussed for the assignment of F in Schwarzschild (1992). His point will be reviewed in the following section.

Given the knowledge about the phonological effects of the domain from the previous section, we can observe a principle for the assignment of DF which is similar to the one proposed by Schwarzschild for the assignment of F. This will be developed in the second section of this part. Since the requirement on the assignment of F from Schwarzschild and the one observed here for DF have the same pragmatic motivation, Schwarzschild's account is easily extended to cover the case of DF.

4.4.1. Minimal focus

Schwarzschild (1992) has argued for a constraint on focus to the following effect: Assume a choice among various assignments of focus to a structure, such that the assignments would all be compatible with a given context (on the standard intepretation of focus sketched earlier). Focus must be chosen in such a way as to be *minimal*. Schwarzschild illustrates this with two cases. His first set of examples is given in (22).

(22)(a) John picked strawberries at Mary's farm.

(b) John picked BLUEBERRIES at SANDY's farm.

(c) John picked STRAWBERRIES at SANDY's farm.

(b), but not (c), can be uttered as a contrast to (a). This is not accounted for by the interpretation of focus adopted from Rooth above: Given the focus in (c), its presupposition is that the context furnish an element with a meaning of the kind [John picked X and Y's farm], an element which is different from the actual meaning of (c). (a) meets this presupposition: it is of the general form [John picked

X and Y's farm], and it is different from (c) in meaning: Mary contrasts with Sandy.

What's wrong with (c) is that it is, as Schwarzschild puts it, 'overfocussed'. The separate focus on *strawberries* in (c) wouldn't be necessary, since (a) and (c) do not differ at this point. Thus another focus-structure, given in (23), would have been possible instead of (22)(c). In (23) less material is focused than in (22)(c). The additional focus on *strawberries* in (22)(c) would not be required. The infelicity of (22)(c) as a contrast to (22)(a) thus suggests that 'superfluous' focus is not allowed.

(23) John picked strawberries at SANDY's farm.

Before discussing Schwarzschild's second case, I would like to offer some examples that make a related but simpler point. Consider (24) and (25).

(24) Mary thinks that John likes big cars, but in fact

(a) John likes [SMALL]$_F$ cars

(b) # John likes [small CARS]$_F$

(25) I'm not sure what she$_i$ thinks about him$_j$, but I think that

(a) Mary$_i$ [LIKES]$_F$ John$_j$

(b) # Mary$_i$ [likes JOHN$_j$]$_F$

In the (a)-cases, focus is chosen more narrowly than in the (b)-cases. Notice, however, that both the (a)- and the (b)-cases are possible foci according to the account adopted from Rooth above: The presupposition of (24)(b), for example, is

that an element from the context has a meaning of the kind [John likes X] and is different from the meaning of *John likes small cars*. In the given contest, ... *John likes big cars* certainly meets this requirement. As in (22), what is going wrong is that too much is focused, when the focus could have also been chosen more narrowly, as shown in (24)(a). Focusing too much, then, appears to generally be infelicitous.

The second example that Schwarzschild offers is reproduced in (26).

(26) Whaddya mean MARY appointed John?

(a) JOHN appointed John.

(b) # John appointed JOHN.

The question Schwarzschild asks is this: Why is (26)(b) not acceptable with focus on VP, compatible with the final stress in the example, such that the focus on VP contrasts, roughly, with a meaning like *was appointed by Mary*, given in the question.

Schwarzschild's answer is that (b), on this reading, would again be overfocused. Since there is a structure in which only *John* is focused, namely (a), a structure in which additional material is focused, such as *appointed John* on the intended reading, is not possible.

What the example in (26) shows over and above all previous examples is that for one focus-structure to block another one, it need not be the case that the two foci under consideration overlap syntactically (as they did in all previous examples). Thus the narrow focus on *John* in (a) is on the subject DP, whereas the focus that is blocked in (b) is on the VP *appointed John*.

Schwarzschild's examples thus not only establish the need for some kind of minimality-requirement, they also show us something about the proper way of formulating it:

It's not about having one vs. more foci, as one might think from (22). This is shown by (26) (as well as (24) and (25)). Nor is it about a choice between focusing a larger or a smaller syntactic constituent, one containing the other, as one might think from (24) and (25). This would not explain either (22) or (26). Thus, there is no syntactic generalization about the relation between the foci in the good cases and the foci that are blocked by the good cases. It seems, therefore, that the relevant constraint is best expressed with reference to meaning, rather than syntax, which is what Schwarzschild proceeds to do. His account of contrast is shown in (27).

(27) Constrast constraint (Schwarzschild (1992))

If B is uttered in contrast with A, then

(i) $||A|| \in$ pset(B)

(ii) there is no element K in pfamily(B), such that $||A|| \in$ K and K is a proper subset of pset(B).

(28) pfamily(m): the set of psets one gets from all logically possible different focussings of m.

Here (i) is the familiar condition that the utterance contrasted with must share the background with the focused utterance. (ii) is the minimality condition of interest here. It sais that there must not be another possible way of focusing the utterance (an element K in pfamily(B)), such that that other focus-assignment is good for

contrasting with the same utterance (||A|| $\in$ K) and leads to a background with more information in it (K is a proper subset of pset(B)).

The net effect is that smaller foci are chosen over larger ones, since smaller foci leave more information for the background. The comparison between smaller and larger backgrounds is done semantically.

In (24), for example, the choice between (a) and (b) is the choice between backgrounds like *[John likes X cars]* for (a) and *[John likes Y]* for (b). (a) is chosen over (b) since, informally, its background has more information in it. In particular, since (a) has narrow focus on the adjective, the meaning of *cars* comes to be part of the background in (a). With the larger focus in (b), on the other hand, *cars* is part of the focus rather and does not become part of the meaning of the background. The smaller focus in (a) thus leaves more of the meaning of the scope to the background, which then leads to the choice of (a) over (b).

4.4.2. Maximal domain

Consider again Rooths example, repeated here, and the slightly different (30).

(29) An *American farmer* was talking to a [CANADIAN]$_F$ farmer

(30)(a) *Mary likes an American farmer.*

(b) No, Mary likes a [CANADIAN]$_F$ farmer

In Rooth's (1992) theory, in which the semantic role of the scope was postulated but nothing was said about the phonology of the scope, a question arose that

could not, as far as I can see, be settled there. How is the scope of a focus chosen, and how can we even tell?

Thus, we know from the semantic calculations that there is always an *upper bound* on how large the scope can be: In (30)(b), the scope could be as large as the whole clause, given the appropriate contrast for this large scope in (30)(a). In (29), on the other hand, it is clear that the scope could be no larger than the object DP. If the object DP is chosen as the scope of the focus, the contrast involves [an X farmer], and on this level, the subject DP of (29) could serve as an appropriate contrast. A larger choice of scope would lead to infelicity since there would not be an appropriate contrast for it, at least in the sentence as given. The context, then, places an upper limit on the choice of the scope.

However, there is no requirement that sais anything about the *minimal* extent of the scope, and in fact there was no way to say anything about this question, for there was no way of observing if there is a lower bound on the size of the scope: For all we knew, the scope of the focus in (30) could have been either on the whole clause (as I assumed in earlier sections) or on the VP, or on the object DP, or even on the focused adjective itsself. These possibilities are shown in (31). Each successive reduction of the scope would lead to a weaker semantic requirement. The context in (30)(a), however, that was good enough to meet the strongest requirement in (31)(a), was of course also good enough to meet the weaker requirements in (31)(b)-(d)

(31)	*choice of scope in (30)(b)*	*contrast in (30)(a) to match scope*
(a)	[Mary likes a [Canadian]$_F$ farmer]$_{DF}$	[Mary likes an American farmer]
(b)	Mary [likes a [Canadian]$_F$ farmer]$_{DF}$	Mary [likes an American farmer]
(c)	Mary likes [a [Canadian]$_F$ farmer]$_{DF}$	Mary likes [an American farmer]
(d)	Mary likes a [[Canadian]$_F$]$_{DF}$ farmer	Mary likes an [American] farmer

Thus, where is the scope of the focus? And how can we tell?

In the present proposal, we can start to make observations and find out if there is anything to say about the scope. In the present example, in particular, we can conclude that (31)(d) cannot be the correct representation: This representation would not account for the stress on *Canadian*. Thus, according to (17), the focus must be the most prominent element within its domain. When focus and domain coincide, as in (31)(d), this requirement is trivially met, i.e. the focus will not have any effect whatsoever on the prosodic structure. This would entail, however, that among the adjective *Canadian* and its sister, the noun *farmer*, the focus does not affect the stress-relations, just as it did not affect the stress outside of the domains in the examples (18) and (19) in the previous section. Therefore the default, the Nuclear Stress Rule, would assign stress to the rightmost noun rather than the adjective in the structure in (31)(d). The result would be *Mary likes a [[Canadian]$_F$]$_{DF}$ FARMER*. This, however, is infelicitous in the context of (30)(a).

We can conclude therefore that in the discourse in (30), the focus-structure with narrow scope on the adjective, as in (31)(d), is inappropriate. We might say that the structure in (11)(d) is 'underscoped'. What we do not yet know is whether what goes wrong is (a) that trivial focus-domain structures are generally avoided,

or (b) that there is a tendendcy to choose the domain maximally large. The example in (32) tells us more in this regard.

(32) Does an American farmer like Mary?

(a)
```
          x
No, a CANADIAN farmer likes Mary
```

(b) #
```
                                x
          x                     x
No, a CANADIAN farmer likes MARY
```

(c) #
```
                                x
                   (x)          x
No, a Canadian farmer likes MARY
```

(33) lists potential assignments of domain for the contrast between *Canadian* and *American* in this example.

(33)

	choice of scope	*contrast in the context*
(a)	[A [Canadian]$_F$ farmer likes Mary]$_{DF}$	Does [an American farmer like Mary]?
(b)	[A [Canadian]$_F$ farmer]$_{DF}$ likes Mary	Does [an American farmer] like Mary?
(c)	A [[Canadian]$_F$]$_{DF}$ farmer likes Mary	Does an [American] farmer like Mary?

As in the case of (31) for (30), the context here is fit to meet the presupposition resulting from the assignment of a maximal domain in (a), or to meet a weaker presupposition resulting from any of the smaller assignments of a domain that are shown.

(33)(c) is analogous to (31)(d): trivial focus does not seem to be an option when other possibilites are around. If it would be possible, we would expect the stress-

pattern in (32)(c) to be available: the focus with a narrow domain would not change the stress-relations in the clause.

Now consider also (33)(b). This assignment of DF does not result in a trivial focus-structure: contrasts of the form [an X farmer] are searched out, and the question in (32) would seem to provide a suitable contrast here. We also know from the discussion of (19) and other examples that focus-structures of this kind are perfectly legitimate in principle. However, (17) predicts the stress-pattern in (32)(b) for this assignment of domain: The focus-structure leads to a retraction of the stress within the subject DP: here stress must be on the focus (the adjective) within the domain (the DP). However, stress outside of the domain is not affected by this focus-structure, so we expect the nuclear stress of the clause to still fall on the final *Mary*, outside of the domain of the focus. This assignment of stress, however, is infelicitous in the given context. From this we now learn that the smaller scope in (33)(b) is in fact not a possible choice in the given context. What's wrong with it appears to be that is that it is too small, given the choice of the larger scope in (a). In this case, however, we can tell that the relevant requirement goes beyond ruling out trivial domain: (33)(b), with no trivial domain but still not the maximal domain, is still ruled out, as we can tell from the oddness of (32)(b).

On the whole, then, there appears to be a maximality-requirement for the choice of the domain. What this maximality-requirement shares with the minimality-requirement on the choice of focus, is that both favour maximal backgrounds: larger choice of focus takes away from the size of the background, as does choice of smaller domains.

It turns out, therefore that Schwarzschild's formulation, repeated here, can easily be made to cover the maximality requirement on choice of domain.

(27) Constrast constraint (Schwarzschild (1992))

If B is uttered in contrast with A, then

(i) $||A|| \in$ pset(B)

(ii) there is no element K in pfamily(B), such that $||A|| \in$ K and K is a proper subset of pset(B).

(28) pfamily(m): the set of psets one gets from all logically possible different focussings of m.

Since (27) is a formulation that blocks non-maximal background (non-maximal within the limits of the context, here represented by A), (27) can stand as it is. All we need to do is to include different choices of domain along with different choices of focus in the definition of pfamily. The somewhat vague specification of pfamily in (28) is from Schwarzschild's draft. He intends 'different focusings' to mean different assignments of F. The result of this section, then, is that the logically possible different choices of DF should likewise be included in the pfamily in this definition, as in (34).

(34) pfamily(m): the sets of psets one gets from all logically possible different assignments of F and DF to the constituents of m.

Thus the maximality-requirement on backgrounds in (27)(ii) rules out (33)(b) with the background [an X farmer] since the choice of a larger domain in (33)(a) would

lead to the larger background [an X farmer likes Mary] that is still compatible with the context in question.

In concluding this section, I note that the maximality requirement on the domain of a focus makes it easy to see why sentential domains appear to been the only relevant case for much of the past research on focus, whereas smaller domains have been overlooked until recently. Sentence scope is maximal scope, and thus preferred over any alternative by (27)(ii), so long as the context allows this. Thus, to get anything smaller than sentence scope, a context has to be set up that will not allow sentence scope and will at the same time favour a smaller scope instead. In other words, examples with a domain that is smaller than the sentence do not simply pop up; they have to be looked for and constructed.

CHAPTER 5:

FOCUS, PROMINENCE AND PHRASING

5.1. The idea

5.1.1. Introduction

The subject of the first chapter was the way in which syntactic structure maps into prosodic structure. Two relevant factors were seen to be at play: Align-XP - Selkirk's alignment of XPs with the edge of phonological phrases, and Wrap-XP - the requirement that syntactic phrases be contained in phonological phrases. In the second chapter, I discussed the effect of focus on prominence (stress). The focused constitent must be the most prominent within the domain of the focus. In Chapter 4, I was working with the simplified assumption that phrasal stress is assigned rightmost in English with regard to constituents directly taken from the syntax. In the present chapter prominence and prosodic constituency are put together, and their interrelation is discussed with regard to the effects that focus has on prosodic structure. The overall situation is sketched in (1).

(1)

syntax:	Align-XP/Wrap-XP	⟶	ph.constit ( )ø	Chapter 3
			⟵	present chapter
focus:	F most prom. within DF	⟶	prominence x	Chapter 4

In the way of fitting phonological constituency and prominence together, I follow up on the remarks in the introductory Chapter 2:

The representation of prominence (metrical structure) and the representation of prosodic constituents (prosodic structure) is one and the same. In this representation, grid-marks that represent prominence are related to constituents in a way that is familiar from metrical structure, and that has been proposed for prosodic structure as well. The following aspects are relevant:

(2) Each grid-mark is the head or a prosodic constituent.

I will take (2) to be axiomatic, a basic property of the representation. I have not found a case where one might profitably maintain that (2) is violable.

The inverse of (2) will likewise be assumed: For each prosodic constituent, there is a grid-mark that heads the constituent (I return to a way of deriving this momentarily). In the representation of bracketed grids from Halle and Vergnaud (1987), adopted here, the head of a constituent is represented on the line above the constituents itself.

So far, then, prominence and prosodic constituents are tied to one another by a one to one relation between grid-marks and the constituents they head, both part of the same representation.

Particularly important for the purposes of this chapter will be a further hypothesis: Prominence is (typically) assigned rightmost or leftmost with regard to prosodic constituents.

The observation that prominence is edgemost with regard to *some* kind of constituent has been around at least since Newman (1946). Prince (1983) has explored the possibility that stress be assigned edgemost with regard to syntactic constituents such as words. Chomsky and Halle (1968) have suggested that the nuclear stress rule assigns prominence edgemost within a string delimited by the phonological boundaries ## - what would today be metrical or prosodic constituents. In the metrical theory of Halle and Vergnaud (1987), each level of the representation in each language may be [+HT], head-terminal, or [-HT], non head-terminal. 'Head-terminal' means that the head of a metrical constituents is systematically at the right or systematically at the left edge of that constituent. All levels in all languages are head-terminal, with the exception of line 0 in Cayuvava stress, a language that has the additional odd property of forming ternary constituents on line 0 (feet). In prosodic phonology, Nespor and Vogel (1986) have defended the claim that stress is assigned leftmost or rightmost within prosodic constituents universally; Selkirk (1986) has argued that prominence on some higher level is assigned rightmost within the phonological phrase in Chi Mwi:ni, "with a hunch in mind that in general, as in Chi Mwi:ni, the metrical grid will be constructed with respect to prosodic structure and not with respect to the syntax" (p.389).

The implementation of edgemost prominence within prosodic constituents that I adopt here is in terms of alignment of an edge of a prosodic constituent with its head, as introduced in Chapter 2. This is an extension of an analogous proposal by McCarthy and Prince for other levels of the prosodic representation. The relevant constraints on the levels of phrasing discussed here are:

(3)	Align-Ø = Align(Ø, edge, H(Ø), edge)	edge-most "phrasal stress"
	Align-I = Align(I, edge, H(I), edge)	edge-most prominence within the intonational phrase
	Align-U = Align(U, edge, H(U), edge)	edge-most prominence within the phonological utterance

A question arises with regard to the proper parametrization of these constraints. Does a language choose between L or R for a constraint on a given level, or does every language have the L- and the R-version of both constraints, with the actual preference then determined by ranking? The predictions of the two implementatios differ, but not in a way that I could decide here, nor will it be crucial for the purposes of this chapter.[1]
To simplify the discussion, I will assume that languages have one of the constraints in ($4) each, choosing L or R for 'edge' on each level.

In this chapter, the hypothesis that prominence be edgemost with regard to prosodic constituents as expressed in ($4) will play a crucial role. I will make a particular kind of case for this hypothesis. I will attempt to show that, given a right/left preference for prominence with regard to phonological constituents, the effects of focus on phrasing can be derived.

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[1]It turns out that the two possibilities make different predictions with regard to the defaults that one might find, but not with regard to the effects of focus on phrasing - the topic of the present chapter.

This, then, is the hypothesis I will explore: The effects of focus on phrasing are all derivative of the way in which the system adapts to FOCUS, the requirement that a focus be the most prominent element in its scope (see chapter 4). The way in which effects of focus on phrasing are derivative of the rearranged prominence due to focus is the following: Since right/left edges of constituents want to be close to the prominence heads of these constituents, changing the locus of prominence by focus would - without adjustment - lead to configurations in which edges and prominence are further apart. The prosody will then react to this by trying to bring them closer together again.

In the typology that results from this, there are two effects of focus on phrasing: insertion of boundaries at the edge of the focus, and deletion of boundaries and/or prominence between the focus and one of the edges of its scope. To the extent that this typology and the present way of deriving it turn out to be correct, we have evidence that the centerpiece of the analysis - the preference for prominence to be edge-most with regard to prosodic constituents - is indeed part of the grammar.

5.1.2. Boundary-insertion by focus: the basic idea

The prosodic requirement of focus from chapter 4 is repeated here.

(4) **Focus**: If F is a focus and DF is its domain, then the highest prominence in DF will be within F.

When focus come into play, and when Focus is ranked above alignment, misalignment as in (5)(b) will be preferred to not stressing the focused constituent. Cases of this sort were discussed in chapter 4 (where (mis)alignment was conceived of as a relation between stress and the sentence).

If stress is aligned with prosodic constituents, a way of improving on the bad alignment comes to mind. Assume for the sake of the argument that right-alignment of Ø and its head is crucial in our hypothetical case. Then the addition of a Ø-boundary to the right to the focus, as in (5)(c), will allow Align-Ø to be met. However, this alone will not do. Thus, in an exhaustively parsed, non-recursive representation, the insertion of this boundary after the focused (stressed) constituent will inevitably lead to there being separate Ø after the focused constituent. This Ø will in turn heave a head, and on the level of the heads of phonological phrases, $x_{\emptyset}$, the two heads in (5)(c) are now equally prominent; thus the requirement that focus be the most prominent constituent is not met and a violation of Focus results. This problem may be fixed by giving additional prominence to the focus, as in (5)(d). In this representation, both Focus and Align-Ø are met, and as far as these two contraints go, the representation in (5)(d), with a Ø-boundary inserted to the right of the focus, is therefore the optimal one. Nothing else being said, then, a prosodic system that tries to meet

Align-Ø, will react to the prominence due to Focus by inserting such a Ø-boundary. In the present example where prominence within Ø wants to be rightmost, a right boundary would be inserted to meet this requirement. The consequences of the additional higher prominence in (5)(d) will be discussed at length below.

(5)		Focus	Align(Ø,R,$x_Ø$,R)
(a)	$x_Ø$ (x x x)$_Ø$ [FOC]$_{DF}$	*!	
(b)	$x_Ø$ (x x x)$_Ø$ [FOC]$_{DF}$		*!
(c)	$x_Ø$ $x_Ø$ (x x)(x)$_Ø$ [FOC]$_{DF}$	*!	
(d)	x $x_Ø$ $x_Ø$ $ (x x)(x)$_Ø$ [FOC]$_{DF}$		

5.1.3. Deletion by focus: the basic idea

In McCarthy and Prince's (1993b) definition of alignment, the degree of an alignment-violation is measured in terms of the length of the terminal string that intervenes the two edges to be aligned. This assumption was taken over in the definitions suggested in the appendix of Chapter 3. The definition of alignment and the definition of right and left edges are repeated here.

(6) For all morphosyntactic or phonological types Cat1, Cat2, and for Edge1, Edge 2 $\in$ {Left, Right}:

Align(Cat1, Edge1, Cat2, Edge2) $\Leftrightarrow$

For all x of type Cat1, there is a y of type Cat2, such that Edge1(Cat1) = Edge2(Cat2).

(7) The right edge of X, Right(X) is defined as that substring that consists of all terminal elements that X precedes in the string.

The left edge of X, Left(X) is defined as that substring that consists of all the terminals that X dominates, and all the terminals that X precedes in the string.

The assumption that the terminal string is crucial here enters into the definition of edge in (7). Consider the case of alignment of a prosodic boundary with its head, such as the application of Align(α, R, x_α, R) to (8). Assume that the line with lower-case letters represents the terminal string in some sense.

(8)

x_α

(... x)α

a b c d e f g

(7) defines the right edge of the constituent α as the substring [e f g]. The right edge of $x_\emptyset$ in (8) is [b c d e f g]. Align(α, R, x_α, R), interpreted according to (6), demands the identity of these substrings. The amount of alignment-violation incurred is the amount to which the substrings differ. In the present case, the

difference would be that of the substring [b c d] - the distance between α and x_α, measured in the terminal string:

Here I would like to explore the effects of a modified definition of right and left edge, one that does not refer to the terminal string.

(9) The right edge of X, Right(X) is defined as all the structure that X precedes.

The left edge of X, Left(X) is defined as all the structure that X dominates, and all the structure that X precedes.

In this definition, there is no mention of a terminal string. The sum of all structure to the right of an element X defines the right edge of X. The difference between the two definitions becomes clear when we consider nonterminal material that intervenes between the elements to be aligned, as in the structure in (10). Again, we are intrested in the amount of violation incurred to the constraint Align(α, R, x_α, R).

(10)

$$\begin{array}{llllllll} & & x_\alpha & & & & & \\ (\ldots & & x & & x' & &)_\alpha & \\ & & a & b & c & d & e & f\ g \end{array}$$

The nonterminal x' in (10) does not make a difference in the alignment-violation under the definition of edge in (7). There, as we saw, the alignment-violation is evaluated soley in terms of the terminal string. For that definition, therefore, the violation of Align(α, R, x_α, R) is the same in (8) and in (10). The intervening nonterminal in (10) does not matter.

However, the definition in (9) distinguishes the two cases. Applied to (8), it yields the structural distance [b c d] between the relevant edges. Applied to (10), however, it yealds the structural distance [b c d] *plus* x'. This is derived on the definition in (9) as follows. The right edge of α is [e f g], as it were, but the right edge of x_α in (10) is [b c d e f g] *plus* x', namely all structure following x_α. The difference between the two, relevant for alignment, is [b d c] *plus* x'. On the definition of edge in (9), Align(α, R, x_α, R) would thus prefer (8) to (10), since there is less structure intervening between the edges in (8) than there is in (10). The additional presence of x' thus makes a difference, given the revised definition of edge.

The idea explored here is that the preference for (8) over (10) that we just saw may lead to 'deletion' of structure after a focus.

The effect of this will be demonstrated in a bit more concrete terms with Align(U, R, x_U, R), the alignment-constraint that requires stress on the level of the utterance to be as far to the right as possible. In the default case, utterance-stress will be directed rightmost by this constraint. If, however, Focus is at play, focus may require the prominence of the utterance to be further to the left, within the focused element, as in (11).

(11) Focus >> Align-U

(a)

```
                x
(               x   )U
[  x     x      x   ]I
(  x  )( x   )( x   )ø
(     )(     )(     )w          *!
word1  word2  word3
[ FOC                ]DF
```

(b)

```
   x
(  x                )U
[  x     x      x   ]I                x       x
(  x  )( x   )( x   )ø              ( x   )( x   )ø
$ (     )(     )(     )w             (     )(     )w
word1  word2  word3                  word2  word3
[ FOC                ]DF
```

As shown in this tableau, all intervening material between the head of the utterance and the right edge of the utterance will contribute to the alignment-violation. The desired effect, then, of this modified definition, is that deletion of any of the intervening material will lead to an improvement of the alignment-relation with regard to Align(U, R, x_U, R). Thus (12), if compared with the structures in (11), will be preferred to either of the structures in (11).

(12)

```
   x
(  x                )U
[  x                ]I
(  x                )ø
(                   )w
word1  word2  word3                  word2  word3
[ FOC                ]DF
```

This, then, is the derivation of destressing by focus. Whether or not in a given language the intervening material will actually be deleted will depend on the relative ranking of yet other factors, discussed in more detail below.

To sum up, Focus leads to a representation of prominence that is different from the default-representation; in particular this may lead to violations of the alignment-constraints that prefer edge-most alignments between prosodic constituents and their heads. We have seen two ways in which a prosodic representation might react to such a situation, both improving the bad alignment: either a boundary is inserted next to the focus, or material between the focus and the boundary may be deleted.

Note, then, that given a choice between the two options, boundary-insertion will be preferred over deletion of intervening material, everything else being equal: If allowed, boundary-insertion will lead to near-optimal alignment, since the boundary is then maximally close to the prominence. Deletion of intervening material, on the other hand, helps, but not as much: Even if all intervening prosodic structure is deleted, there will still be segmental material that intervenes. Segmental material, by assumption, is protected from deletion by faithfulness. The tableau in (13) shows the comparison between boundary-insertion and deletion of prosodic structure with regard to Align(Ø, R, $x_{\emptyset}$, R).

(13) Align(Ø, R, $x_{Ø}$, R)

(a)

```
   x
( x       x  )ø          x
(      )(     )w       (     )          no changes
word1   word2           word2
[ FOC          ]DF
```

(b)

```
   x       x
( x   )(  x )ø
(      )(     )w                        Ø-boundary
$  word1   word2                        insertion
[ FOC          ]DF
```

(c)

```
   x
( x          )ø
(            )w                         deletion of
word1   word2          word2            prosodic
[ FOC          ]DF                      structure
```

5.1.4. Insertion by focus: deriving a typology

The previous comparison crucially relied on the assumption of everything else being equal. To demonstrate the preference for boundary-insertion, all other levels of the prosodic representation were ignored. If we take other levels into account, we see that boundary-insertion comes at a price. Consider again two crucial candidates (c) and (d) from (\$4), repeated here as (14)(a) and (b), with the assigment of intonational phrases added to the right of each.

(14)

(a)

```
                                    xI
     xØ                           [   xØ   ]I
( x  x   x )ø        =>          ( x  x   x )ø
[   FOC   ]DF                    [   FOC   ]DF
```

(b)

```
     x                              xI
     xØ   xØ                      [   xØ   xØ]I
( x  x  )( x )ø      =>          ( x  x  )( x )ø
[   FOC    ]DF                   [   FOC    ]DF
```

Adding a boundary after the focus at the level of the phonological phrase maximally improves the alignment on that level.

However, this maximal improvement on the level of the phonological phrase leads to a deterioration of the alignment-situation on the level of the next higher level, the intonational phrase. Inserting a Ø-boundary is possible at the price of having another Ø following the focus. This Ø will then intervene for the alignment on the level of the intonational phrase. On that higher level, (14)(a) is better than (14)(b), since in (b), but not in (a), a phonological phrase intervenes between x_I and the right edge of *I*.

Now it is possible that alignment of I is likewise maximally improved by the insertion of a boundary on that level:

(15)

```
        xI                                  xI    xI
[     xØ    xØ]I                    [     xØ][ xØ]I
( x   x   )( x )Ø        =>         ( x   x )( x )Ø
[   FOC     ]DF                     [   FOC     ]DF
```

Now alignment of both Ø and I would be optimal. This, of course, only moves the problem up by one level. When we take the level of the utterance into account, as in (16), we have now considerably worsened the alignment of the utterance-stress with the right edge of the utterance: There is now an intonational phrase and a phonological phrase intervening. Had we not inserted the boundaries on the lower level, alignment on the level of the utterance would be much less violated.

(16)

$$\begin{array}{l} \quad\quad x_U \\ (\quad x_I \quad\quad x_I)_U \\ [\quad x_\emptyset][\ x_\emptyset]_I \\ (x\ \ x\ \ )(\ x\ )_\emptyset \\ [\ \ \mathbf{FOC}\ \ \ ]_{DF} \end{array}$$

Now we have reached the rooftop. We cannot improve utterance-alignment by inserting an utterance-boundary. If we did, we would create a second (phonological) utterance to the right of the first, as in (17). Assuming even that this would be allowed in principle, it would still not be permitted by Focus: The newly created utterance on the right would have its own prominence-peak, and this prominence-peak would be as high as that of the focus. There would then be no way to make the focus any higher: the utterance is the highest level in the prosodic representation.

(17)

$$\begin{array}{l} \quad\quad x_U \quad\ x_U \\ (\quad x_I\ )(\ x_I\ )_U \\ [\quad x_\emptyset][\ x_\emptyset]_I \\ (x\ \ x\ \ )(\ x\ )_\emptyset \\ [\ \ \mathbf{FOC}\ \ \ ]_{DF} \end{array}$$

The following typology results. If utterance-alignment is the most important among the alignment-constraints relevant here, then no boundaries will be inserted at any level: Any additional material following the focus would get in the way of optimal alignment of x_U with $)_U$. This is shown in (18).

(18)

		Align-U/x_U >>	Align-I/x_I ,	Align-Ø/$x_Ø$
	x_U (x_I)$_U$ [$x_Ø$]$_I$ (x x x)$_Ø$ [FOC]$_{DF}$	x	x	x
	x_U (x_I)$_U$ [$x_Ø$ $x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	x (x)$_Ø$!	x (x)$_Ø$	√
	x_U (x_I x_I)$_U$ [$x_Ø$][$x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	x [x]$_I$ (x)$_Ø$!	√	√

If, on the other hand, utterance-alignment is at the bottom of the scale, as in (19), then the decision will be in favour of maximal insertion, no matter what ranking among the other two constraints.

(19)

		Align-I/x_I ,	Align-Ø/$x_Ø$ >>	Align-U/x_U
	x_U (x_I)$_U$ [$x_Ø$]$_I$ (x x x)$_Ø$ [FOC]$_{DF}$	x !	x	x
	x_U (x_I)$_U$ [$x_Ø$ $x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	x (x)$_Ø$!	√	x (x)$_Ø$
	x_U (x_I x_I)$_U$ [$x_Ø$][$x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	√	√	x [x]$_I$ (x)$_Ø$

Thus boundary-insertion will be preferred on a prosodic level P if Align-P is ranked above Align-U. Thus, if Align-Ø is ranked above Align-U, but Align-I is ranked below both of these, then Ø-insertion but not I-insertion will result.

(20)

		Align-Ø	>>	Align-U	>>	Align-I
	x_U (x_I)$_U$ [$x_Ø$]$_I$ (x x x)$_Ø$ [FOC]$_{DF}$	x !		x		x
$	x_U (x_I)$_U$ [$x_Ø$ $x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	√		x (x)		x (x)$_Ø$
	x_U (x_I x_I)$_U$ [$x_Ø$][$x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	√		x [x] (x) !		x [x]$_I$ (x)$_Ø$

This turns out to be not symmetrical for the inverse ranking. If Align-I is above Align-U and that dominates Align-Ø, then maximal boundary-insertion (as in (19)) is preferred. This is because boundary-inertion on the level of I, allowed in this case, entails insertion on the lower level of Ø by the Strict Layer Hypothesis.

(21)

		Align-I	>>	Align-U	>>	Align-Ø
	x_U (x_I)$_U$ [$x_Ø$]$_I$ (x x x)$_Ø$ [FOC]$_{DF}$	x !		x		x
	x_U (x_I)$_U$ [$x_Ø$ $x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	x (x)$_Ø$!		x (x)$_Ø$		√
$	x_U (x_I x_I)$_U$ [$x_Ø$][$x_Ø$]$_I$ (x x)(x)$_Ø$ [FOC]$_{DF}$	√		x [x]$_I$ (x)$_Ø$		√

In the resulting typology, then, all possible combinatios of boundary-insertion triggered by focus are predicted to occur: No insertion (18), insertion on the level of Ø but not I (20), and insertion on the level of both Ø and I (19),(21).

5.1.5. Deletion by focus: deriving a typology

The choice of the candidates in the preceding discussion was guided by the assumption (left implicit to simplify discussion) that the syntax-prosody alignment (discussed in the first chapter of this thesis) is left untouched by focus: lexical syntactic words will be aligned with phonological words, lexical syntactic projections will be aligned with phonological phrases etc. The only way in which the candidates in the preceding tableaus differ from those assumptions is by way of allowing *additional* prosodic boundaries, not required by the syntax-prosody alignment. However, none of the alignments with syntax were taken away.

Destressing by focus, however, happens *at the expense of* syntax-prosody alignment. Conider (22).

(22) Align(Ø,R,$x_{ø}$,R)

(a)
```
      x
    ( x        x        x  )ø
    (       )(       )(       )w
     word1  word2  word3
    [ FOC                    ]DF
```
```
(       )(       )w
 word2 word3
```

(b)
```
      x
    ( x                    )ø
    (                      )w
 $   word1  word2  word3
    [ FOC                    ]DF
```
```
word2 word3
```

(b) is favoured over (a) by the alignment-requirement on stress and phonological constituents, However (b), but not (a), will meet the alignment-requirements that link syntactic to prosodic structure. The default-structure in (a) will stem from a constraint like Align(X^0,R,PWd,R). This constraint is unviolated in (a), but violated in (b).

In a simplified first approximation, then, that does not yet take into account the considerations from the previous section, we can derive the following two options: By ranking syntax-prosody alignment over stress-prosody alignment, as in (23), we derive the absence of destressing. If, on the other hand, stress-prosody alignment is ranked above syntax-prosody alignment, as in (24), destressing is derived.

(23) Align(X^0,R,PWd,R) >> Align(Ø,R,$x_Ø$,R)

```
(a)      x
       ( x       x       x  )ø
 $     (       )(      )(      )w          √          (      )(      )w
        word1  word2  word3                            rd1 word2 word3
       [ FOC                 ]DF

(b)      x
       ( x                  )ø
       (                    )w          *!*
        word1  word2  word3                            word2 word3
       [ FOC                 ]DF
```

(24) Align(Ø,R,$x_Ø$,R) >> Align(X^0,R,PWd,R)

```
(a)      x
       ( x       x       x  )ø
       (       )(      )(      )w        (      )(      )w !          √
        word1  word2  word3              word2 word3
       [ FOC                 ]DF

(b)      x
       ( x                  )ø
       (                    )w
 $      word1  word2  word3              word2 word3                  **
       [ FOC                 ]DF
```

To get from this first approach to a more fully developed picture, we have to recall the results of the previous section: Depending on the ranking of the stress-prosody alignment constraints among themselves, we might get boundary-insertion in certain cases. Boundary-insertion, if allowed, will be preferred to destressing since boundary-insertion allows for near-perfect alignment. Destressing, then, can never be optimal so long as boundary-insertion is an option that is also available. It follows that we will only get destressing in those cases where boundary-insertion is ruled out a priori.

The one case where boundary-insertion is blocked is the one outlined in (18): Align-U/x_U is ranked higher than stress-prosody alignment on the level of Ø and I. Here, then, we might get destressing instead. Whether or not destressing will actually occur will depend on the relative ranking of align-stress and align-syntax, much as in (24). Thus, if align-syntax, say on the level of the word (Align(X^0,R,PWd,R)) is ranked above all align-stress constraints, as in (25), no destressing will occur. It is more important, in this case, to preserve the syntax-prosody alignment, than to improve on the imperfect stress-prosody alignment due to focus.

(25) Align(X^0,R,PWd,R) >> Align-U/x_U >> Align-I/x_I , Align-Ø/$x_Ø$

```
        xU
(       xI      )U
[       xØ      ]I
$   ( x  x     x )Ø          x          x          x
    ( )(    )(    )W    √   ( )W       ( )W       ( )W
     wd wd  wd               wd         wd         wd
    [    FOC    ]DF

        xU
(       xI      )U
[       xØ      ]I
( x  x          )Ø                     x          x
( )(            )W        *!          ( )W       ( )W
 wd wd  wd                  wd         wd         wd
[    FOC    ]DF
```

On the other hand, ranking syntax-prosody alignment below any of the stress-prosody alignment constraints will begin to allow destressing. Thus, in (26), Align(X^0,R,PWd,R) is ranked below Align-U/x_U, and destressing is chosen as the optimal output.

(26) Align-U/x_U >> Align(X^0,R,PWd,R) >> Align-I/x_I , Align-Ø/$x_Ø$

```
        xU
(       xI       )U
[       xØ       ]I
( x  x      x )Ø                x              x          x
$  (  )(    )(    )w     √      (  )w          (  )w      (  )w
   wd wd  wd                     wd             wd         wd
[     FOC     ]DF
```

```
        xU
(       xI       )U
[       xØ       ]I
( x  x           )Ø                             x          x
(  )(            )w     *!                     (  )w      (  )w
   wd wd  wd                     wd             wd         wd
[     FOC     ]DF
```

Destressing, of course, can occur on various levels (word, phrase etc.), depending on which of the align-syntax constraints are ranked below an align-stress constraint. Some complex cases will be discussed below. For now, I content myself with having layed out the logic of the situation.

To sum up the essential ideas:

Rightmost and leftmost stress are defined with respect to prosodic constituents (Selkirk (1986), Nespor and Vogel (1986)). These are expressed in terms of constraints of alignment.

Focus leads to imperfect alignment of stress and (default) prosodic constituency. We may expect that grammars improve on this misalignment, in one of two ways: Either by inserting additional boundaries and thus optimizing the alignment on a particular level (at the expense, as we saw, of alignment on other prosodic levels). Or, if that is not an option, by removing some of the intervening prosodic structure ("destressing") to derive an output with less severe violations of alignment. This much, I maintain, we expect from simply putting together syntax-

prosody alignment, stress-prosody alignment, and the prominence-requirement of focus. A crucial ingredient of this theory, however, without which it would not make any of those predictions, is that prominence is preferably rightmost or leftmost within prosodic constituents.

5.1.6. What may not occur on this approach

If we maintain that that is all there is to say about focus and its interaction with prosodic structure, we make some predictions about what prosodic effects of focus should not occur.

First, focus should not have "wild" effects such as could be written in a rule but could not be derived on the present account. There should be no effects like "a focused constituent must be followed by at least two phonological phrases", "a focused constituent will trigger a pyramid of stress towards the focused constituent, as in (27)", "a focused constituent will lead to all the following phonological words becoming phonological phrases" etc.

(27)

```
            x
      x     x     x
x     x     x     x     x
         [ FOC ]
```

Second, the approach makes a prediction about directionality on each prosodic level: If a given language has Align(Ø,R,$x_{ø}$,R) rather than Align(Ø,L,$x_{ø}$,L), default stress will be assigned rightmost within the phonological phrase. Align(Ø,R,$x_{ø}$,R) can then trigger the insertion of a *right* Ø-boundary after a focus: this would optimize the representation with regard to Align(Ø,R,$x_{ø}$,R). Likewise for deletion of prosodic structure: Prosodic structure is deleted only to meet alignment-

requirements. Thus a constraint of right-alignment can only trigger deletion to the right of the focus, whereas a constraint on left-alignment can only trigger deletion to the left of a foucs. These predictions of the present approach are then summed up in (28).

(28) Predictions of the present hypothesis:

If a language assigns default-stress to the right (left) on the prosodic level n , then it may show boundary-insertion at that level to the right (left) of a focus, or it may show destressing below that level to the right (left) of a focus. Focus may have no other effects than these.

Recall that deletion of prosodic structure is only triggered with the help of Align-U in the typology above, since on other levels, boundary-insertion is the preferred option. Nepor and Vogel (1986) have proposed that prominence on the level of the utterance is universally assigned rightmost within the utterance. If this is correct, we would expect that deletion of prosodic structure around a focus would universally affect material to the right of the focus, but not material to the left of the focus.

Let us then consider some actual languages.

5.2. Chichewa

In chapter 3, I suggested that focus has a primary effect on phrasing - inserting a boundary after the focused element, and a secondary effect: breaking up the VP further than just by one boundary-insertion. I suggested to derive the secondary effect as the way in which the system adapts to the primary effect. - In this chapter, I will analyse the primary effect itself as derivative: It is but the way in which the system of contraints adapts to the requirement that a focus must be the most prominent element in its scope.

In Chapter 3, I stated the 'primary' effect of focus on phrasing in Chichewa as in (29).

(29) **Focus** (Chichewa): A focused constituent is followed by a Ø-boundary

Thus in (30)(a) and (31)(a) there is no focus (or, equivalently, a focus coextensive with its domain), and the whole VP forms a single Ø. In the (b)-examples, a narrow focus triggers a Ø-boundary to the right of the focus.

(30)(a)	[V OBL] ( )$_{Ø}$	[What did they do?] (anagóná mnyumá yá mávúuto)$_{Ø}$ 'They slept in Mavuto's nouse'
(b)	[V_{FOC} OBL]$_{DF}$ ( )( )$_{Ø}$	[What did they do in Mavuto's house?] (anagóona) (mnyumbá yá mávúuto)$_{Ø}$ 'They *slept* in Mavuto's house'
(31)(a)	[$_{VP}$ V NP PP] ( )$_{Ø}$	[What did he do?] (anaménya nyumbá ndí mwáála)$_{Ø}$ 'He hit the house with the rock'
(b)		[What did he hit with the rock?]

$[_{VP}$ V NP_{FOC} $NP]_{DF}$ (anaménya nyuúmba)$_{\emptyset}$ (ndí mwáála)$_{\emptyset}$
( )( )$_{\emptyset}$ 'He hit the *house* with the rock'

Here the effects of (29) will be derived from Focus in (4), repeated here, and the alignment-constraint in (32) that was postulated on independent grounds for Chichewa in Chapter 3.

(4) Focus: If F is a focus and DF is its domain, then the highest prominence in DF will be within F.

(32) Align-Ø: Align(Ø, R, $x_{\emptyset}$, R)

Align the right edge of every Ø with the right edge of its head.

Recall that I argued that WRAP-XP should be ranked above Align-XP in Chichewa, since the VP is wrapped at the expense of aligning the right of every XP with a Ø in examples like (31)(a). Furthermore, the effects of focus are stronger than WRAP, since the right Ø-boundary after the focus is inserted at the cost of a WRAP-violation. We had thus arrived at the following ranking:

(33) Chichewa: Focus >> Wrap-XP >> Align-XP

Since (4) and (32) will jointly create the effect of boundary-insertion, they will jointly inherit the ranking-relations from their predecessor. Among (4) and (32), Focus must be the stronger constraint, for otherwise stress would not be retracted to the focused element. The resulting ranking is then

(34) Chichewa: Focus >> Align-Ø >> Wrap-XP >> Align-XP

Consider these constraints at work in deriving Ø-insertion in (35). Other levels of phrasing will be integrated into the picture shortly.

(35) $[_{VP}\ V\ NP_{FOC}\ \ NP]_{DF}$ Focus, Align-Ø >> Wrap-XP >> Align-XP

(a)
```
                                x
      (anaménya nyumbá ndí  mwáála)ø          *!
*
```

(b)
```
                x
      (anaménya nyumbá ndí  mwáála)ø                ndí  mwáála          *
```

(c)
```
                x
                x                 x
   $  (anaménya nyuúmba)ø (ndí  mwáála)ø                                  *
```

(d)
```
                x
      (anaménya nyuúmba)ø (ndí  mwáála)ø            ndí  mwáála          *
```

Candidate (a) simply violates the Focus-requirement: the focused element must have the most prominence in its domain. (b) has the most prominence on the focus and triggers a major alignment-violation. This is fixed in (c) by boundary-insertion. (c) is the optimal candidate. - Boundary-insertion comes at the cost of creating an additional Ø following the boundary. The additional Ø must likewise be stressed, as it is in (c); if it is not, as in (d), another violation of Align-Ø ensues.

As we saw in the discussion of the typology, boundary-insertion comes at the cost of worsening alignment on higher levels, here in particular on the levels of I and U. Align-I and Align-U must therefore be ranked below Align-Ø in Chichewa.

Let us then reconsider the more complex case in which a focus, leading to a violation of WRAP, had the consequence that further constituents of the VP were each phrased separately.

(36)(a) [What did he do to the house with the rock?]

$[_{VP}\ V_{FOC}\ NP\ PP]_{DF}$ (anaméenya)$_{\emptyset}$ (nyuúmba)$_{\emptyset}$ (ndí mwáála)$_{\emptyset}$

( )( )( )$_{\emptyset}$ 'He *hit* the house with the rock'

(b) [Did you weave the mat for Mavuto?]

$[_{VP}\ V_{FOC}\ NP\ NP]_{DF}$ (ndinaángogúliira)$_{\emptyset}$ (mavúuto)$_{\emptyset}$ (mphaása)$_{\emptyset}$

( )( )( )$_{\emptyset}$ 'I only *bought* the mat for Mavuto'

Since prominence even on the levels of I and U will have to be on the focused element, these additional Øs lead to additional violations of Align-I and Align-U, assuming that the latter are cases of right-alignment. If so, it follows that Align-XP, the constraint that is responsible for having two rather than one Ø after the focus in this case, must be ranked above both Align-I and Align-U. We arrive then at the final ranking in (37), with the ranking of Align-I and Align-U, about which we know nothing, left undecided.

(37) Chichewa:

Focus >> Align-Ø >> Wrap-XP >> Align-XP >> Align-I, Align-U

(38) shows the tableau for the derivation of the complex case. Here the highest constraint Focus is not included and the candidates considered are all such that they meet this constraint.

(38) $[_{VP}\ V_{FOC}\ NP\ PP]_{DF}$ Align-Ø WRAP-XP Align-XP Align-I, Align-U

(a)

x
(x)U
[x]I
(anaménya nyumbá ndí mwáála)ø nyumbá ndí mwáála ! * nyumbá ndí mwáála nyumbá ndí mwáála

(b)

x
(x)U
[x x]I
(anaméenya)ø(nyumbá ndí mwáála)ø * *! (nyumbá x ndí mwáála)ø (nyumbá x ndí mwáála)ø

(c)

x
(x)U
[x x x]I
$ (anaméenya)ø (nyuúmba)ø (ndí mwáála)ø * x (nyuúmba)ø x (ndí mwáála)ø x (nyuúmba)ø x (ndí mwáála)ø

The results from chapter 3 are retained in this way: Align-XP, even though lowly ranked, chooses (c) over (b). Align-I and Align-U would choose the other way but are, by assumption, subordinate. This is compatible with the ranking of Align-I and Align-U below Align-Ø, which we had to assume in order to allow for boundary-insertion.

5.3. Japanese[2]

The complexities of Japanese phrasing, mostly inferred from a fairly regular intonation pattern, have been studied by Hattori (1961), McCawley (1968), Haraguchi (1977), Poser (1984), Beckman and Pierrehumbert (1986), Pierrehumbert and Beckman (1988), Selkirk and Tateishi (1988), (1991), among others. Some effects of focus on phrasing have been observed by Pierrehumbert and Beckman. Nagahara (1994) has studied the distribution of these effects in a wider variety of environments.

5.3.1. The intonational pattern

Lexical elements are accented or unaccented as a lexical property. On the surface, an accent is realized as a HL falling tone in Tokyo Japanese. When more than one accented element enters into what is analyzed as the *prosodic word*, at most one of them will surface, and certain more intricate regularities determine which one that will be. From one to three prosodic words may together enter into a *minor phrase* (McCawley 1965) or *accentual phrase* (Pierrehumbert and Beckman 1988). The accentual phrase itself allows at most one accent inside of it, and if more than one accented prosodic word joins into a minor phrase, the leftmost accent is the one that is realized. The accentual phrase is furthermore characterized by an initial LH rising tone, the association of which is subject to a number of phonological conditions that are not of importance here. These tones

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[2]Thanks to Hiroyuki Nagahara for providing me with detailed answers to a number of questions I had about Japanese phrasing and the effects of focus on it. All errors are of course mine.

that characterize the accentual phrase, the initial LH rising tone, and the falling HL on the accent of the accentual phrase, if there is one, are the only tones phonologically specified in Japanese. Schematically, then, a Tokyo Japanese sentence will have a specifications like in (39).

(39)

```
(                )(          *          )(minor phrase ...
 ||               ||         |           ||
LH               LH         HL          LH

unaccented acc.p.          accented acc.p.
```

The L of the accentual HL (but not the L of a LH boundary contour) will trigger downstep on the following tones, so long as these belong to the same *intermediate phrase*, the next higher level of prosodic representation in Japanese (McCawley's *major phrase*). Downstep does not carry over across intermediate phrase boundaries. In the following examples, the application of downstep is marked by ↓ , and the point after which a preceding downstep does not have any effect is marked by ↑.

(40) H*L will trigger downstep on following tones within intermediate phrases (beginning with the L of H*L itself)

```
(a)   (      x                    )intermediate phrase
      (            )(             )accentual phrase
       LH   H*↓L    LH
```

```
(b)   (      x            x       )intermediate phrase
      (            )(             )accentual phrase
      LH   H*↓L   LH  H*↓L
```

(41) Boundary tones will not trigger downstep

```
(a)   (                                  )intermediate phrase
      (              )(                  )accentual phrase
       LH             LH

(b)   (                     x            )intermediate phrase
      (              )(                  )accentual phrase
       LH             LH  H*↓L
```

(42) Catathesis doesn't carry over across intermediate phrase boundaries

```
(a)   ( ...        x      )(                ...  )intermediate phrase
            (             )(                     )accentual phrase
             LH  H*↓L   L↑H

(b)   ( ...        x      )(      x         ...  )intermediate phrase
            (             )(                     )accentual phrase
             LH  H*↓L   L↑H  H*↓L
```

As can be seen in (42), the downstep in one intermediate phrase does not affect the tones in the following intermediate phrase, with the exception of the first L in the latter. To account for this tonal pattern, Pierrehumbert and Beckman suggest that the effects of downstep are limited to the intermediate phrase, as sketched in (43), and that the L of a LH rising pattern phonologically belongs to the preceding accentual phrase in an abstract sense that is relevant for determining the application of downstep.

(43) (intermediate phrase => (↑intermediate phrase

Selkirk and Tateishi (1988), (1991) studied the way in which intermediate phrases are derived from syntactic structure in the default case. They argue that intermediate phrase boundaries coincide with left edges of syntactic XPs. The sentence types in which this clearly emerged are shown in the examples in (44)

from Selkirk and Tateishi. (The syntactic structure is taken from Selkirk and Tateishi.)

(44)(a) [$_{VP}$[$_{NP}$[$_{NP}$[$_{NP}$ Ao'yama-no] Yama'guchi-no] ani'yome-ga] inai]

'We can't find the sister-in-law of Mr. Yamaguchi from Aoyama'

(b) [$_{VP}$[$_{NP}$[$_{NP}$ Ao'yama-no] [$_{NP}$ Yama'guchi-no] ani'yome-ga]] inai]

'We cannot find Mr. Yamaguchi's sister-in-law from Aoyama'

(c) [$_{VP}$[$_{NP}$ Ao'yama-no] Yama'guchi-ga] [$_{NP}$ ani'yome-o] yonda]

'Mr. Yamaguchi from Aoyama called his sister-in-law'

(d) [$_{S}$[$_{NP}$ Ao'yama-ga] [$_{VP}$[$_{NP}$ Yama'guchi-ni] [$_{NP}$ ani'yome-o] yonda]

'Mr. Aoyama called his sister-in-law to Yamaguchi'

In the terminology adopted here, it follows then that Japanese intermediate phrases are phonological phrases (Øs): they are derived by alignment with syntactic phrases (not with words or clauses).

In the theory of Selkirk (1995) the relevant constraint for deriving these Ø-boundaries is Align(XP,L,Ø,L). We can observe that there do not seem to be Wrap-effects in the Japanese default-phrasing: In (44)(b), there is a complex NP containing the left edge of a smaller NP. That smaller NP triggers a Ø-boundary to its left, at the expense of the larger NP not being wrapped. (For the sake of simplicity I assume that Øs are not recursive in Japanese.) This suggests the constraint-ranking in (45) for Japanese.

(45) Align(XP,L,Ø,L) >> Wrap-XP

This is compatible with the information available to me about the phrasing of the VP. According to Nagahara (1994), there is regularly no intermediate phrase boundary between a (non-complex) verb and its object, as shown in his example

(46). This follows from left-edge alignment if the object is within VP. Hiroyuki Nagahara (p.c.) furthermore provided me with the following paradigm of intermediate phrasing.

(46)(a) (N'aoko-ga) (M'ari-ni) (shashin-o m'iseta)
'Naoko showed a picture to Mari'

(b) (N'aoko-ga) (M'ari-ni m'iseta)
'Naoko showed (something) to Mari'

In (46)(a), with both an indirect and a direct object present, the direct object is phrased with the verb, and the indirect object is phrased separately. However, in (46)(b), with an empty direct object, the indirect object is phrased with the verb. The phrasing in (b) suggests that the indirect object is inside of the VP, where it is phrased together with the following verb, due to Align-Ø,L. If the indirect object is in the same position in (a), then (a) would suggest that the VP in this case is cut up by Align-Ø,L introducing a boundary to the left of the direct object at the cost of a violation of Wrap-XP. This would then be analogous to the pattern of NPs in (44).[3]

5.3.2. Focus and Phrasing in Japanese

Two effects of focus on intermediate phrasing have been observed in Japanese. They will be introduced in the following sections. An analyses of these effects will be presented in the sections thereafter.

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[3]An additional factor comes in when compex verbs, consisting of more than one lexical morpheme, are considered; see Nagahara (1994).

5.3.2.1.. Left edges of Ø preceding a focus

Pierrehumbert and Beckman (1988) studied the effects of focus on pitch and on phrasing in controlled discourses like (47) (PB,p.59). This is their "amaimame" ('sweet beans') set.

(47)(a) .. niho'n-ni a'ru yo'o-na amai mame'-ga arima'su ka?
'... are there sweet beans like there are in Japan?'

So'o desu ne. Amerika-ni'-wa mame'-wa arima'su-ga,
'Well, let's see. In America there are beans,'

AMAI mame'-wa arimase'n
'but there aren't SWEET beans.'

(b) ... niho'n-ni a'ru yo'o-na amai mame'-ya ninzin-ga arima'su ka?
... are there sweet beans or carrots like there are in Japan?

... amai NINZIN-wa arima'su-ga,
... there are sweet CARROTS,

amai MAME'-wa arimase'n.
'but there aren't sweet BEANS.'

In discourses such as these, in a clause-structure like [$_{IP}$ [$_{DP}$ A N] V], the focus was either on the adjective, as in (47)(a), or on the noun, as in (47)(b). These two cases were tested with accented and unaccented adjectives as well as accented and unaccented nouns in all combinations. Pierrehumbert and Beckman (p.93ff) report the following effects of focus.

First, focus raises the overall pitch on the focused element. Thus, in the comparison of sentences with [unaccented adjective] plus [accented noun], where either (a) focus is on the adjective or (b) focus is on the noun, or (c) no focus was present (such as in the questions in (47)), the peak of the adjective was - with few exceptions - clearly higher when the adjective was focused than when

it was not (see their plots on p.96f). Likewise, the peak of the noun was overall systematically higher when the noun was focused than when it was not focused (PB,p.98f). As they note, the use of a greater pitch-range for "singling out more salient information" has been studied and documented for many languages (p.99). They adopt the term *tonal prominence* for this phenomenon from Pierrehumbert (1980).

Second, in the configuration that they studied (the one in (47)), focus systematically (with few exceptions) introduced an intermediate phrase boundary to the left of the focus, but not to the right of the focus. Thus, when the noun was focused, an intermediate phrase boundary between the adjective and the noun was detected, as shown in (48).

(48) [S [DP A N_{FOC}] V]

(

Pierrehumbert and Beckman demonstrate this by comparing the sequences in (49).

(49)		no focus	focus on N
[accented A]	[accented N]	catathesis	no difference (no catathesis)
[unaccented A]	[unaccented N]	no catathesis	

With no focus, the pattern observed was the one that is normally observed within intermediate phrases: An accented element triggers catathesis on the following H whereas an unaccented element does not trigger catathesis on a following H (see, for the pattern in (49) in particular, the graphs in PB, p.68). With focus on the

noun, however, this difference was neutralized. Essentially, catathesis didn't occur with accented or unaccented elements. This is characteristic of the behaviour of elements across intermediate phrase boundaries (PB,p.76ff). By definition, intermediate phrase boundaries block catathesis.

It is important for the argumentation below that the two effects of focus reviewed here - raising of the pitch and blocking of catathesis - are each phenomena of their own. The absence of catathesis with focus on the noun cannot simply be attributed to the higher pitch on the noun due to tonal prominence. This is established by Pierrehumbert and Beckman's argument in connection with (49): The absence of catathesis is not established on the basis of the absolute pitch-height of the stressed noun, but rather by comparison of the two sequences in (49), where the absence of catathesis is shown by the neutralization of the difference between accented and unaccented sequences, both of which have additional tonal prominence on the focused noun.

5.3.2.2. Deletion of Øs after the last focus

Nagahara (1994) explores the effects of focus on intermediate phrases further. He describes two effects of focus on intermediate phrasing.

The first is the previously described one from Pierrehumbert and Beckman (1988): Focus triggers an intermediate phrase boundary to its left. The second effect is, with a single focus, that all intermediate phrases boundaries between that focus and the right edge of the clause are deleted. Consider his examples in (50) - (52) (Nagahara (1994), p.40). Focus is here marked by underlining. According to

Nagahara (p.c.) the focused sentences were elicited in a context like "I didn't say ....., I said ___", with "....." and "___" differing in the focused word. This would suggest that the focus here has clausal scope.

(50) Syntactic structure

[NP Náoko wá] [Adv nichiyóobi] [Nágoya dé] [Mári ní] [átta]
Naoko topic Sunday Nagora at Mari with met
'Naoko met with Nari in Nagoya (last) Sunday'

(51) Normal intermediate phrasing

(Náoko wá) (nichiyóobi) (Nágoya dé) (Mári ní átta)

(52) Focus intermediate phrasing

(a) (Náoko wá) (nichiyóobi) (Nágoya dé) (Mári ní) (<u>átta</u>)

(b) (Náoko wá) (nichiyóobi) (Nágoya dé) (Mári) (<u>ní</u> átta)

(c) (Náoko wá) (nichiyóobi) (Nágoya (<u>dé</u> Mári ní átta)

(d) (Náoko wá) (nichiyóobi) (<u>Nágoya</u> dé Mári ní átta)

(e) (Náoko wá) (<u>nichiyóobi</u> Nágoya dé Mári ní átta)

(f) (Náoko) (<u>wá</u> nichiyóobi Nágoya dé Mári ní átta)

(g) (<u>Náoko</u> wá nichiyóobi Nágoya dé Mári ní átta)

Each focused phrasing in (52) can be compared with the default-phrasing in (51). The insertion of the intermediate phrase boundary to the left of the focus can be seen in (b), (c) and (f): there is not normally an intermediate phrase boundary to the left of the particles that are focused in those examples. The second effect, the one of erasing all intermediate phrase-boundaries after a focus can be observed in all of (c)-(g). Observe also that a focus never triggers an intermediate phrase boundary to its right.

A further interesting observation that Nagahara makes relates to multiple foci. In his examples with two foci, an intermediate phrase boundary precedes both the first and the second focus. As for deletion of intermediate phrases, all intermediate phrases between the second focus (of two foci) and the end of the clause are deleted. However, there is no deletion of intermediate phrases after the first of two foci. This is shown in Nagahara's pattern in (53) and (54).

(53) No focus

(Nágoya de) (Mári ní átta)
'(I) met with Mari in Nagoya'

(54) Intermediate phrases with two foci

(a) (Nágoya) (de Mári ní átta)

(b) (Nágoya de) (Mári ní átta)

(c) (Nágoya de) (Mári) (ní átta)

(d) (Nágoya de) (Mári ní) (átta)

(e) (Nágoya) (de) (Mári ní átta)

(f) (Nágoya) (de) (Mári) (ní átta)

(g) (Nágoya) (de) (Mári ní) (átta)

(h) (Nágoya de) (Mári) (ní átta)

(i) (Nágoya de) (Mári ní) (átta)

(j) (Nágoya de) (Mári) (ní) (átta)

It can be seen in all of the examples that the first focus fails to trigger deletion of the boundary that is enforced to the left of the second focus. And it can be seen that the first focus fails to trigger deletion of other intermediate phrase-boundaries to its right as well. Thus in (b), (c) and (d), the default-boundary between *de* and

Mari is retained. These examples contrast minimally with (55), where a single focus on the initial *Nágoya* triggers the deletion of this default-boundary.

(55) (Nágoya de Mári ní átta)

5.3.3. Analysis

Thus focus introduces a Ø-boundary to its left and focus, unless followed by another focus. triggers deletion of all following Ø-breaks within the sentence.

(56)(a) **FOC** -> ø(**FOC**

(b) (...**FOC**)ø( )ø...( )øIs -> (**FOC** ...)øIs

Nagahara (1994) accounts for the first two effects by a constraint each:

(57) FOCUS-LEFT-EDGE

Left edge of focus = left intermediate phrase edge

FOCUS-TO-END

No intervening [i between every focus and the end of the sentence

(where I is an intermediate phrase boundary)

Here I will explore whether we can understand the effects of FOCUS-LEFT-EDGE or FOCUS-TO-END in terms of the way in which the default-phrasing adapts to the prominence in untypical places as enforced by the focus.

5.3.3.1. Focus and the left intermediate phrase boundary

McCawley proposed that major phrases (his intermediat phrases/phonological phrases) are left-prominent. Pierrehumbert and Beckman (1988) disagree with some aspects of his analysis in term of this prominence, but agree, so far as I understand them, with a left-prominent analysis of Japanese intermediate phrases. Building on this assumption, we can reduce the insertion of the Ø-boundary in ($74)(a) to the same force that requires default-stress to be on the left in Japanese: Align(Ø,L,$x_{ø}$,L). This much, then, is analogous to Chichewa, except that Chichewa has right-alignment of Ø and stress, whereas Japanese has left-alignment instead. With no focus, then, prominence will be on the leftmost of two accented elements within the same intermediate phrase, due to this constraint:

If focus is placed in such a way as to worsen this adjacency-relation, a Ø-boundary is inserted to optimize the representation with regard to Align(Ø,L,$x_{ø}$,L).

(58)	Focus	Align(Ø,L,$x_{ø}$,L)
x (Náoko wá)$_{ø}$ ... átta [FOC]$_{DF}$	*!	N
x (Náoko wá)$_{ø}$ ... átta [FOC]$_{DF}$		Náoko w !
x (Náoko)(wá)$_{ø}$ ... átta [FOC]$_{DF}$		w

5.3.3.2. Focus and the deletion of following intermediate phrases.

Consider again one of the examples with multiple foci from Nagahara.

(54)(d) (Nágoya de) (Mári ní) (átta)
[FOC FOC]$_{DF}$
'(I) met with Mari in Nagoya'

Given the structure of intermediate phrases of this case, we can deduce something about its representation from the Focus constraint: Since the focused elements must be the most prominent ones[4], and since there is an intermediate phrase outside of the foci, which, by assumption, has Ø-prominence $x_{\emptyset}$, prominence on both foci must be higher than $x_{\emptyset}$. In the model of the prosodic hierarchy adopted here, that means that both foci must have prominence at least at the level of the intonational phrase, the level between the phonological phrase and the utterance.

(59)

```
                x                 x
[ x           x   ]?[ x         x       x   ]     Intonational phrase
(       )(        )(       )(        )(     )    intermediate phrase
[           FOC             FOC ]DF
```

The existence of such a level as the intonational phrase is all but established in the literature on Japanese prosody. Hattori (1966) talked about multiple levels, and Poser (1984) suggests the existence of such a level, but Pierrehumbert and Beckman reject these claims on the basis of there not being any experimental evidence for it presently; nevertheless, there also seems to be nothing that militates against extending this part of the prosodic hierarchy to Japanese, as in (59). Note that the utterance (the only level that Pierrehumbert and Beckman acknowledge above the intermediate phrase) could not have served this function,

---

[4]on the plausible assumption that Focus generalizes in this way from a single to multiple foci;

since, by assumption, there is but a single prosodic utterance for each actual utterance, and the prosodic utterance may have but a single prominence-peak.

Returning then to the case of a single focus for the moment, Focus will require that not only intonational-phrase prominence must fall on that focus, but utterance-prominence as well: the focused element must be the most prominent in its scope: in the cases at hand: in its clause.

(60)

```
   x
( x                 )U
[ x     x     x     ]I
(     )(    )(      )ø
[ FOC               ]DF
```

Deletion of the phonological phrases that follow a focus will then be anlysed as an effect of right-alignment on the level of either I or U. I will develop an analysis in which U is the relevant level for this phenomenon. Some of the reasons for this choice will become apparent as we proceed.

I have no information either way if it's plausible to assume that utterance-stress is rightmost in Japanese, but let us assume that that is correct for the sake of the present analysis; then the constraint Align(U,R,xø,R) would be relevant in Japanese. This, if true, is interesting, since different levels in Japanese would then assign prominence in different directions: leftmost within Øs, rightmost within Us[5]. Utterance-stress would then be rightmost by default due to this constraint,

---

[5]See Hayes and Lahiri 1991 for another case in which prominence on different higher levels of the prosodic hierarchy is assigned in different directions. In Bengali, they report, the most prominent element in Ø is leftmost within Ø, whereas the most prominent element within the intonational phrase is rightmost within the intonational phrase.

and an early focus, as in (60), would seriously worsen this alignment-relation. In the case of the utterance (see the typological part earlier), boundary-insertion is not a possible way of fixing misalignment: an utterance has to be a single U. Therefore the alternative is chosen: ammeliorating the misalignment by deletion of intervening material, in the present case: deletion of intermediate phrases. For this to be possible, it must be that both Focus and right-alignment within U are more important than the syntax-prosody alignment on the level of Ø, as shown in (61). (Also, as usual, Focus must be ranked above stress-alignment for focus to change the prominence-relatios at all.)

(61) Focus >> Align(U,R,$x_{ø}$,R) >> Align(XP,L,Ø,L)

```
   x<------------------>
( x                   )U
[ x     x     x       ]I          x    x
(     )(    )(        )ø        (    )(    )ø !
[ FOC                 ]DF

   x<------------------>
( x                   )U
[ x                   ]I
(                     )ø                          **
[ FOC                 ]DF
```

Let us then look at multiple foci. Given what we have put together so far, we can derive their prosodic representation. First, as argued, each focus must have an intonational phrase peak. Further, on the level of the utterance, only a single grid-mark x_u is available. According to the assumption that we just introduced and used, prominence on the level of the utterance prefers to be rightmost; in the case of the two foci, the requirements on Focus are already met on the level of the

intonational phrase. Hence Align-U will then prefer for the head of U to be on the rightmost focus, rather than on any earlier focus. This is shown in (62).

(62)

```
                          x<--------->
(       x                 x           )     utterance
[ x     x   ]?[ x   x     x     x     ]     Intonational phrase
(     )(    )(      )(    )(    )(    )     Ø
[       FOC             FOC ]DF
```

At this point, the advantage of attributing Ø-deletion to utterance-alignment becomes apparent: with prominence of the utterance being on the rightmost focus, utterance-alignment only cares about the closeness of the *rightmost* focus and the edge of the utterance. Here utterance-alignment will lead to deletion of Øs as we just saw. No such effect is predicted for non-final foci, which simply have no grid-mark that would head an utterance. Utterance-alignment will therefore correctly delete Øs after the last focus, but not after any earlier foci.

Further work about these questions is of course required before we can know with any amount of certainty whether the proposals developed here are indeed correct. However, the proposals layed out here appear to be a promising line of thinking to explore, as the effects of focus on phrasing in Chichewa as well as in Japanese suggest. To the extent that it is correct, we have evidence for the existence of such constraints as Align-Ø,R and Align-Ø,L that mediate between prosodic constituents and their prominence-heads, and which play a key role in the account of the effects of focus on phrasing developed here.

CHAPTER 6:

PROMINENCE AND SYNTAX

6.1. Two problems

In this chapter I address what appear to be correlations between edge-alignment and stress-assignment on the one hand, and correlatios between the latter two and syntactic branchingness. The former correlation is stated in (1).

(1) Align-XP,R $\longleftrightarrow$ Align-Ø,R
Align-XP,L $\longleftrightarrow$ Align-Ø,L

Thus the languages that have alignment of right edges of XP with right edges of Ø appear to assign prominence rightmost within Ø: Chi Mwi:ni, Chichewa, Kimatuumbi, English, Italian etc. On the other hand, the languages that align the left edge of XP with the left edge of Ø appear to assign prominence leftmost within Ø: Japanese, Korean (see Silva (1989), Shanghai (see Selkirk and Shen 1990) etc.

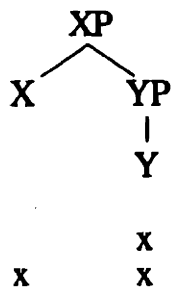
The second correlation concerns the direction of stress-assignment (1) to syntactic branchingness.

(2) right-branching syntax $\longrightarrow$ Align-Ø,R
left-branching syntax $\longrightarrow$ Align-Ø,L

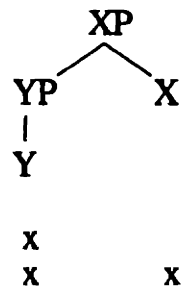
Thus the right-branching languages Chi Mwi:ni, Chichewa, Kimatuumbi, English, Italian etc. assign rightmost prominence within Ø, whereas the left-branching languages Japanese, Bengali (see Hayes and Lahiri 1991) Turkish (see Nespor et.al. 1995) etc. assign leftmost prominence within Ø.

The correlation in (2) has been discussed in the literature in connection with stress. Right-branching structures as in (3)(a) tend to attract stress on embedded element on the right, whereas left-branching structures like (3)(b) tend to attract stress on the embedded element on the left.

(3)(a)



(b)



Different formulations of this tendency have been offered in the literature. Duanmu 1990 (p.174), for example, states it as in (4).

(4) In a head-nonhead structure, stress the nonhead.

Cinque 1993 formulates a theory, one part of which is designed to derive the generalization in (5) (we return to another part of his theory that allows for exceptions to (5)).

(5) The most deeply embedded element receives nucelar stress.

This part of the theory derives the correct results in head-complement configurations such as (3), where Y is more deeply embedded than the X: Y is dominated by YP and XP, whereas X is dominated by XP but not YP. Therefore Y, being more deeply embedded, receives nuclear stress in these configurations according to (5).

Nespor and Vogel 1986 have proposed the algorithm of stress-assignment in (6) (repeated from Chapter 2).

(6) *ø relative prominence*

In languages whose syntactic trees are right-branching, the rightmost node of ø is labelled s; in languages whose syntactic trees are left-branching, the leftmost node in ø is labelled s. All other nodes are labeled w.

[*s* and *w* stand for *strong* and *weak*. H.T.]

According to (6), languages that are right-branching as in (3)(a) have rightmost prominence, and left-branching languages as in (3)(b) have leftmost prominence within Ø. In case the head-complement structures in (3) come to be single phonological phrases, prominence will be on the complement in each case.

Other authors that have made proposals in this connection, include Schmerling 1976 and Selkirk 1984.

Nothing in the present theory, as it stands, speaks in favour of the tendencies in (1) and (2). Worse yet, violations of either of these tendencies can be derived without any constraint-violations whatsoever in the present theory. Consider, for example, the structure in (7). Nothing stands in the way of setting the parameters

of Align-XP and Align-Ø in opposite directions, not corresponding to the correlation in (1).

(7)

```
 Xø        Xø
 |         |
(    )ø (    )ø
     |       |
[    ]XP[    ]XP
```

Align-Ø, L √

Align-XP, R √

Likewise, it is straightforward, given the present constraints, to derive structures that are not conform to (2). This is shown in (8), with the relevant constraints indicated.

(8)(a)

```
      XP
    /   \
   X     YP

   Xø
(        )ø
```

Wrap-XP √
Align-XP,R √
Align-Ø,L √

(b)

```
      XP
    /   \
   YP     X

          Xø
(        )ø
```

Wrap-XP √
Align-XP,L √
Align-Ø,R √

The constraints I have been using up to now, therefore, does not offer a way of approaching (1) and (2).

I will offer a remedy to this situation as follows. First, I will suggest that we replace the constraints that align syntactic and prosodic edges (Align-XP) with a constraint that relates syntax and stress (Stress-XP). It will be shown that this constraint on stress, in conjunction with Wrap-XP and Align-Ø, derives the edge-effects of Selkirk's end-based theory of the syntax-prosody mapping that we have relied on throughout this work. This indirect way of deriving edge-alignment will leave all other results in place, but it will entail (1).

As for (2), this will not be derived as a universal, but as a markedness tendency. In this case, too, replacing direct edge-alignment (Align-XP) with indirect edge-alignment (Stress-XP) will be of cruical importance.

6.2. Stress-XP

6.2.1. Stress-XP; formulation and place in the mapping

Different authors in prosodic phonology that reject direct-reference (to syntax) approach, do so on different grounds. I believe that the position that we want to work towards is the principled one expressed in Inkelas 1989 (see also Selkirk 1986, Zec and Inkelas 1987, 1988, Zwicky and Pullum 1986):

(9) Indirect Reference Hypothesis:
Phonological rules refer to only prosodic constituent structure.

Direct reference to syntactic constituent structure is not allowed on this view. Of course, the rules or constraints that construct prosodic constituent structure must be exempt from (9). The indirect reference hypothesis, then, defines the rules that mediate between syntactic and prosodic structure as a class of rules of their own: the mapping-rules may mention syntactic and prosodic structure. Purely phonological rules, on the other hand, may mention prosodic structure, but may not mention syntactic structure.

An open question, then, is where stress fits into the picture. If stress is assigned by purely phonological constraints such as Align-Ø, Align-I etc., then assignment of stress would be on a par with other purely phonological rules: the constraints that

enforce assignment of stress do not mention syntactic structure. This hypothetical division of labour is shown in (10).

(10)	syntax XP	---------> mapping: XP/Ø	prosodic constituents Ø	<------->	stress-assignment, $x_{\emptyset}$ phonological rules [H] tone etc.

However, there do seem to be correllations between syntactic structure and prominence that are not captured by Align-Ø alone, as reviewed in the introduction to this chapter. Assignment of prominence depends, in part, on syntactic structure.

One might therefore take a different stand on stress-assignment. Prominence, on this other picture, is part of the prosodic structure that mediates between syntactic structure and phonological rules. The mapping-rules relate syntactix to prosodic constituents, and they also relate syntax to prominence. This picture is shown in (11).

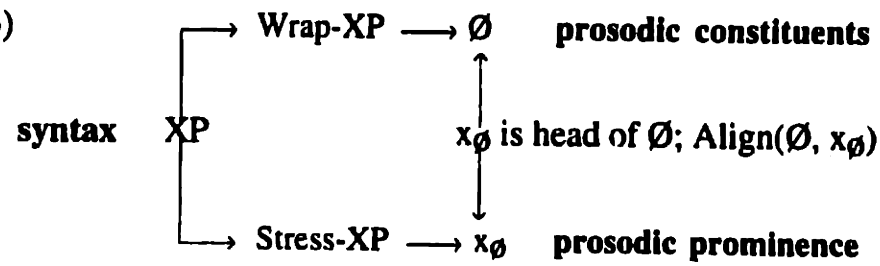
(11)	syntax XP	---------> mapping: XP/Ø XP/stress	prosodic constituents and prominence $x_{\emptyset}$ ( )$_{\emptyset}$	<------->	phonological rules [H] tone etc.

It is this picture of the syntax-phonology relation that I pursue in the following. In particular, I will suggest that we add the constraint in (12) to our theory, which directly relates syntactic structure and phrasal stress.

(12) Stress-XP: Each lexically headed XP must contain a phrasal stress $x_{\emptyset}$.

As I will show in this section, Stress-XP will derive the edge-effects of Sekirk's end-based theory of the syntax-prosody mapping. We will therfore take the constraints of the form Align(XP, edge, Ø, edge) out of the theory. The resulting theory has the following ingredients.

(13)

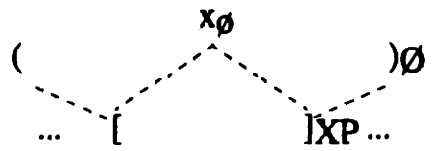


In particular, there are only two mapping-constraints, Wrap-XP and Stress-XP. Align-Ø, which is also crucial to this theory, is not a mapping-contraint in that it does not mention syntactic structure. Neither of the mapping-constraints is directional or parametrized. Both are formulated in terms of containment, rather than alignment. Alignment, even though still crucial to the theory, is here confined to alignment of two prosodic entities with one another: $x_Ø$ and Ø. I now proceed to show the consequences of replacing Align-XP with Stress-XP, beginning with simple cases and working my way toward more complex ones step by step.

6.2.2. The basic configuration

Let us begin by considering the joint effect of the two mapping-constraints, Wrap-XP and Stress-XP on a single XP. For a given XP, Wrap-XP demands that it be contained inside of a Ø, and Stress-XP requires that a phrasal stress $x_Ø$ be contained inside of XP. The joint effect of the two is shown in (14). XP is inside of a Ø and contains a phrasal stress.

(14)



Recall then that we adopted the following requirement on the prosodic representation.

(15) Each grid-mark is the head of a prosodic constituent.

Unless recursive Ø-structure is involved, the $x_{ø}$ that stresses XP in (14) will then become the head of the Ø that wraps XP.

This can be shown as follows. Assume that $x_{ø}$ in (14) is the head of yet another phonological phrase, Ø'. Then (a) $x_{ø}$ is contained inside of Ø; by Wrap-XP, Ø contains XP; by Stress-XP, XP contains $x_{ø}$. By transitivity of containment, Ø therefore contains $x_{ø}$. (b) $x_{ø}$ is also containe inside of Ø', since it will serve as the head of Ø'. It follows from (a) and (b) that Ø and Ø' have a non-empty intersection, namely $x_{ø}$ (or the string dominated by it). The only way in which this is allowed in the present theory is if Ø and Ø' are in a recursive structure: one must contain the other. Thus: $x_{ø}$ in (14) will be the head of Ø unless, possibly, in a recursive structure.

6.2.3. Edge-effects on a single XP

Assume that XP is complex inside and part of a larger representation that contains material to the right of XP, as in (16).

(16) $[\ A_1\ A_2 \ldots\ A_{n-1}\ A_n\ ]_{XP}\ B_1\ B_2 \ldots\ B_{n-1}\ B_n$

Here all that Stress-XP requires is that phrasal stress is somewhere within XP, i.e. on any of $A_1\ A_2 \ldots\ A_{n-1}\ A_n$. Likewise, Wrap-XP is satisfied if XP is wrapped by some Ø that can be arbitrarily larger than XP. The right boundary of that Ø could be to the immediate right of XP, or between any of $B_1\ B_2 \ldots\ B_{n-1}\ B_n$. Thus (17), for example would satisfy both Stress-XP and Wrap-XP.

(17)
$$\begin{array}{l} \quad\ \ x_{\emptyset} \\ (\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad)_{\emptyset} \\ [\ A_1\ A_2 \ldots\ A_{n-1}\ A_n\ ]_{XP}\ B_1\ B_2 \ldots\ B_{n-1}\ B_n \end{array}$$

Now let us factor the constraint Align-Ø into the picture. Assume that our hypothetical language has rightmost phrasal stress within Ø, i.e. the constraint in (18).

(18) Align-Ø,R: Align(Ø, R, $x_{\emptyset}$, R)
Align the righ edge of each Ø with the right edge of $x_{\emptyset}$.

This constraint, restricting the output of the syntax-prosody mapping, now narrows down the possible ways of meeting Stress-XP and Wrap-XP. It prefers those outputs in which $x_{\emptyset}$ is maximally close to the right edge of Ø. Consider the configurations in which $x_{\emptyset}$ and the right edge of Ø can become adjacent. The candidates in (19)(a)-(c) do not violate Align-Ø,R:

(19)		Wrap-XP,	Stress-XP,	Align-Ø,R
(a)	$ (... [A_1 ... A_{n-1} A_n]$_{XP}$ B_1 B_2 ...) $x_Ø$	√	√	√
(b)	(... [A_1 ... A_{n-1} A_n]$_{XP}$ B_1 B_2 ...) $x_Ø$	*!	√	√
(c)	(... [A_1 ... A_{n-1} A_n]$_{XP}$ B_1 B_2 ...) $x_Ø$	√	*!	√
(d)	(... [A_1 ... A_{n-1} A_n]$_{XP}$ B_1 B_2 ...) $x_Ø$	√	√	A_n!
(e)	(... [A_1 ... A_{n-1} A_n]$_{XP}$ B_1 B_2 ...) $x_Ø$	√	√	B_1!

No constraint-violations arise if the right edge of Ø coincides with the right edge of XP, and the righmost element within XP, i.e. the rightmost element within Ø is stressed. All other logically possible placements of the boundary and of the stress, however, lead to a violation of one of the constraints. Thus in candidate (b), stress and boundary are adjacent, but the right edge of Ø is inside of XP. This leads to a violation of Wrap-XP. In candidate (c), stress and boundary are again adjacent, this time outside of XP. This configuration, however, leads to a violation of Stress-XP: $x_Ø$ is no longer inside of XP in this candidate. Other possibilities, such as (d) and (e) are ruled out by Align-Ø,R, since stress and boundary are not as close to one another as they could be.

In other words: Wrap-XP requires that the right edge of Ø be outside of XP (or coincide with the right edge of XP); Stress-XP requires that the stress be inside of

XP. When the two have to get close to one another by Align-Ø,R, the only place where they can meet and still satisfy Stress-XP and Wrap-XP is the right edge of XP. The stress may not go further to the right than that (see (b) above), and the right edge of Ø may not go further to the left than that (see (c) above).

Alignment on left edges, of course, works analogously. Given Align-Ø,L, the left Ø-boundary outside of XP and the stress inside of XP will get as close to one another as they can, meeting at the left edge of XP, and thus deriving the effects of Align-XP,L. Such a structure is shown in (20).

(20)
$$\begin{array}{c} (\; x_{\emptyset} \qquad\qquad)_{\emptyset} \\ \ldots B_{n-1} \; B_n \; [\; A_1 \; A_2 \ldots \;]_{XP} \ldots \end{array}$$

This, then, is the derivation of syntactic-prosodic edge-effects in the present theory. The joint presence of all three contraints, Wrap-XP, Stress-XP, and Align-Ø is crucial for deriving them.

6.2.4. Solving the problem

Note, then, that it is Align-Ø in this new theory that determines the direction of edge-alignment between syntax and prosody: Align-Ø,R has two effects: (a) moving the stress close to the right edge of Ø within XP, and (b) pulling the right edge of Ø close to the stress, thus aligning the right edge of Ø with the right edge of XP.

Align-Ø,L has the analogous effects on the other side: (a) it moves the stress close to the left edge of Ø within XP, and (b) it pulls the left edge of Ø close to the stress, thus aligning the left edge of Ø with the left edge of XP.

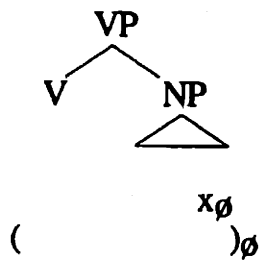
(1) is an immediate consequence of this way of deriving edge-alignment: there is no systematic right-edge alignment without rightmost phrasal stress, and no systematic left-edge alignment without leftmost phrasal stress. Formally, there is only one directionality-parameter, Ali$_{\text{E}}$n-Ø,R/L, and this parameter dictates two choices that were made separately in the previous theory: direction of assignment of phrasal stress, and choice or edge in XP/Ø-alignment.

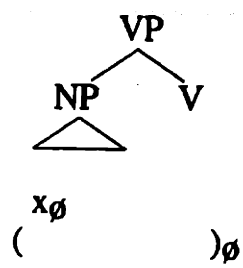
I have tried to motivate in Chapter 3 that we need Wrap-XP in any case. The analysis of the focus-effects in Chapter 5 suggested that we need constraints like Align-Ø in our theory. Below, I will show the that Stress-XP in the theory also does the work of Align-XP in other respects. Since the constraints Wrap-XP, Stress-XP and Align-Ø jointly derive edge-alignment of syntactic and prosodic categories, and since they do so in a way that has a desirable typological consequence, namely (1), I propose to replace the constraints that demand edge-alignment directly (Align(XP, edge, Ø, edge)) by the triangle of Wrap-XP, Stress-XP and Align-Ø. Selkirk's end-based theory, I suggest, is best implemented in a constraint-based framework in terms of the latter constraints.

Let us then consider syntactic configurations with two and more XPs to see that Stress-XP will indeed take over the work of Align-XP properly.

6.2.5. XP inside of XP

Consider the effects of Wrap-XP and Stress-XP on a configuration in which one XP is contained inside of another one, as in (21). Here no conflict arises among Stress-XP and Wrap-XP: First, the whole structure can be wrapped in a single XP, which satisfies Wrap-XP for both the lower and the higher syntactic phrase. Second, the structure is stressed with a single stress, which falls on the embedded element. This stress is then inside of both syntactic phrases and thus satisfies Stress-XP for both XPs.

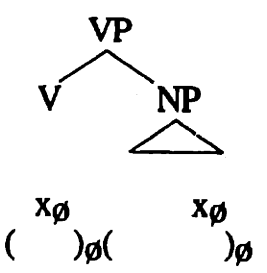
(21)(a) 

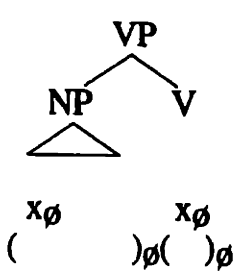
(b) 

Wrap-XP, Stress-XP

√ √

Any other assignment of prosodic stucture will lead to a violation of the mapping-constraints. If, for example, the head and the XP inside of its projection are phrased separatey as in (22), a violation of Wrap-XP results: the higher XP (here: VP) is not contained in a single phonological phrase.

(22)(a) 

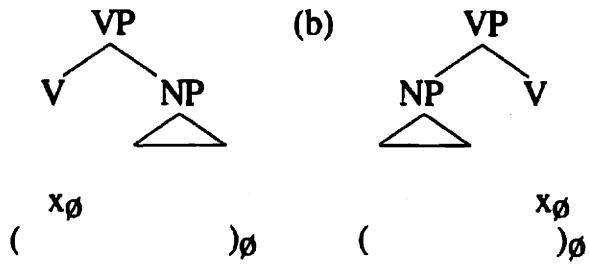
(b) 

Wrap-XP, Stress-XP

* √

Or assume that stress is not assigned within the embedded XP as in (21), but on the head of the higher XP as in (23). In this case a violation of Stress-XP results: The embedded XP has no stress.

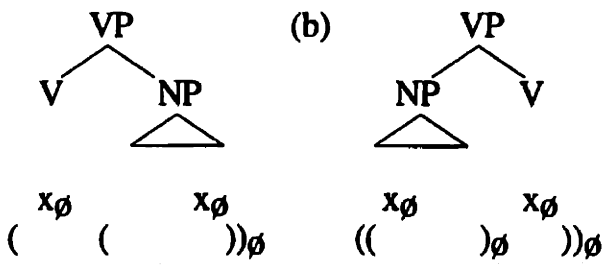
(23)(a) (b) Wrap-XP, Stress-XP



√ *

If both the embedded XP and the head of the higher XP are stressed, both of these stresses will have to head a prosodic constituent. One way in which this might be satisfied is as in (22), with two phonological phrases. In this configuration, however, a Wrap-XP violation results, as we saw. The only other possibility of accomodating more than one stress in the syntactic structures at hand is by way of a recursive structure, as in (24).

(24)(a) (b) Wrap-XP, Stress-XP, NonRec.



√ √ *

Here both Wrap-XP and Stress-XP are met, but the ban on recursive structure is violated.

Nonrecursivity, however, is not violated in (21), and it turns out, so far, that regardless of the ranking of Wrap-XP, Stress-XP, and Nonrecursivity, (21) will always be favoured over alternative candidates, since (21) does not induce any constraint-violations, whereas all other candidates do.

The only other constraint that might matter, then, is Align-Ø. May it change the present picture? The answer depends on the correctness of the correlation

postulated in (2). If (2) holds, then (21)(a) and (b) are still the optimal candidates, since they allow for Align-Ø to be met with no violations: In (21)(a), a right-branching structure, Align-Ø,R would be relevant according to the (2). Align-Ø,R can be met in this configuration if $x_{ø}$ is rightmost within NP. Analogously in (21)(b), a left-branching structure. Here Align-Ø,L would be relevant by (2); this constraint is met in (21)(b) if $x_{ø}$ is leftmost within NP, and thus maximally close to the left edge of Ø. No further constraint-violations are therefore inflicted.

Note, however, that the preceding considerations hold for complements, but not necessarily for specifiers. Both complements and specifiers are inside of a higher projection, but only complements define the direction of branchingness, relevant for (2). Let us therefore sum up the results for complement-head configurations, putting specifiers aside here.

(25)In a complement-head configuration (mirror image), head and complement enter into a single Ø, headed by phrasal stress on the complement. This holds to the extent that (2) is correct, and to the extent that a more complex syntactic configuration does not change the picture.

I will return to (2) below.

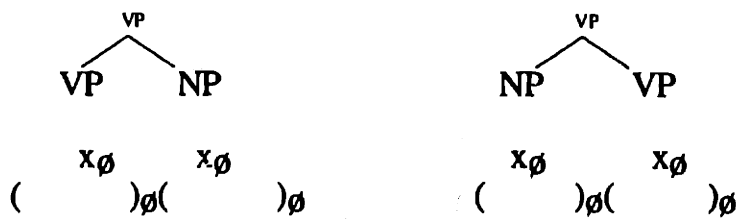
6.2.6. XP outside of XP

Consider then the case of two XPs not contained inside of one another, and not contained inside of a higher lexical XP. This configuration might arise if subject and verb are contained inside the functional projection IP, or if one element is adjoined to the other, as in (26). Recall that in a structure of adjunction to XP, the

lower segment of XP counts for the syntax-prosody mapping, and the higher segment of XP does not (even though formally it is the entire category that is made reference to; see the appendix of Chapter 3).

In such a configuration, a single stress cannot satisfy Stress-XP for both elements at the same time. Therefore Stress-XP will require that each XP receives a separate stress.

(26)



The phonological constituent-structure will then go along with the demands of Stress-XP and provide two Øs, such that each of the grid-marks required by Stress-XP can be the head of a phonological constituent. Wrap-XP is indifferent about this choice in the present structure, since no higher XP is cut up by this separate phrasing (in the case of adjuntion, in particular, Wrap-XP, like Stress-XP, only cares about the lowest segment of an XP.)

This is the only phrasing that does not induce constraint-violations in the syntactic configuration considered here, as shown in the tableau in (27). In particular, a single phonological phrase around both XPs systematically leads to constraint-violation. Thus if either XP does not receive stress, Stress-XP will be violated as in (b) and (c). If both XPs receive stress, the only alternative to (a) is (d), a recursive structure, which violates the ban on recursivity.

(27)(a)	VP' (VP, NP)	(b) VP (NP, VP)	Wrap-XP,	Stress-XP,	NonRec.
(a)	$x_{\emptyset}$ $x_{\emptyset}$ ( )$_{\emptyset}$( )$_{\emptyset}$	$x_{\emptyset}$ $x_{\emptyset}$ ( )$_{\emptyset}$( )$_{\emptyset}$	√	√	√
(b)	$x_{\emptyset}$ ( )$_{\emptyset}$	$x_{\emptyset}$ ( )$_{\emptyset}$	√	*	√
(c)	$x_{\emptyset}$ ( )$_{\emptyset}$	$x_{\emptyset}$ ( )$_{\emptyset}$	√	*	√
(d)	$x_{\emptyset}$ $x_{\emptyset}$ (( ))$_{\emptyset}$	$x_{\emptyset}$ $x_{\emptyset}$ (( )$_{\emptyset}$)$_{\emptyset}$	√	√	*

Within each of the XPs, the Ø-structure will then be assigned as discussed with regard to a single XP earlier: Wrap-XP will demand that the XP be inside of the Ø rather than cut-up. Align-Ø will demand that one of the edges of Ø and the phrasal stress $x_{\emptyset}$ meet at one of the edges of XP. These additional considerations will not affect the result that when one XP is outside of another one, and neither is contained inside of a higher lexically headed XP, they will be phrased separately. This is summed up in (28).

(28) If XP is outside of YP and neither XP nor YP is contained inside a higher lexically headed ZP, XP and YP are phrased separately.

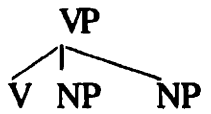
(25) and (28) are predicted to hold universally, with the caveats indicated. This is because the relevant phrasing in each case is the preferred one, regardless of the ranking of the constraints in question. Language-variation then comes into play, when more than one XP is contained inside of a higher lexically headed XP. Here constraint-violation is inevitable, and the output will depend on the language-specific ranking of the constraints.

6.2.7. The ranking of Wrap-XP and Stress-XP: More than one XP inside of XP

The present section essentially recapitulates the findings from Chapter 3 in terms of Stress-XP rather than the constraint Align-XP used there. The relative ranking between Align-XP and Wrap-XP from Chapter 3 will here be replaced by the relative ranking of Stress-XP and Wrap-XP. The resulting typology will turn out to be the same - as desired.

If two XPs are outside of one another, but both inside of a higher lexically headed XP, as in (29), constraint-conflict inevitably arises.

(29)



		Wrap-XP,	Stress-XP,	NonRec
(a)	($x_{\emptyset}$ $)_{\emptyset}$($x_{\emptyset}$ $)_{\emptyset}$	*	√	√
(b)	($x_{\emptyset}$ $)_{\emptyset}$	√	*	√
(c)	(($x_{\emptyset}$ $)_{\emptyset}$ $x_{\emptyset}$ $)_{\emptyset}$	√	√	*

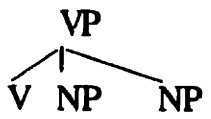
The conflict arises since Stress-XP requires of each of the two embedded XPs to be stressed. The two $x_{\emptyset}$s in turn require two phonological phrases to which they can be the heads. These two phonological phrases, however, will either lead to a violation of Wrap-XP with regard to the higher XP, as in (a), or to a recursive structure in violation of Nonrecursivity, as in (c). Another way of minimizing violations is to not assign stress to one of the embedded XPs, as in (b), in which case a single Ø is enough for the structure, and violations of Wrap-XP and

Nonrecursivity can be avoided. This option, however, comes at the price of violating Stress-XP for one of the embedded XPs.

As I argued in Chapter 3, each of these three structures appear to be attested in Bantu: (a) is represented by Chi Mwi:ni, (b) by Chichewa, and (c) by Kimatuumbi. I will briefly show how each of them is derived by a different ranking of the constraints in (29).

In Chi Mwi:ni, Wrap-XP is the lowest ranked constraint, since violations of it are preferred to violations of either Stress-XP or of Nonrecursivity.

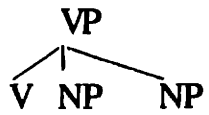
(30) Chi Mwi:ni



		Stress-XP,	NonRec	>> Wrap-XP
(a)	$ ($x_\emptyset$)$_\emptyset$($x_\emptyset$)$_\emptyset$			*
(b)	($x_\emptyset$)$_\emptyset$	*!		
(c)	(($x_\emptyset$)$_\emptyset$ $x_\emptyset$)$_\emptyset$		*!	

Consider then Chichewa. Here Stress-XP is ranked lowest, since violations of Stress-XP are preferred to violations of Wrap-XP or violations of Nonrecursivity.

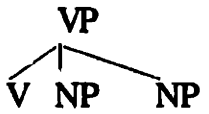
(31) Chichewa



		Wrap-XP,	NonRec >>	Stress-XP
(a)	$(\quad)_{\emptyset}(\quad)_{\emptyset}$	*!		
(b) $	$(\quad)_{\emptyset}$			*
(c)	$((\quad)_{\emptyset}\quad)_{\emptyset}$		*!	

Why is it that the first, rather than the second object is destressed? Here we have to take Align-Ø,R into account. Chichewa is right-branching, so prominence within Ø is rightmost according to the working hypothesis in ($18). The following tableau compares the relevant candidates, (omitting Nonrecursivity which is irrelevant for that particular comparison).

(32)

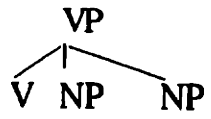


		Wrap-XP >>	Stress-XP	Align-Ø,R
(a)	$(\quad)_{\emptyset}$		*	NP!
(b) $	$(\quad)_{\emptyset}$		*	

As shown, stress on the rightmost NP is preferred due to Align-Ø,R. This result is independent of the ranking of Align-Ø,R relative to the other constraints.

In Kimatuumbi, finally, Nonrecursivity is ranked lowest, and its violations are preferred to violations of Stress-XP or Wrap-XP.

(33) Kimatuumbi



Wrap-XP, Stress-XP >> NonRec

(a)	(xØ)Ø(xØ)Ø	*!		
(b)	(xØ)Ø		*!	
(c) $	((xØ)Ø xØ)Ø			*

6.2.8. Focus and phrasing in Chichewa under the reformulation

In this section it will be shown that the effects of focus on phrasing in Chichewa, carry over from Align-XP to Stress-XP. The work done by Align-XP in the earlier formulation is achieved by Stress-XP in the present reanalysis. The ranking of Align-XP is therefore inherited by Stress-XP.

Recall that in Chichewa, Align-Ø,R is ranked above Wrap-XP, since boundary insertion after a focus, triggered by Align-Ø,R, can induce violations of Wrap-XP. This is shown in the following tableau. Other rankings that are carried over from earlier discussion are the high ranking of Focus, and the ranking of Wrap-XP above Stress-XP from the preceding section.

(34) Focus, Align-Ø,R >> Wrap-XP >> Stress-XP

```
        VP
      /  |  \
     V  NP   NP
    [  FOC    ]DF

                 x
                 xø
(a)   (            )ø        *!                    *

            x
            xø
(b)   (            )ø              NP!             *

            x
            xø    xø
(c) $ (        )ø(    )ø                  *
```

Here Focus forces the highest stress in the domain of the focus on the focused element, in the present example: on the first object. Candidate (a) is thus ruled out by Focus. In candidate (b), where stress is simply shifted but the Ø-structure is otherwise retained, a violation of Align-Ø,R results. The alternative in (c) is preferred. Here the violation of Align-Ø,R is remedied by the insertion of a Ø-boundary after the focus. This leads to an additional Ø after the Ø of the focus, and to a violation of Wrap-XP for the higher VP. Since the Wrap-XP violation in (c) is preferred to the Align-Ø,R violation in (b), it follows that in Chichewa, Align-Ø,R is ranked above Wrap-XP.

So far, then, the subordinate constraint Stress-XP did not have any effect in Chichewa.

Recall from the comparison with Chi Mwi:ni and Kimatuumbi that the effect of Stress-XP is to stress each of two objects, and to thus enforce the presence of a Ø-boundary between two objects (see (30) and (33)). In Chichewa (see (31)) this effect of Stress-XP is suppressed due to the low ranking of Stress-XP (below both

Wrap-XP and Nonrecursivity). The subordinate effect of Stress-XP now emerges in Chichewa in a structure with focus on the verb as in (35).

(35) VP — Focus, Align-Ø,R >> Wrap-XP >> Stress-XP >> Align-U,R

V NP NP

[FOC]DF

		x_u			
	(	$x_ø$)u			
(a)	(	)ø	*!	*	
	x_u				
	($x_ø$	)u			
(b)	(	)ø	NP ! NP	*	NP NP
	x_u				
	($x_ø$	$x_ø$)u			$x_ø$
(c)	( )ø(	)ø	*	*!	(NP NP)ø
	x_u				
	($x_ø$ $x_ø$	$x_ø$)u			$x_ø$ $x_ø$
(d) $	( )ø(	)ø( )ø		*	(NP)ø(NP)ø

This tableau shows the additional constraint Align-U,R as well as utterance-structure in the candidates for reasons that will become apparent presently.[1]

Here, as in the previous tableau, candidate (a) shows a violation of Focus - the highest stress is not on the focus. The second candidate has the highest stress on the focus, but no boundary-insertion after that stress - it is ruled out by Align-Ø,R. Candidates (c) and (d) do not run into these problems: the focused element is stressed, and a Ø-boundary immediately follows the stress. Both candidates violate Wrap-XP due to the Ø-boundary inserted after the focus. Since Wrap-XP

[1] Intermediate I-structure is omitted from the tableau to avoid unneccessary complexity. I-structure is not relevant for the present considerations.

is not gradient (either an XP is contained inside a Ø or it is not), it will not make a distinction between (c) and (d).

Before we consider the choice made by Stress-XP between (c) and (d), consider the role of the constraint Align-U,R. This constraint demands that the right edge of the utterance is aligned with the prominence of the utterance. The formulation of alignment in Chapter 5 thus entails that Align-U,R prefers for there to be as little prosodic structure as possible between the utterance-stress and the right edge of the utterance. Utterance-stress, due to Focus, is on the verb in this case. Align-U,R therefore prefers candidate (c) to (d): There is one more phonological phrase intervening between x_u and the right edge of U in (c) than in (d).[2]

This preference due to Align-U,R, however, is outdone by Stress-XP, which gets its say in this configuration. Stress-XP prefers (d) to (c), since in (d) both objects are stressed, whereas in (c), only the second object is stressed. The first object in (c) thus inflicts the crucial Stress-XP violation.

For Stress-XP to have this effect, Stress-XP will have to be ranked above Align-U,R, the constraint with the inverse preference.

Thus, the tendency to have stress on each of two objects, and a Ø-boundary between them, which we saw in Chi Mwi:ni and Kimatuumbi, emerges in this particular case in Chichewa as well.

[2]Another constraint that would have a preference for (c) rather than (d) is *Struc from Prince and Smolensky 1993. *Struc punishes structure generally and thus prefers (c) to (d) due to the additional Ø in (d). *Struc, not added in the tableau, will have to be ranked below the other constraints, along with Align-U,R.

In summary, what was said in Chapter 3 with regard to Align-XP carries over to Stress-XP. Either constraint will have visible effects in Chi Mwi:ni and Kimatuumbi, which are suppressed in Chichewa: Two objects are each stressed and separated by a Ø-boundary. The effects of the constraint emerge in Chichewa when a focused verb is followed by two objects, where the suppressing effect of the superordinate Wrap-XP is neutralized.

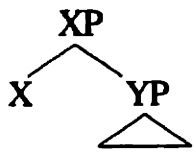
6.3. Stress-XP and the second problem.

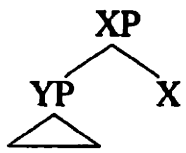
Let us then return to the second generalization mentioned at the outset of the present chapter: The direction of syntactic branchingness in a given language appears to correlate with the direction of stress-assignment within the phonological phrase.

(2)(a) right-branching syntax ⟶ Align-Ø,R

(b) left-branching syntax ⟶ Align-Ø,L

Let us begin by reviewing what the present theory implies about the connection of syntactic branchingness and stress. As was seen earlier in this chapter, the conjunction of Stress-XP and Wrap-XP favours structures in which prominence is on the complement rather than on the head, regardless of direction of syntactic branchingness. Thus the structures in (37) will be stressed on the complement rather than on the head, as far as Wrap-XP and Stress-XP are concerned. The candidates in (a) with stress on the respective complements will not lead to a violation of either of these two constraints, whereas the alternative stress- and phrasing-patterns in (b) and (c) will induce constraint-violations, as shown.

(37)(i) 

(ii) 

			Wrap-XP	Stress-XP
(a)	$(\quad\quad\quad\quad)_{X\emptyset}$	$(\quad\quad\quad\quad)_{X\emptyset}$	√	√
(b)	$(\quad\quad\quad\quad)_{X\emptyset}$	$(\quad\quad\quad\quad)_{X\emptyset}$	√	*
(c)	$(\quad)_{X\emptyset}(\quad\quad)_{X\emptyset}$	$(\quad\quad)_{X\emptyset}(\quad)_{X\emptyset}$	*	√

The preferences derived by Stress-XP are the same as the preferences that are derived by Align-Ø if (2) holds. Thus in the right-branching structure in (37)(a), Align-Ø,R will be the relevant constraint according to (2)(a), and this constraint will assign stress on the complement. Analogously in (37)(b). According to (2)(b), languages with leftbranching structures like (37)(b) will have alignment on the left: Align-Ø,L.

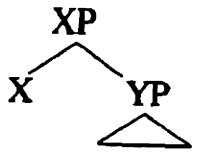
In other words, (2) sais that Stress-XP and Align-Ø have to pull on the same string. In languges with right-branching structures, Stress-XP will favour stress on the right, and Align-Ø will, according to (2), have to do likewise. Analogously for leftbranching structures. I will therefore offer an account of (2) in terms of the following markedness condition.

(38) Markedness Condition

Given a choice, languages will prefer a constraint-system that leads to less (or less severe) violations of the constraints to a constraint-system that leads to more (or more severe) violations of the constraints.

To see how (38) works, consider a right-branching language. If this language chooses Align-Ø,R, as in (39), stress-assignment in head-complement structures will be possible without constraint-violation. Stress on the right is in accord with both Stress-XP and Align-Ø.

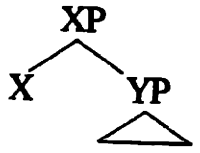
(39)



	Wrap-XP,	Stress-XP,	Align-Ø,R
$(\quad {}^{X_\emptyset} \quad)_\emptyset$	√	√	√

However, if that right-branching language chooses Align-Ø,L, then there will be constraint-violations on the level of Ø whatever the ranking. This is shown in (40).

(40)



		Wrap-XP,	Stress-XP,	Align-Ø,L
(a)	$(\quad {}^{X_\emptyset} \quad)_\emptyset$	√	√	*
(b)	$({}^{X_\emptyset} \quad)_\emptyset$	√	*	√
(c)	$({}^{X_\emptyset} \quad)_\emptyset(\quad {}^{X_\emptyset} \quad)_\emptyset$	*	√	√

Thus, if the right-branching language is given a choice between Align-Ø,R and Align-Ø,L, the Markedness Condition in (38) will compell the language to choose Align-Ø,R, since that choice will lead to systematically less constraint-violations than if the language chose Align-Ø,L. In this way the Markedness Condition accounts for the correlation in (2)(a). (2)(b) is accounted for analogously.

References

Abney, Steven A. (1987). *The English noun phrase in its sentential aspect.* Doctoral dissertation, M.I.T., Cambridge, Mass.

Basbøll, Hans. (1978). Boundaries and ranking rules in French phonology. In B. de Cornulier and François Dell, (eds.), *Études de phonologie française.* Paris, CNRS.

Beckman, Mary, and Janet Pierrehumbert (1986). Intonational structure in English and Japanese. *Phonology* 3, 255-309.

den Besten, Hans, and Jerold A.Edmondson (1983). The Verbal Complex in Continental West Germanic. In W. Abraham (ed), *On the formal syntax of the Westgermania.* Benjamins, Amsterdam.

Bierwisch, Manfred (1966). Regeln für die Intonation deutscher Sätze. In *Studia Grammatica* VII, 99-201.

Bing, Janet (1979). *Aspects of English prosody.* Doctoral dissertation, University of Massachusetts, Amherst

Bresnan, Joan & Janni M. Kanerva (1989). Locative inversion in Chichewa: a case study of factorization in grammar. *Linguistic Inquiry* 20: 1-50.

Bresnan, Joan and Sam A. Mchombo (1987). Topic, pronoun and agreement in Chichewa. *Language* 63: 741-82.

Büring, Daniel, and Katharina Hartmann (1994). Doing the right thing - extraposition as a movement rule. Sprachwissenschaft in Frankfurt, Arbeitspapier Nr. 13, Universität Frankfurt a.M.

Chen, Matthew Y. (1987). The syntax of Xiamen Tone Sandhi. *Phonology Yearbook* 4, 109-149.

Chierchia, Gennaro. (1986). Length, syllabification and the phonological cycle in Italian. *Journal of Italian Linguistics* 8, 5-34.

Cho, Young-Mee Yu (1990). Syntax and phrasing in Korean. In: Inkelas and Zec (eds).

Chomsky, Noam 1970, Deep Structure, Surface Structure and semantic interpretation. In Jakobson, Roman and S. Kawamoto (eds), *Studies in General and Oriental linguistics*. T.E.C. Corporation, Tokyo. Also in D. Steinberg, and L. Jakobovits (eds) (1971), *Semantics: An interdisciplinary reader in philosophy, linguistics, and psychology*. Cambridge University Press, New York.

Chomsky, Noam (1971). Constraints on transformations. In: Stephen R. Anderson and Paul Kiparsky (eds), *A Festschrift for Morris Halle*. Holt, Reinhart and Winston, New York, 232-286.

Chomsky, Noam (1976). Conditions on Rules of Grammar. *Linguistic Analysis* 2.4, 303-351.

Chomsky, Noam (1977). On Wh-movement. In: Culicover, Wasow, Akmajian (eds), 71-132.

Chomsky, Noam (1981). *Lectures on Government and Binding*. The Pisa Lectures. Foris, Dortrecht.

Chomsky, Noam (1986). *Barriers*. The MIT Press, Cambridge, Mass.

Chomsky, Noam 1991. Some notes on economy of derivation and representation. In: Robert Freidin (ed), *Principles and parameters in comparative grammar*, MIT Press, Cambridge, Mass, 417-454.

Chomsky, Noam. 1993a. A minimalist program for linguistic theory. In: Kenneth Hale and Samuel J. Keyser (eds), *The view from Building 20. Essays in Honor of Sylvain Bromberger*, 1-52.

Chomsky, Noam. (1994). Bare phrase structure. MIT Occasional Papers in Linguistics, Number 5. MITWPL.

Chomsky, Noam, and Morris Halle (1968). *The Sound Pattern of English*. Harper and Row, New York.

Cinque, Guglielmo (1993). A null theory of phrase and compound stress. *Linguistic Inquiry* 24, 239-297.

Clements, George N. (1978). Tone and syntax in Ewe. In Donna J. Napoli (ed), *Elements of Tone, Stress, and Intonation*, Georgetown University Press, Washington, D.C., 21-99. <<cited as 1977 in the text (my manuscript-version)>>

Clements, George N,. and K.C. Ford (1979). Kikuyu tone shift and its synchronic consequences. *Linguistic Inquiry* 10, 179-210.

Cooper, William E. and Jeanne Paccia-Cooper. (1980). *Syntax and Speech*. Harvard University Press, Cambridge, Mass.

Cowper, W. E. and Keren D. Rice. (1987). Are phonosyntactic rules necessary? *Phonology Yearbook* 4, 185-194.

Culicover, Peter W., and Michael S. Rochemeont (1990). Extraposition and the Complement Principle. *Linguistic Inquiry* 21, 23-47.

Culicover, Peter, T. Wasow, and Adrian Akmajian (eds) (1977). *Formal syntax.* Academic Press.

Downing, Bruce T. (1970). *Syntactic structure and phonological phrasing in English.* Doctoral dissertation, University of Texas, Austin.

Duanmu, San (1990). A formal study of syllable, tone, stress and domain in Chinese languages. Dissertation, MIT, Cambridge, Mass.

Duanmu, San (1991). Stress and syntax-phonology mismatches: Tonal domains in Danyang and Shanghai. In: Dawn Bates (ed.), The proceedings of the tenth West Coast Conference on Formal Linguistics. Center for the Study of Language and Information, Standford University, 127-137.

Emonds, Joseph (1979). Appositive relatives have no properties. *Linguistic Inquiry* 10.2, 211-243.

Emonds, Joseph E. (1976). *A transformational approach to English syntax. Root, structure-preserving and local transformations.* Academic Press, NY.

Esposito, Anna and Hubert Truckenbrodt. (1995). A note on Raddopiamento Sintattico and the phonological phrase in Italian. Ms. Università di Salerno and MIT.

Evers, Arnold (1975). *The transformational cycle in Dutch and German.* Doctoral dissertation, University of Utrecht. Distributed by IULC, Bloomington, Indiana.

Fery, Caroline (1991). Focus, Topic and Intonation in German. Arbeitspapiere des Sonderforschungsbereichs 340, "Sprachtheoretische Grundlagen für die Computerlinguistik". Nr. 20.

Ghini, Mirco (1993a). Phonological phrase formation in Italian. Ms., University of Toronto.

Ghini, Mirco (1993b). Ø-formation in Italian: A new proposal. In: Carrie Dyck (ed), Toronto Working Papers in Linguistics, 12.2.

Goodman, Morris (1976). Prosodic features in Bravanese, a Swahili dialect. *Journal of African Linguistics* 6, 278-84.

Gueron, Jaqueline (1980). On the syntax and semantics of PP-Extraposition. *Linguistic Inquiry* 11, 637-678

Haegeman, Liliane, and Henk van Riemsdijk (1986). Verb Projection Raising, scope, and the typology of verb movement rules. *Linguistic Inquiry* 17. 417-466.

Haider, Hubert (1993). *Deutsche Syntax generativ*. Gunter Narr Verlag, Tübingen.

Hale, Kenneth (1975). Papago intonation and word order. Ms., MIT, 1975.

Hale, Kenneth. (1976). Phonological developments in particular Northern Paman languages. In P. Sutton, ed., *Languages of Cape York*. AIAS, Canberra.

Hale, Kenneth, and Elisabeth Selkirk (1987). Government and tonal phrasing in Papago. *Phonology Yearbook* 4, 151-183.

Hale, Kenneth, LaVerne M. Jeanne, and Paul Platero (1977). Three cases of overgeneration. In Culicover, Wasow and Akmajian (eds).

Haliday, M.A.K. (1967). Notes on tranitivity and theme in English. *Journal of Linguistics* 3.2, 199-244.

Halle, Morris, and George Nickerson Clements. (1983). *Problem Book in Phonology*. MIT Press, Cambridge, Mass.

Halle, Morris, and Jean-Roger Vergnaud (1987). An Essay on Stress. MIT Press, Cambridge, Mass.

Hammond, Michael, (1987). Accent, constituency and lollipops. In A. Bosch, B. Need and E. Schiller, eds., *CLS 23: Parasession on Autosegmental and Metrical Phonology*. Pp. 149-66.

Haraguchi, Shosuke (1977). *The tone pattern of Japanese: An autosegmental theory of tonology*. Kaitakusha, Tokyo.

Hattori, Shirô (1961). Prosodeme, syllable structure and laryngeal phonemes. In: Roy Andrew Miller, Robert H. Gernhard, Mamoro Shimizu (eds), Studies in descriptive and applied linguistics. Bulletin of the Summer Institute in Linguistics, 1961.1.

Hayes, Bruce (1981). *A Metrical Theory of Stress Rules*. Dissertation, MIT.

Hayes, Bruce (1984). The phonology of rhythm in English. *Linguistic Inquiry* 15, 33-74.

Hayes, Bruce (1989). The prosodic hierarchy in meter. In P. Kiparsky and G. Youmans (eds), *Rhythm and Meter*, Academic Press, Orlando, 201-260.

Hayes, Bruce (1995). *Metrical Stress Theory*. University of Chicago Press.

Hayes, Bruce, and Aditi Lahiri (1991). Bengali intonational phonology. *Natural Language and Linguistic Theory* 9, 47-96.

Heim, Irene (1982). The semantics of definite and indefinite noun phrases. Doctoral dissertation, University of Massachusetts, Amherst.

Höhle, Tilman (1982). Explikationen für "normale Betonung" und "normale Wortstellung". In: Werner Abraham (ed), *Satzglieder im Deutschen. Vorschläge zur syntaktischen, semantischen und pragmatischen Fundierung*. Narr, Tübingen, 75-153.

Hung, Tony T.N. Hung (1987). Syntactic and semantic aspects of Chinese tone sandhi. Doctoral dissertation, University of California, San Diego. Reproduced by the Indiana University Linguistics Club, 1989.

Hyman, Larry (1990). Boundary tones and the prosodic hierarchy. In Inkelas and Zec (eds), 109-125.

Idsardi, William (1992). The computation of prosody. Doctoral dissertation, MIT.

Inkelas, Sharon (1989). Prosodic constituency in the lexicon. Doctoral dissertation, Stanford University.

Inkelas, Sharon, and Draga Zec (1990). *The phonology-syntax connection*. University of Chicago Press, Chicago.

Inkelas, Sharon, and Draga Zec (1995). Syntax-phonology interface. In J.A. Goldsmith (ed), *The handbook of phonological theory*. Blackwell, Cambridge, Mass., 535-549.

Jackendoff, Ray S. (1972). *Semantic interpretation in generative grammar*. MIT Press, Cambridge, Mass.

Jacobs, Joachim (1984). Funktionale Satzperspektive und Illokutionssemantik. *Linguistische Berichte* 91, 25-58.

Jacobs, Joachim (1988). Fokus-Hintergrund-Gliederung und Grammatik. In: Hans Altmann (ed), *Intonationsforschungen*, Niemeyer, Tübingen, 89-134.

Jacobs, Joachim (1989). Focus ambiguities. In: J. Hoepelman (ed), Proceedings der Tagung "Fokus und Intonation" des Frauenhofer-Instituts Stuttgart.

Jin, Shunde (1985). Shanghai morphotonemics. A preliminary study of tone sandhi behaviour across word boundaries. MA thesis, University of Pittsburgh. Reproduced by the Indiana University Linguistics Club, 1986.

Johnson, Kyle B. (1985). A case for movement. Doctoral dissertation, MIT, Cambridge, Mass.

Kaan, Edith (1992). A minimalist approach to extraposition. MA thesis. Institute for General Linguistics, University of Groningen.

Kaisse, Ellen. (1985). *Connected Speech*. Academic Press, San Diego.

Kanerva, Jonni M. (1989). *Focus and phrasing in Chichewa phonology*. Doctoral dissertation, Standford University.

Kanerva, Jonni M. (1990). Focusing on phonological phrases in Chichewa. In: Inkelas and Zec (eds), 145-161.

Kenstowicz, Michael (1987). The phonology and syntax of wh-expressions in Tangale. *Phonology Yearbook* 4, 229-241.

Kenstowicz, Michael, and Charles Kisseberth (1977). *Topics in Phonological Theory*. Academic Press, San Diego.

Kenstowicz, Michael, and Charles Kisseberth (1990). Chizigula tonology: the word and beyond. In: Inkelas and Zec (eds), 163-194.

Kisseberth, Charles, and M. I. Abasheikh (1974). Vowel length in ChiMwi:ni; a case study of the role of grammar in phonology. In A. Bruck, R. A. Fox, M. W. LaGaly, eds., *Papers from the Parasession on Natural Phonology*. Pp. 193-209. Chicago Linguistic Society, University of Chicago.

Kisseberth, Charles, and David Odden (1980). Aspects of tone assignment in Kimatuumbi. *Studies in the linguistic sciences* 10, 125-140.

Klatt, Dennis. (1975). Vowel lengthening is syntactically determined in a connected discourse. *Journal of Phonetics* 3, 129-40.

Klatt, Dennis. (1976). Linguistic uses of segmental duration in English: acoustic and perceptual evidence. *Journal of the Acoustical Society of America* 59, 1208-21.

Klatt, Dennis. (1979). Synthesis by rule of segmental durations in English sentences. In Bjorn Lindblom, Sven E. G. Öhman, eds., *Frontiers of Speech Communication Research*. Academic Press, London. Pp. 287-99.

Kratzer, Angelika (1991). The representation of focus. In: Stechow and Wunderlich (eds), 825-834.

Krifka, Manfred (1985). Fokus, Topic, syntaktische Struktur und semantische Interpretation. Ms., München.

Krifka, Manfred (1991). A compositional semantics for multiple focus constructions. In: Steven Moore and Adam Zachary Wyner (eds), Proceedings of the First Semantics and Linguistic Theory Conference, SALT I (published under Cornell University Working Papers in Linguistics, Number 10). 127-158.

Kroch, Anthony S., and Beatrice Santorini (1991). The derived constituent structure of the West Germanic Verb-Raising Construction. In R. Freidin (ed), *Principles and parameters in comparative grammar*. The MIT Press, Cambridge, Mass., 269-338.

Ladd, Robert D. (1986). Intonational phrasing: The case for recursive prosodic structure. *Phonology* 3, 311-340.

Ladd, Robert D. (1992). Compound prosodic domains. Occasional paper. Linguistics department, University of Edinburgh.

Liberman, Mark Y. (1976) *The intonational system of English*. Dissertation, MIT, Cambridge, Mass.

Liberman, Mark Y. and Alan Prince (1977) On stress and linguistic rhythm. *Linguistic Inquiry* 8, 249-336.

Lin, Jo-wang (1994). Lexical government and tone group formation in Xiamen Chinese. *Phonology* 11, 237-275.

Marotta, Giovanna (1983). Rhythmical constraints on "Syntactic Doubling". *Journal of Italian Linguistics* 8, 35-52.

May, Robert (1985). *Logical form*. MIT Press, Cambridge, Mass.

McCarthy, John J., and Alan Prince (1993a). Prosodic Morphology I. Constraint interaction and satisfaction. Ms., University of Massachusetts, Amherst, and Rutger University.

McCarthy, John J., and Alan Prince (1993b). Generalized Alignment. Ms., University of Massachusetts, Amherst, and Rutger University.

McCawley, James D. (1965). *The accentual system of Standard Japanese*. Doctoral dissertation, MIT.

Nagahara, Hiroyuki (1994). Phonological phrasing in Japanese. Doctoral dissertation, University of California, Los Angeles.

Napoli, Donna J. and Nespor, Marina (1979). The syntax of word initial consonant gemination in Italian. *Language* 55, 812-841.

Nepor, Marina, and Irene Vogel (1986). *Prosodic phonology*. Foris, Dortrecht.

Nespor, Marina, and Irene Vogel (1989). On clashes and lapses. *Phonology* 6, 69-116.

Nespor, Marina, and Irene Vogel (1982). Prosodic domains of external sandhi rules. In Harry van der Hulst and N. Smith (eds), *The structure of phonological representations*, vol.1. Foris, Dortrecht, 222-255.

Nespor, Marina, Maria Teresa Guasti and Anne Christophe (1995). Selecting word order: the rhythmic activation principle. Ms., Universiteit van Amsterdam.

Newman, Stanley S. (1946). On the stress system of English. *Word* 2.3., 171-187.

Odden, David (1984). An accentual approach to tone in Kimatuumbi. In: D. Goyvaerts (ed), *African Linguistics: Studies in memory of M.W.K. Semikenke*. John Benjamins, Amsterdam, 345-419.

Odden, David (1987). Kimatuumbi phrasal phonology. *Phonology Yearbook* 4, 13-26.

Odden, David (1990). Syntax, lexical rules and postlexical rules in Kimatuumbi. In: Inkelas and Zec (eds), 259-277.

Peperkamp, Sharon (1995). Enclitic stress in Romance. To appear in: CLS 31, Proceedings of the parasesion on clitics.

Pesetsky, David (1995). *Zero syntax*. Experiencers and cascades. MIT Press, Cambridge, Mass.

Pheby, John (1980). Phonologie: Intonation. Chapter 6 of K.E. Heidolph et al. (eds), *Grundzüge einer deutschen Grammatik*. Akademie, Berlin.

Pierrehumbert, Janet B. (1980). The phonology and phonetics of English intonation. Doctoral dissertation, MIT.

Pierrehumbert, Janet B. and Mary E. Beckman (1988). Japanese tone structure. MIT Press, Cambridge, Mass.

Poser, William J. 1984, The phonetics and phonology of tone and intonation in Japanese. Doctoral dissertation, MIT, Cambridge, Mass.

Pranka, P. (1983). *Syntax and word formation*. Doctoral dissertation, MIT, Cambridge, Mass.

Prince, Alan (1983) Relating to the grid. *Linguistic Inquiry* 14, 19-100.

Prince, Alan and Paul Smolensly (1993). Optimality Theory. Constraint interaction in generative grammar. Ms., Rutgers University and University of Colorado at Boulder.

Rizzi, Luigi and L. M. Savoia (1992). Conditions on /u/ propagation in southern Italian dialects; a locality parameter for phonosyntactic processes. In A. Belletti (ed.) *Syntactic Theory and the Dialects of Italy*. Rosenberg and Sellier, Torino. Pp. 252-318.

Rochemont, Michael S. (1978). *A theory of stylistic rules in English*. Garland Press, NY, 1985.

Rochemont, Michael S. and Peter W. Culicover (1990). *English focus constructions and the theory of grammar*. Cambridge University Press, Cambridge, England.

Rooth, Mats (1985). Association with focus. Doctoral dissertation, University of Massachusetts, Amherst.

Rooth, Mats (1992). A theory of focus interpretation. *Natural Language Semantics* 1, 75-116.

Ross, John R. 1967. Constraints on variables in syntax. Doctoral dissertation, MIT. Published as *Infinite syntax!*, Ablex Publishing Corporation, Norwood, New Jersey, 1986.

Rotenberg, Joel (1979). The syntax of phonology. Doctoral dissertation, MIT.

Safir, Ken (1986). Relative clauses in a theory of binding and levels. *Linguistic Inquiry* 17.4, 663-689.

Saltarelli, M. (1970) *A Phonology of Italian in a Generative Framework.* The Hague, Mouton.

Schmerling, Susan (1976). *Aspects of English sentence stress.* University of Texas Press, Austin.

Schwarzschild, Roger (1992). The contrastiveness of associated foci. Ms., Hebrew University of Jerusalem.

Selkirk , Elisabeth, (1980a). Prosodic domains in phonology: Sanskrit revisited. In: Mark Aronoff and Mary-Louise Kean (eds) *Juncture.* Anma Libri, Saratoga. Pp. 107-29.

Selkirk , Elisabeth, (1980b). The role of prosodic categories in English word stress. *Linguistic Inquiry* 11, 563-605.

Selkirk , Elisabeth (1986). On derived domains in sentence phonology. *Phonology Yearbook* 3, 371-405.

Selkirk , Elisabeth, and Tong Shen (1990). Prosodic domains in Shanghai Chinese. In: Inkelas and Zec (eds), 313-337.

Selkirk, Elisabeth, and Koichi Tateishi (1988). Constraints on minor phrase formation in Japanese. CLS 1988.

Selkirk, Elisabeth, and Koichi Tateishi (1991). Syntax and downstep in Japanese. In: Carol Georopoulos and Robert Ishihara (eds), *Interdisciplinary approaches to Language. Essays in Honor of S.-Y. Kuroda.* Kluwer, Dortrecht.

Selkirk, Elisabeth (1984). *Phonology and syntax: The relation between sound and structure.* MIT Press, Cambridge, Mass.

Selkirk, Elisabeth (1995a). Sentence Prosody: Intonation, stress and phrasing. In J.A. Goldsmith (ed), *The handbook of phonological theory.* Blackwell, Cambridge, Mass., 550-569.

Selkirk, Elisabeth (1995b). The prosodic structure of function words. In J. Beckman, S. Urbanczyk and L. Walsh (eds), Optimality theory. University of Massachussetts Occasional Papers, GLSA, Amherst.

Selkirk, Elisabeth and Tong Shen (1990). Prosodic domains in Shanghai Chinese. In Sharon Inkelas and Draga Zec, eds., 313-37.

Shen, Tong (1986). The formation of tone groups in Shanghai. Ms., University of Massachusetts, Amherst.

Silva, David James (1989). Determining the domain of intervocalic stop voicing in Korean. In Susumu Kuno et al., eds., *Harvard Studies in Korean Linguistics* 3. Harvard University, Cambridge, Mass.

von Stechow, Arnim (1991). Current issues in the theory of focus. In: Stechow and Wunderlich (eds), 804-825.

von Stechow, Arnim, and Dieter Wunderlich (eds) (1991). *Semantics: An international handbook of contemporary research.* De Gruyter.

Steriade, Donca. (1982) *Greek prosodies and the nature of syllabification.* Dissertation, MIT, Cambridge, Mass.

Takami, Kin-ichi, and Susumu Kuno (1992). Extraposition from NP and VP-internal subjects. In S. Kuno and H. Thrainsson (eds), Harvard Working Papers in Linguistics, vol.1, Cambridge, Mass, 155-173.

Tancredi, Christopher (1992). Deletion, deaccenting and presupposition. Doctoral dissertation, MIT.

Terada, M. (1986). Minor phrasing in Japanese. Ms., University of Massachusetts, Amherst.

Thiersch, Craig (1985). Some notes on scrambling in the German Mittelfeld, VP and X'-theory. Ms. Univ. Köln.

Truckenbrodt, Hubert (1993). Syntax versus phonology: Which gets the stress right? Ms. MIT, Cambridge, Mass.

Truckenbrodt, Hubert (in progress). Tonal register and redundancy.

Uhmann, Susanne (1991). Fokusphonologie. Eine Analyse deutscher Intonationskonturen im Rahmen der nicht-linearen Phonologie. Niemeyer, Tübingen.

Vogel, Irene. (1977). *The syllable in phonological theory; with special reference to Italian.* Dissertation, Stanford University.

Wightman, Colin W., Stefanie Shattuck-Huffnagel, Mari Ostendorf and Patti J. Price (1992). Segmental durations in the vicinity of prosodic phrase boundaries. *Journal of the Acoustic Society of America* 91, 1707-17.

Wright, M.S. (1983). A metrical approach to tone sandhi in Chinese dialects. Doctoral dissertation, University of Massachusetts, Amherst.

Yip, Moira (1980). The tonal phonology of Chinese. Doctoral dissertation, MIT.

Zec, Draga (1988). *Sonority constraints on prosodic structure*. Dissertation, Stanford University.

Zec, Draga, and Sharon Inkelas (1987). Phonological phrasing and the reduction of function words. Paper presented at the annual meeting of the Linguistic Society of America.

Zec, Draga, and Sharon Inkelas (1990). Prosodically constrained syntax. In S. Inkelas and D. Zec (eds), *The phonology-syntax connection*. The University of Chicago Press, Chicago, 365-378.

Zee, E, and Maddieson (1979). Tones and tone sandhi in Shanghai. UCLA Working Paper in Phonetics 93-129.

Zhu, Xiaonong (1994). Shanghai tonetics. Doctoral dissertation, The Australian National University.

Zwicky, Arnold, and Geoffrey Pullum (1986) The principle of phonology-free syntax: introductory remarks. *Ohio State University Working Papers in Linguistics* 32, 63-91.