

THE POSTSYNTACTIC DERIVATION
AND ITS PHONOLOGICAL REFLEXES

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ABSTRACT

THE POSTSYNTACTIC DERIVATION AND ITS PHONOLOGICAL REFLEXES

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This dissertation is an investigation into the nature of the syntax-phonology interface. The phenomena under consideration here are *phrasal phonological alternations*, which I define as phonological rules that apply across words but not across the board. I develop a model of the interface in which: (i) phonological rules work directly with spelled-out chunks of syntactic structure (i.e. cycles or phases); and (ii) within each spellout domain, a series of linearization procedures create ‘sub-units’ of various sizes, which serve as domains for different kinds of phonological rules. The proposal is illustrated with in-depth case studies from Huave and Luganda, along with data from other languages. A key feature of this model is that phrasal rules are *directly* constrained by the underlying syntax, but are also allowed a certain amount of variability – e.g. there is a class of ‘late-linearization’ rules that may merge domains in fast speech or split them apart in slow speech. We will see that in languages with multiple phrasal rules, like Luganda and French, these rule domains may be different sizes and may even reverse their containment relationships (contra the predictions of Prosodic Hierarchy Theory), but will ultimately be constrained by a common set of syntactic factors. Comparisons with other proposed models of the syntax-phonology interface are addressed in the course of the discussion.

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Chapter 1

Introduction

1.1 A theory of the syntax-phonology interface

This dissertation is an investigation into the nature of the syntax-phonology interface. The phenomena under consideration here are *phrasal phonological alternations*, which I define as phonological rules that apply across words but not across the board. The central goal of this dissertation is to develop a theory of what is at the root of the observation in (1):

- (1) GENERALIZATION: Phrasal phonological rules are cross-linguistically *sensitive to the syntactic constituent structure* in some very general sense – words are not just randomly grouped together into phonological domains, but instead are grouped systematically in ways that preserve basic aspects of the underlying syntax.

An example is given in (2), from the Bantu language Luganda (Hyman 1987, Hyman et al. 1987). Luganda has a rule of Low-Tone Deletion (LTD) that potentially applies between two H_nL_n words; when LTD applies, the L on the first word is deleted and a H-plateau is formed between the two words. LTD applies in (2a), where a H_nL_n verb is followed by a H_nL_n object (notice the string of boldfaced H-tones crossing the word boundary). In (2b), the same verb is followed by the same noun, but the two words are

in a different structural relationship – the noun is a right-dislocated subject rather than an in-situ object. LTD cannot apply in this context: the L-tone on the verb is preserved and no H-plateau is formed. (Parentheses are used here and in subsequent examples to demarcate phonological domains.)

- (2) a. *LTD between verb and object:*

y-a-fúúmb-à nnawólòvu → (yàfúúmbá nnáwólòvù)
 sbj1-pst-cook-ind 1.chameleon
 ‘S/he cooked a chameleon.’

- b. *No LTD between verb and right-dislocated subject:*

y-a-fúúmb-à nnawólòvu → (y-à-fúúmbà) (nnàwólòvù)
 sbj1-pst-cook 1.chameleon
 ‘The chameleon cooked (something).’

As observed by Hyman (1987), Hyman et al. (1987), et seq., Luganda L-Deletion does not apply between just any two H_nL_n words, but only applies between words that are in a sufficiently ‘close’ syntactic relationship.

Another demonstration of the generalization in (1) involves the placement of intonational boundary tones in languages like English, Korean and French, among many others. Consider the examples in (3), adapted from Taglicht (1998), where parentheses denote phonological (or ‘prosodic’) domains marked by final lengthening and HLH ‘continuation rise’ boundary tone.

- (3) a. (On Monday morning Jane left^{LLL})
 b. (On Monday **morning**^{HLH}) (Jane left^{LLL})
 c. * (On **Monday**^{HLH}) (morning Jane left^{LLL})

In (3a) the entire utterance is treated as a single phonological domain. In (3b) there is a single break, at the juncture between an adjunct PP and the remainder of the clause. Both

(a) and (b) are grammatical, demonstrating a very common tendency for phrasal phonological rules to allow multiple parses of what appears to be a single syntactic structure. (3c), however, where there is a break *within* the PP *but not between the PP and the rest of the clause*, is ungrammatical. The phonological phrasing has apparently deviated from the underlying syntactic structure in a way that violates whatever principle is at the root of (1).

Many more examples of phonological rules that show the tendency in (1) could be included here; a partial list is given in (4) and we will be looking at some of these cases in more detail in later chapters. The striking fact is that the generalization in (1) appears to be exceptionless: whenever a phonological rule is found to apply across words but not across the board, it turns out to be constrained by some basic aspect(s) of the syntactic constituent structure.

- (4) **Additional examples of syntax-sensitive phrasal rules:** French liaison, Korean obstruent voicing, Japanese initial lowering, Hausa final vowel shortening, Tohono O'odham tone spread, Xiamen tone sandhi, English rhythm rule, English palatalization, Celtic consonant mutation, penultimate vowel length and tone spread in various Bantu languages, Mandarin third-tone sandhi, processes that fall under the rubric of *intonation* or *prosody* in many languages (assignment of pitch melodies at the boundaries of phrasal units; downdrift/declination; final vowel lengthening; 'planned-pause' insertion).

In order to account for the generalization in (1), the phonology must be able to 'see' certain aspects of the syntactic constituent structure. Perhaps more accurately, a given phrasal phonological rule must have access only to certain *subsets* of the syntactic structure at any given time: in (2b), for example, LTD is somehow prevented from seeing the verb *yafuumba* and the right-dislocated subject *nnawolovu* together at the same time, even though they are linearly adjacent on the surface.

I will account for this generalization by adopting the following hypothesis, which has been featured in various forms in a long line of previous work (including Chomsky and Halle 1968, Bresnan 1971, Kiparsky 1985, Mohanan 1986, and Chomsky 1999 et seq., among others):

(5) **CYCLIC-SPELLOUT HYPOTHESIS:** The phonology deals with the syntax in cycles.

In a *cyclic-spellout* (or *multiple-spellout*) architecture, syntactic structures are built up and processed in subparts (or cycles, or phases) rather than all at once; the phonology then deals with each of these subparts discretely, so that each syntactic cycle serves as a separate phonological domain. Since cycles are syntactic constituents (or predictable units derived from them, e.g. ‘leftover’ material from a previous cycle), parses like (3c) are automatically ruled out.

In the simplest case, this would be all we needed: there would be a direct isomorphism between syntactic cycles and phonological domains, no other syntax-phonology mappings or conversions would be required, and the interface would be maximally transparent. However, we will see that things cannot be this simple. There are at least two major complications, which we will look at in more detail below:

- **Multiple-domain effects:** First, it is well known that not all phrasal rule domains pay attention to the same aspects of the syntax – some rules are blocked only by clause boundaries, for example, while others are apparently blocked by all XP boundaries. Moreover, it is possible for a single language to have more than one phrasal rule, with each rule applying to a different-sized domain. This is demonstrated in (6) with two phrasal rules from Luganda. In addition to the L-Tone Deletion (LTD) rule shown in (2), Luganda has a phrasal rule that spreads a H-tone leftward onto toneless moras (H-Tone Anticipation, or HTA). As we will see in Chapters 4 and 5,

HTA domains are *larger* than LTD domains – HTA can apply between a verb and a right-dislocated subject, for example (6b), while LTD cannot (6a):

- (6) a. *No LTD between verb and right-dislocated subject:*

y-a-fúúmb-à nnawólòvu → (y-à-fúúmbà) (nnàwólòvù)
sbj1-pst-cook 1.chameleon
'The chameleon cooked (something).'

- b. *HTA freely applies between verb and right-dislocated subject:*

a-som-a nnawólòvu → (a-sómá nnáwólòvù)
sbj1-read 1.chameleon
'The chameleon is reading.'

This means that there must be something more at work than a simple one-to-one correspondence between cycles and phonological domains. Our theory must have a way to provide larger (or smaller) phonological domains in addition to the phase, and to correctly predict how these domains will be related to each other (e.g. by containment, a fixed hierarchy, top-down or bottom-up ordering, etc.).

- **Variable-domain effects:** As demonstrated by (3a)–(3b), many phrasal phonological alternations are *variable* – what is arguably a single syntactic structure can correspond to multiple phonological phrasings. This is a well-known property of ‘intonational phrasing’ (Nespor and Vogel 1986, Taglicht 1998), and has also been observed to be a property of segmental alternations like Korean Obstruent Voicing (Jun 1996, 1998). Our theory must provide a way to account for this kind of variability, but without ruling in unattested cases.

As noted in Chomsky and Halle (1968:9), the surface phonology and the output of the syntax ‘do coincide to a very significant degree, but there are also certain discrepancies.’

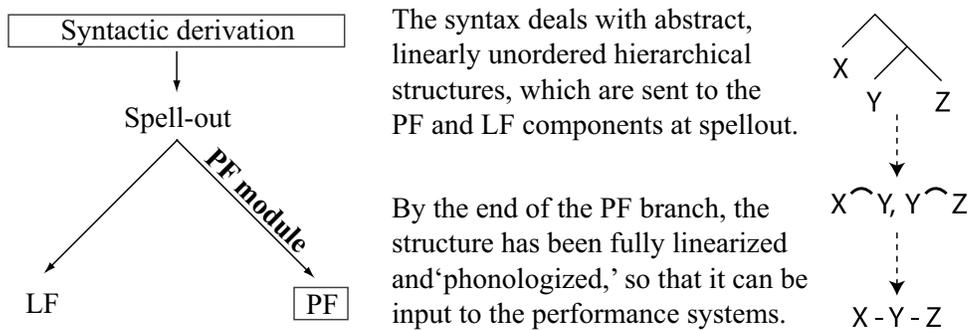
The goal of this thesis is to provide a constrained account of these deviations, while maintaining the basic premise that phonological interactions are directly and automatically circumscribed by the underlying syntax.

- (7) GOAL: Develop a model that (i) maintains a direct and transparent interface between the syntax and the phonology, but that (ii) can accommodate multiple-domain effects, variable-domain effects, and other cases of variability.

A brief preview of the proposed model follows.

- I begin with the assumption that syntactic structures are computed in phases, and that phonological rules deal directly with the output of each phase.
- I adopt an articulated, derivational model of the syntax-phonology interface, in which syntactic structures are converted to phonetic strings by a series of operations in PF:

Figure 1.1: Spellout and the PF derivation



Within this architecture, I propose that phonological rules apply at *various points* in the PF derivation. Specifically, phonological rules are interleaved with different kinds of *linearization procedures*, which apply in PF in order to convert abstract hierarchical structures into fully linearized strings.

- Linearization procedures work by establishing linear order over syntactic objects of gradually increasing size – single words, then pairs of words ($X \wedge Y$), then longer Chains of words ($X-Y-Z$). ‘Early’ phonological rules therefore apply to smaller, partially linearized syntactic objects, while ‘late’ phonological rules apply to fully linearized Chains at the end of the derivation.
- All phonological rules apply *directly* to the syntactic structure as it happens to exist at the given point in PF. Phonological rule domains ‘come for free’; there is no need for specially derived prosodic constituents like the Phonological Phrase.

The remainder of this chapter lays out this model in more detail. As we will see, the current proposal gives us a way to account for the multiple-domain and variable-domain effects described above, and makes some further predictions about e.g. rule ordering and domain containment that appear to be borne out. In Chapter 2 I discuss how this model compares with other prevailing theories of the syntax-phonology interface – primarily Prosodic Hierarchy Theory, in which phonological rules apply to a derived set of hierarchically ordered phonological constituents. Chapters 3, 4 and 5 are devoted to detailed case studies that illustrate how the current model works – a ‘late-linearization’ phrasal rule from Huave, and two phrasal rules from Luganda, one that applies early in PF and therefore ‘sees’ only two words at a time, and one that applies later, to the fully linearized Chains produced within each spellout domain. Most of the data reported in these chapters comes from my own work with linguistic informants; additional relevant case studies from the literature are included at the end of each chapter. Chapter 6 returns to some of the points raised in Chapters 1 and 2 and presents some broader questions for future investigation in the syntax-phonology interface. Chapter 7 summarizes and concludes the thesis.

1.2 Proposal, Part 1: The direct-spellout hypothesis

1.2.1 Background and motivations

As we saw in Generalization (1) above, phrasal phonological rules are cross-linguistically able to distinguish between relatively close and relatively distant syntactic relations in terms of how much material they see. An auxiliary point, which is not always explicitly recognized, is that phrasal phonological rules appear to pay attention primarily to the ‘gross’ aspects of the syntactic constituent structure (e.g. juncture strength, branchingness, clause-hood), at the expense of other information that is available in the syntax. Information about the identity of particular vocabulary items or morphosyntactic features, for example, is either ignored completely by the phrasal phonology or assigned at most a secondary role (Inkelas and Zec 1995, Nespor and Vogel 1986). This means that hypothetical cases like (8) – a modified form of English, where the phonological rule in question is ‘continuation rise’ (HLH) boundary tone assignment – simply do not occur:

- (8) Unattested syntax-phonology correspondence:
- a. Syntax-phonology mapping algorithm: A phonological break occurs (only) after every adjective in the utterance.
 - b. * (While my **best**^{HLH}) (friend was buying a **small**^{HLH}) (**black**^{HLH})
(coffee I read my **new**^{HLH}) (book^{HLH})
 - c. * (My friend Paul who took biology **last**^{HLH}) (year told me that the **final**^{HLH})
(exam was **challenging**^{HLH}) (in an **interesting**^{HLH}) (way and that everybody passed it^{HLH})

The ungrammaticality of (8b) and (8c) is quite clear – these examples are not just odd or unlikely but nearly incomprehensible, and as far as I am aware there is no parallel to the hypothetical system in (8a) in any language. I therefore take it to be a basic desideratum of

any theory of the syntax-phonology interface to successfully account for the generalization in (9) (which also underlies the ungrammaticality of (3c) above):

- (9) GENERALIZATION: The phrasal phonology cannot override the basic syntactic constituent structure by e.g. assigning special status to an arbitrarily selected morphosyntactic feature or category label.

Notice that the problem with (8b)–(8c) is not simply a problem of ‘too many breaks.’ In fact, such examples are marginally improved if *additional* breaks are placed at the stronger syntactic junctures – after full-DP subjects and after the adjunct clause – instead of only after adjectives:

- (10) ?? (While my **best**^{HLH}) (**friend**^{HLH}) (was buying a **small**^{HLH}) (**black**^{HLH})
(**coffee**^{HLH}) (I read my **new**^{HLH}) (book^{HLL})

The problem with (8b)–(8c) is also not simply that it makes reference to the particular node label Adj(ective). As we will see in Chapters 2, 5, and 6, there are some phrasal phonological rules whose application is influenced by particular categories or morphosyntactic features – the Luganda LTD rule above, for example, fails to apply in certain verb tenses. As far as I have been able to tell, though, such alternations are as a rule *also* influenced by the overall syntactic constituent structure – so that phonological breaks are placed not only according to specific morphosyntactic labels but also at major syntactic junctures.

The problem with (8b)–(8c), then, is not that phonological breaks are placed after every adjective, but that these relatively weak junctures correspond to phonological breaks *while stronger syntactic junctures are ignored*. Although phrasal phonological rules allow considerable variability cross-linguistically, they are uniformly prevented from overriding the basic syntactic constituent structure in this way (cf. (9)).

Interestingly, it is not immediately obvious why (9) should hold – we know that the phonology is able to see *some* information about the syntax (Generalization (1) above),

so what prevents it from having equal access to *all* the information that is available in a syntactic structure at once, and assigning primary importance to the node label Adj? As noted above, a basic hypothesis I will be pursuing here is that this gap exists because the phonology deals directly with the output of syntactic cycles:

(11) DIRECT SPELLOUT HYPOTHESIS:

- a. Syntactic structures are built up and processed in smaller chunks (or cycles, or phases), instead of all at once.
- b. Phases are syntactic constituents; what is spelled out at each phase is either a constituent or a predictable subpart of one (e.g. ‘left-over’ material from a previous phase).
- c. **Phonological rules apply directly to the material that is spelled out at each phase.**

Syntax-phonology mapping systems like (8a) are unformulable under this hypothesis. Such algorithms work under the assumption that the phonology deals with the entire syntactic structure at once, so that phonological boundaries can be placed only after Adj nodes *and nowhere else*. Under the direct-spellout hypothesis, on the other hand, the phonology sees only a subpart of the structure at a time, and phonological domains directly reflect the amount of structure that is available at a given time. Under this proposal, the generalization in (9) falls out automatically: barring a speech error or mid-utterance restart, there is no way to get *friend was buying a small* in (8b) to be built up and spelled out as a unit by itself, without also including *my best, black* and *coffee*.

The common goal behind cyclic-spellout treatments is to limit the ‘active workspace’ – the substructure that is accessible to combinatory operations at a given point in the derivation – in a way that (i) reduces computational load and (ii) imposes the correct locality conditions on syntactic, semantic, and phonological operations. The idea is that the syntax,

the semantics, and the phonology all deal with the same discrete chunks of structure. In Minimalist work (Chomsky 1999 et seq.), syntactic structures are built up until they reach a certain point, which is defined as a phase; the phase head complement (which I will call the *spellout domain*) is then spelled out, or ‘shipped’ to PF and LF, for phonological and semantic computation respectively. The phase head itself, as well as material in the phase specifier (or *edge*), is spelled out on a subsequent cycle.

Assuming that the spellout domain of each phase is shipped to PF separately, it would be surprising if we did *not* find some evidence for phases in the surface phonological form. Correspondingly, there is a growing body of work that uses some version of phase theory to analyze phonological domains (see Adger 2006, Cheng and Downing 2007, Dobashi 2004a, Downing 2008, Henderson 2005, Ishihara 2004, Kratzer and Selkirk 2007, Legate 2003, Kahnemuyipour 2005, Marvin 2002, Scheer 2008, Seidl 2001, Tokizaki 2006, Wagner 2005, among others). However, these proposals by no means converge on a single definition of the phase, nor can they be clearly unified with phase-based treatments of syntacticosemantic phenomena (availability of reconstruction sites, etc.). Furthermore, most of these proposals focus on a *single* phonological phenomenon in a given language, and do not provide an account for languages like Luganda that have multiple phrasal rules. To demonstrate this point with just a few examples:

- Marvin (2002) focuses on word-internal phenomena, and argues that all category-defining heads are phases. Her proposal accounts for many of the observations made in *Lexical Phonology and Morphology* (e.g. that ‘special’ phonological domains correspond with special, non-transparent semantic interpretations). It does not, however, provide any account of structure-sensitive phonological rules that apply across words.

- Henderson (2005) adopts Chomsky's (1999 et seq.) proposal that CP and vP are phases, and argues that stress is assigned to the phase level. He demonstrates with data from Swahili, where verbs move from V to T, Neg, or C, and thus end up receiving two word-internal stresses – primary stress on the penult of the v domain, and secondary stress on the penult of the C domain. The implication is that the same CP- and vP-level stress rules could be realized as *phrasal* stress in languages like English, where verbs typically do not move into the C domain (see e.g. Legate 2003). Again, this proposal raises the question of how to account for languages with *both* word-internal *and* phrasal phonological rules, since the phase provides the only means of mediating between syntactic structures and phonological domains.
- Wagner (2004) provides a theory of phrasal phonology in which the cycle is defined as a syntactic object over which the associative law holds (e.g. a coordinate structure with a 'flat' prosody, like *John and Mary and Bill*). In coordination structures where the prosody is more articulated, indicating that its internal bracketing makes an interpretive difference (e.g. *(either) John // or Mary / and Bill*, where the number of /-marks indicates relative boundary strength), each bracketed constituent is assumed to be a cycle. The proposal is used primarily to account for sentential stress but can potentially be extended to other structure-sensitive phrasal rules as well (e.g. English flapping). The question of whether the branching-direction definition of a cycle is expected to replace or coexist with Chomsky-style CP and v*P phases remains open.

Given the discrepancies seen here, together with the multiple-domain and variable-domain complications noted earlier, we might consider the possibility that phases play only a *secondary* role in defining phrasal phonological domains. Tokizaki (2006), for example, develops a model where *all* syntactic brackets (in a bare phrase structure syntax) are converted to prosodic brackets (/), and phonological rules interpret /-boundaries rather

than applying directly to spelled-out phases. Phases do play a role in this proposal, but only insofar as they ‘strengthen’ certain boundaries – i.e., additional /-boundaries may be inserted around CP and vP phases.

In another set of proposals (see e.g. Dobashi 2004a, Downing 2008, Kratzer and Selkirk 2007), phases are involved in the mapping between the syntax and a Prosodic Hierarchy. Under this type of treatment, phonological rules do not apply directly to the material that is spelled out at each syntactic cycle, as proposed here, but instead apply to a derived set of hierarchically arranged prosodic constituents. Because the phase plays only a secondary role in these proposals, considerable leeway is allowed for the kinds of variation we have observed in the phrasal phonology – phase boundaries could be overridden by some higher-ranked prosodic well-formedness constraint, for example. One drawback of these proposals, as I will argue in Chapter 2, is that they risk allowing for *too much* variation and possibly ruling in hypothetical cases like (8).

It is true that the questions of how the phase is defined, whether the definition of a phase can vary from language to language, and what syntactic and semantic phenomena phase theory is equipped to capture are far from settled, even in work that does not address the phonological reflexes of phase theory (cf. Chomsky 2004, Johnson 2002, Truswell 2005, among others). But the observation we started with – that the phrasal phonology is cross-linguistically constrained by the syntactic constituent structure in a way that rules out logically possible interactions like (8) – provides strong support for the idea that the phonology deals with the syntax in cycles. In the case studies examined in this thesis, we will find a convergence between syntactic and phonological diagnostics for clause size that provides additional support for the direct-spellout hypothesis in (11). Furthermore, while I will not attempt to re-examine and reconcile all the cases listed above, we will see that the current model has the potential to accommodate many of these apparent discrepancies. For example:

- While my focus in this thesis is on phrasal phonological rules, the model is equipped to provide separate domains for word-internal phonology as well – the idea being that morphemes internal to maximal complex heads (M-words) are linearized before M-words are linearized with respect to each other.
- Although the phase is defined as a CP in the cases examined here, the proposal allows for the possibility that spellout is triggered by other categories (e.g. v*P and DP) in other languages. We will see that changes branching direction are also shown to have an effect on certain kinds of phonological rules in the languages examined here – because branching direction affects the way linearization proceeds (see §1.3.2 and Chapter 5 for discussion).

The balance I aim to achieve is between a maximally *transparent* view of the interface, where the generalizations in (1) and (9) are automatically captured by having the phonology work directly off spelled-out phases, and a model that provides a range of additional structures (or modified structures) for the phonology to use as domains. In a sense, the goal of this dissertation is to push the direct-spellout hypothesis as far as possible – to see how far we can get by assuming a transparent interface where syntax-phonology interactions are tightly circumscribed, rather than allowing the phonology to parse utterances by its own set of autonomous principles.

The next section shows how the proposed model works with a concrete example.

1.2.2 Case study: Luganda HTA

In Chapters 3 and 4 of this thesis, I examine unrelated languages where there is a highly transparent mapping between CP phases and phonological domains. One of these is a phrasal tone rule from Luganda called H-Tone Anticipation (HTA), introduced in example (6) above.

- (12) **Luganda H-Tone Anticipation (HTA)**: applies when a H_nL_n word is preceded by a word that ends with at least one toneless mora; the H tone (underlined in the examples below) spreads *leftward* through a potentially indefinite string of toneless moras, stopping short of the first mora of the domain.
- (13) a. omulenzi a-gul-ir-a Mukasa kááwà
 1.boy sbj1-buy-appl-ind 1.Mukasa 1a.coffee
 ‘The boy is buying Mukasa some coffee.’
- b. → (òmùlènzi) (àgúlírá Múkásá kááwà)
- (14) a. omulenzi o-mu-gul-ir-a énsáwò
 1.boy 2s-3s-buy-appl-ind 9.bag
 ‘The boy, you’re buying him a bag.’
- b. → (òmùlènzi) (òmúgúlír’ énsáwò)

In (13), the underlined H tone on *kááwà* spreads leftward through the toneless indirect object *Mukasa* and up to the first mora of the toneless verb *agulira*. The toneless subject *omulenzi*, however, is not included in the HTA domain and instead surfaces with Default L tones. In (14), the underlined H-tone on *énsáwò* ‘bag’ spreads leftward onto the toneless verb, but does not continue onto the left-dislocated indirect object; instead, *omulenzi* is assigned Default L (see Chapter 4 for more details). The initial generalization, then, is as follows:

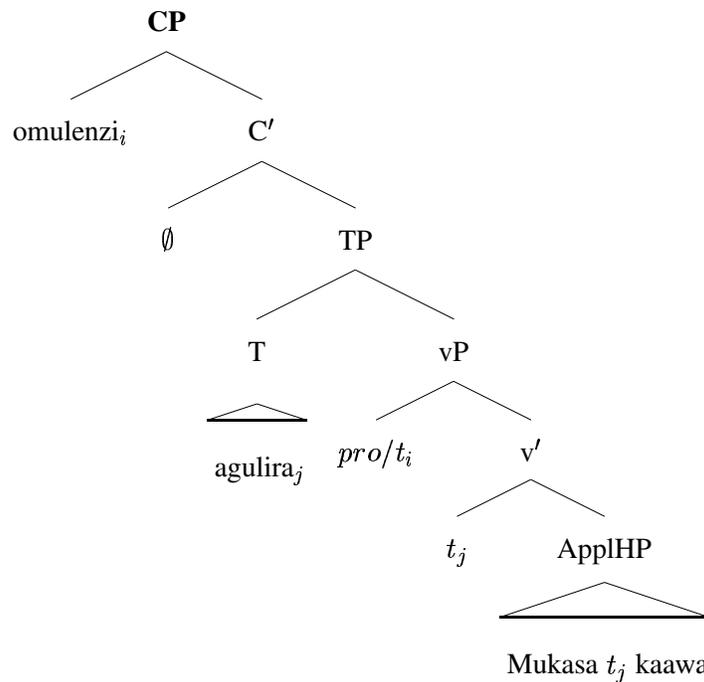
- (15) **HTA domains**: In monoclausal structures, the verb groups together with following arguments and modifiers into a single HTA domain, while preverbal subjects, objects, and adverbs form separate domains.

To explain this pattern, I argue that:

- Matrix-clause preverbal subjects, objects, and adverbs obligatorily occupy Spec,CP in Luganda.

- **Spellout takes place at each CP node in the structure** (i.e., CP is a phase).
- At a given CP phase, only the complement of the C head (here, TP) is spelled out. The phase edge (CP specifier) is spelled out on the next cycle.
- **HTA applies directly to the spelled-out material in each cycle.**

- (16) a. (òmùlènzi) (à-gúl-ír-á Múkásá kááwà)
 1.boy sbj1-buy-appl-ind 1.Mukasa 1a.coffee
 ‘The boy is buying Mukasa some coffee.’



- b. **Spellout domains:** (òmùlènzi), (agulira Mukasa kaawa)

Since each CP is spelled out separately in Luganda, the prediction is that phrasal rules like HTA should not be able to ‘see across’ clause boundaries. This prediction is borne out. In (17), for example, the H-tone on the embedded object *Nakátò* spreads leftward onto the toneless embedded verb *ayagala* but *not* onto the toneless matrix verb *angamba* – because the higher CP is spelled out separately. Similarly, the toneless predicate *kizibu* ‘difficult’ in (18) forms a separate tone domain from the following (CP) infinitive.

- (17) a. a-n-gamb-a _{CP}[a-yagal-a Nakátò]
 sbj1-1s-say-ind sbj1-like-ind 1.Nakato
 ‘S/he’s telling me that s/he likes Nakato.’
- b. → (àngàmb’) (à**yágálá** Nákátò)
- (18) a. ki-zibu _{CP}[oku-som-er’ abààna ebitabo]
 7-difficult inf-read-appl 2.child 8.book
 ‘It’s difficult to read children books.’
- b. → (kìzìbù) (òkùsómér’ á**bàà**na èbítábó)

There are some infinitives that *can* group together with the next-higher clause in Luganda, unlike in (18). For example:

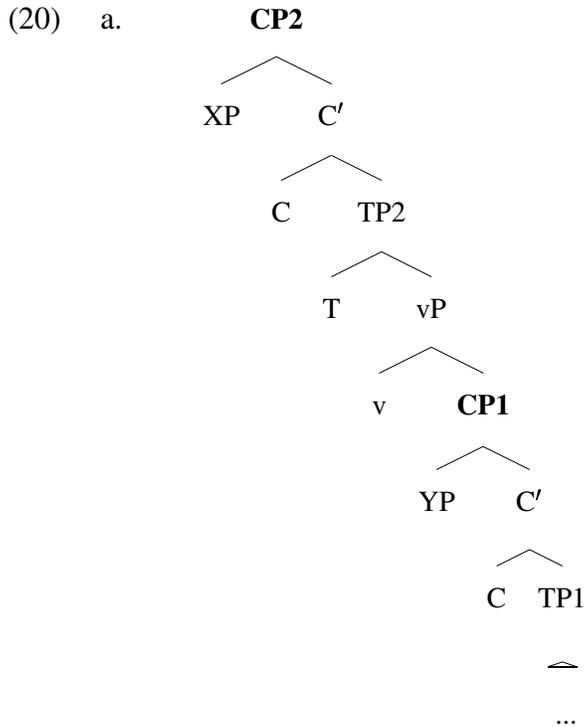
- (19) a. i. nj-agal-a oku-yîmba
 1s-want-ind inf-sing
 ‘I want to sing.’
- ii. → (nj**ágálá** ókúyîmbà)
- b. i. Mukasa a-sobol-a oku-fuumba obulúngì
 1.Mukasa sbj1-can-ind inf-cook well
 ‘Mukasa can cook well.’
- ii. → (Mùkàsà) (às**óbólá** ókúfúúmbá óbúlúngì)

However, this is possible only with a handful of verbs that belong to the class of *restructuring* predicates cross-linguistically – e.g. ‘want,’ ‘go,’ ‘can.’ Under the assumption that restructuring predicates can optionally take a reduced TP or vP complement rather than a full CP complement (Cinque 2001, Wurmbrand 2001), these facts are unsurprising – the infinitive groups together with the matrix verb for HTA because it is smaller than a CP, and thus automatically gets spelled out at the next-higher cycle. Rather than presenting a challenge to the current proposal for Luganda, the examples in (19) show a convergence of phonological and syntactic evidence that is exactly what we expect under the direct-spellout hypothesis in (11).

In the example in (16), the preverbal subject *omulenzi* forms a separate domain for HTA because it is spelled out separately from the rest of the clause. For rules like HTA, phonological domains *are* spellout domains: *omulenzi* in (16a) is simply invisible at the point when the H-tone on the direct object spreads leftward. Of course, not all phonological domains show such a transparent, one-to-one correspondence with spellout domains, and in §1.3 we will continue with the Luganda case study and see how the current model accounts for other kinds of rules. First, though, I would like to be a bit more explicit about what is meant by ‘spellout’ in this proposal.

1.2.3 Spellout ‘holding bins’ and non-constituent domains

An important question that arises in cyclic-spellout theories of phonological interactions is how exactly the spelled-out material at each phase is dealt with on later cycles. One option is to assume that the output of each phase is fed back into the next phase (or that ‘[a]fter spellout, a cycle can enter a new cycle as an atom’ (Wagner 2004: 18)), so that PF processes apply multiple times to recursively embedded objects (see also Guy (1991) for word-internal interactions). I will refer to this kind of treatment as a ‘continuous-feeding’ model. An alternative – which I adopt here – would be a ‘holding-bin’ or ‘placeholder’ model, where the spelled-out material at each phase is set aside in a holding bin until the end of the derivation, when it is reinserted at its category-label placeholder (see Nunes and Uriagereka 2000: 23–24 for a relevant proposal). In holding-bin models, the spelled-out material at each phase is subjected to PF processes only once, rather than multiple times. Given the structure in (20a), where spellout is assumed to occur at each (boldfaced) CP level, the contents of each spellout domain will be those listed in (20b) under a continuous-feeding model and those listed in (20c) under a holding-bin model.



- b. Continuous-feeding model:
- i. CP1 spellout domain: (TP1)
 - ii. CP2 spellout domain: (T, v, YP, C, TP1)
 - iii. Final spellout domain: (XP, C, T, v, YP, C, TP1)
- c. Holding-bin model:
- i. CP1 spellout domain: (TP1)
 - ii. CP2 spellout domain: (T, v, YP, C)
 - iii. Final spellout domain: (XP, C)

The differences between the two approaches are to some extent reconcilable. We might ask, for example, how a continuous-feeding model would account for rules like Luganda HTA, which are *always* blocked by CP boundaries regardless of how deeply embedded a given CP is. That is, given a sentence like (21), how would we prevent the string *àyágálá Nákátò* from being re-submitted to the phonology after the CP1 cycle and trig-

gering another application of HTA on the CP2 cycle, yielding the ungrammatical (21b) or (21c)?

- (21) CP₂[Mukasa TP[agamba CP₁[TP[ayagala Nakátò]]]]
 1.Mukasa sbj1.say sbj1.like 1.Nakato
 ‘Mukasa says s/he likes Nakato.’
- a. → (Mùkàsà) (àgàmbà) (àyágálá Nákátò)
- b. ↛ *(Mùkàsà) (àgámb’ áyágálá Nákátò)
- c. ↛ *(Mùkás’ ágámb’ áyágálá Nákátò)

While this appears to present a problem for continuous-feeding models, it can be dealt with as long as some kind of ‘phase-marking’ mechanism is assumed. Wagner (2004), for example, claims that pipe-marks are inserted at the beginning and end of every cycle, and that the phonology is sensitive to the presence (and height) of these marks (see Tokizaki 2006 for a similar proposal). A rule like Luganda HTA could then be made sensitive to these phase-boundaries, so that it would be correctly predicted not to apply in (21b) or (21c).

- (22) CP₂[Mukasa TP[agamba CP₁[TP[ayagala Nakátò]]]]
 1.Mukasa sbj1.say sbj1.like 1.Nakato
 ‘Mukasa says s/he likes Nakato.’
- a. → / Mukasa / agamba / ayagala Nakato ///
- b. Assumption: HTA is blocked by /-boundaries:
 → (Mùkàsà) (àgàmbà) (àyágálá Nákátò)

A more substantial difference between the continuous-feeding and holding-bin models has to do with the number of times that spelled-out material is subjected to phonological rules. In a continuous-feeding model, spelled-out material is subjected to phonological rules multiple times, depending on how deeply embedded it is. We therefore might expect

to find examples of variable phonological rules that are affected by *absolute* depth of embedding, contrary to fact (see Clements 1978 for discussion). To see what this would look like, consider the hypothetical case study in (23). The question is whether Flapping will occur between *that* and *apple* or not; we can assume for illustrative purposes that spellout is triggered at each CP. If absolute embedding played a role in this rule, we would expect flapping to be more likely in (23b) than in (23a), since *that apple* is being re-entered into the structure on the higher CP cycle and re-submitted to phonological rules, and to further increase in likelihood in (23c) (and so on as higher levels of structure were added).

- (23) a. $CP[\text{John wants that apple.}]$
 b. $CP[\text{Mary thinks } CP[\text{John wants that apple.}]]$
 c. $CP[\text{Amy said } CP[\text{Mary thinks } CP[\text{John wants that apple.}]]]$

Phenomena of this kind, however, are not attested, suggesting that absolute depth of embedding does not play a role in the phrasal phonology. This gap is not expected under the continuous-feeding hypothesis. I will therefore assume that the material that is spelled out at given phase remains in a ‘holding bin’ until the end of the derivation; it is not re-entered into the derivation or subjected to repeated iterations of spellout.

On the other hand, many phrasal phonological rules are sensitive to *relative juncture strength*, so that e.g. Flapping is more likely to apply to *rat* in (a) and to *cat* in (b) (Wagner 2004).

- (24) a. [a **cat** [or a **rat** or a mouse]] (flapping is more likely on *rat* than on *cat*)
 b. [[a **cat** or a **rat**] or a house] (flapping is more likely on *cat* than on *rat*)

This kind of effect can be modeled in a number of ways. We will see in §1.3.1 that the current model allows phonological rules to apply at multiple stages in the PF derivation, as objects of gradually increasing size are being linearized. It is possible that Flapping could

apply to the more deeply embedded constituent *a rat or a mouse* in (24a) at an earlier stage, then apply again optionally at a later stage, when the larger structural object that includes *cat* has been linearized. The phrase *that apple* in (23), however, is in the same structural configuration in (23a), (23b), and (23c), and will therefore be subjected to Flapping the same number of times in all three examples.

Another important effect of adopting a holding-bin model alongside the direct spellout hypothesis in (11) is that it correctly predicts *that not all all phonological domains will be syntactic constituents*. Consider the example below, where the rule in question is again Luganda HTA:

- (25) a. nj-agal-a ku-mu-gamb-a a-fuumb-a bulúngì
 1s-want-ind inf-obj1-tell-ind sbj1-cook-ind well
 ‘I want to tell him/her that s/he cooks well.’
 → (**njàgàlà kùmùgàmbà**) (àfúúmbá búlúngì)
- b. nj-agal-a ku-bá-gàmb-a bá-fùùmb-a bulúngì
 1s-want-ind inf-obj2-tell-ind sbj2-cook-ind well
 ‘I want to tell them that they cook well.’
 → (**njàgàlá kúbágàmbà**) (báfúúmbá búlúngì)

The only underlying H tone in (25a) is on the final adverb *bulúngì*. This H spreads leftward onto the embedded verb *afuumba* ‘cook,’ but no farther; the boldfaced string *njàgala kumugamba* ‘I want to tell him’ surfaces with default L tones. Example (25b) is identical to (25a) except that the embedded verbs are marked with the H-toned class-2 *-bá-* instead of the toneless class-1 *-mu-/a-*. The H on the infinitive *kubágamba* spreads leftward onto the matrix verb *njàgala*, indicating that the string *njàgala kubagamba* (and likewise *njàgala kumugamba* in (25a)) group together for the purposes of HTA – *even though they do not form a syntactic constituent*.

Similar examples of ‘syntax-phonology mismatches’ are attested in English (Taglicht 1998), Italian (Nespor and Vogel 1986: 38–40), Xiamen Chinese (Chen 1987), and Chimwi-

ini (Kisseberth and Abasheikh 1974, Selkirk 1986), among others, and have often been used as evidence *against* direct-reference models like the one developed here, where phonological rules apply directly to syntactic objects rather than to derived prosodic constituents like the Phonological Phrase. Perhaps the best-known example of this type is from the nursery rhyme ‘The House that Jack Built,’ discussed in Chomsky and Halle (1968) and much subsequent work, where the first three prosodic domains in parentheses are non-constituents:

- (26) (This is the cat) (that killed the rat) (that at the malt) (that lay in the house that Jack built)

It is important to recognize, however, that such examples only represent a problem for direct-reference under the assumption that phonological domains *must* be syntactic constituents in direct-reference models. This is by no means a necessary assumption. In the model developed here, where phonological rules apply directly to the spelled-out content of each cycle *minus what has already been spelled out on previous cycles*, these examples are explained straightforwardly.

In Chapter 4 I argue that a sentence like (25) has the structure in (27), where the complement of the matrix verb *njagala* ‘I want’ is headed by the infinitive *kumugamba* ‘to tell him/her’ in T, which in turn takes a full-CP clausal complement. Assuming that spellout occurs at each CP phase (see §1.2.2), the contents of spellout domain of CP1 (*afuumba bulungi*) will form one HTA domain, while the spellout domain of CP2 *minus the spellout domain of CP1* – i.e., *njagala kumugamba* – will form a separate HTA domain:

- (27) CP₂[TP[nj-agal-a TP[ku-mu-gamb-a CP₁[TP[a-fuumb-a bulúngì]]]]]
 1s-want-ind inf-obj1-tell-ind sbj1-cook-ind well
 ‘I want to tell him/her that s/he cooks well.’

- (28) a. Spelled-out material at CP1: (àfúúmbá búlúngì)

- b. Spelled-out material at CP2: (njàgàlà kùmùgàmbà)

The kinds of ‘syntax-phonology mismatches’ seen in (25) and (26) have a very different flavor from the ungrammatical examples we saw at the beginning of this chapter (e.g. **(On Monday)(morning Jane left)*). Examples like (25) and (26) do not represent wild deviations from the syntactic constituent structure; instead, these nonconstituents can be seen as ‘constituent complements’ – the contents of a syntactic constituent *minus* the subconstituent that has already been spelled out. Their existence is straightforwardly predicted under the direct-reference model developed here. This point is discussed further in Chapter 2.

1.3 Proposal, Part 2: Modeling variability

As noted above, it is clear that the direct-spellout hypothesis in (7) alone is not sufficient to account for all phonological interactions cross-linguistically. We have noticed the following kinds of complications in our discussion so far:

- (29) a. **Multiple-domain effects:** Some languages have multiple phonological rules applying to domains of different sizes. The phase may correspond to one of these rule domains, but what about the others?
- b. **Variable-domain effects:** Some phonological domains (notably English intonational chunks, as demonstrated in (3) above) vary in size depending on phonological weight, rate and style of speech, and other factors, even given what appears to be the same basic syntactic structure. Some rate-sensitive rules apply across clauses (e.g. flapping in *It’s cold out. I’m getting my jacket*), again indicating that not all rule domains are absolutely delimited by phases.

The model developed here has the capacity to account for variability, while still maintaining the idea that phonological rules apply directly to the material that is spelled out at

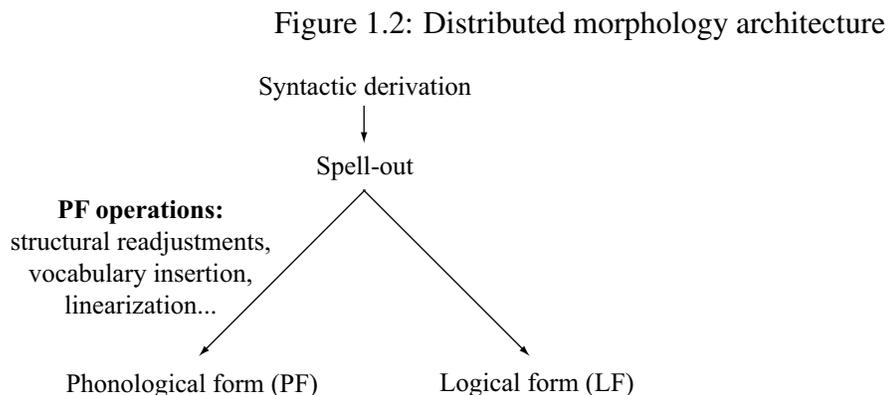
each cycle. The explanation lies in refining what exactly is involved in spellout. The basic proposal is that:

- (30) Within each spellout domain, phonological rules apply at different stages in the PF derivation and are directly constrained by the structure as it exists at each stage. Specifically, the structures produced during *linearization* are used as phonological domains.

This idea is explained in detail in the following subsections.

1.3.1 Architecture: linearization and other PF operations

The proposal to be developed here assumes the architecture of the grammar that underlies the theory of distributed morphology (Halle and Marantz 1993, 1994, et seq.):



In the distributed morphology framework, the syntactic derivation is the locus for both word-internal and phrasal combinatorics; i.e., there is no separate system for generating ‘lexical’ structures. The output of the syntactic derivation is taken to be a hierarchically arranged but linearly unordered configuration of roots (content morphemes) and abstract syntacticosemantic feature bundles (function morphemes), which is sent to the PF and LF branches at spell-out. On the PF side, the surface form at the end of the branch clearly has

very different properties from the syntactic structure as it is envisioned here: it is linearly ordered, its function morphemes have been phonologically realized, and some morphemes may appear to be displaced or otherwise mismatched, among other things. In Embick and Noyer (2001, 2006), and others, these differences are derived by a series of operations that take place along the PF branch:

(31) PF operations (unordered list):

- a. *Structural readjustments*, a limited set of movement, rebracketing, and deletion/insertion operations whose surface effects are often recognized as ‘syntax-morphology mismatches’
- b. *Vocabulary insertion*, which adds phonological content to function morphemes
- c. *Linearization operations*, which establish linear order between/across structures

The PF branch in Figure 1.2 is thus viewed as a highly articulated derivational component, which yields a number of intermediate structural representations before the final surface form is reached.¹

As noted above, one of the tasks undertaken in the theory of distributed morphology involves formalizing the procedures that establish linear order among the various nodes in a syntactic tree. These procedures are assumed to take place on the PF branch, consistent with the idea that linear order is a requirement of the articulatory-perceptual interface rather than of the syntax proper (see Chomsky 2004, Johnson 2002, and others). The particular formalization adopted here is based on the idea that the surface PF representation, where all individual terminals are chained together from left to right, is derived from an earlier representation where more abstract categories are linearized by general headedness

¹The term *PF* is used to refer both to the derivation along the branch and to the surface form produced at the end of the branch; for clarity, I will use the term *surface PF* when this latter meaning is intended.

principles (see Embick and Noyer 2001, 2006, Embick 2006, Sproat 1985). To begin with, Embick and Noyer (2001, 2006) decompose linearization into the two steps below:²

1. Within a given workspace (or cycle), *LIN* visits each branching node of a structure and produces a statement of left-adjacency between its two daughters, drawing upon language-specific principles about e.g. headedness in order to select the correct order. In the output statements below, ‘*’ is read as ‘is left-adjacent to’; notice that this operator can relate either M-words (i.e. maximally complex heads like X, Y, Z) or phrases (XP, YP):³

$$\begin{array}{r}
 (32) \quad \begin{array}{c}
 \text{XP} \\
 \diagdown \quad \diagup \\
 \text{X} \quad \text{YP1} \\
 \quad \quad \diagdown \quad \diagup \\
 \quad \quad \text{YP2} \quad \text{W} \\
 \quad \quad \quad \diagdown \quad \diagup \\
 \quad \quad \quad \text{Y} \quad \text{Z}
 \end{array}
 \end{array}
 \quad
 \begin{array}{l}
 \text{Lin[XP]} \rightarrow \text{}_{XP}(\text{X} * \text{YP1}) \text{ (or } \text{}_{XP}(\text{YP1} * \text{X})) \\
 \text{Lin[YP1]} \rightarrow \text{}_{YP1}(\text{YP2} * \text{W}) \text{ (or } \text{}_{YP1}(\text{W} * \text{YP2})) \\
 \text{Lin[YP2]} \rightarrow \text{}_{YP2}(\text{Y} * \text{Z}) \text{ (or } \text{}_{YP2}(\text{Z} * \text{Y}))
 \end{array}$$

2. *Concatenation*: In order for a structure to be executed in real time, linear order must be established among all the M-words contained within it. *-statements like those in (32) do not necessarily encode this information; for example, we know that X in (32) is adjacent to a phrasal category YP, but we do not have a direct statement about which M-word(s) X is adjacent to. This information is provided by a second

²I am restricting my discussion here to the linearization of *M-words*, or maximally complex heads, with respect to each other; M-word-internal linearization is assumed to follow a parallel set of steps that precede those listed below (see Embick 2007 for discussion).

³This first step, *LIN*, is trivialized in theories that assume the Linear Correspondence Axiom (Kayne 1994), insofar as the linear precedence relations between the two daughters of any node automatically follow from their c-command relations. However, there still needs to be some means of getting from a syntactic tree to a two-dimensional string; this proposal is one way of making these steps explicit.

operation, Concatenation, which has the effect of ‘looking inside’ each member of a *-statement and producing a corresponding statement of left-adjacency between the peripheral M-words on each side (Embick 2006). Like *, \frown below is a binary operator read as ‘is left-adjacent to’; unlike *, \frown relates M-words only.

- (33) a. ${}_{YP2}(Y * Z) \rightarrow Y \frown Z$
 b. ${}_{YP1}(YP2 * W) \rightarrow Z \frown W$
 c. ${}_{XP}(X * YP1) \rightarrow X \frown Y$

The two steps above do not of course make up a complete list; further steps are needed to derive the complete ‘string’ or ‘chain’ of M-words produced internal to each spellout domain, as well as the final chain that includes all the spellout domains under the root node. Furthermore, we might ask if different kinds of Concatenation need to be distinguished – deriving the Concatenation statement $Y \frown Z$ from the *-statement $Y * Z$ in (33a), for example, might involve fewer computational steps than (33b) or (33c), which require downward searching within one of the members of the *-statement. I address these possibilities in Chapters 3–5.

The hypothesis advanced in Embick and Noyer (2006), Embick (2007) is that Concatenation statements like $X \frown Y$ may provide the locality conditions, or domains, for certain kinds of PF-movement operations – e.g. the ‘local dislocation’ of affixes like English comparative *-er* and Latin *-que*. The fact that this kind of PF-movement *immediately follows* the Concatenation stage of linearization helps explain why it is (i) highly local and (ii) sensitive to both linear order and hierarchical structure.

The hypothesis pursued in this dissertation is that phonological rules may also use Concatenation statements – as well as other kinds of linearization statements – as their domains. In other words, *phonological rules are interleaved with linearization operations*, so that e.g. some rules apply to Concatenation statements, some apply to *n*-ary chains

internal to spellout domains, and some apply across spellout domains at the end of the derivation. The idea is that these domains are automatically made available during the PF derivation as linear order is established over larger and larger objects; the phonology simply applies to the structure as it happens to exist at a given stage in PF.

(34) PROPOSAL:

- a. Phonological rules apply directly to spelled-out phases, but...
- b. within the PF module (after spellout), objects created during *linearization* create sub-domains for various kinds of phonological rules.

Next we will see how this proposal accounts for the multiple-domain and variable-domain effects described above, along with a number of other attested patterns.

1.3.2 Multiple-domain effects

Recall that in addition to HTA, Luganda has a phrasal rule of L-Tone Deletion (LTD), which identifies two adjacent $H_n L_n$ words and creates a H-plateau between them. As noted in (2) above, LTD applies to *smaller* domains than HTA. This is demonstrated with a further example below:

(35) a. *No LTD between indirect and direct object in double-object structure:*

- i. bá-lis-a kaamukúúkùlu doodô
 sbj2-feed-ind 1a.dove 1a.greens
 ‘They’re feeding greens to the dove.’

ii. → (bálísá káámúkúúkùlù) (dòdòdô)

b. *HTA applies freely throughout double-object structure:*

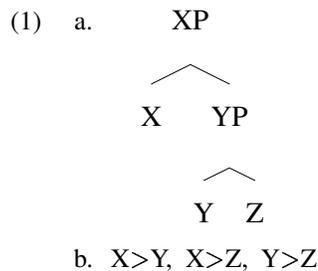
- i. a-lis-a empologoma doodô
 sbj1-feed-ind 9.lion 1a.greens
 ‘S/he’s feeding greens to the lion.’

ii. → (àlís' émpólógómá dóódô)

All three words in (35a) are underlyingly H_nL_n , so LTD could in principle apply throughout the string. However, the rule only applies between the verb *bálisa* and the indirect object *kaamukúúkùlu*, while the direct object *doodô* forms its own LTD domain. (35b) has the same structure as (35a), but the H_nL_n words have been replaced with toneless words to meet the phonological context for HTA. As shown in (35b-ii), the H tone on *doodô* spreads leftward through both the indirect object and the verb, indicating that the entire structure has formed a single HTA domain.

Within the current model, the contrast between LTD and HTA domains is accounted for as follows:⁴

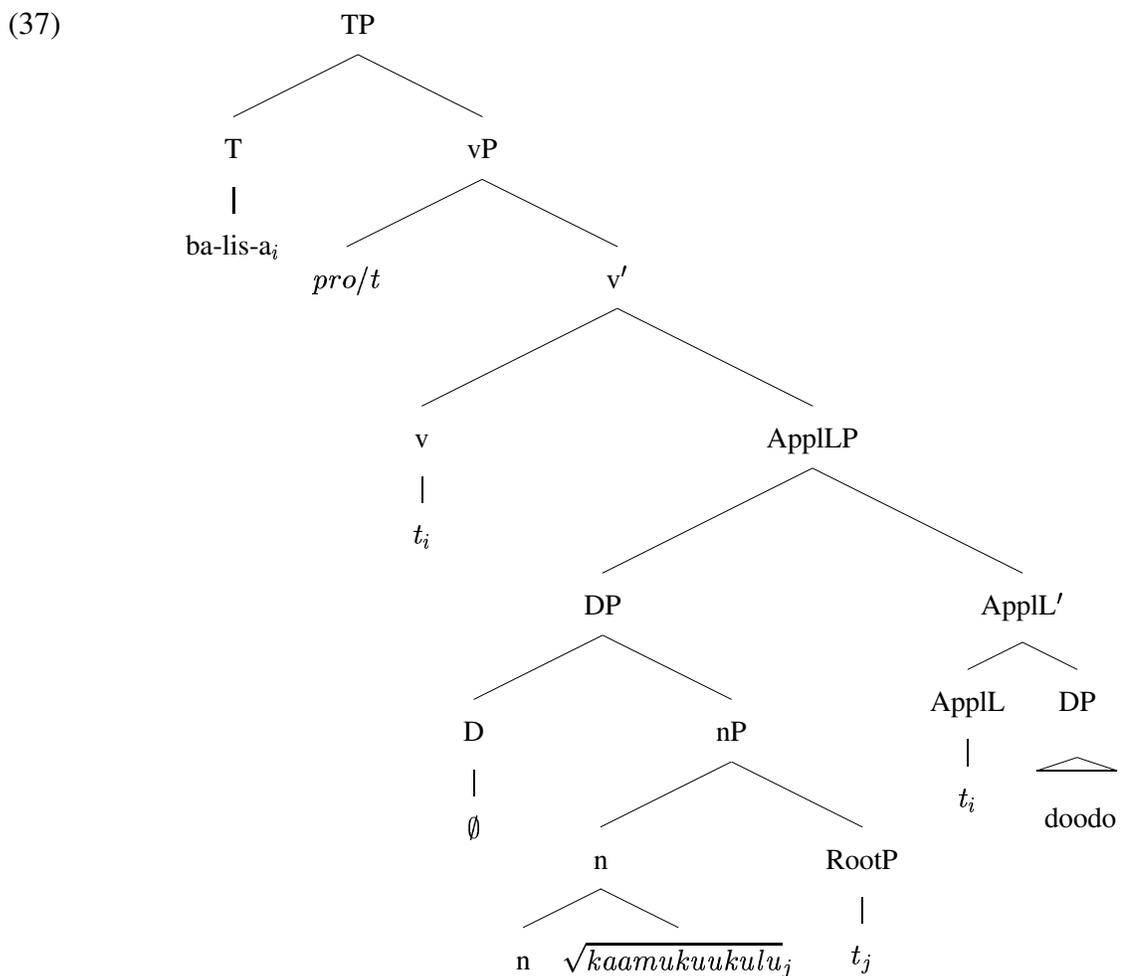
⁴Of course, not all theories of linearization involve this particular breakdown of steps, and it may be possible to incorporate the basic hypothesis in (34) into another theory of linearization. For example, it is possible that modified versions of the tree-traversal and extraction algorithms in Kural (2005) could provide a set of intermediate representations that would account for many of the same phenomena as those discussed here. On the other hand, (34) could not be easily incorporated into a theory where linear order is derived via a single transitive precedence operator $>$ based on e.g. c-command relations. Such a theory might work as follows: given the structure in (1a), the set of transitive precedence statements in (1b) would be available, from which the linear order (X, Y, Z) could be derived.



Under the hypothesis in (34), we would expect the statements in (1b) to provide domains for various kinds of phonological rules. However, notice that since there is only one linearization operator, $>$, the ‘local’ statement $X > Y$ is treated on a par with the ‘nonlocal’ statement $X > Z$. This proposal would incorrectly predict that some phonological rules would apply in nonlocal contexts like $X > Z$. Under such a theory, the

- (36) a. **Luganda LTD is an early Concatenation rule.** It applies to ‘partially linearized’ structures, after binary Concatenation statements have been formed over uniformly right-descending structures within a spellout domain.
- b. **Luganda HTA applies later,** after the entire contents of each spellout domain have formed a single n -ary Chain.

The ditransitive structure in (35) presumably has the structure in (37). Assuming that CPs are phases in Luganda, this structure is built up and spelled out as a single chunk.



phonological locality effects discussed in this dissertation would therefore need to be explained by some other means.

As I argue in Chapter 5, ‘early Concatenation’ proceeds by (i) identifying a node in the structure (or *-statement) whose left-hand daughter is an overt M-word, or maximally complex head, and (ii) searching within the right-hand daughter until it finds the immediately following M-word. For (37), this algorithm will yield a single Concatenation statement:

(38) T[ba-lis-a] \frown n[kaamukuukulu]

While Concatenation is able to establish the linear order of the verb *balisa* with respect to the indirect object *kaamukuukulu* at this early stage, the fact that *kaamukuukulu* precedes *doodo* cannot yet be determined. The early-Concatenation algorithm can identify *kaamukuukulu* as the left-hand daughter of the nP node, but when it searches within the right-hand daughter of this node it does not find any overt material, and therefore comes to a stop. The *backtracking* that is required to concatenate *kaamukuukulu* with *doodo* requires additional processing that is done by a separate linearization procedure (see Chapter 5).

Luganda LTD applies immediately after this early stage of linearization. The only domain that will be available to it is the Concatenation statement in (38). This correctly predicts that LTD will only apply between the verb and the indirect object in double-object structures – and, more generally, that *LTD will only apply between a head and the first M-word in its complement* (Hyman 1987, among others).

We will look at Luganda LTD in more depth in Chapter 5. Other potential examples of early Concatenation rules include French liaison (Encrevé 1988, De Jong 1990, Moisset 2000), Basque vowel assimilation (Elordieta 1999), and Hausa vowel shortening (Crysmann 2004, Hayes 1990). Some of these cases are discussed in Chapters 2, 5, and 6.

As noted earlier, an additional step is needed in order to establish linear order across *all* the M-words produced within a spellout domain. I assume that this is achieved by a Chaining operation, which has the effect of ordering the set of Concatenation statements produced in a workspace and ensuring that each M-word is only pronounced once. The

output is a stringlike object like that contains the entire contents of the spellout domain. Given the structure in (37), Chaining will yield the n -ary linearization statement below:

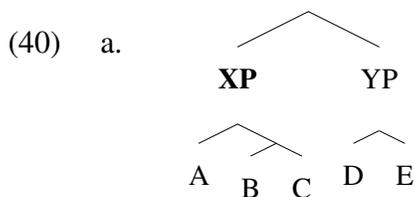
- (39) balisa – kaamukuukulu – doodo
 ‘They’re feeding greens to the dove.’

Luganda HTA is a Chaining rule, and is therefore correctly predicted to apply throughout a CP spellout domain regardless of its internal constituency. Other potential examples of Chaining rules are found in Kinande, Slave, and Tohono O’odham, and are briefly described at the end of Chapter 4.

The basic idea pursued here is that linearization proceeds in steps and that ‘partially linearized’ objects may serve as domains for certain phonological rules. We have seen that this hypothesis gives us a way to account for multiple-domain effects while maintaining a direct-spellout view of the interface.

1.3.3 Variable-domain effects

A final procedure is needed in order to determine how separate spellout domains are linearized with respect to one another. This *Late-Linearization* operation ‘plugs in’ the Chained contents of each holding bin at the placeholder nodes in the tree, establishing their linear order along the way.



- b. Late-Linearization: A–B–C, D–E → (A–B–C), (D–E)

Late-Linearization works with the spelled-out Chains from each cycle as discrete chunks, and in the default case these Chains will be left intact. However, information about speech

rate and other performance-related factors has become available at this late stage, and in some cases Late-Linearization may break apart Chains (Chain-splitting, e.g. in fast speech) or join separate Chains together (Chain-merging, e.g. in slow speech). For example:

- (41) Late-Linearization of A–B–C, D–E:
- a. Default: → (A–B–C), (D–E)
 - b. Fast speech: → (A–B–C–D–E)
 - c. Slow speech: → (A) (B–C) (D) (E), etc...

Phonological rules that apply at this stage are characteristically variable, and are the only phrasal rules that can ‘cross’ what otherwise appear to be spellout-domain boundaries. Late-linearization rules are still sensitive to the boundaries between spellout domains, but these boundaries may be overridden (e.g. in fast speech), or additional boundaries may be added (e.g. in slow or careful speech), depending on performance-related factors that come into play late in the derivation.

‘Intonational phrasing’ in English, French, Korean, German, Japanese, and other languages is assumed to fall under the rubric of late-linearization rules. We will look in detail at a late-linearization from Huave, an isolate language spoken in Mexico, in Chapter 3. Luganda Final Vowel Elision, which deletes the a word-final /a/, /e/, or /o/ when the following word begins with a vowel, is another example of a late-linearization rule. As shown by (Cole 1967: 18–20), Elision can apply between a preverbal subject and a verb, unlike the tone rules HTA and LTD:

- (42) a. omulenzi a-génz-è
 1.boy sbj1-go-perf
 ‘The boy has gone.’
- b. → **òmùlènzágénzè** (Cole 1967: 19)

Elision is shown applying twice in (43) – once between *Musok(e)* and *asom(a)*, and once between *asom(a)* and *ekitabo*:

- (43) Musoke a-som-a ekitabo kyâ-Walúsìmbi
 1.Musoke sbj1-read-ind 7.book 7.poss-1.Walusimbi
 ‘Musoke is reading Walusimbi’s book.’ SM042908)
- Mùsòk’ àsóm’ ékítábó kyâ-Wálúsìmbi

When we observe the tones on these examples, we see that the underlyingly toneless pre-verbal subjects *omulenzi* and *Musoke* forms separate domains for HTA from the rest of the sentence. For the purposes of Elision, however, the subject groups together with the following verb. In other words, the Elision domain is *larger* than HTA domains in these examples, indicating that ‘Chain-merging’ has taken place.⁵

⁵It is important to be aware that Luganda Elision does not apply obligatorily across the board, nor is it ‘structure-blind.’ Consider the following example:

- (1) [[empologoma engagga] e-yigg-ibw-a]
 9.lion 9.rich 9-hunt-pass-ind
 ‘The rich lion is being hunted.’

The first two words in this example are separated by a relatively weak syntactic juncture while the second and third word are separated by a stronger syntactic juncture. If Elision were structure-blind, we would expect it *not* to distinguish between these two junctures. In other words, we would expect all four of the renditions below to be equally likely, all else being equal:

- (2) a. empologom’ engagg’ eyiggibwa (Elision at both junctures)
 b. empologoma engagga eyiggibwa (Elision at neither juncture)
 c. empologom’ engagga eyiggibwa (Elision at weaker juncture only)
 d. empologoma engagg’ eyiggibwa (Elision at stronger juncture only)

However, (2d) – where Elision applies at the stronger juncture and fails to apply at the weaker juncture – is degraded. Such examples do not occur in my corpus, and the consultant I asked reported that such renditions sound odd. This gap would be unexpected if Elision were structure-blind.

(44) *Elision* [*HTA*(Mùsòk') *HTA*(àsóm' ékítábó kyá-Wálúsìmbi)]

As shown in the next subsection, there are also contexts where HTA applies but Elision does not, suggesting the reverse domain relationship.

1.3.4 Containment-reversal effects

Alongside examples like (44), where Elision applies to ‘merged’ HTA domains, there are also examples where Elision *fails* to apply *within* an HTA domain:

- (45) a. nj-agal-a ekitabo Wálúsìmbi kye y-a-gúl-à
 1s-want-ind 7.book 1.Walusimbi 7.rel sbj1-pst-buy-ind
 ‘I like the book that Walusimbi bought.’
 b. → njágálá ékítábó Wálúsìmbì kyè yàgùlà

In this example, the underlying H-tone on the embedded subject *Walusimbi* spreads leftward through the toneless object *ekitabo* and onto the toneless matrix verb *njagala* – indicating that at least the first three words have grouped together into a single HTA domain. However, the final vowel on the matrix verb *njagala* is preserved. This example is therefore in a sense the reverse of (44) – here, Elision domains are *smaller* than HTA domains.

(46) *HTA*(*Elision*[njágálá] *Elision*[ékítábó Wálúsìmbì...])

The fact that Elision domains can be either larger or smaller than HTA domains is unsurprising in the current model. The existence of Late-Linearization rules, which can optionally merge or split apart Chains, allows for exactly this kind of ‘containment reversal.’ In this case, HTA (a Chaining rule) has already applied by the time Late-Linearization occurs, and so its domains are unaffected by the rate-sensitive variability of Elision domains.

Containment reversal:

- | | <i>Utterance 1</i> | <i>Utterance 2</i> |
|------|---------------------------|---------------------------------|
| (47) | Elision (òmùlènz' àgènzè) | (njágálá)(ékítábó Wálúsìmbì...) |
| | HTA (òmùlènz')(àgènzè) | (njágálá ékítábó Wálúsìmbì...) |

On the other hand, containment reversals like (47) are strictly ruled out by Prosodic Hierarchy Theory (Selkirk 1995 and others), which holds that phonological rules apply to a hierarchically arranged set of derived prosodic constituents. The constituents in the prosodic hierarchy are strictly layered, meaning that e.g. a Phonological Phrase can never be larger than an Intonational Phrase. The fact that such examples are attested – see Chapter 2 for another example from French – represents a considerable challenge for Prosodic Hierarchy Theory, and lends support to multiple-stage models like the one developed here.

To review, the prediction of the current model is that:

- (48) a. In languages with more than one phrasal rule, the rule domains should generally be in a containment relationship, with early rules applying to smaller domains than later rules...
- b. ...but late-linearization rules, because they may merge or split apart chains, may sometimes have smaller domains than Chaining/Concatenation rules.

1.3.5 Ordering effects

From the discussion so far, we can see that my model will also make a strong ordering prediction:

- (49) **Ordering prediction:** Rules that are constrained to see only two M-words at a time (Concatenation) should precede and feed/bleed rules that need to see more than two M-words at a time (Chaining/Late-linearization).

There is very little evidence available for or against Prediction (49), simply because it is difficult to identify languages with multiple phrasal rules that have the necessary phonological qualities to enter into (counter-)feeding or (counter-)bleeding relationships with each other. I do, however, know of two cases that provide supporting evidence – one from Luganda and one from Zinza, another Bantu language.

We have seen two phrasal tone rules from Luganda: HTA and LTD. There are some contexts where either LTD or HTA could apply – namely, cases where a H-L- \emptyset word is followed by a H-L word. The prediction made here is that LTD should apply, since Concatenation rules systematically precede Chaining rules. This prediction is borne out: LTD takes precedence.

- (50) tógùla káàwa ‘we buy coffee’
 → *túgùlá káàwa (by HTA)
 → túgùlá káàwa (by LTD)

Another potential illustration of ordering effects is found in Zinza (Odden 2000), which has a phrasal rule of H-Deletion as well as a phrasal rule of H-insertion, or Lapse Avoidance. Odden (2000) describes the two rules as follows:

- (51) Zinza tone rules:
- a. *H deletion*: deletes a H tone on a verb followed by another word within the vP
 akazína → akazina géeta ‘he sang in Geita’
 - b. *Lapse Avoidance*: inserts a H on the final syllable of a toneless word followed by another toneless word within the phrase
 akalima → akalimá seengelema ‘he cultivated in Sengerema’

A further point about Lapse Avoidance is that it does not apply to any two consecutive words, but targets the *last* two words in a recursively embedded structure:

- (52) a. nibeenda bukoko → nibeendá bukoko
 ‘they want bukoko bananas’
- b. → nibeenda kusoomboola kulima bukokó yaBulemo
 ‘they want to explain the cultivating of Bulemo’s bukoko bananas’

Odden argues that ‘the process of inserting H tone on a toneless word does not inspect just the immediately following word to determine if it is toneless, but rather inspects an entire unbounded sequence of words in the phrase’ (p. 47). Within the model developed here, Lapse Avoidance would therefore be classified as a Chaining rule (or possibly a Late-Linearization rule), while H-Deletion is most likely a Concatenation rule (since it apparently applies only between a verb and the immediately following M-word in its complement).

As predicted, Lapse Avoidance can be shown to apply later than H-Deletion:

- (53) akazína seengelema → akaziná seengelema ‘he sang in Sengerema’

H-Deletion applies first, removing the H-tone on *akazína* and creating a sequence of two toneless words. This provides an environment for Lapse Avoidance, which inserts the H tone on the final syllable of *akazina*. With the opposite ordering, the environment for Lapse Avoidance would not be met by the input form in (53), so the rule would not apply. H-Deletion would apply later, though, and the surface form would be two toneless words.

The ordering prediction in (49) follows from the interleaving of phonological rules with other operations in a derivational PF component – a key feature of the current model. It is not necessarily made in other theories of the syntax-phonology interface (e.g. Prosodic Hierarchy Theory), even those that assume some version of phase theory.

1.4 Summary and conclusion

The main questions I set out to address at the beginning of this chapter were:

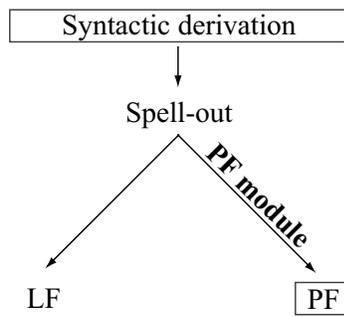
- What is the relationship between the structure of an utterance and the way it gets broken down into phonological/prosodic units?
- How can this relationship be modeled in a way that is constrained enough to rule out unattested patterns, but general enough to accommodate cross-linguistic variation?

The fact that the phrasal phonology is cross-linguistically *constituency-sensitive* in some sense provides an interesting source of support for a phase-based or cyclic-spellout architecture, where structures are built up and processed in smaller chunks instead of all at once. A basic assumption made in this dissertation is that this pattern is strong enough so that it should fall out automatically from the way the syntax-phonology interface is modeled.

To review the proposal here:

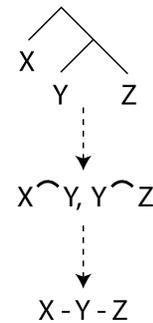
- **PF is a derivational component** in which syntactic structures are subjected to a series of operations that yield a final phonetic form.
- Among these operations are a series of **linearization** operations (Embick and Noyer 2001, Embick 2006, following Sproat 1985 and others), which establish linear order between structures of various sizes.
- What this means is that internal to each spellout domain, a number of intermediate representations are automatically created in the course of the PF derivation.
- **Phonological rules apply directly to these intermediate representations.**

(54) Architecture (repeated from Figure 1.1):



The syntax deals with abstract, linearly unordered hierarchical structures, which are sent to the PF and LF components at spellout.

By the end of the PF branch, the structure has been fully linearized and 'phonologized,' so that it can be input to the performance systems.



(55) **Direct spellout hypothesis (refined):** Phonological rules are specified to apply at *different stages in the PF derivation*, and are directly constrained by the structure as it exists at each stage. Specifically, the structures produced during *linearization* are used as phonological domains.

While a number of questions remain open – concerning both the role of the phonology in phase theory and fundamental aspects of phase theory itself – the current model provides a way to account for phonological variability while maintaining a direct, transparent view of the syntax-phonology interface. This model predicts that syntactic and phonological evidence will converge in ways that might otherwise go unnoticed or unexplained. We also saw that the model makes predictions about containment-reversals and ordering effects that are borne out, and that are not made in other theories of the syntax-phonology interface.

Chapter 2

The role of the prosodic hierarchy

In Chapter 1 I sketched a model of the syntax-phonology interface in which:

- Syntactic structures are built up and processed (spelled out) in smaller chunks, or phases, rather than all at once;
- The PF module involves a series of operations – including different kinds of linearization operations – that step by step convert abstract hierarchical structures into phonetic strings;
- Phonological rules apply at different stages in PF, so that earlier rules apply to partially linearized syntactic objects while later rules apply to fully linearized Chains.

Among other things, this proposal is intended to account for the fact that a single language can have more than one phrasal rule, with each rule applying to a different-sized domain. We saw that this prediction was borne out in Luganda, which has phrasal rules of at least three distinct types:

- (1) Phrasal rules in Luganda:
 - a. L-Tone Deletion (LTD): applies between a H_nL_n head and a right-adjacent H_nL_n word in its complement.

- b. H-Tone Anticipation (HTA): applies throughout an entire clause, minus any preverbal constituents (subjects or left-dislocated objects), which form their own domains; does not cross clause boundaries.
- c. Elision: potentially applies between any two words in the utterance, including words that straddle a clause boundary.

The rules in (1) are listed in order of increasing domain size, and correspondingly in their presumed order of application. The idea is that all of these rules work off the same spelled-out chunk of structure, but that they apply at different points during spellout and are therefore able to ‘see’ different subsets of material internal to this chunk (and, in the last case, have the option of seeing more than one chunk at a time).

The basic hypothesis pursued here is that phonological domains are produced automatically as part of the linearization procedure, and that phonological rules operate *directly* on the structure as it happens to exist at that particular point in the PF derivation. In this respect, the current model diverges from Prosodic Hierarchy Theory (PHT), whose central tenet is that phonological rules do *not* apply directly to syntactic structures but instead operate on a derived set of hierarchically arranged prosodic constituents (Nespor and Vogel 1986, Selkirk 1986, et seq.). Under my proposal, there is no need for specially derived prosodic structure and thus no prosodic hierarchy:

- (2) Proposal: Phonological rules apply directly to the structure as it exists at the given stage in the PF derivation. There is no need for a separately derived prosodic hierarchy.

The question of whether we can satisfactorily account for phrasal phonological patterns without the prosodic hierarchy deserves careful attention. PHT has been the prevailing model of the syntax-phonology interface since the mid-1980s, and is so well established that the existence of the Phonology Phrase, Intonational Phrase, and other familiar prosodic

constituents is taken as a given in a wide range of theoretical frameworks (Scheer 2008). The question I explore here is: if we assume that the derivation proceeds in cycles, and that we *independently* need some means of deriving linear order from hierarchical structures, do we need an additional set of special prosodic constituents?

My goal in the first part of this chapter is to clarify some of the key points that are relevant to the ‘direct vs. indirect reference’ debate. I will go on to argue that the phase-based, direct-reference model of the interface developed here can account for the principal observations that have traditionally been seen as unique predictions of PHT (including, as shown in Chapter 1, the fact that phonological domains can be ‘non-constituents’ of a particular type), and in some cases achieves these goal more straightforwardly than PHT. I will also isolate some of the different predictions of the two models and compare them, and I will include empirical findings that support the current model.

2.1 Background

It is clear that phonological rules apply to domains of different sizes, with some rules restricted to the mora or syllable, some operating across the board, and some applying in a range of intermediate-sized environments. What is not immediately clear is how these domains are determined—specifically, what kind of information is visible to phonological rules, and when and how this information becomes available.

As we saw in Chapter 1, certain aspects of the underlying morphosyntactic structure play a key role in conditioning phrasal phonological rules. The question that arises in light of such phenomena is *how* exactly the syntax is able to inform the phonology. This question has traditionally been framed in terms of ‘direct vs. indirect reference’ – whether phonological rules operate directly on the syntax (3a) or refer to some kind of derived intermediate structure (3b):

- (3) a. **Direct reference:** Phonological rules apply directly to morphosyntactic structures.
- b. **Indirect reference:** Phonological rules cannot ‘see’ the syntax directly but instead refer to a level of derived intermediate structure (e.g. Phonological Phrase, Intonational Phrase, etc.).

The model advanced in this thesis is a direct-reference model: phonological rules apply directly to the structure as it exists at the given stage in PF. Prosodic Hierarchy Theory, on the other hand, is an indirect-reference approach: it is based on the premise that phonological rules operate on a derived prosodic structure. Specifically, phonological rules are believed to refer to some version of (4)—a strictly layered hierarchy of phonological constituents.¹ In most current work, the constituents in this hierarchy are held to be the *only* possible phonological domains; e.g., there is no separate class of rules that can apply directly to the syntax (5).

(4) **Prosodic hierarchy:** (subword constituents not shown)



¹A number of modifications to (4) have been proposed. For example, Inkelas (1989) and Downing (2006) argue that the subword constituents (foot and syllable) belong to a separate metrical hierarchy; Nespor and Vogel (1986) and Hayes (1989) posit a Clitic Group between the Phonological Phrase and the Prosodic Word; Beckman and Pierrehumbert (1986), Downing (2002), Selkirk (1986), and others expand the Phonological Phrase into two or more levels (e.g. the Major Phrase and Minor Phrase); and Ladd (1986) and Selkirk (1995) allow certain constituents to recursively dominate constituents of the same type. Except where noted, the differences among these proposals will not bear on our discussion here.

- (5) **Indirect Reference Hypothesis** (Inkelas 1989: 10): Phonological rules refer only to prosodic constituent structure.

The constituents in (4) are distinguished from one another both by their size and by the way they are derived. Each level is argued to be produced by a unique mapping algorithm. In derivational approaches, these algorithms extract relevant information from the syntax and/or other components, convert it into prosodic structure, and discard any extraneous information. In OT models, the work of the mapping algorithms is done by high-ranking constraints that determine a particular correspondence between syntactic structure and prosodic structure (see Truckenbrodt 1995, 1999, Selkirk 2000, 2004, among others); however, the basic notion that each prosodic constituent is related to the syntax in a unique way is preserved.

To take a well-known example of a mapping algorithm/constraint, Selkirk (1986) and Chen (1987) propose that the Phonological Phrase (ϕ) is derived in some languages by aligning the right/left *edge* (or end) of a particular type of syntactic constituent with the corresponding edge of a ϕ . This is illustrated in (6) with colloquial French liaison, where according to Selkirk (1986), boundaries are inserted at the right edges of ‘lexical heads’ (a class that excludes pronouns, adverbs, and prenominal adjectives). Liaison then applies wherever a latent final consonant is followed by a vowel-initial word without an intervening ϕ boundary, i.e., to the boldfaced consonants below:

- (6) Ces très aimables enfants] ϕ **en** ont avalé] ϕ
these very nice children of-it have swallowed
‘These very nice children swallowed some of it.’ (Selkirk 1986: 395)

Of course, not all ϕ -level rules are sensitive to edges in this way; consequently, a variety of other mapping algorithms and constraints have been proposed. For the ϕ level in particular, these include algorithms that make reference to branching direction and head-complement relations (Nespor and Vogel 1986, Hayes 1989), syntactic sister-

hood or ‘branchingness’ (Inkelas and Zec 1995, Nespor and Vogel 1986, Hayes 1989), and prosodic weight and eurythmy (Ghini 1993). In more recent work (Cheng and Downing 2007, Dobashi 2003, 2004a,b, Ishihara 2004, 2007, Kratzer and Selkirk 2007, among others), it has also been suggested that the **phase** may play a key role in the formation of the ϕ . We will see that these proposals, which integrate PHT into a cyclic-spellout architecture, raise some interesting questions related to what is meant by *spellout* and how the levels of the Prosodic Hierarchy above and below the ϕ are derived. In the meantime, the important point is that PHT allows different languages to have different means of deriving each level of the hierarchy – so the ϕ , for example, may be derived by marking right edges of XPs in one language, and by measuring units of roughly equal prosodic weight in another.

While PHT accommodates a considerable amount of cross-linguistic variation, its core prediction – that prosodic domains will consistently unify into a well-formed tree structure – is maintained to be an uncompromisable principle of universal grammar. The best-known formalization of this principle is the Strict Layer Hypothesis (Selkirk 1986, 1995, among others), which rules out configurations like (7). In (7a), two rule domains have misaligned boundaries, so that the resulting set of constituents can never enter into an exhaustive containment relationship. In (7b), containment relationships have changed from one utterance to another—i.e., the levels of the hierarchy have been rearranged—against the universally inviolable Layeredness and Headedness tenets of the Strict Layer Hypothesis (8) (Selkirk 1995).

	a. Misaligned boundaries:	b. Containment reversal:	
(7)	(----) (----)		<i>Utterance 1</i> <i>Utterance 2</i>
	... (----) ...	rule A	(---) (---) (-----)
		rule B	(-----) (---) (---)

- (8) ‘Layeredness and Headedness, which together embody the essence of the Strict Layer Hypothesis, appear to be properties that hold universally, in all phonological representations.’ (Selkirk 1995: 443)
- a. Layeredness: No C^i dominates a C^j , where $j > i$ (e.g., ‘No Phonological Phrase may dominate an Intonational Phrase.’)
 - b. Headedness: Any C^i must dominate a C^{i-1} , unless C^i is the Syllable, the lowest constituent in the hierarchy (e.g., ‘A Phonological Phrase must dominate a Prosodic Word.’)

With this much background, we can begin to explore some of the key properties that distinguish PHT from the current model.

First of all, it is important to recognize that the goals of PHT and the current model are quite similar. Both theories are based on the idea that the syntax will play a significant role in phonological interactions. The phonology is not free to group words arbitrarily in either model; instead, the common aim is to provide a restricted view of the syntax-phonology interface, in which unattested deviations like those we saw at the beginning of Chapter 1 (repeated below in (12)) are systematically ruled out. Furthermore, both proposals recognize a need to provide a *defined set* of objects for languages to use as phonological domains, and to have these domains be related both to the underlying morphosyntax and to one another in a principled way.

The main purported difference between the two theories has to do with how directly these results are achieved. It has often been claimed that PHT does a better job of automatically predicting many of the observed patterns, while in direct-reference theories they can only come about by coincidence. I will show that these claims assume one particular instantiation of the direct-reference hypothesis – either one where phonological domains can only be syntactic constituents, or one where the entire syntactic structure is visible to the

phonology at once – and are not relevant to other direct-reference models, or to the direct-reference hypothesis itself. In fact, we will see that the model developed here directly and automatically imposes constraints on phonological domains that must be imposed extrinsically in PHT. I will also show that what is taken to be a desired outcome of PHT – the idea that phonological domains will be *consistently* ordered in the same hierarchical structure across utterances – is falsified by observed data (see also Chapter 1 §1.3.4). It is therefore a strength of the current theory that it does not make this particular prediction, and a problem for PHT that it does. In Chapter 6 I will show that these problems cannot be solved by arguing that one of the two rules is ‘lexical’ or ‘morphological’ rather than phonological – at least not without seriously complicating our theory of ‘morphological’ alternations.

2.2 Re-evaluating the traditional arguments for PHT

In considering whether it is possible to do without the prosodic hierarchy, it is worth revisiting some of the traditional arguments in support of PHT that have been summoned in the ‘direct vs. indirect reference’ debate. These are briefly summarized below:

- (9) a. **Non-isomorphism:** Phonological rule domains are not always isomorphic with syntactic constituents, which may suggest that rules apply to phonological rather than syntactic structures.
- b. **Clustering effects:** Some languages have several rules that apply to the same constituent (e.g. Korean phrasal accent and obstruent voicing both apply to the ‘Accentual Phrase’ according to Jun (1996)). Such cases might support the idea that universal grammar provides a limited set of prosodic domains, making it statistically more likely that rules will co-occur around the same object. ‘Any similarity among the domains of different rules could only be viewed as an accident on a direct reference model, where each rule looks independently

at syntactic structure to determine its domain of application.’ (Inkelas 1989: 10; see also Hayes 1990: 104)

- c. **Restrictiveness:** It is often observed that phrasal phonological rules normally do not make reference to category labels or morphosyntactic features, but rather to more general notions of X-bar levels and/or tree geometry. This is one possible motivation for arguing that phonological rules refer to a ‘simplified’ intermediate structure rather than the syntactic structure itself: ‘In constructing a prosodic bracketing from a syntactic one, the fairly rich set of syntactic node labels is reduced to the more impoverished phonological inventory.’ (Hayes 1989: 205)
- d. **Hierarchical well-formedness:** In languages with several phonological rules applying to different-sized domains, these domains usually appear to be in a hierarchical containment relationship. This follows automatically from the idea that all phonological rules apply to constituents in a Prosodic Hierarchy.

None of these points are legitimate arguments against direct-reference approaches. Rather, they are arguments against particular *instantiations* of the direct-reference hypothesis. In the following subsections I consider each argument in turn.

2.2.1 Non-isomorphism

As we saw in Chapter 1 §1.2.3, phonological domains are not always coextensive with syntactic constituents. In the Luganda sentence below, for example, the verb *agamba* and the indirect object *omulenzi* form an HTA domain that is (probably) not a syntactic constituent:

- (10) (Mùkàsà) (à-gàmb’ òmulènzi) (Nàkátò) (y-à-gênd-à)
 1.Mukasa sbj1-tell 1.boy 1.Nakato sbj1-pst-go-ind
 ‘Mukasa told the boy that Nakato left.’

Relatedly, Nespov and Vogel (1986:41ff) point out that some phonological rule domains are **weight-sensitive**, varying in size depending on the prosodic weight of the constituent, and that some rule domains are able to **cross sentence boundaries** (e.g. English Flapping in *Don't shout. It's rude.*). Such phenomena would present a problem for the idea that phrasal phonological rule domains are syntactic constituents, since the formation of syntactic constituents does not vary with prosodic weight and (presumably) cannot extend beyond a single sentence.

It has been argued that these kinds of 'syntax-phonology mismatches' provide strong support for an indirect-reference treatment as opposed to a direct-reference treatment: 'Some of the strongest motivation for postulating prosodic structure...comes from the existence of cases in which phonological rule domains do not correspond to syntactic constituents and consequently, the correct phonological generalizations can be captured only in terms of prosodic structure' (Han 1994: 12; see also Hayes 1990: 86).

Notice that in order for the non-isomorphism argument to go through, we have to make the following assumption:

- (11) Assumption 1: Within a direct-reference treatment, phonological rule domains can *only* be syntactic constituents.

But this assumption is ungrounded: direct-reference theories are not forced to adopt (11) but can in principle use any type of information that is available in the syntax to define phonological domains, including XP edges, head-complement relations, or branchingness. (The same is in fact true of indirect-reference theories; see §2.2.2.) For example, Kaisse (1985) – probably the best-known direct-reference proposal in the literature – appeals to notions of c-command and constituent edges, but not constituenthood, to define (certain kinds of) phrasal rule domains. Similarly, Elordieta (1999), Seidl (2001), and I all advance the direct-reference hypothesis without assuming any version of (11).

The assumption in (11) is in fact no more entailed by the direct-reference hypothesis than it is by the indirect-reference hypothesis. Moreover, it is possible for a direct-reference treatment to account for apparent mismatches like the one in (10). In the model developed here, which is based on a ‘holding-bin’ version of a cyclic-spellout model (see Chapter 1, §1.2.3), the relevant phonological rules apply to the spelled-out material at each phase. Since phases are syntactic constituents, phonological domains will often line up with syntactic constituents. In some cases, however, a phonological domain will be a ‘phase complement’ – the material spelled out on the current cycle *minus* the material spelled out on previous cycles. This model correctly predicts that the attested cases of non-isomorphism are mismatches of the ‘phase-complement’ type – not wild deviations like (12), but examples like (10) and (13), which do in fact honor the syntactic constituent structure to a large extent.

(12) Unattested syntax-phonology mismatch:

- a. A phonological boundary is inserted after every Adjective.
- b. * (While my **best**^{HLH}) (friend was buying a **small**^{HLH}) (**black**^{HLH})
(coffee I read my **new**^{HLH}) (book)

(13) Attested syntax-phonology mismatches:

- a. (This is the cat) (that killed the rat) (that ate the malt) (that lay in the house that Jack built) (see Chomsky and Halle 1968: 372)
- b. (Mùkàsà) (**ày-àgàl-à kù-gàmb’ òmùlènzi**) (Nàkátò) (y-à-gênd-à)
1.Mukasa sbj1-want-ind inf-tell 1.boy 1.Nakato sbj1-pst-go-ind
‘Mukasa wants to tell the boy that Nakato left.’

While the first three phonological domains in (13a) are non-constituents,² as is the bold-faced string in (13b), the overall constituent structure has not been completely overridden

²In fact, some kind of mismatch of this type is inevitable if (13) is to be broken down phonologically at all, unless a single break is placed after the first word *this*.

in these examples as it has in (8). The final phonological domain of each sentence is in fact a constituent, and the other breaks are consistently placed at ‘strong’ clause (CP) junctures rather than e.g. after determiners or adjectives. This kind of mismatch is derived when a structure contains multiply recursive phase heads, each of which is spelled out separately and placed in its own holding bin; each non-constituent domain can be viewed as a ‘phase complement.’ These mismatches are quite common cross-linguistically. They have a very different status from the unattested mismatches seen in (12), where an arbitrarily selected node label has taken precedence over the basic constituent structure and caused *subparts of separate constituents* to group together phonologically. The current theory provides a way of explaining the contrast between (12) and (13) while maintaining the idea that phonological rules apply directly to syntactic objects.

2.2.2 Clustering effects and restrictiveness

The next two arguments above – which appeal to **clustering effects** and **restrictiveness** – are based on a very different instantiation of the direct-reference hypothesis from the ‘nonisomorphism’ argument. Rather than assuming that all phonological domains must be syntactic constituents under the direct-reference hypothesis (11), these arguments make the assumption in (14):

- (14) Assumption 2: Under the direct-reference hypothesis, the entire syntactic phrase-marker is visible to the phonology at once. There is no way of restricting this information in a principled way, or of defining a set of intermediate-sized objects that could play a role in delimiting phonological interactions.

Again, this assumption is ungrounded: there are ways to impose constraints on what the phonology can ‘see’ in a direct-reference architecture just as there are in an indirect-reference architecture. **Clustering effects**, for example, will be a natural outcome of *any*

theory – direct- or indirect-reference based – that provides a limited set of objects that can serve as phonological domains. In PHT, these objects are the constituents of the Prosodic Hierarchy; in Elordieta’s (1999) direct-reference proposal, they are pairs of heads in privileged morphosyntactic relationships (e.g. T-v, D-n, etc.); in the model developed here, they are either spellout domains or linear representations created internal to spellout domains. The point is that the ability of a given proposal to account for clustering effects is orthogonal to whether it is situated in a direct- or indirect-reference architecture. All that is needed is some means of defining a restricted set of domains.

The **restrictiveness** argument is re-stated below:

- (15) ‘Certain...aspects of the syntactic constituency, such as syntactic category or the morphological specifications of terminal elements, appear to be irrelevant for the purposes of the phonology and, in a sufficiently constrained theory, the phonological component should not be able to access them.’ (Inkelas and Zec 1995: 537–537)

In PHT, the existence of feature/category-sensitive rules is prevented by imposing constraints on the syntax-phonology mapping algorithms. For example, under the fairly common assumption that Phonological Phrases are derived by marking right or left XP edges and that Intonational Phrases must exhaustively contain Phonological Phrases (Selkirk 1986, 1995), unattested parses like (12) cannot be derived. Other well-known mapping algorithms extract information about head-complement relations, sisterhood, prosodic weight, or (more recently) phase-hood, and effectively ‘strip away’ all other information from the syntax, including all information about morphosyntactic categories or features.

It should be noted, however, that it is technically possible for the PHT mapping algorithms to refer to *any* information that is available in the syntactic tree, including information about particular features and categories. The hypothetical algorithm in (12a), which

inserts a phonological domain boundary after every Adjective in the string, is not ruled out by PHT or the indirect-reference hypothesis itself, but rather by *extrinsic constraints* on the mapping algorithms – specifically, the conventional belief that mapping algorithms should refer only to ‘basic’ or ‘general’ aspects of the syntactic constituent structure. But such an axiom could just as easily be incorporated into a direct-reference approach, as acknowledged by Poser (1990):

- (16) ‘Any constraint that we might impose on direct reference to syntactic structure could equally well be formulated as a constraint on the mapping between syntactic structure and prosodic structure, and conversely.’ (Poser 1990: 286)

In the cyclic-spellout based model advanced here, cases like (12) are ruled out not by extrinsic constraints on mapping algorithms, but by the very nature of spellout. Hypothetical systems like (12a) are simply unformulable – the phonology never ‘sees’ the entire structure at once, and there is no way for *friend was buying a small* in (12b) to form a domain without also including (at least) *black, coffee, and my*. Since cases like (12) are unattested, I take it to be preferable for a system to rule them out automatically, e.g. by assuming some form of cyclic spellout (which can be done in either a direct-reference or an indirect-reference treatment; see below), rather than by adopting independent constraints on the way the syntax-phonology mapping works.

It is also worth noting that, despite the claim in (15), some phrasal rules *do* appear to require reference to particular morphosyntactic features and categories. We will look at some of these cases in Chapters 5 and 6 and see how they are handled by various theories. In the current model, it is possible for some phonological rules to be directly conditioned by syntacticosemantic features – *as long as they are also constrained by spellout domain boundaries*. Thus, unattested cases like (12) are still successfully ruled out.

The basic point here is that the restrictiveness argument does not constitute real support for the indirect-reference hypothesis over the direct-reference hypothesis. The nonexistence of cases like (12) would only pose a threat to a theory that had no way of encoding restrictions on the amount of syntactic information that the phonology could see.

2.2.3 Hierarchical well-formedness

As pointed out at the end of §1, PHT makes a strong prediction that phonological domains will consistently unify into a well-formed hierarchical structure (see e.g. Poser 1990: 286 and Hayes 1989: 205–206). This means that we should not find cases where two rules have ‘overlapping’ domains, or where the domain for one rule is sometimes larger and sometimes smaller than the domain for another rule (see e.g. (7)). Similarly, assuming that each utterance is *exhaustively* parsed into a Prosodic Hierarchy, we should not find cases ‘where the first element of an utterance fails for syntactic reasons to undergo a rule applying to the initial element of a phonological phrase, or word.’ (Inkelas 1989: 1) To the extent that these predictions are borne out, they could be seen as evidence in support of PHT and against any other proposal (direct- or indirect-reference based) that does not make them.

At the end of Chapter 1 we saw some evidence from Luganda that phonological domains do not in fact consistently unify into a hierarchical structure. Specifically, we saw an example of the ‘containment-reversal’ scenario schematized in (7b), where the domain for one rule is sometimes larger and sometimes smaller than the domain for another. In §2.4.3 of this chapter we will see an additional case of this type from French. I take these phenomena to be reflective of the fact that phonological rules can apply at *distinct stages* in the PF derivation, rather than all applying at the same stage to the same static set of domains. The existence of these cases presents a challenge to the core tenet of PHT – that

phonological rules can only refer to a strictly layered hierarchy of prosodic constituents provided by universal grammar.

On the other hand, there is a very strong tendency for phonological domains to be related to one another by exhaustive containment, even if the exact dominance relationships do not remain constant from utterance to utterance. Can a direct-reference theory account for this pattern?

The current proposal does predict that most phonological domains will be related by exhaustive containment. For example, we saw in Chapter 1 that Luganda L-Tone Deletion (LTD) domains appear to be smaller than Luganda H-Tone Anticipation (HTA) domains. In Chapters 4 and 5 I examine these rules in detail and conclude that:

- Luganda HTA applies to Chains, or the fully linearized contents of each spellout domain.
- Luganda LTD applies earlier, to partially linearized objects (Concatenation statements) that are produced between heads and complements *within a given spellout domain*.

The (CP) spellout domain is the basic unit that both rules work with. HTA domains will always be isomorphic with spellout domains, since HTA applies after full linearization (Chaining) at each CP phase. LTD domains will be either isomorphic with or smaller than HTA domains. There is no way for LTD or HTA to ‘see beyond’ a spellout-domain boundary. Consequently there is no way for cases of misaligned boundaries or non-exhaustive containment (as schematized in (7a)) to arise between these two rules.

Since the spellout domain plays a fundamental role in delimiting phonological interactions, my model automatically produces exhaustive containment relations among various types of rule domains. In fact, it may achieve this result more straightforwardly for the Luganda case than a ‘traditional’ (non-phase-based) PHT approach would. In a PHT analysis,

we would begin by associating each of the rules in question with a level of the Prosodic Hierarchy – e.g., HTA could be an Intonational-Phrase (IntP) rule while LTD could be a Phonological-Phrase (ϕ) rule. Under the fairly standard PHT assumption that phonological domains are derived by aligning constituent edges, the domains for HTA and LTD could be analyzed as follows.

- ALIGN-L(CP/TP,INTP): Luganda HTA applies throughout a ‘minimal clause,’ or a CP without its head and specifier. These domains could be derived by aligning Intonational Phrase boundaries with the *left edge of a CP or TP* (see Rice 1987 for a similar treatment; see also Cheng and Downing 2007, Cheng and Kula 2006).
- ALIGN-R(XP, ϕ): Luganda LTD applies between a head and the first word in its complement. We can derive this pattern by aligning Phonological Phrase boundaries with the *right edges of XPs*.

This treatment yields the correct results for single-clause structures like (17). ALIGN-L(CP/TP,INTP) causes a single IntP boundary to be placed at the left edge of the structure in (17a), correctly predicting that the entire VOS utterance forms a single domain for HTA (cf. (18a)). ALIGN-R(XP, ϕ) causes a ϕ boundary to be inserted at the right edge of each DP (17b). Correspondingly, as shown in (18b) (which is similar to (18a) except that the toneless vocabulary items have been replaced with H_nL_n ones to provide the phonological context for LTD), the verb and the object group together into an LTD domain, while the subject phrases separately.

- (17) $CP[TP[Verb DP[Object]] DP[Subject]]$
- a. IntP: (Verb Object Subject
 - b. ϕ : Verb Object) Subject)

- (18) a. HTA: (à-gúl' ébítábó Nàkátò)
 sbj1-buy 8.book 1.Nakato
 'She's buying books, Nakato.'
- b. LTD: (y-à-ly-á nnámúnyè) (Nàkátò)
 sbj1-pst-eat-ind 1.beans 1.Nakato
 'She ate beans, Nakato.'

A problem arises, however, when we look at complement-clause structures like (19). ALIGN-L(CP/TP,INTP) causes three IntP's to be formed, each starting at the beginning of a CP or TP (19a), correctly predicting that the matrix subject, matrix verb, and embedded clause will each form their own domain for HTA (20a). The ϕ 's derived by ALIGN-R(XP, ϕ), however, incorrectly group the matrix and embedded verb together into a single LTD domain because there is no right-XP edge separating them. The result is a hierarchy violation – ϕ 's are smaller than IntP's in (17), but larger than IntP's in (19). Furthermore, this violation is *not* supported by the attested facts – LTD domains can never be larger than HTA domains (20b).

- (19) CP[Subject TP[Verb CP[TP[Verb Adverb]]]]
- a. IntP: (Subject (Verb (Verb Adverb
- b. ϕ : Subject) **Verb Verb Adverb**)
- (20) a. HTA: (Mùkàsà) (à-gàmb-à) (à-fúúmb-á búlúngì)
 1.Mukasa sbj1-say-ind sbj1-cook-ind well
 'Mukasa says s/he cooks well.'
- b. LTD: (Nàkátò) (y-à-gámb-à) (à-yímb-á búlúngì)
 1.Nakato sbj1-pst-say-ind sbj1-sing-ind well
 'Nakato said s/he sings well.'
- cf. * (Nàkátò) (yàgámb' áyímbá búlúngì)

The most obvious solution for the PHT approach sketched here would be to appeal to the Strict Layer Hypothesis as a kind of repair strategy. Within an OT analysis, this effect

would be achieved by a high-ranking (perhaps undominated) LAYEREDNESS constraint ('No ϕ may dominate an IntP'; see (8)). ALIGN-R(XP, ϕ) would be ranked lower, to allow the extra ϕ boundary to surface in a position where there is no right edge of an XP.

(21) LAYEREDNESS >> ALIGN-L(CP/TP,INTP) >> ALIGN-R (XP, ϕ)

Within the cyclic-spellout-based treatment developed in this dissertation, the desired containment relationship is an automatic consequence of the way the derivation proceeds. Both HTA and LTD are working within the same spelled-out chunk of material – the complement of a C head minus whatever has already been spelled out on previous cycles – and there is no way for either of these rules to see beyond the spellout domain boundary. In PHT, however, each level of the hierarchy can be derived by its own autonomous set of principles. It is possible to derive the ϕ by marking right edges, the IntP by marking left edges, and e.g. the Major Phrase by reifying some other aspect of the constituent structure, like branchingness. The fact that the various prosodic constituents unify into a strictly layered hierarchy is enforced by an independent set of constraints (Layeredness, Headedness, etc.), rather than by the syntax-to-phonology mapping algorithms themselves. The desired results can be achieved in both proposals; the main difference between the two accounts, I believe, is that the current account offers some explanation for *why* phonological domains appear to be hierarchically arranged in this way.

2.3 The role of cyclic spellout

My goal in the previous section was to show that the traditional arguments for PHT do not in fact reveal any substantive differences between the direct- and indirect-reference hypotheses. Phenomena that are sometimes perceived as problematic for direct-reference proposals turn out to be problems only for particular *instantiations* of the direct-reference

hypothesis, which have no bearing on the current proposal. Furthermore, it is possible that a cyclic-spellout model like the one advanced here may account for some observed patterns more directly than traditional PHT treatments.

In this section, I would like to look more closely at some recent proposals that incorporate PHT into a cyclic-spellout architecture. It is not surprising that the possibility of combining PHT and phase theory has arisen, given that recent versions of phase theory lead to the expectation that there will be reflexes of phases in the surface phonology. In the four proposals reviewed here, the CP/vP phase is argued to correspond to a Phonological Phrase or Major Phrase. An interesting question that arises in light of this idea is how the other levels of the Prosodic Hierarchy are derived for languages like Luganda, that have *multiple* syntax-sensitive phrasal rule domains of different sizes. In my proposal, multiple-domain effects are achieved by having the objects produced by Linearization serve as ‘intermediate’ phonological domains *within* each spellout domain. PHT offers another potential solution, since it provides a set of prosodic constituents of various sizes. However, it is not obvious up-front exactly how the Prosodic Hierarchy should fit into a cyclic-spellout architecture. Since my primary goal in this chapter is to determine whether the Prosodic Hierarchy is a necessary construct in theories of the syntax-phonology interface, I will reviewing these proposals with the following questions in mind:

- How much work is done by phase theory in each proposal? Does the spellout domain of a given phase actually produce a prosodic constituent, or is the correspondence between phases and phonological domains less direct?
- What is the exact relationship between spellout, phases, and the construction of the Prosodic Hierarchy? If a spellout domain corresponds to one level of the Prosodic Hierarchy (e.g. the Phonological Phrase), how are the other levels formed?

The four proposals reviewed here vary widely with respect to how these questions are answered, and we will see that on some points they are very much in sympathy with the current non-PHT proposal.

2.3.1 Cheng and Downing 2007

Cheng and Downing’s 2007 analysis of Penultimate Lengthening domains in Durban Zulu assumes the *least direct* correspondence between phases and prosodic constituents of any of the four proposals reviewed here. In Durban Zulu (as in Luganda; see Chapter 4), a restrictive relative clause groups together with the next-higher clause into a single phonological domain. Nonrestrictive relative clauses, on the other hand, phrase separately. The lengthened penultimate vowel is boldfaced in each of the domains below:

(22) Restrictive relative clause:

(si-thánd’ ísí-gqok’ ín-dod’ é-si-gqok-ilê:-yo)
 we-like 6-hat 9-man 9.rel-obj6-wear-TAM-rel
 ‘We like the hat the man is wearing.’ (Cheng and Downing 2007: ex. (54b))

(23) Nonrestrictive relative clause:

(si-mem’ ú-**Ja:bu**) (o-m-ázi:-yo) (é-dilî:-ni)
 we-invite 1a.Jabu rel.you-obj1-know-rel loc9-party-loc
 ‘We are inviting Jabu, who you know, to the party.’ (Cheng and Downing 2007:
 ex. (13c))

As Cheng and Downing point out, this pattern cannot be derived by simply aligning Intonational Phrase edges with CP edges, since both restrictive and nonrestrictive relative clauses are (presumably) CPs. The constraint in (24), for example, will produce the correct results for the restrictive relative clause in (25a), but will not produce the desired Intonational Phrase boundary between *Jabu* and *omaziyo* (i.e. between the nonrestrictive relative clause and its head) in (25b).

(24) ALIGN-R(CP, INTP): Align the right edge of each CP with the right edge of an Intonational Phrase (IntP).

(25) a. Restrictive relative clause:

CP [si-thánd' ísí-gqok' *CP* [ín-dod' é-si-gqok-ilê:-yo)]

'We like the hat the man is wearing.'

b. Nonrestrictive relative clause:

CP [si-mem' ú-Ja:bu *CP* [o-m-ázi:-yo)] (é-dilî:-ni)]

'We are inviting Jabu, who you know, to the party.'

In order to account for the Durban Zulu pattern, Cheng and Downing replace the constraint (24) with the constraint in (26a), which hinges crucially on the assumptions in (26b):

(26) a. ALIGN-L(PHASE, INTP): align the left edge of a *phase* with the left edge of an Intonational Phrase.

b. i. CPs are only phases if they are not complements (i.e. not selected by a head).

ii. Restrictive relative clauses are complements of a D head (following Kayne (1994)).

This treatment derives the observed contrast between restrictive and nonrestrictive relative clauses, but only by assuming the particular definition of a phase in (26b-i). Furthermore, it is important to be aware that the alignment constraint in (26a) is referring to the left edge of the *phase itself*, rather than the left edge of the *spellout domain* of the phase. The idea that the phase head and phase edge are spelled out separately from the phase-head complement (Chomsky 1999 et seq.) does not play a role here. Instead, there is an implicit assumption that the distinction between the phase and its spellout domain is of less importance for

the phonological component than for the syntactic and semantic components (Lisa Cheng, p.c.).

In sum, the phase plays only an indirect and secondary role in determining phonological phrasing in Cheng and Downing (2007). The phase is a syntactic object that the syntax-phonology mapping constraints *can* refer to, on par with CPs and XPs, but the idea that its contents are spelled out as a separate chunk is not expected to have direct effects on the phonology cross-linguistically. It is conceivable within this treatment that there would be languages where the phase plays no role at all in phonological phrasing. In this respect, Cheng and Downing's proposal is somewhat different from Kratzer and Selkirk (2007), discussed next.

2.3.2 Kratzer and Selkirk 2007

Kratzer and Selkirk (2007) adopt a cyclic-spellout architecture in which:

- vP and CP are phases;
- material in the complement of the phase head is spelled out, while the phase head and its specifier(s) are spelled out on the next cycle;
- spellout operations include phonological realization of words, linearization, and the assignment of 'higher order prosodic structure' or 'prosodic phrasing' (9).

This proposal is similar to mine insofar as the division of an utterance into multiple spellout domains is expected to have direct effects on the phrasal phonology cross-linguistically: 'Phase theory leads to the hypothesis that [prosodic phrasing] will be produced as a consequence of prosodic spellout on phase-dependent spellout domains' (10). However, unlike in my proposal, spellout domains (or designated subparts of them) are mapped to con-

stituents in the Prosodic Hierarchy for Kratzer and Selkirk, rather than being objects that phonological rules can ‘see’ and apply to directly.

The specific proposal, which builds on work on sentential stress by Cinque (1993), Kahnemuyipour (2005), Wagner (2004), Zubizarreta (1998), and others, is:

- (27) The highest phrase within the spellout domain of a phase corresponds to a prosodic Major Phrase in phonological representation. (Kratzer and Selkirk 2007: ex. 20)

By restricting the Major Phrase to the highest phrase *within* a spellout domain, Kratzer and Selkirk are able to explain why phrase stress falls on the object, rather than the verb, in German OV sentences (the ‘Highest Phrase Condition’):

- (28) $_{CP}$ [dass $_{TP}$ [(Maria) $_{vP}$ [(**die Gesetze**) studiert]]]
‘...that Mary studies law.’

The verb *studiert* in this example is not parsed as part of a phrase-stress domain, even though it does undergo spellout at the vP phase level. Kratzer and Selkirk’s approach, where a Prosodic Hierarchy is constructed as part of spellout, allows for this kind of mismatch – spellout domains are only *indirectly* related to prosodic constituents, and may undergo inexhaustive parsing as a consequence. For languages where the Highest Phrase Condition does not hold, the spellout principle in (27) is presumably overridden by prosodic well-formedness constraints that mask its effects, e.g. Exhaustivity (Selkirk 1995). More generally:

- (29) ‘[I]t is worthwhile to entertain a theory of prosodic phrasing which includes universal interface principles of prosodic spellout... and, as part of the phonology, an optimality-theoretic ranking of prosodic markedness constraints which operate to produce surface prosodic structures that are more nearly phonologically ideal. With such a theory, language-particular variation in prosodic phrasing would be the consequence of the phonology: different language particular rankings of prosodic markedness constraints could give rise to different alterations to the prosodic structure produced by the universal prosodic spellout principles.’ (Kratzer and Selkirk 2007: 30)

For Kratzer and Selkirk (2007), the phase is involved in creating prosodic structure cross-linguistically, unlike in Cheng and Downing (2007) – but the effects of phase spell-out can still be modified by an independent set of phonological principles. *How much* the phonology can alter spelled-out structures is the crucial question. Would it be possible, for example, for a constraint like *ALIGN-R(ADJ, ϕ)* to wipe out the default prosodic boundaries provided by spellout, resulting in an unattested parse like (12b)?

The model developed in this dissertation would not allow for this degree of variation, since there is no creation of special prosodic structure in the first place. Phonological domains apply directly to either spellout domains, or ‘merged’ or ‘split’ spellout domains produced under special conditions late in the derivation, or subparts of spellout domains that are independently believed to be produced during linearization. German phrase-stress domains would (most likely) be analyzed as entire spellout domains within my model, and the Highest Phrase Condition would be interpreted as a condition on the phrase-stress assignment *rule* rather than on its domain.³

A further question is how the other constituents of the Prosodic Hierarchy (Intonational Phrase, etc.) are derived in Kratzer and Selkirk’s proposal. Although this question is not addressed in depth, it is suggested that constituents like the Intonational Phrase and Prosodic Word could also correspond to spellout domains – but spellout domains of a different type of phase head. For example, ‘prosodic word could be understood as the spell-out of lexical...heads, while intonational phrase could be the spellout of ‘comma phrase’” (Kratzer and Selkirk 2007: 29, note 12). The implicit assumption here is stated below; notice that this hypothesis cross-cuts the question of whether a direct- or indirect-reference grammar is assumed:

³E.g., ‘Assign phrase stress within the highest phrase within the spellout domain’ (Kahnemuyipour 2005). See Wagner (2004) for another treatment.

- (30) Possibility: There are different types of phase heads, which can in turn trigger different types of spellout.
- a. Example (PHT-based): The spellout domains of CP and vP phases correspond to Major Phrases. The spellout domains of Comma Phrases correspond to Intonational Phrases.
 - b. Example (direct-spellout-based): CPs and/or Comma Phrases trigger ‘full spellout’ – including Chaining, Late Linearization, and all associated phonological rules. Smaller phases (e.g. DPs, vPs) trigger ‘partial spellout,’ which stops after Concatenation so that only some phonological rules apply.

This hypothesis presents an interesting alternative to the current proposal, where all spellout domains are treated on par with one another. I have chosen not to pursue this hypothesis primarily because it is not clear to me how to rule out the possibility of distinguishing among arbitrarily selected labels or features. For example, we would not want to rule in a scenario where [+finite +tense] TPs were associated with one set of phonological rules while [+def] NPs were associated with another. In Chapter 5 I return to this alternative hypothesis as a way to analyze Luganda LTD and show that, at least for this case, it is preferable to have a single type of phase that undergoes full spellout. For present purposes, the point is that the alternative hypothesis in (30) provides a way to distinguish among the levels of the prosodic hierarchy in proposals that incorporate PHT into a cyclic-spellout grammar. The questions raised by this kind of solution deserve careful consideration in future work.

2.3.3 Ishihara 2007

Ishihara (2007) argues that the Major Phrase in Japanese, the domain for downstep or catathesis after the initial pitch-accented word, is a spelled out v*P or CP phase. He adopts

a different notion of spellout-domain from Chomsky's 'phase-head complement' definition – for Ishihara, the spellout domain of a phase is the entire phase minus any adjuncts or A-bar moved material. Ishihara does not address the question of how the other levels of the Prosodic Hierarchy are derived. He does, however, examine the domain for another rule – Focus Intonation (FI), the F_0 rise on a narrow-focused element followed by down-trend of post-focal material – and concludes that it is not a constituent in the Prosodic Hierarchy at all. His motivations for this claim are primarily based on hierarchy violations – the fact that FI domains can contain other FI domains (a Recursivity violation) as well as downstep/catathesis domains. He proposes a spellout-based source for FI domains as well, arguing that they are created at the spellout of a phase that contains a focus-related functional category and a focused phrase in a syntactic Agreement relation.

Like Kratzer and Selkirk (2007), Ishihara assumes that (i) spellout domains directly correspond to certain kinds of phonological domains (an assumption also made in my proposal), and that (ii) the spellout mechanism itself can distinguish among different kinds of phases – distinguishing e.g. phases that contain wh-phrases from those that do not, and marking the former as domains for certain kinds of phonological processes. As noted above, the current model provides no means for this latter kind of distinction, and my current goal is to proceed as far as possible without allowing for this possibility. The risk, I believe, is that once we allow spellout to distinguish among phases that contain one feature from phases that do not, we open the door for a wide range of unattested phenomena – e.g. rules that apply to all spellout domains except those that contain AdjPs, or [+def] nouns.

Since Ishihara does not address the question of how the other levels of the Prosodic Hierarchy are derived, his proposal could easily be couched in either a direct- or an indirect-reference framework. The same questions would arise under either approach – given that Japanese seems to have evidence for phonological domains of various sizes (Beckman and Pierrehumbert 1986), how does the spellout domain as it is defined here interact with other

factors to produce the required domains? This same question arises in Dobashi (2003, 2004a,b), discussed next.

2.3.4 Dobashi 2003, 2004

Dobashi (2003, 2004a,b) advances a proposal that has many key properties in common with the current proposal. The basic idea is that phonological domains are spellout domains: ‘[T]his is a null hypothesis. Since spellout is the only interface operation that connects syntax with [the phonology], the output unit of Spell-Out is the only unit that may correspond to some local domain in [the phonology]’ (p. 9). Dobashi also assumes, like me, that there must be some mechanism for linearizing structures within spellout, and that this mechanism has a direct impact on the size of phonological domains.⁴ Finally, Dobashi assumes that phonological domains can be restructured by purely phonological principles, and this restructuring is predicted to be restricted in scope, as in the current proposal.

Although Dobashi assumes a PHT grammar, the proposal does not in fact require any reference to special prosodic structure at all – the unit that Dobashi calls the Phonological Phrase could just as easily be viewed as the spellout domain itself. There is an assumption, however, that of the various units in the Prosodic Hierarchy, ‘the phonological phrase is the prosodic category that is defined by the syntax-phonology mapping’ – i.e., while a language may have various phonological rules applying to domains of different sizes, only *one* of these rules, namely the Phonological Phrase-level rule, should be clearly syntax-sensitive. It is not clear how the other units in the Prosodic Hierarchy are derived, or how the phonological phrase ends up being related to them hierarchically. By itself, the

⁴The proposals differ in how this idea is implemented, however. For Dobashi, structures are linearized ‘at spellout,’ *before* they are sent to the phonological component; furthermore, the leftmost element is held back so that linear order between the current cycle and the next cycle can be established.

proposal is not equipped to handle a language like French or Luganda, which have *multiple* syntax-sensitive phrasal rules.

2.3.5 Interim conclusion

I would like to emphasize that arguments for or against any of these four proposals do not necessarily represent arguments for or against PHT. In fact, I have tried to show that many aspects of these proposals could just as easily be adopted into a direct-reference grammar. Ko (to appear), for example, adopts Kratzer and Selkirk's proposal that phrasal stress is assigned to the highest unit within a spellout domain, but incorporates it into a direct-reference grammar that shares many features of Pak (2006) and the current thesis. Similarly, phase-based proposals in Legate (2003), Adger (2006), Kahnemuyipour (2005), and others are theory-neutral insofar as they do not argue explicitly for or against a prosodic hierarchy.

My main question in reviewing these four PHT-based proposals is to what extent they account for the following tension:

- (31) a. On the one hand, phrasal phonological rules are cross-linguistically constrained by the syntactic constituent structure in a way that rules out e.g. (12)...
- b. ... but the phrasal phonology is also notoriously variable and complex, allowing for both multiple-domain effects and variable-domain effects.

We saw that for Cheng and Downing (2007) and Dobashi (2003, 2004a,b), the phase spellout-domain provides a domain for *one* type of phonological alternation – but there is no prediction about additional phrasal domains in any given language, other than the prediction that they will unify into a strictly layered hierarchy. Kratzer and Selkirk (2007) and Ishihara (2007) account for multiple-domain effects by associating different phonological rules with different *kinds* of phase heads – an interesting alternative to the current proposal

that I return to in Chapter 5. Kratzer and Selkirk (2007) argue furthermore that there is an independent set of phonological principles that may alter these spellout domains, and the crucial question is just how drastic these modifications can be.

A further issue has to do with how syntactic structures are linearized within PHT approaches. While e.g. Kratzer and Selkirk (2007:8–9) acknowledge that linearization is done as part of spellout, and that it must precede the application of phonological rules, the formal mechanism that achieves linearization is not described. If linearization is done in steps as outlined here, establishing linear order over larger and larger objects, we might ask to what degree the Prosodic Hierarchy duplicates these structures and introduces a redundancy into the grammar.

We have seen that there are a number of open questions with regard to (i) to what extent spellout domains can be modified, (ii) how the phase head and phase edge are handled by the phonology, (iii) whether different kinds of phases can be associated with different kinds of spellout, and (iv) if so, how to impose the right constraints on this kind of variability. These are all extremely important questions for future research on the role of cyclic spellout in phonological interactions. I hope to have clarified the extent to which the ‘direct vs. indirect reference’ question bears on them.

2.4 Some further comparisons

In this final section I review a set of case studies that highlight some of the similarities and differences between PHT and the current model. I will show that while both theories provide a way to model multiple-domain effects, they make different predictions about strict-layering and rule-ordering effects (see also Chapter 1).

2.4.1 Multiple-domain effects

As we saw in Chapter 1, it is possible for a language to have multiple phrasal rules, with each rule applying to a different-sized domain. The main premise of PHT – that universal grammar provides a hierarchically arranged set of prosodic constituents to be used as phonological domains – straightforwardly accounts for this fact. The current model does so as well, but by different means: phonological domains in this model are syntactic objects at different stages of the derivation, rather than derived prosodic constituents.

In Chapter 1 we saw examples of multiple-domain effects from Luganda and Zinza. Luganda has three phrasal rules – L-Deletion, H-Anticipation, and Elision – which apply to domains of gradually increasing size. Zinza has two tone rules, H-Deletion and Lapse Avoidance, which also apply to different-sized domains. In this section I would like to point out that multiple-domain effects have also been observed with the *same* rule, or slightly different versions of the same rule, applying to different-sized phrasal domains. These effects can also be captured under either the current model or PHT.

French liaison is one such case. It is well-known that liaison is frequent or obligatory between prenominal adjectives and nouns, but much less frequent between nouns and postnominal adjectives:

- (32) a. *Frequent/obligatory liaison*: des petits_employés
b. *Optional/formal liaison*: exploitations_agricoles

Selkirk (1986) and De Jong (1990) propose that liaison applies at (at least) two different levels of the Prosodic Hierarchy, which are derived as follows:

- (33) a. *Domain for frequent/obligatory liaison*: Align the right edge of a \mathbf{X}^0 with the right edge of a Small Phonological Phrase (SPP).⁵

⁵De Jong makes a further distinction between SPP's and Prosodic Words, which serve as domains for frequent and obligatory liaison respectively.

- b. *Domain for optional liaison*: Align the right edge of a **XP** with the right edge of a Maximal Phonological Phrase (MPP).

The specific proposal relies on a syntactic analysis where (i) postnominal adjectives are right-adjoined at the N' level; and (ii) prenominal adjectives have a special status as heads of specifiers and thus are not recognized as 'real' heads by the algorithm in (33a). The basic idea is that liaison applies within the SPP for all speakers/styles, but only applies within the MPP in certain contexts (e.g. formal or careful speech).

This idea can be implemented within the current model as well. We can begin by proposing that frequent/obligatory liaison applies after 'early Concatenation' – i.e. at the same stage when Luganda LTD applies (see Chapter 1 §1.3.2). Early Concatenation establishes linear order over a *uniformly right-descending* structure within a spellout domain. Assuming that French prenominal adjectives are Adj heads that take nP complements (cf. Abney 1987), liaison will be correctly predicted to apply in prenominal contexts like (32a).⁶

The optional liaison that occurs in contexts like (32b) applies after a later stage of Concatenation, which establishes linear order between a head and a following word that is *not* in its complement. Assuming that the postnominal adjective *agricoles* in (32b) is located outside of the nP that contains *exploitations* – either because it is right-adjoined to nP or because the nP has moved to a specifier position above the adjective (Cinque 2005) – the Concatenation statement *exploitations*∧*agricoles* will not be formed until this later stage in the derivation. In sum, then, frequent/obligatory liaison is an early (head-left) Concatenation rule, while optional/formal liaison is a late (phrase-left) Concatenation rule

⁶At the same time, Concatenation rules can impose additional conditions on rule application based on specific morphosyntactic features and categories; e.g. Luganda LTD only applies in certain verb tenses (see Chapter 5). This could be what prevents liaison from applying between non-light verbs and full-DP complements (Pak and Friesner 2006).

(see Chapter 5 for more discussion of head-left and phrase-left Concatenation). Certain cases where liaison is absolutely forbidden, e.g. between the two adjectives in (34), could be attributed to the demarcation of spellout domains: for example, stacked postnominal adjectives like *irritants* in (34) could be reduced relative clauses, which obligatorily form their own spellout domains and thus can never participate in liaison with preceding material.

(34) corpuscules bleus_∅ irritants

A number of questions remain open about liaison in other syntactic contexts (see e.g. De Jong 1990, Moisset 2000). My purpose here has been simply to show that the current model, like PHT, can potentially account for multiple-domain cases where ‘the same’ rule applies to domains of different sizes, with slightly different effects at each level. Some further case studies that could be analyzed in this light include Tsonga H-spread (Kisseberth 1994, Downing 2002) and Taita tone shift and delinking (Odden 2001).

2.4.2 Ordering predictions

The current proposal makes a number of predictions with respect to rule ordering that are not made in PHT. In general, rules that apply to smaller domains are predicted to *precede* – and thus potentially (counter)feed or (counter)bleed – rules that apply to larger domains. More specifically:

1. Rules that can only ‘see’ two M-words at a time within a given spellout domain (i.e. Concatenation rules) must precede rules that can see *n*-ary strings of M-words.
2. If a rule is identified that must apply strictly from left-to-right (or right-to-left) across a string of words, e.g. a rule that lowers a H tone if another H-toned word precedes it, the rule must apply after Chaining has taken place. It is therefore predicted to follow any Concatenation rules in the language.

3. Rules whose domains systematically vary in size with speech rate – becoming larger in faster speech and smaller in slower speech – are predicted to follow non-rate-sensitive rules.

At the end of Chapter 1 I presented evidence from Luganda and Zinza that Prediction 1 is borne out. Finding evidence for or against the other predictions remains an important task for future work. It is important to recognize that these predictions are an inevitable consequence of the current theory; PHT, on the other hand, does not necessarily make any association between domain size and rule ordering. Although some theorists have assumed that the levels of the Prosodic Hierarchy are built bottom-up, with each set of rules applying immediately after the relevant constituent is formed (see e.g. Hayes 1989, Hyman 1990, McHugh 1990), this idea is by no means entailed by the theory; in OT-based versions of PHT, for example, there is no reason to expect ‘bottom-up’ over ‘top-down’ effects in the surface phonology.

2.4.3 Strict layering

As noted in §2.1, PHT strictly rules out configurations like the following:

- | | | | | | | | | | | | | | | | |
|--------|---------------------------------|--------------------|--|--|--------------------|--------------------|--|--------|-------------|---------|--|--------|---------|-------------|--|
| | a. Misaligned boundaries: | | b. Containment reversal: | | | | | | | | | | | | |
| (35) | (----) (----)
... (----) ... | | <table style="border: none; width: 100%;"> <tr> <td style="width: 15%;"></td> <td style="width: 30%; text-align: center;"><i>Utterance 1</i></td> <td style="width: 30%; text-align: center;"><i>Utterance 2</i></td> <td style="width: 25%;"></td> </tr> <tr> <td style="vertical-align: top;">rule A</td> <td style="text-align: center;">(---) (---)</td> <td style="text-align: center;">(-----)</td> <td></td> </tr> <tr> <td style="vertical-align: top;">rule B</td> <td style="text-align: center;">(-----)</td> <td style="text-align: center;">(---) (---)</td> <td></td> </tr> </table> | | <i>Utterance 1</i> | <i>Utterance 2</i> | | rule A | (---) (---) | (-----) | | rule B | (-----) | (---) (---) | |
| | <i>Utterance 1</i> | <i>Utterance 2</i> | | | | | | | | | | | | | |
| rule A | (---) (---) | (-----) | | | | | | | | | | | | | |
| rule B | (-----) | (---) (---) | | | | | | | | | | | | | |

While configurations like (35a) will generally be ruled out by my proposal as well,⁷ configurations like (35b) will not necessarily. In Chapter 1 I argued that a special class of Late-Linearization rules introduce some variability into the phrasal phonology, allowing

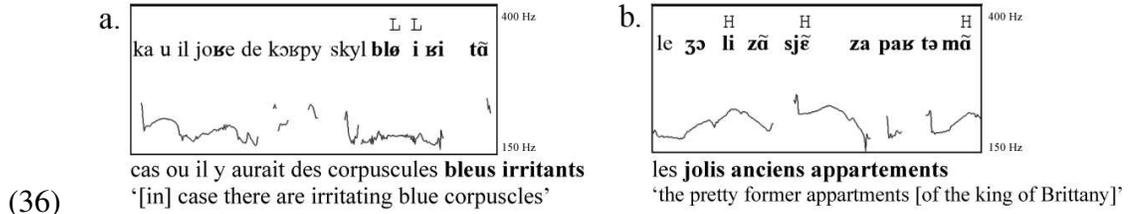
⁷See Chapter 6 for discussion of a possible case of this type from Xiamen Chinese.

separate spellout domains to be merged in fast speech and allowing a single spellout domain to be broken apart in slow speech. If Rule A in (35b) is a Late-Linearization rule while Rule B is a Chaining rule, we could observe this kind of ‘containment-reversal’ – a single Chain could be split in Utterance 1 while two Chains are merged in Utterance 2.

At the end of Chapter 1 I showed that containment-reversals are in fact attested in Luganda – presenting an immediate problem for PHT. In this section I present a further case of this type from French, also discussed in Pak and Friesner (2006); see Scarborough and Jun (2003) and Post (1999) for similar results.

In addition to liaison, French has a rule that assigns final prominence (increased pitch, amplitude and length) to the final non-schwa syllable of a phrase. French words are not lexically contrastive for stress; instead, words pronounced in isolation are regularly marked with final prominence, as well as an optional (and weaker) prominence on the first or second syllable in longer words. In phrasal contexts, several words can be grouped together into a single accent domain, so that domain-medial words may remain unaccented (see Fougeron and Jun 1998, Jun and Fougeron 2000, 2002 for more discussion).

When liaison and phrasal accent were examined in tandem in a reading task in Pak and Friesner (2006), accent domains were found to be sometimes larger and sometimes smaller than liaison domains. In (36a), for example, *bleus* and *irritants* belong to a single accent domain (since this sequence is L-toned throughout until the final syllable). However, as noted above, liaison is forbidden between two postnominal adjectives (and correspondingly does not apply here), suggesting that the example contains two separate liaison domains. In (36b), the same speaker has applied liaison both between *jolis* and *anciens* and between *anciens* and *appartements*. However, there are three H tones distributed over these three words, indicating that they form at least two separate accent domains.



- (37) *Accent:* (...bleus irritants) (jolis anciens)(appartements)
Liaison: (...bleus)(irritants) (jolis anciens appartements)

Within the current model, this containment-reversal is explained as follows:

- Liaison is a Concatenation rule, applying between pairs of M-words within a spellout domain. Phrasal accent is a Late-linearization rule, which has the option of merging separate spellout domains in fast speech or splitting a single spellout domain apart in slower speech.
- In (36a), *irritants* is spelled out separately from *corpuscules bleus*, perhaps by virtue of being a relative clause (see Cinque 2005 for some precedent for this idea). Therefore, Liaison cannot apply between *bleus* and *irritants*. However, late in the derivation, these spellout domains are merged into a single domain for the Late-Linearization rule of Phrasal Accent.
- In (36b), *jolis anciens appartements* all belongs to a single spellout domain, and Liaison correspondingly applies throughout the string. Late in the derivation, however, this spellout domain is split apart into separate domains for the Late-Linearization rule of Phrasal Accent. Liaison has already applied when this Chain-splitting takes place, and so its domains are unaffected.

The current model is able to account for these mismatches because it allows different phrasal rules to apply at *different stages* in the PF derivation, and to have different sets

of corresponding properties. In PHT this kind of distinction cannot be encoded.⁸ To the extent that cases like those described above are recognized within PHT, they have generally been handled by claiming that one of the two domains involved has a distinct status in the grammar, such that it does not belong to the prosodic hierarchy in the first place (see e.g. Post 2000 for such an explanation of domain mismatches in French). Perhaps the best-known formalization of this intuition is the theory of *precompiled phrasal phonology* (Hayes 1990), in which rules like French liaison are treated as cases of allomorphy rather than true phonological rules. We will look closely at precompilation theory and other ‘lexical’ or ‘allomorphic’ treatments of Liaison in Chapter 6; the conclusion I will arrive at is that these proposals require that we significantly relax the standard locality conditions on

⁸There is another case of an apparent Layeredness/Headedness violation from Luganda, reported in Hyman (1987), Hyman and Katamba (2004) and also discussed in Seidl (2001). The domain conflict involves the rules of L-Tone Deletion (LTD, see Chapter 1) and Final Vowel Shortening (FVS), which shortens a word-final long vowel. The boldfaced word-final vowel is the primary indicator of phrasing in (1): if its underlying L surfaces as H, there is a single LTD domain; and if it is long rather than short, there is a single FVS domain. These examples reveal a hierarchy violation parallel to (7b)—sometimes LTD and FVS domains are coextensive ((1a)–(1b)), sometimes LTD domains are larger (1c), and sometimes FVS domains are larger (1d) (Hyman et al. 1987, Hyman 1987, Seidl 2001).

- (1) a. tw-áá-ly-**áá** kô ‘we ate a little’ (one LTD domain, one FVS domain)
 b. te-tw-áá-ly-**à** mù-pùunga ‘we didn’t eat rice’ (two LTD domains, two FVS domains)
 c. tw-áá-ly-**á** mú-pùunga ‘we ate rice’ (one LTD domain, two FVS domains)
 d. te-tw-áá-ly-**àà** kô ‘we didn’t eat a little’ (two LTD domains, one FVS domain)

While this looks like another example of the relevant type, I do not believe that this particular case represents a true containment reversal. Rather, I believe that LTD domains are always at least as large as FVS domains, but that LTD can be blocked by additional morphosyntactic criteria *within a given domain*. (In other words, (b) and (d) both contain a single LTD domain, but the rule is blocked by a [neg] feature on the verb.) FVS, on the other hand, applies strictly within an M-word.

allomorphy, thus admitting a host of unattested interactions. It is also extremely difficult to identify a cohesive class of phonological rules that can be analyzed as ‘allomorphic’ – Luganda HTA, for example, which can participate in a containment-reversal with a rule of Elision (Chapter 1 §1.3.4), cannot easily be analyzed as a case of allomorphy because it renders changes across an n -ary string of adjacent words, rather than just on a single word in a narrowly defined context.

2.5 Conclusion

This thesis advances a direct-reference, multiple-stage model of the syntax-phonology interface that does not incorporate any version of Prosodic Hierarchy Theory (PHT). I have devoted this chapter to the question of whether we can satisfactorily account for attested patterns without the prosodic hierarchy. My goals were:

- to revisit some of the earlier arguments against direct-reference approaches, and show that they do not pose a threat to the model advanced here;
- to raise some questions about the role of *phase theory* in PHT, in particular how spellout domains are incorporated into the prosodic hierarchy and to what extent they can be ‘readjusted’ or overridden by phonological principles;
- to compare some of the predictions of the two models.

In the last section I showed that my model makes an ordering prediction that is not made by PHT, and that PHT makes a strict-layering prediction that is not made by my model (see also Chapter 1 §1.3.4). Evidence from French and Luganda supports the current model in both cases. Teasing apart the predictions of both models, and finding additional evidence for or against them, remains an important task for future research.

Chapter 3

Tone and syntax in San Mateo Huave

In this chapter we'll use a case study from Huave to illustrate some of the central points of this thesis. Huave is an isolate language spoken in four villages in southeastern Oaxaca, Mexico. The facts presented here are all taken from the dialect of Huave spoken in the village of San Mateo del Mar, which is argued to be only dialect that has preserved a system of lexical tone contrast from Proto-Huave (Suárez 1975). The role of pitch in the other three dialects has not yet been investigated in detail.

In San Mateo Huave, a (L)H(L) melody is assigned to phrasal units that appear to correspond, with striking regularity, to certain types of syntactic constituents (Pike and Warkentin 1961, Noyer 1991). I present findings from a new corpus of Huave speech that help clarify exactly what kinds of syntactic constituents are involved in this phenomenon. Working from the basic hypothesis advanced here – that syntax-phonology interactions are *transparent* in the default case – I lay out a model that accounts for the basic observed pattern and also accommodates possible areas of variability. One of the consequences of this type of approach is that the phonology can be viewed as a source of information about the underlying syntactic structure. We will see that taking phonological evidence

seriously in this sense can lead to new insights about the syntax that might otherwise remain unnoticed.

3.1 The basic pattern

San Mateo Huave exhibits one of the hallmark properties of tone languages – the use of different pitch contours to distinguish lexical items that are otherwise phonologically similar. As illustrated below, Huave words pronounced in isolation have exactly one pitch peak, a high tone (H), which usually docks on the final syllable. In some cases this H is immediately followed by a low tone (L), producing a falling tone on the final syllable (HL) (2). Whether a given word ends with H or HL is an arbitrary property of the particular vocabulary item; cf. the minimal pairs in (1a)/(2a) and (1b)/(2b). Any syllables preceding the pitch peak are regularly assigned L.¹

- | | |
|--|---|
| <p>(1) Words with final H</p> <p>a. kàwák ‘sapodilla (a fruit tree)’</p> <p>b. chíl ‘black mojarra (a fish)’</p> <p>c. ndeór ‘mud’</p> <p>d. nàdám ‘big’</p> <p>e. sàmpúy ‘coyote’</p> <p>f. nàxéy ‘man’</p> | <p>(2) Words with final HL</p> <p>a. kàwâk ‘south’</p> <p>b. chîl ‘needle’</p> <p>c. nàmbeôr ‘black’</p> <p>d. nàngân ‘sweet’</p> <p>e. kôy ‘rabbit’</p> <p>f. kàfêy ‘coffee’</p> |
|--|---|

¹The orthographic conventions used in Stairs and Stairs’ (1981) Huave-Spanish dictionary are adopted here in a slightly modified form: **x** = /ʃ/, **u** = /i/, **ch** = /tʃ/, **rr** = /r/, **ng** = /ŋg/, **y** = /j/, and other letters have their normal IPA values. In syllables containing glides resulting from the spreading of palatal features from surrounding consonants (usually transcribed with **e** or **i**, as in (1c)), tone is marked only on the nuclear vowel.

While the contrast between final H and final HL is easily distinguished on isolation forms, it is often neutralized in phrasal contexts. In the bracketed verb phrases in (3), for example, the boldfaced adjectives from (1d) and (2c) receive H tone throughout:

- (3) a. tím xíkè [tàhàwás **nádám** sámpúy] (< nàdám)
 yesterday I pst.see.1s big coyote
 ‘Yesterday I saw a big coyote.’
- b. tím xíkè [tàhàwás **námbeór** kòy] (< nàmbeôr)
 yesterday I pst.see.1s black rabbit
 ‘Yesterday I saw a black rabbit.’

The sentences in (3) illustrate a rule of High Tone Plateau (HTP), which spreads a H tone rightward onto any following words up to the right edge of a phrasal domain. In these examples, HTP extends rightward from the final syllable of the verb *tahawas*, wiping out the underlying tonal contrast between the domain-medial *nadam* and *nambeor* and continuing to the end of each sentence, stopping short only of the lexically marked final syllable *koy* in (3b) (see §3.2.2). HTP does not apply in (1) or (2), where each word is spoken in isolation and necessarily forms its own domain. As argued by Noyer (1991), the correct generalization for San Mateo Huave seems to be that there is *exactly one H pitch peak per phrase*, whether the phrase contains a single word (with a single H-toned syllable) or several words (with the H tone potentially extending across multiple syllables).

The question we will be primarily concerned with here is what exactly counts as a phrase for the purposes of HTP and other tone-association rules in San Mateo Huave. Pike and Warkentin (1961), the seminal work on Huave phrasal tone and previously the only primary data source that included tonally transcribed phrases, report that ‘tone is used extensively for syntactic purposes’ in Huave (627) but leave unanswered a number of questions. For example, why does the preverbal subject *xike* in (3) have its own phrasal pitch peak instead of being included in a HTP domain with the following verb – is it because it is an external argument, because there is some kind of prosodic-weight restriction on

the size of tone domains, or because it is in some clause-peripheral topic position? Pike and Warkentin note the basic pattern but do not examine the range of cases that would be needed to distinguish among these (and other) possibilities.

I present findings from a new corpus of recorded San Mateo Huave speech – consisting of 388 elicited phrases, 23 spontaneously produced phrases, and 306 read/rehearsed phrases, including SVO and VOS sentences, intransitives, ditransitives, modified verb phrases, and clausal complements and adjuncts. The principal findings are:

- (4) a. Preverbal subjects, topicalized time/place adverbs, and certain kinds of clause-peripheral elements (*wh*-words, subordinators, etc.) systematically form their own tone domains, separate from one another and from the following verb.
- b. The main verb can group together with any number of following arguments and modifiers – including a postverbal subject – up to the next clause boundary.
- c. Separate clauses (where ‘clause’ is provisionally defined as containing its own tensed verb) always phrase separately.

I will account for these facts as follows:

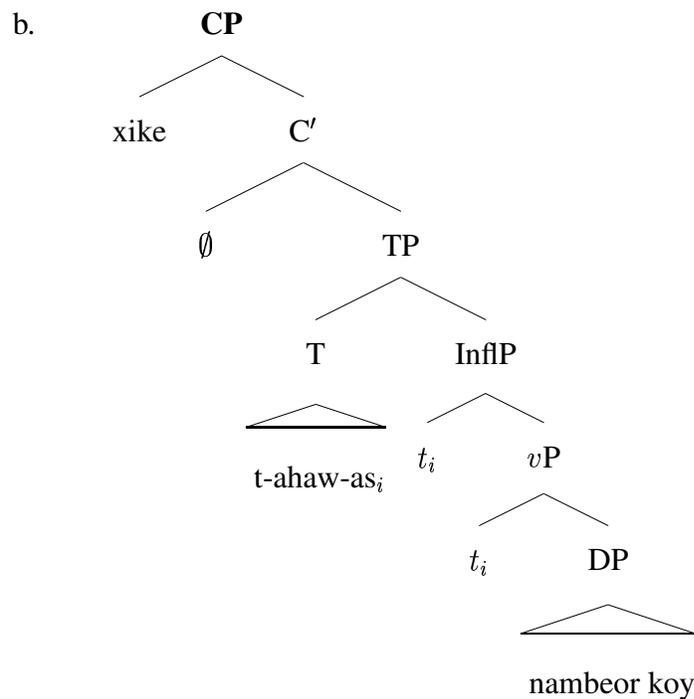
- (5) a. Syntactic structures are built up and spelled out in cycles, or phases. The *spellout domain* of a given XP includes any material below the phase head X that has not been spelled out on a previous cycle.
- b. In Huave, spellout is triggered at each CP node. Preverbal subjects and topicalized adverbs are in Spec,CP, a *phase edge* position, and thus get spelled out separately from the following verb.
- c. Within each spellout domain, an *n*-ary string of M-words is formed (Chaining). At the end of the derivation, after the contents of the last CP node have been spelled out (or ‘shipped to PF’), the separate spellout domains are linearized with respect to each other (Late-Linearization). In the default case,

each spellout domain is dealt with as a discrete chunk, but spellout domains may be combined or broken apart in fast or slow speech (rsp.).

- d. Huave tone-assignment is a Late-Linearization rule.

To illustrate, the SVO sentence below contains two spellout domains: the preverbal subject in Spec,CP and the TP complement of the C phase head. In the default case, each of these spellout domains forms its own Chain. Consequently, the subject forms one (single-word) tone domain and the verb and its complement group together to form a second:

- (6) a. *xike t-ahaw-as nambeor koy*
 1s.pro pst-see-1s black rabbit
 'I saw a black rabbit.'



- c. Spellout domains:
- i. CP edge (subject *xike* in Spec,CP)
 - ii. C complement (= contents of TP: *tahawas nambeor koy*)
- d. Chains: In the default case, each spellout domain forms its own Chain.

- i. Chain 1: xike
- ii. Chain 2: tahawas–nambeor–koy

As predicted by the current analysis, some variability is observed in Huave tone-domain formation. For example, while a verb *can* group together with all of its following arguments and modifiers (4b), it doesn't necessarily do so: some Verb-Object constituents are broken into separate tone domains. I assume that in these cases, the contents of a single spellout domain have been split apart into two or more Chains during Late-Linearization instead of forming the default single Chain. Another kind of observed variability, I will argue, reflects a difference in the underlying *syntax*. For example, I will argue that the light verb *uuch* 'give' can take various kinds of vP-like complements, some of which are full clauses and some of which are reduced clauses, and I will use both phonological and syntactic evidence to support this analysis. Some possible diagnostics for distinguishing between these two kinds of variability will be laid out in the course of the discussion.

3.2 Background on Huave syntax and tone

3.2.1 Huave morphosyntax and word order

In order to familiarize the reader with the kinds of structures we will be looking at throughout the paper, I begin with some background information about Huave word and sentence structure. This information is taken primarily from Stairs and Hollenbach's (1981) grammar, supplemented by my own field observations and studies of Huave texts.²

²The written materials examined here include the example sentences in Pike and Warkentin (1961), miscellaneous example sentences from Stairs and Stairs (1981) and Stairs and Hollenbach (1981), the first ten texts in Radin (1929) (oral narratives told by a male speaker of San Dionisio Huave), *Cuentos huaves* (2004), and the St. John's gospel translation provided by La Liga Bíblica México (2005).

Huave is a pro-drop language. Transitive and intransitive verbs are inflected for person and number agreement with the (overt or null) subject; verbs are also inflected for tense and what can roughly be called ‘finiteness’ (*n-/m-* is prefixed in an assortment of subordinate contexts, labeled ‘sub’ in the example glosses here). There is an eight-way pronominal distinction: 1, 2, and 3 singular and plural, plus a dual and an inclusive first-plural (gender is not distinguished). Subject and object pronouns are identical except that first- and second-person subject pronouns optionally end with a final harmonizing vowel. Outside of the pronominal system, subjects and objects are not distinguished morphologically (i.e. no case-marking), and number distinctions are limited to a small set of roots and derived nouns (Stairs and Hollenbach 1981:291).

Primarily for the sake of concreteness, I will assume here that the main verb in Huave raises to T(ense) in the syntax to acquire tense and agreement inflection, passing through an intermediate head (which I will call Infl) where mood or finiteness is distinguished. The resulting complex T head includes (roughly in the order listed): tense features distinguishing present (\emptyset), preterite (*t-*), and future (*ap-/sa-*), among others; a *n-/m-* ‘subordinate’ prefix that presumably spells out [-finite]/[irrealis] on Infl in certain contexts (e.g. in imperatives, purpose clauses, under T[+future] (Stairs and Hollenbach 1981:323-325)); a theme vowel; the verb root; and person and number agreement features copied from the subject.³

- (7) **ap- m- a- xom -uw**
 T[+fut]- Infl[-finite]- Theme- Root[\sqrt{find}] -Agr[3pl]
 ‘they will find’

The position of the subject with respect to the verb is variable in Huave. Perhaps for this reason, ‘basic’ word order in Huave has been described both as VOS (Fromkin

³See Stairs and Hollenbach (1969) and Matthews (1972) for further details about verb morphology. Note that person and number exponents are realized sometimes prefixally, sometimes suffixally, and sometimes ‘split’ between the two positions; see Noyer (1994), Embick and Noyer (2006) for details and analyses.

and Rodman 1998: 470) and as SVO (Campbell et al. 1986: 547, SIL International Ethnologue). According to (Stairs and Hollenbach 1981: 335), the position of the subject is influenced by the transitivity of the verb:

- (8) ‘In intransitive sentences that have a subject, the most frequent order is VS. In transitive sentences that have a subject, the most frequent order is SVO.’ (translated from Spanish)

Dryer (1997, 2005) reports that transitivity plays a similar role in word order in the Mexican languages Huastec, Tepehua, and Michoacán Nahuatl, as well as in the Austronesian languages Iai and Muna. A plausible explanation for this pattern (at least for Huave) is that in a significant portion of intransitive sentences – namely those with unaccusative verbs – the ‘subject’ is merged as an object and is allowed to remain in situ instead of raising to Spec,vP or Spec,TP.⁴ In other words, the asymmetry noted in (8) could have to do with argument structure rather than (just) transitivity: if unergatives were examined separately, they might be found to have the same default subject-initial order as transitives (and

⁴Note that Huave unaccusative verbs, like other verbs, agree with the ‘subject’ in person and number:

- i. xowuy a-pat-uw xe-pet
 much th-be.fierce-3p 1-dog
 ‘My dogs are very fierce.’ (Stairs and Stairs 1981: 48)

Under the account just proposed, the verb *apat* in (i) would be agreeing with a structural object rather than a structural subject. The idea that object-agreement is available in Huave is supported by sentences like *t-a-ngal-as-uw a kawuy* (past-see-1s-3p det horse; ‘I see the horses’), where the plurality of a direct object (whose number would otherwise be undistinguished) is indicated by a plural suffix on the verb. Moreover, the *n-/m-* subordinate prefix in InfP is sometimes conditioned not only by (non)finiteness but also by whether the verb it attaches to takes a direct object or not: *t-amb-as n-andok tixem* (pst-go-1s 1.sub-fish shrimp; ‘I went to fish shrimp’ vs. *t-amb-as s-andok* ‘I went to fish’) (Stairs and Hollenbach 1981: 291,324). Such pairs indicate that the object is somehow ‘visible’ to the embedded verb, again suggesting that object-agreement is available in Huave.

likewise, if unaccusatives were isolated, they might turn out to be overwhelmingly verb-initial simply because Huave is VO rather than OV). A larger corpus study of spontaneous Huave discourse will be needed in order to verify this hypothesis.

In the meantime, it is worth emphasizing that the statement in (8) describes a tendency rather than a hard-and-fast rule. VOS sentences, in particular, occur alongside their more frequent SVO counterparts in all of the corpora examined here, and our informants generally accepted VOS sentences as grammatical in out-of-the-blue contexts. While further corpus studies may show that the choice between SVO and VOS is constrained by information-packaging principles (focus, relative salience in the discourse, etc.), we at least know at this point that Huave VOS is more freely available than the superficially similar English ‘afterthought’ construction below:

(9) He_i really annoys me, John_i (I mean).

John in (9) is introduced as a repair device, to aid the hearer in identifying the referent of *he*; it is also phonologically separated from the preceding content by an independent pitch contour and an optional intervening silence (Grosz and Ziv 1998). While afterthought constructions may very well be available in Huave as well, the overwhelming majority of postverbal subjects in our corpus do not have these properties: they are used in both first and second repetitions of the same utterance and occur in read and rehearsed speech, suggesting that they are planned rather than corrective, and – as we will see below – they are not set off by pauses or pitch changes but are systematically included into the same phonological domain as the preceding predicate.

The following examples demonstrate the range of available word orders just discussed:

(10) SV:

- a. ahkuw a hael kiah xowuy aw
 such the cloth that much fade

‘That kind of cloth fades a lot.’ (Stairs and Stairs 1981: 76)

- b. nahtah ngo m-a-ndium
woman not sub-th-want
‘The woman didn’t want to.’ (Radin 1929: 4)

(11) VS:

- a. t-a-peay mi-noh
pst-th-arrive pos-spouse
‘Her husband arrived.’ (Radin 1929: 4)
- b. a-ntsorr-uw a pet
th-bark-3pl the dog
‘The dogs bark.’

(12) SVO:

- a. namix kich atsohch-uw a paleta
little little lick-3pl the popsicle
‘The children lick the popsicles.’ (Stairs and Stairs 1981: 218)
- b. maria a-wichwich mi-chiig-neh ti-how
Maria th-rock pos-younger.sibling-3s in-hammock
‘Maria rocks her little sister in a hammock.’ (Stairs and Stairs 1981: 77)

(13) VOS:

- a. t-a-mbiy mi-wakux naxey kam
pst-th-kill pos-cow man this
‘This man killed his cow.’ (Radin 1929: 2)
- b. t-a-toing xe-kamis a sats
pst-th-catch 1pos-shirt the thorn
‘The thorn caught my shirt.’ (Stairs and Stairs 1981: 191)

VSO order, another logical possibility, occurs in Radin (1929) and St. John’s gospel when the object is a quotation or complement clause. I assume that the word order in such cases results from extraposition of the object. In fact, I will assume that this type of extraposition is obligatory, since VOS order in sentences where the object is fully clausal is so far unattested:

- (14) a. ngom m-a-haw t_i naxey kam [tiul mintah a-kiiub]_i
 not sub-th-see man this if wife th-accompany
 ‘This man didn’t realize that his wife was with him.’ (Radin 1929: 4)
- b. * ngom m-a-haw [tiul mintah a-kiiub] naxey kam

3.2.2 Basic tonal melodies

In general, it is easy to tell where tone domains begin and end in Huave. There is exactly one pitch peak per domain, so any time we see a fall from H to L (e.g. at the end of the subject *xike* in (3)) we know that a tone-domain boundary has been reached. However, the exact shape of the (L)H(L) tonal melody varies considerably from phrase to phrase: the H pitch peak may be realized on a single syllable or spread over several syllables, may be preceded by a series of L tones, or may surface as part of a HL contour tone. While these distributions may seem irregular or even random at first sight, Noyer (1991) shows that they are in fact systematically constrained by the syllable structure and underlying tones of the morphemes that comprise a given domain. I briefly review his analysis here, with the aim of making subsequent examples in the paper maximally clear to the reader.

The basic claim in Noyer (1991) is that tone and stress in San Mateo Huave are both calculated by the same metrical grid (Halle and Vergnaud 1987). More precisely, tone-association rules are argued to apply to a constituent defined by the grid – the line 2 foot – the end result being that the location and extent of the pitch peak on a given phrase are largely predictable.

Most Huave words end with heavy syllables, which regularly receive primary word stress.⁵ The small class of function words and loanwords that end with light syllables (e.g.

⁵I am abstracting away from the computation of word-internal secondary stress; my grids are therefore one level shorter than Noyer’s (my line 2 corresponds to Noyer’s line 3 and so on). Aside from being possible docking sites for phrasal H and lexical L, stressed syllables are distinguished from unstressed syllables by the full voicing of the /Vh(C)/ rime (compare the boldfaced second syllables in *taxehpius* ‘I bathed’ (no

xike ‘I,’ *tele* ‘TV’) have penultimate stress instead. Noyer accounts for this pattern with the following grid-construction rules:

- (15) a. Syllable heads are stress-bearing units and are projected onto line 0.
 b. The final segment of a word is extrametrical.
 c. Line 0 feet are unbounded and right-headed; heads are promoted to line 1.

Rule (15)c produces default final stress for words ending with heavy syllables (e.g. *kafey* ‘coffee’). Rule (15)b prevents a word-final vowel from being projected onto line 0, so that words like *xike* and *tele* receive penultimate stress.⁶

(16) Word-level stress

a.	1	*	b.	1	*
	0	(* *)		0	(*)
	kafe<y> ‘coffee’			xik<e> ‘I’	

The metrical grid continues to be built up as larger syntactic objects are computed. Specifically, Noyer argues for an ‘inner cycle’ in which right-headed line 1 feet are constructed, and an ‘outer cycle’ in which left-headed line 2 feet are constructed.

- (17) a. Inner cycle: Line 1 feet are unbounded, right-headed. Promote heads to line 2.

2				*
1	(*	*)	(*	*)
0	(*	*)	(*	*)
	nerraa<r> kafe<y>			

stress), *taxe**eb*** ‘s/he bathed’ (primary stress), and *taxe**eb**asan* ‘we bathed’ (secondary stress)). A further stress correlate is the unrounding and depalatalization of vowels in the syllable following secondary stress (e.g. *tamòngosón* → *tamòngasón* ‘we passed’) (Rolf Noyer, p.c.).

⁶For current purposes the rules in (15) are adequate, but other formalizations are probably possible. The basic observation is that Huave has right-aligned moraic trochees, although there are a few words that end with a heavy syllable followed by a light syllable (e.g. the 1pl inclusive subject pronoun *ikootsa*) that might present a challenge for the idea that moraic trochees are quantitatively balanced cross-linguistically (cf. Hayes (1995)).

- b. Outer cycle: Equalize stress (i.e. add a line 2 asterisk above newly-introduced words). Line 2 feet are unbounded, left-headed. Promote heads to line 3.

3		*					
2		(*			*)		
1		*		(*	*)		
0	(*	* *	*)	(*	*)	(*	*)
	tanganeo<w> nerraa<r> kafe<y>						

The crux of Noyer’s proposal is the idea that *the line 2 foot is the domain for three tonal rules*, which I will call Lexical L Licensing, Phrasal H Insertion, and High Tone Plateau (HTP).

(18) Line-2 tonal rules in San Mateo Huave Huave (ordered):

- a. Lexical L Licensing: Certain morphemes have an underlying L tone; this ‘lexical L’ is licensed only at the right boundary of a line 2 foot and deleted elsewhere.
- b. Phrasal H Insertion: Assign H to the head of a line 2 foot (i.e. the vowel that projects the leftmost line 2 asterisk). If this vowel already has lexical L, a HL contour tone is produced.⁷
- c. High Tone Plateau (HTP): H spreads rightward within the line 2 foot.

A further rule, called Default L, assigns L to all toneless syllables at the end of the derivation.⁸

⁷See Evanini (2007) for possible correlations between vowel length and contour tone.

⁸Since the syllables that receive Default L are inevitably located at the left and right edges of the domain, Default L could probably be reanalyzed as %L and L% boundary tones. This adjustment might provide a way to account for non-L final unstressed syllables in yes-no questions (e.g. the final M tones on xikónà ‘(Is it) us?’ (< xikónà; Pike and Warkentin 1961:642)) and possibly in other environments as well (e.g. lists, vocative chants). It would also circumvent one arguably odd feature of Noyer’s account, viz. that L is both the default tone and the tone used for lexical marking.

Noyer illustrates these rules with several examples from Pike and Warkentin (1961). A sample derivation is shown in (19), repeated from (17). The line 2 foot, the domain for the rules in (18), is boldfaced, as are the tone-bearing units that are affected by each stage of rule application.

(19) ‘S/he drank hot coffee.’

line 3	*		
line 2	(*		*)
line 1	*	(*	*)
line 0	(* * *)	(* *)	(* *)
	tanganeo<w> nerraa<r> kafe<y>		
a. Lexical L:	tanganeow nerraar kafèy		
b. H insertion:	tanganeów nerraar kafèy		
c. HTP:	tanganeów nérráár káfèy		
d. Default L:	tàngàneów nérráár káfèy		

Kafey has a Lexical L tone, which is licensed because it appears at the right edge of the domain (19a). Phrasal H is then assigned to the head of the line 2 foot – the leftmost asterisk, in this case *-neow* (19b). HTP applies next, spreading Phrasal H rightward through the line 2 foot (19c). Finally, Default L tone is assigned to the pretonic syllables *tanga-* (19d).

If a noun phrase is pronounced in isolation, a line 2 constituent is still formed, but without any new material being introduced between the first and second cycles. The shape of the phrasal pitch peak is therefore predicted to be somewhat different. Consider (20):

(20) ‘hot coffee’

line 3		*
line 2		(*)
line 1	(*)	(*)
line 0	(*) (*)	(*)
	nerraa<r> kafe<y>	
a. Lexical L:	nerraar	kafèy
b. H insertion:	nerraar	kafêy
c. HTP:	NA	
d. Default L:	nèrrààr	kàfêy

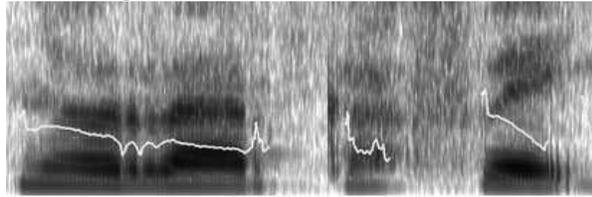
Unlike the tensed verb phrase in (19), which has a sustained H plateau, the noun phrase in (20) has a sustained pretonic default L followed by a HL contour tone. Both structures have the same basic (L)H(L) melody, however, as predicted by Noyer’s analysis.⁹

Figures 1 and 2 below show pitchtracks and spectrograms for (20) and (19), respectively. In Figure 2, the verb phrase is part of an SVO sentence. Notice that the preverbal subject in this sentence is treated as its own tone domain, with a pitch peak on the final syllable; this is part of a robust tendency for preverbal subjects to phrase separately that will be discussed in more detail below.

⁹As it turns out, the (L)H(L) melody is not always skewed rightward in noun phrases and leftward in verb phrases; our corpus contains several examples of HTP applying within isolation noun phrases (e.g. **nóik nákánts chípìn** ‘one red tomato’), and Pike and Warkentin (1961:638) include verb phrases where Phrasal H docks on the object rather than the verb (e.g. **teàsàhàw òlám** ‘I’m seeing sugarcane’). The present study is primarily concerned with how domains are formed, rather than with where phrasal H docks within each domain, and the discussion here does not rely crucially on the idea that noun phrases are right-headed while verb phrases are left-headed. One possibility is that the docking site of phrasal H is influenced by the focus structure of the sentence, so that e.g. a default accent on a verb is deleted if the verb is presupposed. The current model is compatible with a number of possible treatments of accent placement/deletion – including grids, trees, etc. – and could in theory be treated as either an early-linearization or a late-linearization rule. At this point there is no evidence that variation in accent placement within a domain affects the breakdown into domains itself, so I believe the question of where phrasal H docks can safely be set aside for future work.

- (21) **Figure 1.** Noun phrase *nèrrààr káfèy* ‘hot coffee’ in isolation.

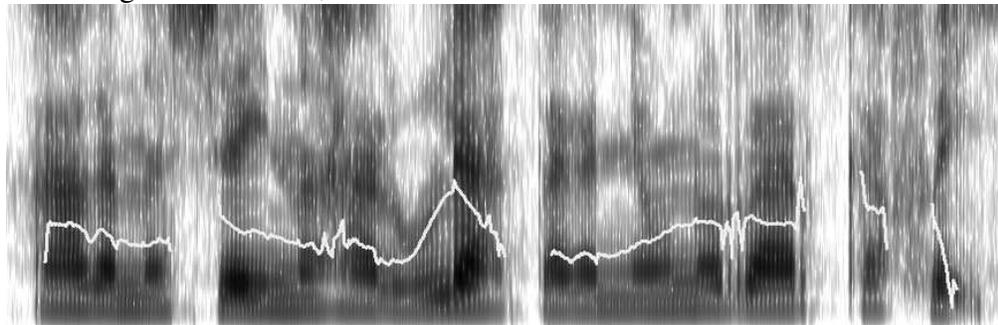
Pitch range: 150-400 Hz, Duration: 1.208 s.



n e r a r k a f e y

- (22) **Figure 2.** Noun phrase *nèrrààr káfèy* ‘hot coffee’ as object in an SVO sentence.

Pitch range: 150-400 Hz, Duration: 3.367 s.



a a g a n a x e y n a h a l o l e a h t a n g a n e o w n e r a r k a f e y

- (23) *ààgà nàxèy nàhàl òleâh tângàneów nèrrààr káfèy*
 the man long body drink.pst hot coffee
 ‘The tall man drank hot coffee.’

To summarize, Noyer (1991) shows that tones are assigned at the level of the phrase, rather than the word, in San Mateo Huave. His analysis accounts for the following facts:

- (24) a. Each phrasal domain – a unit containing at least one word – has exactly one H pitch peak (i.e., there are no words that surface with two pitch peaks when pronounced in isolation, like **nípìlán* (cf. *nìpìlán* ‘people’)).
- b. The pitch peak must begin either on a heavy word-final syllable or immediately before a light word-final syllable (ruling out e.g. **nèrrààr káféy*, **nàdàm tèle*).

- c. If one or more words follow the beginning of the pitch peak within the phrase, the pitch peak extends rightward to the end of the phrase, stopping one syllable short iff (i) the final syllable is lexically marked with L tone, or (ii) the final syllable is light. (I.e., there is at most one L tone at the right edge of the domain, ruling out e.g. **tàháwás nípilàn.*)
- d. Syllables preceding the pitch peak are always L (meaning, among other things, that no word in isolation can be HH, e.g. **nádám*).

These basic generalizations are consistent with the data in Pike and Warkentin (1961) and are confirmed by the current study as well. There are probably other ways of formalizing the type of object that Noyer's tone-association rules apply to – e.g. by replacing the metrical grid with a ToBI-style prosodic hierarchy in the tradition of Beckman and Pierrehumbert (1986) et seq. – but the rules in (18) appear to derive the correct generalizations about the tonal composition of Huave phrases, and for current purposes we can assume that they apply to some kind of phrasal domain. The question I address here is how exactly utterances are parsed into phrasal domains in the first place.

3.3 Questions for the current study

Noyer (1991) does not offer a formal answer to the question of how tone domains are defined; that is, he shows that SVO sentences are mapped to metrical structure at two separate cycles but does not offer an explicit definition of the cycle that could be generalized to a wider range of sentence types. This is of course because the descriptive facts about other sentence types were not available until recently. Noyer's principal data source, Pike and Warkentin (1961), focuses primarily on (S)VO sentences and includes enough examples to establish the following patterns:

(25) Pike and Warkentin (1961):

a. A verb groups together with a following direct object noun phrase (DO) or adverbial modifier (or both, as shown in (ii)):

i. (tằ̀dòmúw nóik nánghá mánchìuk)
pst.find.3p one holy iron
'They found a bell.'

ii. (sàhàw nàhén nóp tìud)
1s.see quickly one tick
'I quickly see one tick.'

b. Preverbal subjects do *not* group together with the verb, but form their own tone domains ('When a noun (or pronoun) precedes the verb, functioning as subject, it is tonally independent of the verb' (639)):

i. (xíkè) (sànèngóch)
I 1s.meet
'I meet (him).'

ii. (nèhìw) (àhòyíw ómál sàp)
they carry.3p head sheep
'They carry a sheep's head.'

But a number of questions are left unanswered. The data gathered for the current study allow us to address at least three of them:

Question 1: Given that V(O)S order is available in Huave, what is the tonal behavior of *postverbal* subjects? Pike and Warkentin (1961) provide two tonally unambiguous examples that suggest that postverbal subjects group together with the preceding verb:

(26) a. (làntsàhyáw xíwìs)
damp.part my.hand
'My hand is sweaty.'

b. (mònxyé néhìw)
pl.man 3p.pro
'They're men.'

But (26a) and (26b) are both predicative constructions, lacking a tensed verb, and it is unclear if the postverbal NPs here are subjects or objects. A wider range of cases, including VOS sentences, were collected here in order to determine whether the pre- vs. postverbal subject distinction has a consistent effect on the phonology. Our results indicate that it does (i.e., postverbal subjects consistently group together with the verb); moreover, a similar pre- vs. postverbal contrast was found with certain kinds of adverbials.

Question 2: Does a verb *always* group together with following material – regardless of how much material the tone domain ends up containing? What happens if a verb takes *two* NP objects, for example, or if it is followed by a clausal complement or adjunct? Pike and Warkentin (1961) include some examples that suggest that separate clauses form their own tone domains (27); the current study confirms this basic result and examines some points of apparent variation:

- (27) a. (nìpílán) (àpìùng-úw) (àp-m-àndeòw-áàts)
 people say-3p fut-sub-die-1p/incl
 ‘People say we’ll die.’
- b. (t-àsáh chúk nèh) (ì-yák ápìx)
 pst-say part 3s.pro 2-put clothes
 ‘He reportedly said to him, put on clothes.’

Question 3: Finally, within the context of this dissertation, we would like to know what kind of rule Huave tone-melody assignment is, i.e. at what stage in the derivation tone-melody assignment takes place. To review:

- (28) a. **Concatenation rules** apply within each spellout domain, as linear relations are established between pairs of M-words. As such, they are (i) highly local, unable to ‘see’ more than two M-words at a time; and (ii) unaffected by speech rate or other information that becomes available later in the derivation.
- b. **Chaining rules** apply later in the PF derivation, after an *n*-ary string of M-words has been created internal to each spellout domain.

- c. **Late-linearization rules** apply when separate spellout domains are linearized with respect to one another. These rules use Chains as discrete chunks in the default case, but may merge Chains together (e.g. in fast speech) or split Chains apart (e.g. in slow or careful speech), depending on performance-related factors that come into play late in the derivation.

Based on what we have seen so far, we can already tell that Huave tone-assignment rules are unlikely to be early/Concatenation rules. As shown by Noyer (1991) (§3.2.2), the characteristic feature of Huave tone phrasing is that it takes an entire phrase – potentially containing more than two M-words – and treats it as a *single object* for the purposes of H-placement, HTP, etc. This type of effect would be extremely difficult to formalize with Concatenation statements. To see why, consider examples (21)–(22) from above once more:

- (29) a. nèrrààr kàfèy
hot coffee
‘hot coffee’
- b. t-àngàneów nérráár káfèy
pst-drink hot coffee
‘S/he drank hot coffee.’

If we tried to treat the VO sentence in (29b) as the output of a Concatenation rule, we would have to argue that tones were assigned separately to each of the following domains:

- (30) a. tanganeow^ˆnerraar
b. nerraar^ˆkafey

But in order for the last M-word, *kafey*, to surface correctly as *káfèy* rather than *kàfèy* (cf. the isolation NP in (29a)), it has to ‘know’ that it is the object of a VP rather than just (part of) an NP in isolation – i.e., it has to ‘see past’ the immediately preceding M-word *nerraar* to the verb *tanganeow*. Any time a phonological rule requires reference to

material spanning a domain larger than two immediately adjacent M-words, the current model forces us to conclude that it applies after Chaining.¹⁰

The next question is whether Huave tone domains vary in size depending on rate, rhythm, and other information that becomes available late in the derivation – a hallmark property of late-linearization rules. Pike and Warkentin (1961) suggest in passing that tone domains may be rate-sensitive (639), but do not investigate the question in detail. We will see some evidence below that speech rate does play a role in Huave tone phrasing. Perhaps more interestingly, we will see that this kind of variability does not completely destroy the effects of the spellout-domain boundaries – in other words, the rule does not end up looking completely structure-free. This is another characteristic feature of late-linearization rules, and we will see how this property allows even variable phrasal rules to be viewed as a reliable source of information about the underlying syntax.

3.4 Data collection and analysis

Most of the data discussed in this section are taken from a ‘core corpus’ of 411 recorded phrases elicited during linguistic interviews in July 2004 and July 2006 in San Francisco del Mar and San Mateo del Mar, Mexico. All six speakers who contributed to the corpus are native to San Mateo and bilingual in Spanish and Huave (although F4 learned Spanish late in childhood). Most of the material was elicited by presenting a phrase in Spanish and asking for the Huave equivalent. In some cases, some or all of the expected Huave words were provided with an English-style ‘questioned-list’ intonation and the informant

¹⁰We could argue that Huave tone-assignment rules apply both early *and* late, with the late-stage application effectively canceling out the early-stage application. This would in fact look much like the cyclic model assumed by Noyer (1991). This type of analysis is certainly compatible with the current model, but since its effects would be indistinguishable from the ‘late-linearization only’ approach, I will assume the latter for simplicity’s sake.

was asked to (i) judge whether the resulting sentence was well-formed and (ii) say it out loud if it was. Speakers were usually asked to repeat each phrase once. In the handful of cases where the tone phrasing changed from one rendition to another, the two tokens were counted separately. Otherwise, each phrase counted in the corpus represents a distinct type.

Table 3.1: Huave study participants

speaker	# phrases	sex	age (approx.)	occupation/family
F1	14	F	12	daughter of F2
F2	149	F	35	mother of F1
F3	38	F	40	weaver; married to M1
F4	88	F	14	domestic service
M1	45	M	40	fisherman; married to F3
M2	99	M	20	student

The core corpus also includes 23 spontaneously produced phrases, all of which were uttered by M2 during interludes of conversation with his mother.

Where noted, I have included results from an extended corpus consisting of 306 read and/or rehearsed phrases: excerpts from the online Jesus film (www.jesusfilm.org), a recording of John 1:1-20 provided by La Liga Bíblica México, 40 sentences from free-verse poems composed and read aloud by M2, and 24 sentences that were presented in Huave orthography and read aloud by speaker F4.

In general, the tone-domain parsing could be detected using a combination of impressionistic judgments and pitchtrack analysis. However, ambiguous cases of at least three types occurred. First, some utterances are syntactically ambiguous, independent of the placement of tones. In (31), for example, the 3sg pronoun *neh* could be either a sentence-final subject or a noun-phrase-internal possessor (which would make the possessor unambiguously 3sg rather than 2sg).

(31) (àsóónd mí-kámís nèh)

- a. [[remove poss-shirt] 3s] ‘S/he removes his/her/your shirt.’

- b. [remove [poss-shirt 3s]] ‘(S/he) removes his/her shirt.’

Furthermore, there are phonologically ambiguous cases where it is unclear whether two adjacent words belong to the same tone domain or separate tone domains. In (32), repeated from (3b), *tim* and *xike* could be separate domains (each with their own phrasal H) or a single tonal phrase (where phrasal H docks on *tim* and spreads to *xi-*).

- (32) a. (tím) (xíkè) (tàhàwás námbeór kòy)
 b. (tím xíkè) (tàhàwás námbeór kòy)
 yesterday I pst.see.1s black rabbit
 ‘Yesterday I saw a black rabbit.’

Finally, there are cases where tonal distinctions are perceptually indistinguishable. If the /i/ in the subject pronoun *xike* ‘I’ is devoiced, for example, it is impossible to tell if the word is HL (and thus separate from a following verb) or LL (and thus phrased together with a following verb). Furthermore, particularly at low amplitudes, the range of pitches within an utterance sometimes becomes more compressed than is usual for the speaker; in such cases it is difficult to tell whether e.g. a rise of 10 Hz should ‘count’ as a shift from L to H or not.

Certain cases of the last type – where it was impossible to distinguish L and H tones throughout the utterance – were excluded from the tonal analysis entirely. Other ambiguous cases were treated differently depending on the question being investigated. (32), for example, was treated as ambiguous with respect to whether preverbal subjects and adverbs are grouped together or not, but was counted as unambiguously demonstrating that a verb groups together with a following object (since the relevant part of the sentence, *tahawas nambeor koy*, is syntactically and phonologically unambiguous).

3.5 Observations from the current study

3.5.1 The verbal tone domain

The main verb can group together with multiple following arguments and modifiers.

Returning to the questions posed in §3.3, consider first the sentences below. In (33), a verb and its direct object are followed by a locative adverbial; (34) is a sentence with *uuch* ‘give,’ which takes two objects, and in (35) the head of the direct object is followed by a phrasal modifier. In all three sentences, H-tone plateau extends from the last syllable of the verb to the end of the utterance (domains in parentheses):

- (33) (tàxòmás nóts kóchíl sálín)
pst.find.1s one knife Salina.Cruz
‘I found a knife in Salina Cruz.’ (vvv20)
- (34) (nèhîw) (tàhchúw nérráár yów námbeór íchweàik)
they pst.give.3p hot water black monkey
‘They gave hot water to a black monkey.’ (vvv33)
- (35) (xíkè) (sàngànéów cháw pópóx xówúy lángàn)
I 1s.drink atole foam very sweet
‘I drink very sweet foam atole (a warm drink).’

These examples show that the Huave verb can potentially group together with any number of following NP/DP arguments and modifiers. The resulting tone domain – which I will refer to as the *verbal tone domain* for convenience – may be both phonologically and semantically heavy compared to the preverbal tone domain, which in (34) and (35) contains nothing but a pronominal subject. One implication of this finding is that there is no ‘single-object’ limit on the Huave verbal tone domain; i.e., nothing forces tone-domain boundaries to be inserted at every right *XP edge*, as has been argued for phrasal phonological rules in e.g. Chimwiini (Selkirk 1986, Truckenbrodt 1999). If such a requirement were in place,

we would expect the verbal tone domain to end after *kochil* in (33), after *yow* in (34), and after *popox* in (35).

A second implication of these examples is that rhythmic uniformity, or a principle of equal or gradually increasing weights of phonological domains (see e.g. Ghini (1993)), plays at most a secondary role in Huave tone. The two tone domains in (34) and (35) are heavily unbalanced, with a single M-word forming the first domain and the five remaining M-words grouping together into a second. A logically possible, more eurhythmic alternative might be to group the subject and the verb into a single domain, with the remainder of the predicate in a second domain:

(36) Hypothetical alternatives to (34)–(35)

- a. (nehiw tahchuw) (nerraar yow nambeor ichweaik) (S V) (DO IO)
- b. (xike sanganeow) (chaw popox xowuy langan) (S V) (DO AdjP)

But examples like (36) are so far unattested. What this suggests is that there is something about the juncture between the preverbal subject and the verb that the phonology ‘respects,’ even if the resulting domains are not well-balanced prosodically.

To explain these facts, I provisionally assume that the verbal tone domain is a TP constituent. Within the current model, this TP constituent forms a single tone domain because it is spelled out and linearized as a single unit, by virtue of being the complement of the *phase head* C. Preverbal subjects are located above C, at the phase edge, and thus get spelled out separately.

(37) Basic proposal:

- a. Syntactic structures are built up and spelled out in phases; the output of each phase potentially serves as a phonological domain.

- b. In Huave, CPs are phases. The spellout domain of a given CP phase includes any verbs, arguments or modifiers below the phase head C – presumably a TP constituent in the monoclausal examples seen so far.¹¹
- c. Preverbal subjects are in Spec,CP, a ‘phase edge’ position; this explains why they are spelled out in separate tone domains in (34) and (35).

This basic proposal makes an initial prediction about the composition of tone domains, which I address next.

Prediction 1: The verbal tone domain does not necessarily begin with a verb.

Although the main verb is the leftmost element of the domain in the examples we have seen so far, the current proposal does not necessarily predict that this should always be so. If Huave allows TP-adjoined adverbs, for example, these will be predicted by (37) to belong to the same tone domain as the following verb. (I follow Stairs and Hollenbach (1981) in using the term ‘adverb’ to refer to an uninflected word that modifies a verb with respect to time, duration, location, direction, intensity, manner, and so on.) Similarly, if

¹¹One question that might arise at this point is why *v* does not count as a phase head in Huave, since it has been assumed since Chomsky (1999) that CP and ‘strong’ *v*P are the two basic phase types. There are at least two possible ways to answer this question. One is to argue that *v* *is* in fact a phase head in Huave, but that we never see the effects of spellout at this phase because all *v*P-internal material obligatorily raises to higher projections. (For example, *v* raises to T and objects raise to Spec,InflP or Spec,*v*P to satisfy Case and/or agreement requirements.) This approach would in fact provide an interesting way to account for VOS order, as shown in the Appendix. Another tack would be to argue that *v*P is not necessarily a phase head cross-linguistically; the implication of this approach would be that languages could vary with respect to which types of heads count as phase heads, perhaps by selecting different points along a scale (CP > *v**P > *v*P > DP...). At the moment I do not have the evidence needed to distinguish between these two approaches for the Huave case at hand, although we will see in the next chapter that there are other languages where spell-out domains appear to be larger than *v*Ps.

there is additional functional structure between TP and CP (NegP, FocusP), this material is also predicted to be spelled out with the main verb.

In the corpora examined here, the preverbal negator *ngo* and the preverbal intensifier *xowuy* are consistently L-toned, indicating that they have grouped together with the following verb. (Notice that the verb under *ngo* is marked with a subordinate prefix and is unmarked for tense, suggesting that *ngo* might head Tense itself):

- (38) a. (**ngò** n-àndíúm tén náchích
 not sub.1-want cherry bitter
 ‘I don’t want the bitter cherry.’ (cg)
- b. (**xòwùy** àndíùm) (m-àtsôh)
 very want sub-play
 ‘He wants to play very much.’ (avv37)

A similar pattern is found with the relativizer *leaw* and a handful of other clause-initial items (e.g. *pa(ra)* ‘in order to’). I take the L-tone marking on these items to indicate that they occupy functional projections between CP and TP, so that they end up being included the verbal tone domain even though they precede the verb.¹²

The extended corpus also contains a number of preverbal manner adverbials – including *atkiah* ‘like that’ and *nahneahay* ‘very well’ – whose H tones spread onto the verb:

- (39) a. (**àtkiáh** t-ámóngóch-ìw) (mòndeàk àndeàk teàt diòs tànómb)
 like.that pst-suffer-3p hearers word lord god before
 ‘So suffered the prophets before us.’

¹²Another possibility is that these items are located in C, but that the phase head C (unlike the phase edge, Spec,CP) can be spelled out together with its complement, contra Chomsky (1999). As far as I am aware there is very little phonological evidence that phase heads and phase edges group together; none of the phase-based proposals reviewed in Chapters 1 and 2 demonstrate this pattern, and in fact some of them predict that the phase head will group with its complement. We will see in Chapter 4 that the phonological behavior of items in C in Luganda is ambiguous, and thus inconclusive. I leave this as a question for future investigation.

- b. (nàhneàháy íich m-ápák í-meáhts-án)
 very.well 2.cause sub-strong 2-heart-pl
 ‘It will strengthen your hearts very well; it will make you very happy.’
- c. (nàleáing í-píung) (teât)
 truth 2-speak lord
 ‘You speak truthfully (the truth), sir.’ (JF 7:43)

At this point it is not possible to specify exactly where these preverbal modifiers are located in the clause. It could be that manner adverbs are first-merged as TP adjuncts, or they could be merged as specifiers of a functional projection between TP and CP. Alternatively, they could move to a functional projection between TP and CP to fulfill some discourse-related requirement (cf. FocusP in the work of Aissen (1992) and Rizzi (2006)). The important point for present purposes is that, as predicted by (37), the verbal tone domain in Huave is not necessarily verb-initial.

Verbal tone domains containing multiple M-words can be split apart.

We have seen evidence that Huave tone domains can be very unbalanced prosodically, suggesting that certain aspects of the syntactic constituent structure must be preserved even at the expense of eurhythmy. This does not mean, however, that rhythmic well-formedness plays no role at all in the language. For example, if Huave tone domains are formed during *Late Linearization*, the proposal in (37) leaves open the possibility that a spelled-out TP constituent could be broken apart into separate domains in slow and/or careful speech.

This kind of variability does appear to be a feature of Huave tone domains. In many examples from our corpus, a given string was rendered as a single tone domain by one speaker but as two separate tone domains by another – and a few cases like (40), the same speaker produced two different parses of the same string.

(40) (S) (V DO AdjP) vs. (S) (V DO) (AdjP)

- a. (xíkè) (sàngàneów cháv pópóx xówúy lángàn)

- b. (xíkè) (sàngàneów cháv pópóx) (xòwùy làngân)
 I drink.1s atole foam very sweet
 ‘I drink very sweet foam atole (a warm drink).’

(41) (V DO IO) vs. (V) (DO IO)

- a. ... (ap-m-úúch ákókiáw chípín mí-kwál xé-kómbúl)
 fut-sub-give five tomato poss-son 1.poss-friend
 ‘...[he] will give five tomatoes to my friend’s son’
- b. ... (ap-m-ùùch) (àkòkiáw chípín mí-kwál xé-kómbúl)

(42) (V DO) vs. (V) (DO)

- a. i. (t-àpééd chípìn)
 pst-cut tomato
 ‘S/he picked tomatoes.’
- ii. (tà-n-àháw á wààr)
 pst-1.sub see det rat
 ‘I saw the rat.’
- b. (t-àpèht-îus) (à chípîn)
 pst-cut-1s det tomato
 ‘I picked the tomato.’

Some of this variation could have a syntactic source – for example, there could be two different syntactic structures for the string in (40), one where *xowuy langan* is an adjective phrase (a), and one where it is a (possibly extraposed) relative clause (b). Extraposition seems less plausible, however, for cases like (41b) and (42b). I assume that the verbal tone domains in these examples have undergone limited ‘rhythmic restructuring’ of the type described in Chapter 1: under certain conditions (e.g. in slow or careful speech), it is possible for Chaining to string together only a subset of the M-words contained in a spellout domain, then stop and deal with the rest of the M-words in a separate Chain. As a result, two phonological domains will be produced instead of one.

Notice that the resulting ‘restructured’ domains do not necessarily correspond to syntactic constituents of any obvious type (cf. *sanganeow chaw popox* in (40b)), nor are their

boundaries consistently aligned with right XP edges (cf. the verbs *apmuuch* in (41b) and *tapehtius* in (42c)). The Chaining mechanism is allowed a certain amount of freedom: internal to a given spellout domain, it can insert a break at one juncture without necessarily inserting a corresponding break at the next juncture of the same type. It is important to recognize, though, that this particular kind of variability – i.e. the variability that is produced when the Chaining mechanism stops short internal to a spellout domain and produces two chains instead of one – will not cause Huave tone domains to look completely ‘structure-free,’ nor will it allow mismatched (S V)(Adj O) parses like those in (36). This is because separate spellout domains still form separate Chains in the default case, as we will see next.

3.5.2 Preverbal tone domains

Preverbal subjects and topicalized time/place adverbs form their own tone domains.

The question I address now is what happens with material *preceding* the verbal tone domain in Huave. I begin by looking at **adverbs of time and place**. Our main corpus contains 48 examples of the time/place adverbs *tim* ‘yesterday,’ *nganuy* ‘now; today,’ *oxep* ‘tomorrow,’ and *ninguy* ‘here,’ all of which can be either preverbal or postverbal. The preverbal instances ($n=35$) uniformly formed their own tone domains, while the postverbal instances ($n=13$) uniformly phrased together with the verb.

(43) Preverbal time/place adverbs:

- a. (**tím**) (tàxòmás ákókiáw pès)
yesterday pst.find.1s five peso
‘Yesterday I found 5 pesos.’ (vvv23)
- b. (ìkórà) (**ngànúy**) (tàxòmár ákókiáw pès sálín)
pro.dual today pst.find.dual five peso Salina.Cruz
‘Today you(sg) and I found 5 pesos in Salina Cruz.’ (zss21)

(44) Postverbal time/place adverbs:

- a. (mìkwàl xèkòmbúl) (àpmúúch **óxép** ákókiáw chípín áágá nàxéy kiàh)
poss.son 1.poss.friend fut.give tomorrow five tomato det man there
'My friend's son will give five tomatoes to that man tomorrow.'
- b. (xíkè) (tànàmóng **tím**) (< tànàmông)
I pst.pass yesterday
'I passed yesterday.'

This pattern is also found with overt **subjects** in Huave. As discussed in §3.2.1, Huave subjects can be either preverbal or postverbal. Almost without exception, preverbal subjects form their own tone domains, while postverbal subjects group together with the verb and other arguments and modifiers. Examples (43b) and (44a–b) above illustrate the first part of this pattern, and (45)–(49) illustrate both parts with a series of contrasting pairs.

- (45) a. (nìngúy) (**òlám**) (ngò m-àtàng)
here cane neg 3s-grow
'Sugarcane doesn't grow here.'
- b. (nìngúy) (ngò m-àtàng **ólám**)
- (46) a. (**nèhìw**) (t-àhàw-úw nákánts ólám)
3p.pro pst-see-3p red cane
'They saw red sugarcane.'
- b. (t-àhàw-úw nákánts ólám **nèhìw**)
- (47) a. (**pét**) (àntsôrr)
dog bark
'The dog is barking.'
- b. (àntsôrr-úw á **pèt**)
bark-3p det dog
'The dogs are barking.'
- (48) a. (**xíkè**) (t-àxèhp-íus)
I pst-bathe-1s
'I bathed.'

b. (tàxèhpíús á xíkè)¹³

(49) a. (xíkè) (ngò n-àráng náhiut)
pro.1s not sub.1-do work
'I'm not working.' (avv40, avv41)

b. (ngò nàráng ná'ut á xíkè)
neg sub.1-do work a pro.1s

Out of more than sentences with preverbal subjects from our main and extended corpora, there was only one case where the apparent subject phrased together with the following verb (and in this particular case it is unclear what the intended meaning was):

(50) (nèhíw ákiándìw)
pro.3p stick.3p
'They fight / stick(?)' (Spanish stimulus: *ellos se pegan*) (cg29-29)

Our main corpus also includes 20 tokens with both a preverbal subject and a preverbal time/place adverb. In all 20 cases, the subject and the adverb phrased separately from each other, regardless of their respective order:

(51) (Subject) (Adverb) (Verb) (see also (43b))

a. (mìkwàl xèkòmbúl) (òxêp) (àpmúúch ákókiáw chípín áágá nékiàch)
poss.son my.friend tomorrow fut.give five tomato det teacher
'Tomorrow my friend's son will give five tomatoes to the teacher.' (zss57)

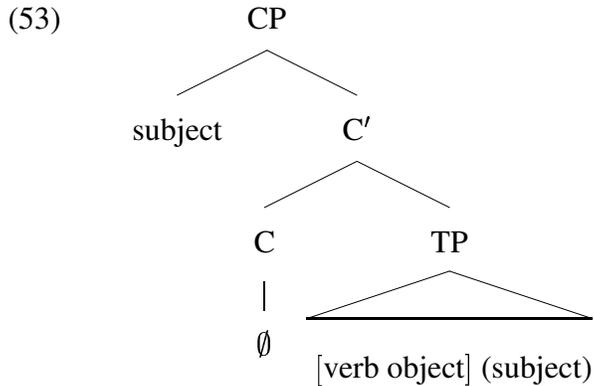
¹³The status of the vowel between the verb and the subject here is unclear. In some cases a is probably a reduced form of the definite determiner aaga (Stairs and Stairs 1981:3), as indicated in many of the other glosses in this paper, but this analysis is unlikely to be correct in examples where the following word is a pronoun or proper name. In our corpus, these extra vowels show up variably in the following contexts: between a verb phrase and a following subject, between a noun and a postnominal adjective, and at the end of a question; in St. John's gospel it also shows up occasionally before an indirect object. In some of our recordings the vowel harmonizes with the preceding verb (*taxeeb e aaga naxey* 'the man bathed', an example that also suggests that this is not a case of phonological epenthesis). I leave the analysis of this vowel for future research.

- b. (xìkónà) (tím) (tà-n-àlik-ián námíx nínè)
 pro.1p yesterday pst-1-scold-1p little child
 ‘Yesterday we scolded the child.’ (cgg28-29)

(52) (Adverb) (Subject) (Verb)

- a. (nìngúy) (òlám) (ngò màtâng)
 here cane not sub.grow
 ‘Sugarcane does not grow here.’
- b. (òxêp) (ààgà mìkwàl xèkòmbúl) (àpmúúch ákókiáw chípín áágá
 tomorrow det poss.son my.friend fut.give five tomato det
 nékiàch)
 teacher
 ‘Tomorrow my friend’s son will give five tomatoes to the teacher.’

The robustness of the tendency for preverbal subjects and time/place adverbs to form their own tone domains is taken as an indicator that they are *spelled out separately from the verb* – i.e., preverbal subjects and time/place adverbs occupy a position in the clause outside the cut-off point for the spellout domain that includes the verb and its following arguments and modifiers. Specifically, as noted in (37c) above, preverbal subjects are assumed to be in Spec,CP, part of the phase edge. The contrast between the (a) and (b) examples in (45)–(49) then follows from the assumption that *preverbal subjects are located higher in the structure than postverbal subjects*. The only position for preverbal subjects in Huave is apparently the phase-edge position Spec,CP; TP-internal subjects are by default postverbal, whether this is because they are right-specifiers (as argued for Mayan in Aissen (1992)) or because the verb and objects obligatorily raise above them. (See the appendix for further discussion of VOS syntax in Huave.)



The fact that each clause-edge constituent phrases separately, as demonstrated in (51)–(52), is taken as evidence that there can be recursive layers of CP structure at the top edge of the clause; since spellout is triggered at *every* CP node, every preverbal constituent is spelled out separately.

Prediction 2: Postverbal subjects sometimes get separated from the rest of the verbal tone domain

Within the current proposal, postverbal subjects are assumed to be located lower in the clause than preverbal subjects; they are part of the TP and are consequently spelled out together with the main verb (see Appendix for more details). If this proposal is on the right track, we might expect postverbal subjects to show the same kind of tone-phrasing variability as we observed with postverbal *objects* in (40)–(42) above. In other words, since we know that the verbal tone domain can be split up into smaller units in e.g. slow or careful speech, then this possibility should be available whether the verbal tone domain contains a postverbal subject or not.

Correspondingly, out of 57 V(O)S sentences in our main corpus, there were 5 unambiguous cases where the subject formed its own tone domain. In one case there was an extended silence (353 ms) preceding the subject, suggesting that it was added as an afterthought and quite plausibly did belong to its own spellout domain. In the other cases,

however, there was no intervening silence. The extended corpus also contains examples of this type:

- (54) a. (àl-m-àmeày-îw) (nèhîw)
 prog-sub-sleep-3p pro.3p
 ‘They’re sleeping.’ (cg28-76)
- b. (ngòmè àp-m-àmbeól nèh) (nikwàhînd)
 neg fut-sub-help pro.3s nothing
 ‘Nothing will help him.’ (JF 8:18)

Prediction 3: Spellout domains can be broken apart or merged together, but not both.

In addition to cases where a tone domain is broken up into separate units during Chaining in e.g. slow or careful speech, the current model also allows for the opposite type of effect: two separate spellout domains can be merged together into a single Chain in fast speech. So far I have not seen any clear examples of this second type in the Huave corpora; (50), noted above, is the only candidate for such an analysis but its intended meaning and structure of that sentence are not clear. Pike and Warkentin (1961:639) speculate that preverbal subjects may group together with verbs in fast speech: ‘possibly a more rapid form leads to a non-junctural fusion as in *xíké sánéngóch* [‘I met (him)’]’, but it is unclear whether the two examples they include are attested or hypothetical.

Our particular data, then, include many examples of Chaining breaking apart spellout domains, but only one possible example of the reverse type, where Chaining merges together two separate spellout domains. This is in fact what we expect given the type of corpora examined here, which are made up almost entirely of elicited and read/rehearsed speech – i.e. careful speech. It is likely that evidence for ‘Chain-merging’ will become available when more examples of spontaneous and unmonitored speech are examined. This current model would be equipped to handle such cases, without ruling in unattested ‘mismatched’ parses like the ones given in (36) above and shown schematically below:

- (55) Syntactic structure: [S [V [DO AdjP]]
↗ Phonological parse: * (S V) (DO AdjP)

The phrasing in (55) could only be produced if both types of rhythmic restructuring applied to the same utterance – i.e. if ‘Chain-merging’ joined the subject and the verb together and then ‘Chain-splitting’ inserted a break after the verb. This type of phrasing might occur under exceptional circumstances, e.g. if there is a mid-utterance restart, but such cases are predicted to be recognizably deviant in normal contexts. In general it does not appear to be possible for a subpart of one tone domain to ‘escape’ and join another; under the model advanced here, rhythmic restructuring is limited in such a way that automatically rules out such cases.

3.5.3 Multiclausal structures

A possible counterproposal

A question that might arise at this point is whether the patterns reported so far really provide sufficient evidence for the proposal in (37). Perhaps there is another explanation for these results, one that does not involve the idea that tone domains correspond to spelled-out syntactic objects and that therefore does not entail that preverbal subjects are structurally higher than postverbal subjects. For example, we might hypothesize that Huave tone domains are formed as follows:

- (56) Alternative proposal (to be rejected): Preverbal subjects and time/place adverbs have a [+topic] feature. There is a rule in Huave that maps every [+topic]-marked constituent to its own tone domain, then groups the remainder of the utterance into its own tone domain by default.

Under this proposal, the syntactic constituent structure is irrelevant – all that the phonology pays attention to is the presence of a specific feature, in this case [+topic]. The default

rule that groups together the rest of the utterance into a tone domain is structure-blind. Consequently, there is no way we can use the phonology as an indicator of the underlying syntactic structure. The postverbal subject in a VOS sentence could be as high as Spec,CP, and it would still get grouped together with the verb simply because it is part of the utterance that lacks [+topic].

This dissertation makes a strong claim that hypothetical rules like (56) are impossible. The problem is not that the rule makes reference to a specific feature (since we saw in Chapter 1 that some Concatenation rules may have this property), nor that the default-grouping part of the rule is structure-blind (the current model is compatible with the idea that there is a class of truly structure-blind rules applying at the very end of the derivation). Rather, the problem is that this rule *combines syntax-sensitivity with structure-blindness* in a way that opens the door for a wide range of unattested scenarios. If we admitted a rule like (56), we would also implicitly admit hypothetical rules like (57), which assigns each [+def] noun-phrase in the structure to its own phonological domain and groups everything else together by default:

- (57) a. Map every [+def] constituent in the structure to its own phonological domain.
Group ‘leftover’ material together.
- b. (John[+def]) (went to) (the bookstore[+def]) (to buy some coffee for) (Mary[+def])

Syntax-phonology interactions like this are not attested to my knowledge; presumably they are automatically ruled out by some general principle in the grammar. Under the hypothesis advanced in this dissertation, any phonological rule that is found to be ‘syntax-sensitive’ in a broad sense (paying attention to a particular feature, juncture strength, c-command relations, etc.) is also predicted to be constrained by the separation of the overall structure into spellout domains. Moreover, if a syntax-sensitive rule is found to require reference to more than two M-words at a time, then the default assumption is that its

domains *are* spellout domains, subject to the rate-sensitivity effects we have discussed at various points.

In the case at hand we also have independent evidence that (56) cannot be correct, as we will see next.

Prediction 4: In utterances containing more than one clause, each CP will form a separate tone domain.

Under the current proposal, the Huave tone domain is basically a clause minus its edge. Since spellout is assumed to occur at *every* CP node, the proposal makes a clear prediction that multiclausal utterances will be divided into multiple tone domains, with the boundaries between tone domains coinciding with the boundaries between spellout domains.

The first set of relevant examples show finite complements of ‘say/know’ verbs and finite clausal adjuncts. I assume that the boldfaced verbs in these examples all head their own CPs; they correspond to contexts where full CP clauses would be found in other languages; they have their own tense and agreement inflection; and there is a position in the clause for both overt preverbal subjects and overt postverbal subjects. Notice that each of these boldfaced verbs begins its own tone domain, as expected under the current account.

(58) Finite complement clauses:

- a. (nìpílán) (àpiùngûw) (**àpmàndeòwáàts**)
 people say.3p die.fut.1p/inc
 ‘People say we will die.’ (Pike and Warkentin 1961:639)
- b. (t-àhàw-ûw) (**nàkánt** ómeááts á ólám)
 pst-say-3p red body det cane
 ‘They said the sugarcane was red.’ (hugo)
- c. (pwès néh) (t-àngiáy) (teàt jèsús) (**àl-ànìùng** áágá fàriséó)
 then 3s.pro pst-hear lord Jesus be.loc-house det pharaoh
 ‘When she heard that Jesus was in the pharaoh’s house...’

(59) Finite adjunct clauses:

- a. (sà-n-àyàk-án ndòk) (kós) (**lè-m-àsáh** xík)
1fut-1sub-put-1p/ex net because 2rec.pst-sub-say 1s.pro
'We'll cast our nets because you told me (to).'
- b. (wùx teàt Simòn Pédrò) (**t-àháw**) (leàw t-àráng teát Jésús) (t-àsâh)
when lord Simon Peter pst-see rel pst-do lord Jesus pst-say
'When Simon Peter saw what Jesus had done, he said...'

The hypothetical counterproposal in (56) cannot accommodate these facts, since it blindly groups together everything in the utterance that does not carry the [+topic] feature. We could modify the proposal to make the default grouping structure-sensitive – i.e. by having the non-[+topic] material be grouped together *up to the next clause boundary* – but once this modification has been made, the option of not requiring reference to features like [+topic] at all becomes much more feasible. The phase-based analysis outlined in the previous subsection provides accounts for the relevant contrasts without requiring reference to features like [+topic].¹⁴

¹⁴It is still of course possible within the current account for preverbal subjects and time/place adverbs to have a [+topic] feature. This idea would be consistent with the fact that they are located high in the structure, in recursive projections that can be ordered freely with respect to each other (see e.g. Rizzi (2006), Aissen (1992)), and with the fact that they are set apart phonologically (cf. the 'comma intonation' typically associated with topicalization and/or clitic left-dislocation in other languages). It is unclear, however, whether Huave preverbal subjects carry all the discourse functions that are implied by the use of the term *topic* or not. Examples from the extended corpus indicate that the preverbal subject can be a nonreferential noun phrase like *nikwahind* 'nothing' or *nehingind* 'nobody,' suggesting that the Spec,CP position in Huave is not reserved for contextually salient entities or for setting up what the following discourse will be 'about.' This point is not crucial for the current thesis, since the idea here is that phonological domains reflect the location of various constituents without regard for how/why they ended up there, but it remains an important question for future research on Huave syntax.

Turning now to nonfinite verbal complements and adjuncts,¹⁵ we see that there is some variability with respect to whether the subordinate verb groups together with the matrix verb or not. Interestingly, though, the variability is not random, but appears to depend on the context: whether the nonfinite verb is being used as an adjunct or a complement, and if it is a complement, what the matrix predicate is. As shown below, nonfinite purpose clauses (60) and ‘want’-complements (61) uniformly form their own phrases, while nonfinite complements of ‘go’ and ‘cause’ sometimes group together with the matrix verb.

(60) Nonfinite purpose clauses:

- a. (ìyàk-án mí-ndók-òn) (m-èsàp-án kùt)
2-put-pl poss-net-pl sub-2.get-pl fish
‘Cast out your nets to get fish.’
- b. (sàhàlán teát bìumb) (pàrà n-àtsánts á yòw)
light.1p sir fire for 1.sub-reheat the water
‘We make a fire to reheat the water.’

(61) Nonfinite ‘want’-complements:

- a. (s-andíum) (n-àtsám kùt)
1-want 1.sub-eat fish
‘I want to eat fish.’
- b. (s-àndíùm) (n-àndeák ómbeáy-ìiùts) (pòrkè m-àhneâh)
1-want 1.sub-speak language-1p/incl because sub-beautiful
‘I want to speak Huave because it’s beautiful.’

(62) a. i. (ìkónà) (teàmbán) (ìndòkón tíxém)

- ii. (ìkónà) (teàmbán ìndókón tíxém)
pro.2p prg.go.pl 2sub.fish shrimp
‘You’re going to fish shrimp.’

b. i. (íkè) (teàmààch) (màngàneów nángán yów xékwál)

¹⁵I identify nonfinite verbs as those with the subordinate *n-/m-* prefix and no separate tense prefix.

- ii. (íkè) (teàmáách mángáneów nángán yów xékwál)
 you.sg prg.2.cause sub.drink sweet water my.son
 ‘You’re letting my son drink soda / giving my son soda to drink.’

There is a clear structural explanation available for the variability observed here with ‘go’ and ‘cause’: these predicates could be taking different-sized complements, possibly with different corresponding interpretations, in the (i) and (ii) versions above. For example, ‘go’ could be a true motion verb in (62a-i) and a future-oriented aspectual verb in (62a-ii); similarly, (62b-i) could mean ‘give my son soda to drink’ while (62b-ii) could mean ‘make/cause my son to drink soda.’ Alternatively, it could be that the interpretation is the same in each rendition, but that these predicates can appear optionally in either restructuring or non-restructuring environments (i.e. sometimes take full CP complements and sometimes take reduced InfIP complements), as suggested by Wurmbrand (2001:39ff). The main point for our purposes is that this variability is distinct from the Chaining-induced variability described in §3.5.1–3.5.2. The variability seen here affects *specific predicates*, which moreover happen to be verbs that are typically included in the class of *restructuring predicates* cross-linguistically. This suggests that the relevant distinction is made deterministically, based on the type of structure involved – e.g., if the infinitive after ‘go’ is a CP adjunct, it *must* be spelled out separately from the matrix clause. The Chaining-induced variability discussed in §3.5.1–3.5.2, on the other hand, is produced after the default parsing of structures into is not expected to differentiate among specific types of predicates or M-words within spellout domains.

If the restructuring-based analysis of variation in Huave tone phrasing is on the right track, then we might expect the notion of full vs. reduced clause to play a role in other (syntactic or semantic) operations as well. Limited evidence from VSO word orders suggests that this is in fact the case. Recall from (14) (repeated below) that clausal complements

undergo obligatory extraposition in sentences with postverbal matrix subjects, yielding surface VSO_{CL} order instead of VO_{CLS} order (where O_{CL} stands for ‘clausal object’):

- (63) a. ngom m-a-haw t_i naxey kam [tiul mintah a-kiiub]_i
 not sub-th-see man this if wife th-accompany
 ‘This man didn’t realize that his wife was with him.’ (Radin 1929:4)
- b. * ngom m-a-haw [tiul mintah a-kiiub] naxey kam

There are in fact a handful of apparent counterexamples to this pattern – cases where a subordinate verb and its arguments appear between the matrix verb and matrix subject, yielding what looks like surface VO_{CLS} order. In all of these cases, however, the matrix verb is causative *uuch* – which, as we saw in (62c) above, exhibits variable tone-domain phrasing behavior with respect to its complement verb and is therefore arguably a restructuring predicate. The examples in (64) have apparent VO_{CLS} word order, with the (bold-faced) matrix subject appearing last, while (65) has the VS_{CL} order that I assume is the result of clausal extraposition.

- (64) a. (nêh) (t-íun) (ùùch nêh m-ìun **teàt diôs**)
 3s.pro pst-come give 3s.pro sub-come lord god
 ‘He came; God sends him / makes him come.’ (Spanish: enviado por Dios)
- b. hoguy xike t-iun-as, t-uuch xik n-iun **Xe-teat Dios**
 here.is pro.1s pst-come-1s pst-cause pro.1s 1sub-come my-lord god
 ‘Here I have come, my lord God made me come.’ (John 5:43)
- c. t-uuch m-ahneah omeaats mi-chiig neh **a Juan**
 pst-cause sub-good heart poss-brother 3s.pro ? Juan
 ‘Juan calmed his brother (lit. made his brother’s heart happy)’
- (65) kos atkiah uuch neh [**teat dios**]_{SBJ} m-arang
 because like.that give 3s.pro lord god sub-do
 ‘Because in that way God makes/lets him do (so).’

(Spanish: así también le ha dado al Hijo (tener vida en sí mismo))

The idea here is that the ‘propositional’ substructure that is relevant for tone-domain demarcation in Huave is also relevant for syntactic operations — more specifically, that the CP that is spelled out as a single tone domain also undergoes obligatory extraposition. If this is correct, then at least the following predictions are made: (i) apparent VO_{CL}S order should only be possible if the matrix verb is a restructuring predicate; (ii) O_{CL} should always form a separate tone domain in VSO_{CL} sentences but never in VO_{CL}S sentences; and (iii) any matrix verbs that allow both VO_{CL}S and VSO_{CL} orders should also show variation in tonal phrasing. While these predictions remain to be systematically tested, they are so far consistent with the available data.

This discussion has shown that there is an advantage to taking seriously the idea that Huave tone domains correspond to certain kinds of syntactic constituents, rather than to the hybrid mix of information referred to in (56). Viewed in this light, Huave tonal phrasing interacts with the underlying syntax in a way that is familiar from other languages. Intonational chunking, for example, appears to be cross-linguistically sensitive to the relative embeddedness of adjacent constituents – a fundamental observation that has been derived in the literature by various means, including edge-marking (Selkirk 2005), sensitivity to changes in branching direction (Wagner 2005), and reference to particular constituent types (Nespor and Vogel 1986, López 2006). If the current proposal continues to be supported by other syntactic and semantic diagnostics in Huave,¹⁶ it will represent considerable progress in the understanding of Huave syntax and phonology.

¹⁶For possible semantic diagnostics see e.g. Alexiadou and Anagnostopoulou 1998, who argue that overt subjects in Greek obligatorily have wide quantifier scope and specific indefinite readings in preverbal position but not postverbal position; the idea is that the preverbal position is too high to be included in the domain for reconstruction.

Other clause-edge material

Wh-words are predicted to phrase separately from following material under the current account – assuming that they are all in Spec,CP. This pattern appears to be confirmed with *kwane* ‘what’, *neol* ‘why,’ and *hondot* ‘if/whether’:

- (66) a. (kwánè) (àp-m-àráng áágá náhtáh kiáh)
what fut-sub-do det woman here
‘What’s this woman going to do?’ (7:36)
- b. (kwánè) (indíùm) merang wux ximbas a ike
what you.want sub.do on my.body ? 2s.pro
‘What do you want to do to me?’
- c. (neól) (tàndíùm) mahaw aaga nahtah kiah
why he.wanted to.see that woman
‘Why did he want to see that woman?’ (6:34)
- d. (hòndót) (àndùy kàwúx ándérák) (ngwá) (àndùy tíut) (ngwá) (àléáing
whether goes up word or goes down or straight
íun mí-né-wíun)
comes poss-agentive-come
‘[They’re seeing] whether the word goes up or goes down or keeps going
straight.’

However, the wh-word *ngineay* ‘how,’ which carries a H tone that spreads onto the following verb in all 15 of the examples from our corpus:

- (67) (à nòik xè-kiék) (jòndót) (sàneáy) (**ngineáy** ndóm) (m-àndeâk)
det one my-bird if I.belong how can sub-say
‘A bird of mine, if it belongs to me, how do you say that?’

It is not immediately obvious why *ngineay* should pattern differently from other wh-words in Huave. In the spirit of the current project, I assume that the phonological grouping is reflecting a real difference in the syntactic structures involved here: specifically, that *ngineay* does not move as high as other wh-words or perhaps does not move at all in

the default case. We saw above in (39) that preverbal manner adverbs, unlike preverbal time/place adverbs, tend to group together with the following verb:

- (68) (**àtkiáh** t-ámóngóch-ìw) (mòndeàk àndeàk teàt diòs tànómb)
 like.that pst-suffer-3p hearers word lord god before
 ‘So suffered the prophets before us.’

The fact that the manner-oriented *wh*-word *ngineay* patterns like the manner-oriented adverbs shown here and in (39) suggests that it *ngineay* has remained in its base position, e.g. adjoined to TP or in a functional projection between TP and CP, instead of raising to Spec,CP.¹⁷ The consequences of this hypothesis remain to be tested; for example, we might expect to find that multiple *wh*-fronting is permitted just in case the second *wh*-word is *ngineay*, or we might expect to find contrasting distributions with respect to the order of *ngineay*, other *wh*-words, and preverbal subjects. The main point is that within the context of this thesis, *ngineay* must be part of the same spellout domain as the following verb, which presumably means it must be located below C. The idea that there could be a word- or feature-specific rule affecting the way separate spellout domains are Chained after the fact (‘merge Chains iff the first Chain consists of the M-word *ngineay*’) is not independently motivated to my knowledge and will be avoided here if possible.

3.6 Conclusion

As observed by Pike and Warkentin (1961), utterances in San Mateo Huave are broken down into phonological domains in a way that closely reflects their underlying syntax. This chapter has explored the exact relationship between syntax and surface tone in more detail, drawing on a new corpus of recorded phrases collected on-site. We have seen that Huave

¹⁷Wasike (2007) shows that ‘how’ agrees with the subject in the Bantu languages Lubukusu, Swahili and Runyaro, suggesting that it may be lower in the structure than other *wh*-words.

tone domains are potentially quite large – containing a verb and multiple following NP objects and/or modifiers – but that large domains can optionally be broken down into smaller ones. I took this as an indication that Huave tone-assignment is a *Late-Linearization* rule, which applies at the end of the derivation when separate spellout domains are linearized with respect to each other.

Many phonological rules that deal with multi-word objects as their domains – including what is commonly known as ‘intonational phrasing’ – have two opposing properties in common: (a) on the one hand, these domains are flexible, allowing a considerably amount of variability from utterance to utterance depending on such factors as speech rate, carefulness, and phonological weight; and (b) on the other hand, there are constraints on this variability, with certain parses having a clearly ungrammatical status. Ideally, our theory of the syntax-phonology interface will take both of these properties into account. Within the model proposed in this dissertation, certain pre-determined ‘chunks’ of syntactic structure are spelled out separately from each other, and in the default case each chunk will be a separate domain for the relevant type of phrasal phonological rule. During spellout, separate chunks may be joined together into a single domain or split into separate domains, but there is no way for a subpart of one spellout domain to ‘escape’ and join a subpart of another (except in the case of a mid-utterance repair, which, while by no means uncommon, has a predictably exceptional status).

In the next chapter we will look at a phrasal rule from Luganda that also applies to CP spellout domains, but that does not appear to have this property of rate-sensitive variability.

Chapter 4

CPs and spellout domains in Luganda

4.1 Introduction: Two phrasal tone rules in Luganda

In the next two chapters I examine two phrasal phonological rules from Luganda, a Bantu language spoken in Uganda.¹ One rule applies to domains that look quite similar to Huave tone domains, and I correspondingly propose that it applies to fully linearized Chains near the end of the PF derivation. The other rule applies to smaller syntactic objects, which are argued to correspond to partially linearized syntactic objects at an earlier stage in the derivation. Examining these rules in tandem enables us to explore one of the main predictions of this thesis – that a single language may have multiple phrasal rules, applying to different-sized objects but remaining tightly constrained by the underlying syntactic structure. We will also see how the current model sheds light on many additional properties of these rules that might otherwise go unexplained.

¹The Luganda data reported in the next two chapters were collected during interviews with three adult female native speakers from Entebbe, currently living in the Philadelphia area.

The two Luganda rules examined here both happen to produce H-plateaus. As demonstrated by the examples below, however, they apply in distinct phonological and morphosyntactic contexts:

- (1) a. **L-Tone Deletion (LTD)**: Applies between two H_nL_n words.² Deletes L on word 1 and assigns H to toneless moras between word 1 and word 2.
- i. abasómèsa bá-gùl-ir-a Kaséddè kááwà
 2.teacher 2-buy-appl-ind 1.Kasedde 1a.coffee
 ‘The teachers are buying Kasedde some coffee.’
- ii. → (àbàsómèsà) (bágúlírà Káséddè) (kááwà)
- b. **H-Tone Anticipation (HTA)**: Spreads H leftward onto preceding toneless moras, crossing at least one word boundary and stopping short of the first mora of the domain.
- i. omulenzi a-gul-ir-a Mukasa kááwà
 1.boy sbj1-buy-appl-ind 1.Mukasa 1a.coffee
 ‘The boy is buying Mukasa some coffee.’
- ii. → (òmùlènzi) (àgúlírà Múkásá kááwà)

The L-Tone Deletion (LTD) rule in (1a) is actually composed of two steps – deletion of L, followed by insertion of H on toneless moras – but since these two steps always occur in tandem I will treat them as a single process and refer to them collectively as ‘LTD.’ As noted by Hyman and Katamba (1990/1991), Hyman et al. (1987), Hyman and Katamba (2004), and others, LTD applies between two H_nL_n words *provided that the two H_nL_n words meet certain morphosyntactic criteria*. Among other things, the two words must be sufficiently ‘close’ syntactically, in a way that will be examined carefully in Chapter 5. In the example in (1a), each word in the string is H_nL_n , but LTD only applies between the tensed verb *bágùlira* and the following indirect object *Kaséddè*, as shown by the string of

²See §4.2.2 for information on word-internal tone.

boldfaced H-toned moras. LTD does not apply between the preverbal subject *abasómèsa* and the verb *bágùlira*, or between the indirect object *Kaséddè* and the direct object *kááwà* – nor does it ever apply in these contexts, as we will see in Chapter 5.

H-Tone Anticipation (HTA) applies when a $H_n(L_n)$ word is *preceded* by a word that ends with at least one toneless mora; the H tone then spreads leftward through a potentially indefinite string of toneless moras, stopping short of the first mora of the domain. In (1b), the H tone on *kááwà* spreads leftward through the toneless indirect object *Mukasa* and onto the toneless tensed verb *agulira*. It does not, however, continue to spread onto the preverbal subject *omulenzi*, even though this word is toneless; the subject shows up with default L instead.

Based on these two examples, we can already see that:

- The preverbal subject forms its own tone domain, separate from the verb, for both LTD and HTA;
- The verb groups together with the first object to its right for both LTD and HTA;
- The indirect object and direct object in a double-object structure are grouped separately for LTD, but together for HTA.

The generalization, which will become clear in the course of these two chapters, is that HTA domains correspond to *larger* syntactic objects than LTD domains. I begin by examining HTA – the rule with the larger domain, which I believe applies later in PF – in this chapter. We will see that Luganda HTA domains closely correspond to Huave tone domains (examined in Chapter 3) and yield to a similar treatment; points of divergence are generally treated as resulting from different underlying syntactic structures. Similar case studies from the literature are briefly reviewed at the end of Chapter 4, and some questions about how this treatment extends to languages like English are addressed as well. In Chap-

ter 5 we circle back to Luganda LTD and see how its structural conditions are accounted for in the current model.

4.2 A Chaining rule: Luganda HTA

Huave, examined in detail in Chapter 3, is not the only language with a phrasal phonological rule that regularly applies to some kind of ‘minimal clause.’ Kinande, Slave, Tohono O’odham, and Luganda also have phrasal rules that can plausibly be analyzed as applying to Chains after spellout of CPs. In this chapter I look closely at the Luganda case – the HTA rule demonstrated in (1a) above, described in Hyman (1982, 1990) and further investigated through my work with native-speaking consultants living in Philadelphia. The Kinande, Slave, and Tohono O’odham rules are briefly reviewed at the end of the chapter.

As demonstrated in (1b), Luganda HTA domains look at first sight very much like Huave tone domains: preverbal constituents form their own domains, while the verb plus all following clause-internal material forms a single domain. We will see that, also like Huave HTP, Luganda HTA can apply between a main clause and an arguably reduced complement clause (e.g. an infinitive under ‘want’ or ‘go’). Luganda HTA also applies, however, between a main clause and a *relative* clause (RC) – an unexpected finding under the traditional assumption that RCs cross-linguistically require a CP projection. I devote §4.4 to exploring the idea that Luganda RCs are reduced (non-CP) clauses. Among other things, I show that alternatives to the reduced-RC hypothesis require us to abandon the constrained model of the syntax-phonology interface developed here and in other frameworks, ruling in all kinds of unattested scenarios. Moreover, I show that there is independent evidence for the reduced-RC hypothesis from the (non-)availability of left-dislocation within RCs in Luganda – a fact that would be unexplained if we assumed that all RCs were full CPs.

4.2.1 Background: Luganda morphosyntax and word order

Luganda is a pro-drop, SVO language with affixal morphology on the verb marking tense, aspect, mood, voice, subject agreement and sometimes object agreement (see below). Nouns are categorized into 22 classes, or genders, each associated with a particular prefix; a harmonizing ‘initial vowel’ or ‘augment’ also occurs on nouns in certain contexts. Case is not marked.

While the default word order is SVO, OV order (as well as OSV and SOV order) can also occur in certain discourse contexts. When an object does precede the verb, the verb is obligatorily marked with an agreeing prefix. This prefix sometimes appears in VO contexts as well; I will assume that in these cases string-vacuous right-dislocation has occurred (see below). The object prefix is also used if the object is interpreted pronominally.

- (2) a. abalenzi ba-a-(mu-)lab-a Kasedde
2.boy sbj2-pst-see-ind 1.Kasedde
‘The boys saw Kasedde.’ (SVO)
- b. abalenzi Kasedde ba-a-*(**mu**-)lab-a
2.boy 1.Kasedde sbj2-pst-obj1-see-ind
‘The boys saw Kasedde.’ (SOV)
- c. Kasedde abalenzi ba-a-*(**mu**-)lab-a
1.Kasedde 2.boy sbj2-pst-obj1-see-ind
‘The boys saw Kasedde.’ (OSV)
- d. abalenzi ba-a-mu-lab-a
2.boy sbj2-pst-obj1-see-ind
‘The boys saw him/her.’ (SV)

VS, VOS, and VSO orders are also possible in Luganda, although again these variants appear to be felicitous only under limited discourse conditions. While an investigation of the discourse contexts that permit verb-first syntax is beyond the scope of this thesis, I have observed a strong tendency for these sentences to be rejected or labeled as marginal in judgment tasks – in clear contrast to V(O)S sentences in Huave, which were generally

accepted and sometimes even spontaneously produced in elicitations (see Chapter 3). One consultant reported that a sentence like (3) sounds more natural as an answer to a question like ‘What is Walusimbi doing?’

- (3) a-gul’ ebitabo Walusimbi
 sbj1-buy 8.book 1.Walusimbi
 ‘Walusimbi is buying books.’ (VOS)

Notice that in VSO sentences – where both the subject and the object are arguably ‘right-dislocated’ – the object prefix is again obligatory.

- (4) a. Musoke y-a-(ki-)som’ ekitabo
 1.Musoke sbj1-pst-read 7.book
 ‘Musoke read the book.’ (SVO)
- b. y-a-(ki-)som’ ekitabo Musoke
 sbj1-pst-read 7.book 1.Musoke
 ‘Musoke read the book.’ (VOS)
- c. y-a-*(**ki**-)som-a Musok’ ekitabo
 sbj1-pst-read-ind 1.Musoke 7.book
 ‘Musoke read the book.’ (VSO)

In contexts where the object is neither left- nor right-dislocated, the object-prefix is ungrammatical. This can be demonstrated with a double-object construction, where the default word order is S-V-IO-DO; as long as the IO precedes the DO, the IO can only be associated with an object-prefix if the DO is as well:

- (5) a. n-a-lag-a Nakato ebimuli
 1s-pst-show-ind 1.Nakato 8.flower
 ‘I showed Nakato the flowers.’
- b. n-a-bi-lag-a Nakato ebimuli
 1s-pst-obj8-show-ind 1.Nakato 8.flowers
 ‘I showed them to Nakato, the flowers.’
- c. n-a-bi-mu-lag-a Nakato ebimuli
 1s-pst-obj8-obj1-show-ind 1.Nakato 8.flower
 ‘I showed them to her, Nakato, the flowers.’

- d. * n-a-mu-lag-a Nakato ebimuli
 1s-pst-obj1-show-ind 1.Nakato 8.flower
 ‘I showed her the flowers, Nakato.’
- e. cf. n-a-mu-lag’ ebimuli Nakato
 1s-pst-obj1-show 8.flower 1.Nakato
 ‘I showed her the flowers, Nakato.’ (V-DO-IO)

I take this pattern as evidence that the Luganda object prefix is not simply an agreement marker, but indicates that the object DP (when present) is showing up in a ‘peripheral’ position rather than in its basic position within the vP. This hypothesis is compatible with a treatment of the object prefix as an incorporated pronoun; see Henderson (2006) for a comparison of this pattern with other Bantu languages. Later in this chapter, we will see some evidence that at least some ‘left-dislocated’ objects are as high as Spec,CP and thus are treated as separate phonological domains from the main clause.

4.2.2 Background: Luganda tone

Since the distinction between ‘underlyingly toneless’ and ‘underlyingly H_nL_n ’ M-words plays a crucial role in understanding the phrasal rules of LTD and HTA, this section provides a brief overview of word-level tone in Luganda. Further details can be found in Hyman (1982, 1990), Hyman et al. (1987), Hyman and Katamba (1990/1991, 1993), and Hyman and Katamba (2004), among others.

Like San Mateo Huave, Luganda is a tone language, with each mora surfacing as either H, L or HL. The distribution of surface tones is largely predictable if it is assumed that (i) each mora is underlyingly either H or \emptyset (toneless), and (ii) the full range of H, L and HL tones is derived by a series of *word-internal* and *phrasal* tone-assignment rules (Hyman 1982, Hyman and Katamba 1990/1991, 1993). Luganda word-level tone rules are listed in (6); effectively, they create a single H-plateau between the first and last H

tones (‘word-level LTD’) and then insert a L after the final H. Put differently, these rules ‘conspire to produce at most one pitch drop per Luganda word’ (44).

(6) Word-internal tone rules

- a. *Meussen’s rule*: $\mu_H \rightarrow \mu_L / \mu_H _ _$ (applies iteratively right to left)
- b. *L insertion*: $\emptyset \rightarrow L / H _ _$, where H is the last tone on the tonal tier (if the last H occurs on the last mora, an additional mora is inserted and a HL contour tone is produced)
- c. **LTD/HTP**: $L_0 \rightarrow H / H _ _ H$

(7) Sample derivation: (Hyman and Katamba 1993: ex. 14)

Underlying	tú-lí-ba-láb-a (1pl-fut-3pl-see-indic ‘we will see them’)
a. Meussen’s rule	tú-lì-ba-láb-a
b. L insertion	tú-lì-ba-láb-à
c. LTD/HTP	tú-lí-bá-láb-à

For current purposes, the important point is that the rules in (6) will not always exhaustively assign tones to every mora in an M-word. If an M-word is composed entirely of underlyingly toneless morphemes, for example, no word-internal tone rules will apply – i.e., the M-word remains toneless at the end of this part of the derivation. Similarly, if an M-word begins and/or ends with several underlyingly toneless morphemes, most of these morphemes will still be toneless after the application of (6) and will receive their surface tones by the application of **phrasal rules**.

One such phrasal rule is **Boundary H%**, which (optionally) assigns H to any toneless moras at the right edge of a spellout domain. If H% is not assigned, then these moras receive **Default L**. Toneless moras at the left edge of the domain also receive Default L, as shown in (8a). If a word is completely toneless underlyingly, it usually ends up with a

LH_n melody in isolation – H% spreads leftward up to the first mora, which gets Default L (8b).

- (8) Phrase-level H% and Default L:
 - a. H_nL_n M-word: ebikópò → èbìkópò ‘cups’
 - b. Toneless M-word: omuntu → òmúntú ‘person’

When a spellout domain contains multiple M-words, additional rules may apply – notably LTD (1a) and HTA (1b). HTA, the focus of the current chapter, is re-stated below:

- (9) **High Tone Anticipation (HTA)**: A word-level H tone spreads *leftward* through toneless moras onto preceding words within the domain, stopping short of the first mora of the domain.

Vowels that are still toneless after the application of HTA and other phrase-level tone rules are assigned Default L.

Like Huave HTP, Luganda HTA has the effect of creating a H-tone plateau that can extend across *n*-ary strings of words. Unlike Huave HTP, however, Luganda HTA is phonologically context-sensitive – it only applies if there happens to be a string of *toneless* words in the relevant domain – and the direction of tone-spread is right-to-left rather than left-to-right. In subsequent examples, the ‘source’ H-tone is underlined for clarity.

4.3 The relation between syntax and HTA domains

4.3.1 Monoclausal structures: the basic pattern

As noted above, the breakdown of utterances into HTA domains in Luganda looks very similar to the breakdown of utterances into tone domains in Huave.

First, if the utterance consists of a single clause, there is an extremely strong (perhaps exceptionless) tendency for items preceding the main-clause verb – preverbal subjects, left-dislocated objects, and topic adverbials – to each form their own HTA domain, while the verb and any following objects/modifiers group together into a single HTA domain. In (10a), all of the morphemes are underlyingly toneless except for the H-toned class 8 possessive marker *bya*. This H tone spreads leftward through the possessee and onto the verb. In (10b), repeated from (1b), the only underlying H tone is on *kaawa* ‘coffee’; this H spreads leftward through the indirect object and onto the verb, stopping short of the first mora of the domain. The H tone in (10b) does not spread onto the subject *omulenzi*, however, indicating that the subject belongs to a separate HTA domain. In (10c), the indirect object *Mukasa* is in a left-dislocated position preceding the verb. The fact that *Mukasa* surfaces with L tones in this example – unlike in (10b) – indicates that it belongs to a separate tone domain from the verb and direct object and has been assigned Default L.

- (10) a. (nj-ógér-á kú bítábó by-á Mùkàsà)
 1s-talk-ind loc 8.book 8-poss Mukasa
 ‘I’m talking about Mukasa’s books.’
- b. (òmùlènzi) (à-gúl-ír-á Múkásá kááwà)
 1.boy sbj1-buy-appl-ind 1.Mukasa coffee
 ‘The boy is buying Mukasa some coffee.’
- c. (òmùlènzi) (Mùkàsà) (à-mú-gúl-ír-á kááwà)
 1.boy 1.Mukasa sbj1-obj1-buy-appl-ind coffee
 ‘The boy is buying Mukasa some coffee.’

In addition to applying through V-DO and V-IO-DO structures, HTA also applies between verbs and adverbs in various configurations, as shown below:

- (11) a. (Wàlúsìmbì) (à-yógér-ér-á wággúlú ábáànà)
 1.Walusimbi sbj1-talk-appl-ind loudly 2.child
 ‘Walusimbi is speaking loudly for the children.’ (S-V-Adv-Obj)
- b. (Wàlúsìmbì) (à-yógér-ér-á ábálímí búlúngì)
 1.Walusimbi sbj1-talk-appl-ind 2.farmer well

‘Walusimbi is speaking well for the farmers.’ (S-V-Obj-Adv)

In (11a), the toneless manner adverb *waggulu* surfaces between the verb and the object. The H-tone on the object *abààna* spreads leftward through *waggulu* up to the first mora of the verb. In (11b), the order of the manner adverb and the object is reversed (and the individual vocabulary items are replaced to yield a phonological string that can condition the rule). Again, the verb groups together with all following material into a single tone domain: the H tone on the manner adverb *bulúngì* spreads leftward through the toneless object *abalimi* onto the verb.³

As with Huave HTP, postverbal subjects (when permitted) group together with the verb for the purposes of Luganda HTA. The only underlying H tone in (12) is the underlined second vowel of *Wálúsìmbi*; this H spreads leftward through the object and onto the verb, stopping short of the first mora.

- (12) (à-gúl’ ébítábó Wálúsìmbi)
 sbj1-buy 8.book 1.Walusimbi
 ‘Walusimbi’s buying books (he’s buying books, Walusimbi)’

So far, then, we have a very similar pattern to what we found with Huave tone domains in Chapter 3: in a monoclausal structure, the verb groups together with following ar-

³It is of course possible for the order of the adverb and the object to be reversed in both (11a) and (11b) while preserving the same vocabulary items, as in the examples below:

- (1) a. Wálúsìmbì à-yógér-ér’ ábààna wàggúlú
 1.Walusimbi sbj1-talk-appl 2.child slowly
 ‘Walusimbi is speaking for the children loudly.’ (S-V-Obj-Adv)
- b. Wálúsìmbì à-yógér-ér-á búlúngì àbálímí
 1.Walusimbi sbj1-talk-appl-ind well 2.farmer
 ‘Walusimbi is speaking well for the farmers.’ (S-V-Adv-Obj)

In these examples, the H tones from *abààna* and *bulúngì* spread leftward onto the main verb. The final toneless word in each example, *waggulu* in (a) and *abalimi* in (b), receives H tones by Boundary H%, discussed in §4.2.2 above.

guments and modifiers, while preverbal subjects (as well as left-dislocated objects) phrase separately. In the next subsection I give a preliminary analysis of this pattern, which in turn makes predictions for more complex multiclausal structures. In §4.3.3 I look at what happens in these multiclausal structures and show that the predictions of the current proposal are borne out.

4.3.2 Preliminary analysis

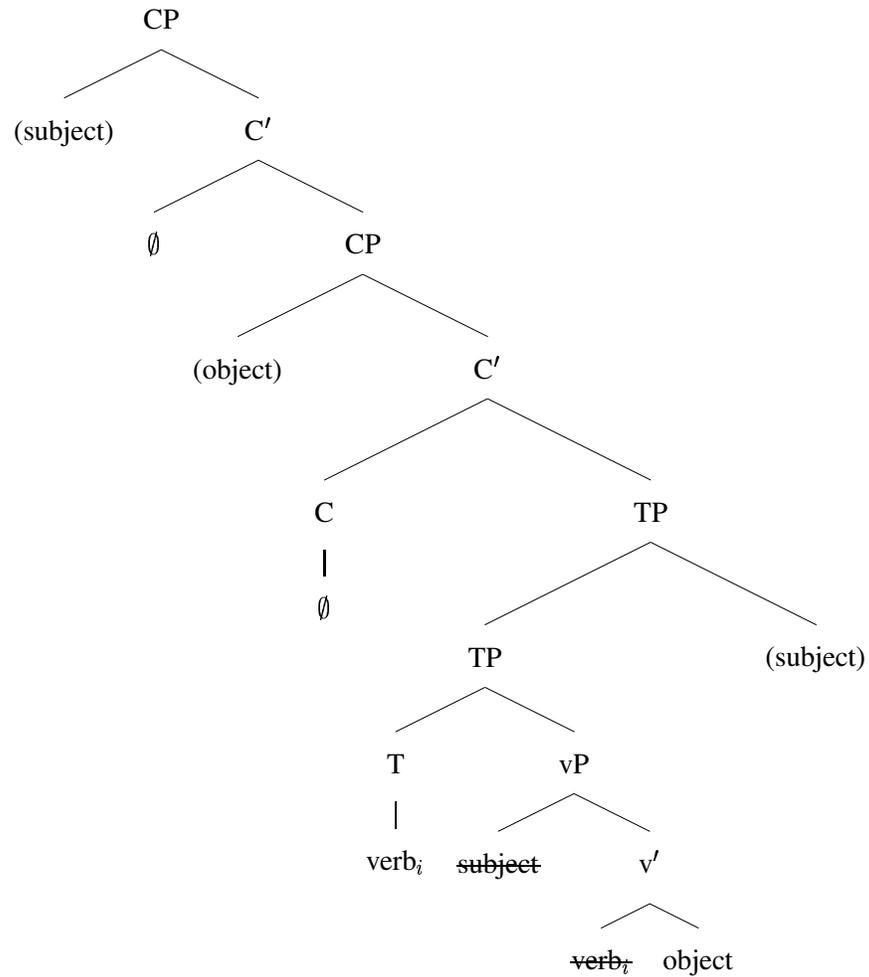
Based on what we have observed so far, I assume that Luganda HTA applies to Chains that are produced internal to each CP spellout domain.

- (13) Proposal for Luganda spellout:
- a. Matrix-clause preverbal subjects, left-dislocated objects, and ‘topicalized’ adverbials in Luganda obligatorily occupy Spec,CP.
 - b. Sentences with multiple preverbal constituents have multiple (recursive) CPs.
 - c. Spellout is triggered at each CP; material at the CP *edge* (C and Spec,CP) is spelled out on a separate cycle.
 - d. HTA applies to the Chains that are produced internal to each cycle.

According to this analysis, postverbal subjects must be structurally lower than main-clause preverbal subjects in Luganda (as in Huave; see Chapter 3). I will assume that postverbal subjects and objects are right-adjoined to Spec,TP, although nothing hinges on this particular treatment.⁴

⁴A serial-raising treatment, where the verb (and object(s)) raise to positions above the subject in Spec,vP, could also work in principle. The main question that would arise within such a treatment would be how to account for the distribution of the object prefix (described above). Presumably the object prefix would appear obligatorily any time an object raised leftward out of its vP-internal position – but it is unclear why a DO could not raise past an in-situ IO, yielding a sentence like (5d).

(14)



Some additional evidence that preverbal subjects, objects, and adverbials are as high as Spec,CP in Luganda comes from the fact that they (i) are freely ordered with respect to one another (see (2b)–(2c) above and (15) below), and (ii) can optionally precede the complementizer *nga* (see (16)):

- (15) a. Mukasa oluvannyuma y-a-gul' ebimuli
1.Mukasa finally sbj1-pst-buy 8.flower
'Mukasa eventually bought the flowers.'
- b. oluvannyuma Mukasa y-a-gul' ebimuli
finally 1.Mukasa sbj1-pst-buy 8.flower
'Eventually Mukasa bought the flowers.'

- (16) omuntu **nga** t-a-nna-fun-a maka, t-a-kul-a
 1.person comp neg-sbj1-not.yet-get-ind 6.home neg-sbj1-be.mature
 ‘If a person doesn’t have their own home yet, they’re not grown up.’ (Ashton et al.
 1954: 446)

A related question that arises at this point is whether preverbal subjects in Luganda raise from Spec,vP to Spec,CP or are base-generated in Spec,CP and coindexed with a *pro* in Spec,vP (i.e. clitic left-dislocation (CLLD)). Since Luganda is a pro-drop language with rich subject-agreement on the verb, we might expect it to pattern like Greek, Romance, and other languages studied by Alexiadou and Anagnostopoulou (1998) and others in having CLLD’d preverbal subjects with \bar{A} properties (see Letsholo 2002 and others for such proposals for Bantu). The evidence for the CLLD analysis in Luganda, however, is not clear. First, the overt subject in a main clause obligatorily forms a separate phonological domain even in contexts where the subject is not a ‘topic’ in the sense of being familiar, previously mentioned, or backgrounded information. For example, an even-focus context can be forced by setting up a scenario where someone has just asked ‘What’s going on?’ – and the preverbal subject still phrases separately:

- (17) What’s going on?

 (Mùsòkè) (à-gúl’ ékífáànyànì)
 1.Musoke sbj1-buy 7.picture
 ‘Musoke’s buying a picture.’

Furthermore, preverbal subjects in Luganda can be non-referential (as in Huave, see Chapter 3 note 14) – and they still obligatorily form their own tone domains:⁵

⁵Some further diagnostics that could be useful in determining whether or not the preverbal subject is base-generated in Spec,CP involve finding out if there are (i) obligatory surface-scope readings in sentences like *Some man read every book* and (ii) specific (rather than existential) readings of indefinite subjects in sentences like *A child read The Never-Ending Story yesterday* (see Alexiadou and Anagnostopoulou 1998). I

- (18) a. (bùlì mùlènzi) (à-sóból' ó-kú-fúumbá búlúngì)
 every 1.boy sbj1-be.able iv-inf-cook well
 'Any boy can cook well.'
- b. (bùlì mùntù) (tɛ̃-y-á-tú-láb-à)
 every 1.person neg-sbj1-pst-1p.obj-see-ind
 'Nobody saw us.'

I therefore provisionally conclude that Luganda preverbal subjects are not necessarily clitic left-dislocated 'topics' in Spec,CP, but at least have the option of raising to Spec,CP from Spec,vP. The choice between the CLLD and raising analyses is not crucial for our purposes here, as long as it is understood that Spec,CP is the obligatory final position of overt preverbal subjects in main clauses. Later we will see some evidence that in certain kinds of reduced clauses, preverbal subjects occupy a lower (Spec,TP) position, suggesting that at least some preverbal subjects start out below Spec,CP.

4.3.3 Multiclausal structures

In this section I examine three types of multiclausal structures: complements of 'think/say' verbs, secondary-predicate constructions, and clausal adjuncts. We will observe the following pattern in all three of these cases:

- (19) Multiclausal pattern:
- a. There is an obligatory HTA-domain boundary between the main clause and the embedded clause.
 - b. *Within each clause*, there is an obligatory HTA-domain boundary between preverbal constituent(s) and the verb – as in monoclausal structures (see §4.3.1).

have made several attempts to find out if these patterns hold for Luganda, but my consultants report that the judgments are not clear-cut, and the results have been inconsistent both within and across speakers.

This pattern is similar to what we observed for Huave in Chapter 3, and it is essentially what we expect given the proposal in (13)–(14), where spellout is automatically triggered at each CP node.

Complements of ‘think/say’ verbs

In structures where the main-clause verb introduces indirect speech or thought – e.g. with *ku-lowooza* ‘to think’ or *ku-gamba* ‘to say,’ both of which have toneless roots – HTA fails to cross the clause boundary. In (20a), for example, the only underlying H tone in the sentence occurs on the embedded verb *yagéndà*. This H tone fails to spread leftward onto the embedded toneless subject *Mukasa* or into the matrix clause, and so the remainder of the clause ends up surfacing with Default L. (20b) shows the same pattern with the matrix verb *alowooza* ‘to think’ and the embedded unaccusative predicate *bî* ‘to be bad’:

- (20) a. (òmùlènzi) (à-gàmbà) (ntì) (Mùkàsà) (y-à-géndà)
 1.boy sbj1-say that Mukasa sbj1-pst-go
 ‘The boy says that Mukasa went.’
- b. (Kàsédde) (à-lòwòòz-à) (èbìntù) (bì-bî) (kù-Wàlúsìmbì)
 1.Kasedde sbj1-think-ind 8.thing 8-bad loc-1.Walusimbi
 ‘Kasedde thinks things are bad with Walusimbi.’

The next set of examples clearly show that there is an obligatory phonological break at the clause boundary. In (21a), the embedded clause contains neither an overt subject nor the toneless complementizer *nti* (which can be deleted in at least some contexts), but the H tone on the embedded verb *ayîmba* still fails to spread onto the toneless matrix-clause verb *ndowooza*. In (21b)–(21d), the embedded clause contains an underlyingly $H_n L_n$ subject or left-dislocated object, which could in principle trigger HTA-spread into the matrix clause. However, in these and similar examples, the embedded preverbal constituent forms its own tone domain.

- (21) a. (n-dòwòòzà) (à-yîmbà)
 1s-think sbj1-sing
 ‘I think s/he’s singing.’
- b. (n-dòwòòzà) (Wàlúsìmbì) (y-á-bb’ ènkókò)
 1s-think 1.Walusimbi sbj1-pst-steal 10.chicken
 ‘I think Walusimbi stole the chickens.’
- c. (n-dòwòòzà) (lwèwùnzìkâ) (y-à-gwâ wànsî)
 1s-think 1.banana sbj1-pst-fall down
 ‘I think the bananas fell down.’
- d. (n-dòwòòzà) (òmùsáwò) (tw-á-mú-sáng-à)
 1s-think 1.farmer 1p-pst-obj1-meet-ind
 ‘I think that the doctor, we met him/her.’

While the phrasing in (21a) is straightforwardly predicted by the analysis in (13), the pattern in (21b)–(21d) is not necessarily expected. Recall that within Minimalist versions of phase theory (Chomsky 1999 et seq.), the phase head and phase edge are spelled out together with the next-higher phase (see Chapter 1). In (21b), then, if *Walusimbi* is in Spec,CP, we would expect it to undergo spellout with the next-higher spellout domain, so that *ndowooza* and *Walusimbi* would be spelled out together. In order to explain the pattern in (21b–d), I assume that the embedded clause under a ‘think/say’ verb must be a CP headed by the null or overt complementizer *nti*. Unlike *nga* from example (16), *nti* cannot have any material in its specifier; therefore, if an embedded clause under a ‘think/say’ verb contains an overt subject, it must have a recursive CP structure:

- (22) $CP_3 [TP [n-dowooz-a CP_2 [C [< nti >] CP_1 [Walusimbi TP [y-abb' enkoko]]]]]]$

At the CP2 level in this structure, the embedded subject *Walusimbi* in Spec,CP1 will be spelled out. The complementizer *nti*, if it were overt, would undergo spellout at the CP3 level, together with the matrix verb *ndowooza*. Since *nti* is underlyingly toneless, it will

surface as L whether it has grouped together with material on its left or has formed its own domain.⁶

Before moving on, it is important to be aware that it is possible for the toneless roots *-lowooz-* ‘think’ and *-gamb-* ‘say’ to acquire H tones by HTA, as long as the source H occurs on a word to the right *within the same clause*. In (23a), which contrasts minimally with (20a), the H tone on the indirect object *Nakátò* spreads leftward onto the matrix verb *agamba*. In the monoclausal (23b) (cf. (20b)), the H tone on the oblique DP *Walúsìmbi* spreads onto the verb *abirowooza* (which contains a class-8 object prefix referring to the left-dislocated object *ebintu bibî*).

- (23) a. (òmùlènzì) (à-gámbá Nákátò) (ntì) (Mùkàsà) (y-à-géndà)
 1.boy sbj1-say 1.Nakato that Mukasa sbj1-pst-go
 ‘The boy is telling Nakato that Mukasa went.’
- b. (èbíntú ebíbî) (Kàsédde) (à-bí-rówóóz-á kú-Walúsìmbí)
 8.thing 8.bad 1.Kasedde sbj1-obj8-think-ind loc-1.Walusimbi
 ‘Kasedde is thinking bad things about Walusimbi.’ (SM022408)

These examples show that there is nothing special or ‘lexically marked’ about the roots *-lowooz-* and *-gamb-* that prevents them from receiving H tones by HTA. The fact that they surface with Default L in (20)–(21) is instead attributed to the fact that they are in a *separate clause* from the potential H_nL_n trigger to their right.

Secondary predicate constructions

Moving on to other kinds of multiclausal structures, Luganda has a **secondary predicate** construction with the following components:

- a tensed matrix verb that agrees with the (null or overt) matrix subject;
- an embedded predicate that has a subject-agreement prefix but no tense marker;

⁶See Chapter 3 note 12 for some comments on the indeterminate phonological status of phase heads.

- an optionally overt subject of the embedded predicate, which normally precedes the embedded predicate;
- the complementizer *nga*, which is obligatory if the matrix verb has its own DP object and optional otherwise:

- (24) a. Mukasa y-a-fuumb-a (ng') a-kaab-a
 1.Mukasa sbj1-pst-cook-ind (comp) sbj1-cry-ind
 'Mukasa cooked while crying.'
- b. Mukasa y-a-fuumb-a lwewunzika *(ng') a-kaab-a
 1.Mukasa sbj1-pst-cook-ind 1.bananas (comp) sbj1-cry-ind
 'Mukasa cooked bananas while crying.'

As with 'think/say' complements, HTA is systematically blocked from applying between the two clauses in a secondary-predicate construction, as well as between the subject and the verb of the embedded clause – even in contexts where the toneless complementizer *nga* is absent. In (25a), the underlying H tone on the embedded verb *akáàba* 'cry' fails to spread leftward onto the embedded toneless subject *Mukasa* or into the matrix clause. (The toneless matrix verb *oleka* gets its H tones by Boundary H%, described above in §4.2.2.⁷ In (25b), the subject of the embedded clause has its own H tone; this H still fails to spread leftward, however, demonstrate that HTA is unable to 'see across' CP boundaries. I have included labeled brackets to indicate where the relevant CP boundaries are located.

- (25) a. (ò-lék-á) (Mùkàsà) (à-káàb-à)
 2s-leave-ind 1.Mukasa sbj1-cry-ind
 'You leave Mukasa crying.' (SM020708)
- b. (ò-lék-á) (Nàkátò) (à-káàb-à)
 2s-leave-ind 1.Nakato sbj1-cry-ind
 'You leave Nakato crying.' (SM020708)

⁷Boundary H% is not assigned uniformly to all spellout domains; none of the matrix clauses with 'think/say' verbs above, for example, receive Boundary H%. I have not yet attempted a careful examination of the contexts where Boundary H% is and is not assigned.

HTA also fails to apply across clause boundaries if the embedded subject is null. In (26a), the underlying H tone on *Walúsìmbi* spreads only onto the toneless embedded verb and fails to continue onto the toneless complementizer *nga* or onto the toneless matrix verb. (Again, the matrix verb gets its H tones by Boundary H%.) In (26b), *nga* is deleted but the H on *Walúsìmbi* still does not spread into the matrix clause. Instead, this example demonstrates the application of **Downstep**, which applies when two independent H tones end up surfacing on adjacent or nearly-adjacent moras. In this case, the final vowel of the matrix verb *andeka* is assigned Boundary H%, while the first vowel of the embedded verb *mpandikira* is assigned H by HTA-spread from *Walúsìmbi*. The two H tones end up being adjacent in (26b), and so the second H is downstepped.

- (26) a. Mùkàsà à-n-dék-á ngà m-pándík-ír-á Wálúsìmbí
 1.Mukasa sbj1-1s.obj-leave-ind comp 1s-write-appl-ind 1.Walusimbi
 ‘Mukasa leaves me writing (while I’m writing) to Walusimbi.’
- b. Mùkàsà à-n-dék-á m-p!ándík-ír-á Wálúsìmbí
 1.Mukasa sbj1-1s.obj-leave-ind 1s-write-appl-ind 1.Walusimbi
 ‘Mukasa leaves me writing (while I’m writing) to Walusimbi.’

In Chapter 1 I proposed that Downstep is a *Late-Linearization* rule, which applies after separate spellout domains have been linearized with respect to each other; if each of two independent spellout domains contain an H tone that end up being adjacent after late-linearization, the second H will be downstepped. The important point for now is that a situation like (27), where the second of two adjacent H tones undergoes the sudden drop in pitch characteristic of Downstep, is clearly distinguishable from a situation like (28), where HTA creates a continuous H plateau:

(27) Downstep

o-fuumb-a o-káàb-a
2s-cook 2s-cry-ind

→ òfúúmbók!áàbà

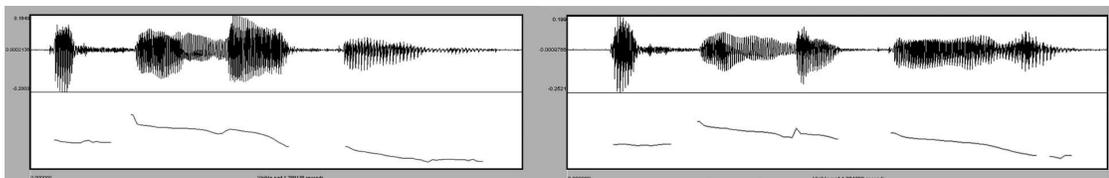
‘You cook (while) crying.’

(28) HTA

o-fuumb-a kááwà
2s-cook-ind 1a.coffee

→ òfúúmbákááwà

‘You’re making coffee.’



If the two verbs in the secondary-predicate construction in (27) belonged to the same HTA domain, we would expect to find a steady pitch plateau extending leftward from the H on *-káàb-* to the second mora of *ofuumba* (cf. the pitchtrack in (28)). Instead, the matrix verb *ofuumba* is assigned Boundary H%, which in turn triggers Downstep of the underlying H tone on *-káàb-*. I therefore conclude that these two verbs belong to separate clauses and, correspondingly, separate HTA domains.

Clausal adjuncts

Finally, it can be shown that HTA systematically fails to apply across the boundary between a main clause and a clausal adjunct. The examples in (29) contain a main clause followed by a future-oriented ‘if/when’-clause formed with the class-14 relative-marker *bwe*. In (a), the only underlying H tone is on the future prefix *-náá-*; this H fails to spread leftward onto the toneless embedded subject or into the main clause. (The main-clause subject and verbs receive their H tones by Boundary H%; see below for more on HTA with infinitives under *ku-jja* ‘go.’) Examples (b) and (c) show that even if the first word in the ‘if/when’ clause is H_nL_n , HTA will not cross the clause boundary: the first mora of *kamújjè* and *bw’ozínà* surfaces as L rather than H.

- (29) a. (Mùkásá) (à-jjá génd-á) *CP*[(òmulènzi) (bw-à-náá-kààb-à)]
 1.Mukasa sbj1-come go-ind 1.boy 14.rel-sbj1-fut-cry-ind
 ‘Mukasa is going to go if the boy cries.’ (SM042407)
- b. (òmwáànà) (à-sék-á) *CP*[(kàmújjè) (bw-à-bbâ) (lùmóóndé)]
 1.child sbj1-laugh-ind 1a.squirrel 14.rel-sbj1-steal 1a.potato
 ‘The child laughs when the squirrel steals potatoes.’
- c. (òmwáànà) (à-sék-á) *CP*[(bw-ò-zín-à)]
 1.child sbj1-laugh-ind 14.rel-2s-dance-ind
 ‘The child laughs when you dance.’

The examples in (30) include a main clause followed by a rationale clause with a tenseless subjunctive verb. Again, HTA fails to cross the clause boundary in these examples (we know that the H tones on *agul’ ekitabo* are assigned by Boundary H% rather than HTA, because the first mora of *Walusimbi* and *nsèkê* surfaces as L).

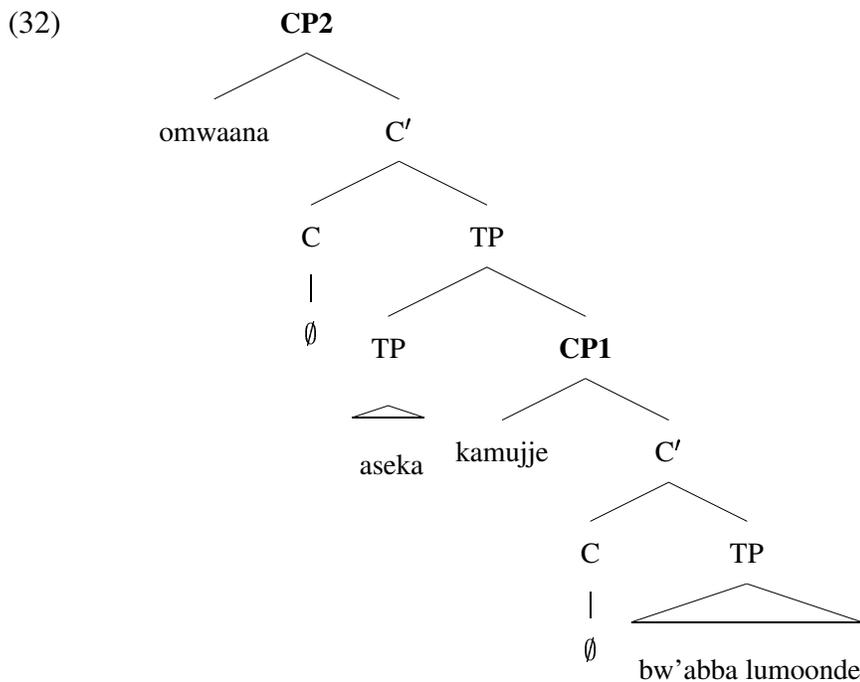
- (30) a. (Kàsédde) (à-gúl’ ékítábó) *CP*[(Wàlúsìmbì) (à-sèk-ê)]
 1.Kasedde sbj1-buy 7.book 1.Walusimbi sbj1-laugh-subj
 ‘Kasedde is buying a book so that Walusimbi will laugh.’
- b. (Kàsédde) (à-gúl’ ékítábó) *CP*[(n-sèk-ê)]
 1.Kasedde sbj1-buy 7.book 1s-laugh-subj
 ‘Kasedde is buying a book so that I will laugh.’

Given the pattern we observed with ‘think/say’ verbs and secondary-predicate constructions, it is not surprising that clausal adjuncts, too, form their own HTA domains. However, it is worth taking a closer look at examples (29b) and (30a) before moving on. Notice that the H tone on the embedded subject in these examples does not spread leftward into the main clause (i.e., the H on *kamújjè* in (29b) does not spread onto *aseka*, nor does the H on *Walúsìmbì* in (30b) spread onto *omulènzi*). This raises the same question as the ‘think/say’ examples in (21) above – if this embedded subject is in Spec,CP, and if the phase edge is spelled out on the next-higher cycle, then why doesn’t e.g. *kamújjè* group together with *aseka* instead of forming its own domain?

To explain the phonological independence of embedded subjects with the ‘think/say’ complements in (21), I argued that there is an obligatory ‘extra’ CP headed by null or overt *nti* that forces the embedded subject to be spelled out by itself. This kind of explanation is not readily available for clausal adjuncts like (29)–(30), however, since there is no option of pronouncing any overt functional material before the subject of the adjunct. Instead, I believe that the explanation has to do with the fact that the embedded CP is an adjunct rather than a complement. The relevant generalization is stated more explicitly in (31):

- (31) If a CP is merged as a sister to a branching node, it is ‘closed off,’ or spelled out in its entirety, as if it were a root node.

The sentence in (29b) is then spelled out as follows:



- (33) (òmwaàà) (â-sék-á) _{CP}[(kàmújjè) (bw-à-bbâ) (lùmóóndé)]
 1.child sbj1-laugh-ind 1a.squirrel 14.rel-sbj1-steal 1a.potato
 ‘The child laughs when the squirrel steals potatoes.’

- At CP1, the C complement *bw'abba lumoonde* is spelled out.

- When CP1 is merged as a sister to TP, any of its contents that have not been previously spelled out (i.e. its edge *kamujje*) are spelled out, as if it were a root node.
- At CP2, the C complement *aseka* is spelled out.
- Since CP2 is the root node, any of its contents that have not been previously spelled out (i.e. its edge *omwaana*) are spelled out.

At the moment I do not have a formal account of the generalization in (31). I also do not know if it true cross-linguistically or not. One implication of this generalization, though, is that the two proposals for defining the phase that I reviewed in Chapter 1 – the ‘category-specific’ proposal and ‘tree-geometric’ proposal – are not mutually exclusive and might both have a role to play in at least some languages.⁸

4.3.4 Reduced-clause structures

Restructuring infinitives

So far, Luganda HTA domains look very similar to the Huave tone domains we saw in Chapter 3: material at the left ‘edge’ of each clause forms its own domain, and in sentences with multiple clauses, each clause forms its own domain as well. Recall, though, that some apparently biclausal structures in Huave can form a single tone domain – e.g.

⁸An interesting question that arises at this point is whether island/CED effects might be traced to the generalization in (31). The idea would be that since the entire adjunct must be spelled out, including its edge, there would be no way for a DP to escape from the adjunct, thus explaining why adjuncts are typically islands. This is the kind of argument that is used in Johnson 2001 and Truswell 2004, where the phase is defined as an internally complex syntactic object merged with another internally complex syntactic object. For Luganda, however, this cannot be the full story. We will see below that relative clauses in Luganda are islands, as in English, even though they are *not* spelled out independently, suggesting that islandhood must be derived from some property other than spellout.

sentences with a subordinate verb under causative *uuch* ‘give’ or future-oriented *amb* ‘go.’ I argued that these are restructuring predicates, which optionally take a reduced (sub-CP) complement and correspondingly may undergo spellout together with their complement.

Not surprisingly, there is evidence for restructuring in Luganda as well. We have already seen an example demonstrating this – (29a), repeated in (34a), contains the matrix verb *a-jja* ‘come’ followed by the infinitive *genda* ‘go,’ which together end up meaning ‘is going to go.’ Both of these verbs are underlyingly toneless. Notice that Boundary H% spreads from the right edge of the main clause up to the second mora of *a-jja*, indicating that *a-jja* and *genda* belong to the same domain for Boundary H%. Similar examples can be constructed with an H_nL_n embedded infinitive (e.g. *ku-kwât-a* ‘hold’ in (34b)), in which case HTA applies between *a-jja* and the infinitive as well. (HTA and Boundary H% consistently apply to the same kinds of domains as far as I have been able to tell.)

- (34) a. (Mùkásá) (**à-jjá** **génd-á**) (òmùlènzi) (bw-à-náá-kààb-à)
 1.Mukasa subj1-come go-ind 1.boy 14.rel-sbj1-fut-cry-ind
 ‘Mukasa is going to go if the boy cries.’ (SM042407)
- b. (Wàlúsìmbì) (à-jjá kú-kwâta lwèwùnzikâ)
 Walusimbi subj1-come inf-hold 1.bananas
 ‘Walusimbi is going to hold the bananas.’

Other verbs that group together with their infinitival complements for HTA and Boundary H% include *-agal-* ‘want, like’ and *-sobol-* ‘be able.’ Notice that the source H tone for HTA does not have to occur on the infinitive itself, but may be on a following object (e.g. *omusómèsa* in (35c)):⁹

- (35) a. (ày-ágál’ ó-kú-yîmba)
 subj1-want iv-inf-sing
 ‘S/he wants to sing.’

⁹The infinitive under a restructuring verb can appear with or without the infinitive marker *ku-*; furthermore, if *ku-* is used, an ‘initial vowel’ /o/ may optionally precede it, as in (35a) and (35b). In non-restructuring contexts, the initial vowel /o/ and *ku-* both appear to be obligatory.

- b. (n-sóból' ó-kú-yîmb-à)
 1s-can ivi-inf-sing-ind
 'I can sing.'
- c. nj-ágál-á kú-sáng' ómúsómèsà
 1s-want-ind inf-meet 1.teacher
 'I want to meet the teacher.'
- d. (Mùkàsà) (à-sóból' ó-kú-fúúmb-á búlúngì)
 1.Mukasa sjb1-can iv-inf-cook-ind well
 'Mukasa can cook well.'
- e. èkìmù bá-kí-síb-à kù-bikòndò kù-lùbálàmá (**ò-kù-sóbó-z-és-á ékírálá**
 7.one 3p-obj7-tie-ind loc-8.stump loc-11.shore iv-inf-can-caus-ind 7.other
ó-kú-yítà-wò)
 iv-inf-pass-loc
 'They tie one ship to a post on the shore to enable the other to pass by.' (from
 Nsereko 2001: 56–58)

Not all infinitives are phonologically dependent in this way. Example (35e), for example, contains two infinitive verbs – *okusobozesa* 'to enable' and *okuyítàwo* 'to pass by.' The two infinitives group together for the purposes of HTA (the H tone on *okuyítàwo* spreads through the toneless object *ekirala* onto the toneless *okusobozesa*). However, the H tone does not continue to spread across the purpose-clause boundary into the matrix clause. In this particular example, this could be due to the fact that the word preceding *okusobozesa* is $H_n L_n$ (*lubálàma* 'shore'); but in fact HTA never spreads from a purpose infinitive to the main clause. Rather, HTA application between an infinitive and a tensed verb is limited to complement infinitives under a handful of typical restructuring predicates, including 'want,' 'go,' and 'can.' I assume, following Wurmbbrand (2001), Cinque (2001) and others, that complement infinitives under restructuring verbs are TPs, rather than CPs, and thus get spelled out together with the next-higher clause. Purpose infinitives, on the other hand, are always adjunct CPs.

Subjunctive complements

In contexts where the complement of ‘want’ has a different subject from the main-clause verb, a tenseless subjunctive form of the embedded verb is used instead of an infinitive. These complements also group together with the main verb for the purposes of HTA. In (36a)–(36b), for example, the H tone from the subjunctive suffix on the embedded verb spreads leftward onto the toneless matrix verb *njagala* – through an embedded subject in (36a). Example (36c) shows that the source H tone can come from an embedded subject (here, the $H_n L_n$ *Nakátò*) as well. Examples (36d)–(36e) show the same pattern with the matrix verb *-gamb-* ‘tell/command’:¹⁰

- (36) a. (nj-ágál’ ómúlénzí á-wándíík-ér-ê Mùkàsà èbbàlúwà)
1s-want 1.boy sbj1-write-appl-subj Mukasa 9.letter
‘I want the boy to write Mukasa a letter.’
- b. (nj-ágál-á á-sék-ê)
1s-want-ind sbj1-laugh-subj
‘I want him/her to laugh.’
- c. (nj-ágálá Nákátò à-sék-ê)
1s-want 1.nakato sbj1-laugh-subj
‘I want Nakato to laugh.’
- d. (m-mú-gámb-á á-sék-ê)
1s-obj1-tell-ind sbj1-laugh-subj
‘I’m telling him/her to laugh.’

¹⁰I am loosely referring to both *Nakato* in (36c) and *Nakato* in (36e) as the ‘embedded subject,’ even though they probably occupy different structural positions. Notice that an object prefix is required on the matrix verb (*m-mu-gamba*) in (36d), but not on the matrix verb *njagala* in (36b). I take this as an indication that *-gamb-* ‘tell’ requires a DP object, which can in turn control a *pro*/PRO in the complement infinitive, while *-agal-* ‘want’ can take an infinitival complement with its own subject. Further evidence that *Nakato* in (36c) is a subject, rather than an object, comes from the limited availability of VS order within the infinitive: *njágál’ ásékè Nàkátò*. The important point for our purposes is that the infinitive is a reduced, sub-CP structure in both cases and thus undergoes spellout together with the matrix verb.

- e. (n-gám-b-á Nákátò à-sèkê)
 1s-tell-ind 1.Nakato sbj1-laugh-subj
 ‘I’m telling Nakato to laugh.’

I take this pattern as an indication that subjunctive complements of certain predicates can also be reduced, sub-CP structures and thus undergo spellout with the next-higher clause. Again, it is important to note that not all subjunctives are reduced in this way; in (30) we saw that subjunctives can be used as purpose/rationale adjuncts, in which case they do phrase separately from the main clause.

Relative clauses

A more surprising pattern is found when we look at relative clauses (RCs). Like infinitival and subjunctive complements, restrictive RCs in Luganda group together with the main clause. This is true even if the RC contains its own subject, as in the object RCs in (37) – the H tone on the RC verb spreads leftward through the RC subject and the head DP, all the way up to the main-clause verb:

(37) Object relatives:

- a. (nj-ágál’ ékítábó ómúlénzí kyé y-á-láb-à)
 1s-like 7.book 1.boy 7.rel sbj1-pst-see-ind
 ‘I like the book the boy saw.’
- b. (Wálúsìmbì) (à-gúl-á lúmóóndé Múkásá gw’ á-génd-à ò-kù-w’ ábàlènzi)
 1.Walusimbi sbj1-buy 1.potato 1.Mukasa 1.rel sbj1-go-ind iv-inf-give 2.boy

‘Walusimbi is buying the potatoes that Mukasa is going to give to the boys.’

- c. (n-sóm’ ákátáb’ á-ká-tónó Múkásá ké y-á-gúl-à)
 1s-read 12.book iv-12-small 1.Mukasa 12.rel sbj1-pst-buy-ind
 ‘I’m reading the little book that Mukasa bought.’ (SM022308)

(38) Subject relatives:

- a. (Bàbíryè) (ày-ágál' ómúntú é-y-á-wá Wálúsìmbì nnàwólòvù)
 1.Babirye sbj1-like 1.person rel-sbj1-pst-give 1.Walusimbi 1.chameleon
 'Babirye likes the person who gave Walusimbi a chameleon.'
- b. (n-jógér-á kú-mpólógómá é-y-á-kúb-á Nákátò)
 1s-talk-ind loc-9.lion rel-sbj9-pst-bite-ind 1.Nakato
 'I'm talking about the lion that bit Nakato.'¹¹ (SM022308)
- c. (bulijjô) (eykómbó é-kí-bá kí-vâ è-Bùlààyà) (kyè bà-sìb-â)
 every.day 7.ship rel-7-be 7-come.from loc-9.Europe 7.rel 2p-tie-ind.rel
 'Usually the ship that is coming from Europe is the one they anchor down.'

The source H tone does not have to be located on the RC verb; HTA will also spread up to the matrix verb if it originates on the head noun (39a) or RC subject (39b):

- (39) a. (nj-ágál' ékíkópò òmùlènzi kyè y-à-láb-à)
 1s-like 7.book 1.boy 7.rel sbj1-pst-see-ind
 'I like the cup the boy saw.'
- b. (nj-ágál' ékítábó Nákátò kyè y-à-lábà)
 1s-like 7.book 1.Nakato 7.rel sbj1-pst-see-ind
 'I like the book Nakato saw.'
- c. (nj-ágál-á ókúfúumb-ír-á Músóké lúmóóndé ómúkyáà gwè)
 1s-want-ind inf-cook-appl-ind 1.Musoke 1a.potato 1.lady 1.rel
 y-â-m-p-à
 sbj1-pst-1s.obj-give-ind
 'I want to cook Musoke the potato that the lady gave me.'

In sum, RCs in Luganda pattern like restructured infinitives and subjunctive complements with respect to phonological phrasing – even though RCs are traditionally assumed to be full CPs.

In the spirit of this thesis, I will use the phonological evidence we have just seen as support for a *reduced-clause* analysis of Luganda RCs:

¹¹The H-plateau between the RC verb *eyakuba* and the object *Nakato* in this example is derived by L-Tone Deletion (LTD), discussed in further detail in Chapter 5.

- (40) Reduced-clause hypothesis for Luganda RCs: Restrictive relative clauses in Luganda are reduced, sub-CP structures.

This proposal is explored in-depth in the following section.

4.4 Discussion: Relative clauses as non-CPs

Having observed that Luganda RCs group together with the next-higher clause for HTA, we could in principle pursue either of the following hypotheses:¹²

- **Option 1.** We can maintain the idea that Luganda RCs are CPs, and adjust our view of the syntax-phonology interface to accommodate the HTA facts. This adjustment would involve the claim that spellout can ‘see’ the difference between relative

¹²A third option might be to adopt aspects of the proposal in Cheng and Downing (2007), who report that restrictive RCs in Durban Zulu also group phonologically with the next-higher clause (in this case, the phonological rule in question is penultimate lengthening:

- (1) (si-thánd’ ísí-gqok’ ín-dod’ é-si-gqok-ilê:-yo)
 we-like 6-hat 9-man 9.rel-obj6-wear-TAM-rel
 ‘We like the hat the man is wearing.’ (Cheng and Downing 2007: ex. (54b))

Cheng and Downing argue that restrictive RCs are *complements* to a D head, rather than adjuncts, and that the difference in phonological phrasing between restrictive RCs and other multiclausal structures corresponds to a difference between complement and adjunct syntax. While the idea that the complement-adjunct distinction might be relevant for spellout is intriguing, this kind of approach will not work for Luganda because it predicts that *all* clausal complements will phrase together with the next-higher clause, contrary to fact. As we saw above, complements to ‘think/say’ verbs *do* phrase separately for HTA in Luganda, as do non-restructuring infinitival complements (under e.g. ‘learn’), and we will see in Chapter 5 that complements of perception verbs phrase separately for LTD as well. Whether or not these problems arise for Durban Zulu is not clear from the paper, but Lisa Cheng (p.c.) reports that at least complements of ‘think/say’ verbs do group together with the main clause. See Chapter 2 for more discussion of Cheng and Downing (2007).

clauses and other CPs, and makes a special exception for relative clauses (‘spellout occurs at every CP *unless that CP is a relative clause*’).

- **Option 2.** Or we can assume that Luganda RCs are reduced (non-CP) structures, so that they automatically group together phonologically with the main clause, like the infinitival and subjunctive complements above.

In order to get Option 1 off the ground, we could argue that relative clauses have a feature (e.g. [+rel]) in C, and that there is a special provision that [+rel] CPs be ignored for the purposes of spellout. This kind of provision is completely unprecedented as far as I am aware, and it represents a major departure from the idea that the phrasal phonology does not distinguish among particular morphosyntactic features – a central idea in the prosodic hierarchy theory literature, and also a basic assumption in phase theory (see Chapter 1 for discussion). If we admitted such a provision, it is difficult to see how we would avoid also admitting a range of alternative scenarios, such as one where reduced infinitives are the *only* CP complements that *do* form their own tone domains, or where special exceptions are made for e.g. [-def] determiners or [+fem] adjectives. It is worth noting that relative clauses do not receive this kind of special phonological treatment cross-linguistically: Huave relative clauses consistently form their own tone domains (see e.g. example (59b) in Chapter 3), as do relative clauses in Kinande (Hyman 1990), which has a phrasal tone rule whose domains look much like Luganda HTA domains (see §4.5.2).

Under **Option 2**, which I am pursuing here, we give up a different assumption – the idea that \bar{A} -movement can only be driven by C. It is worth pointing out here that Luganda relativization is indeed a case of \bar{A} -movement: the moved DP (i) leaves a gap (the ‘resumptive’ object marker found in some Bantu languages (Henderson 2006) is not possible in Luganda (41)); (ii) can cross multiple intervening noun phrases (unlike passivization; see (42)); (iii) and is subjected to island constraints (43)–(44).

(41) No ‘resumptive’ pronoun or agreement-marker in object RCs:

n-a-gul’ ekitabo kye w-a-(***ki**)-som-a
 1s-pst-buy 7.book 7.rel 2s-pst-(***obj7**)-read-ind

‘I bought the book that you read (*it).’

(42) a. Luganda relativization can cross multiple intervening DPs...

i. n-a-gul’ ekitabo **kye_i** nj-agala **Mukasa** a-som-er’ **abaana** *e_i*
 1s-pst-buy 7.book 7.rel 1s-want Mukasa sbj1-read-appl-(subj) 2.child
 ‘I bought the book that I want Mukasa to read to the children.’

ii. nj-oger-a ku musomesa **gwe_i** n-a-lag-is-a **omuggo abaana** *e_i*
 1s-talk-ind loc 1.teacher 1.rel 1s-pst-show-appl-ind 3.stick 2.child
 ‘I’m talking about the teacher that I showed to the children with a stick.’

(teacher = DO)

b. ...but passivization cannot.

i. *ekitabo ky-agal-ibwa Mukasa a-som-er’ abaana
 7.book 7-want-pass Mukasa sbj1-read-appl 2.child
 Lit: ‘The book is wanted Mukasa to read to the children.’

ii. *ekitabo ky-agal-ibwa ki-som-er-w-e Mukasa abaana
 7.book 7-want-pass 7-read-appl-pass-subj 1.Mukasa 2.child
 Lit: ‘The book is wanted to be read to the children by Mukasa.’

iii. *omusomesa y-a-lag-is-ibw-a omuggo abaana
 1.teacher sbj1-pst-show-appl-pass-ind 3.stick 2.child
 ‘The teacher was shown to the children with a stick.’ (teacher = DO)

(43) Relativization cannot extract from an adjunct island (see Walusimbi 1996, §4.4):

a. omulenzi y-ebaka bwe n-a-mu-som-era ekitabo
 1.boy 1-sleep when 1s-pst-obj1-read-appl 7.book
 ‘The boy fell asleep when I read him the book.’

b. *n-jogera ku kitabo omulenzi kye y-ebaka bwe n-a-(ki)-mu-som-era
 1s-talk loc 7.book 1.boy 7.REL sbj1-sleep when 1s-pst-(7)-obj1-read-appl
 Lit: ‘I’m talking about the book that the boy fell asleep when I read (it) to him.’

(44) Relativization cannot extract from a(nother) relative-clause island:

- a. n-a-sanga omusomesa gwe tw-a-wa ebimuli
1s-pst-meet 1.teacher 1.REL 1p-pst-give 8.flower
'I met the teacher we gave flowers to.'
- b. *Walusimbi y-a-gula ebimuli be n-a-sanga omusomesa gwe
Walusimbi sbj1-pst-buy 8.flower 8.REL 1s-pst-meet 1.teacher 1.REL
tw-a-(bi)-wa
1p-pst-(8)-give
Lit: 'Walusimbi bought the flowers that I met the teacher we gave (them to).'

The hypothesis explored in this section is that the confluence of word-order and morphosyntactic (negation) factors in Luganda RCs may allow learners to analyze Luganda RCs as reduced, non-CP structures, much like restructured complement infinitives. Since relativization is clearly a case of \bar{A} -movement in Luganda, this proposal involves an adjustment to the traditional idea that \bar{A} -movement can only be licensed by a C head: instead, I will propose that Luganda relativization is driven by a lower head, either T or a functional head between T and C.

It is important to recognize that this proposal does not necessarily open the door for reduced-clause treatments of other \bar{A} structures, e.g. *wh*-questions. Relative clauses do have some special properties that might make them uniquely compatible with a reduced-clause analysis: they cannot stand alone, they must be associated with a noun phrase in the main clause, and they are not necessarily associated with any context-specific morphosyntactic features on par with [+wh] or the Q-morpheme. As pointed out by Heim and Kratzer (1998: 89), The CP label is not required for the purposes of semantic computation of relative clauses (λ -abstraction) – other structures work as well, 'as long as there is a relative pronoun at the top and a trace in [the position of the gap].'

4.4.1 Corroborating evidence from morpheme order

Relativization in Luganda is done via relative markers that precede the relative-clause verb. In subject relatives, where the head noun is coreferential with a gap in the subject position of the relative clause, this prefix takes the form of an ‘initial vowel’ that is pronounced as /e/, /a/, or /o/ depending on the height and roundness of the vowel in the following syllable. An example is given in (45b), where the initial vowel is boldfaced:

(45) Subject relative:

- a. ekikopo ki-gu-dde
7.cup 7-fall-perf
‘The cup fell down.’
- b. ekikopo **e**-ki-gu-dde ky-atis-e
7.cup **REL**-7-fall-perf 7-be.cracked-perf
‘The cup that fell down is broken.’ (Ashton et al. 1954: 136)

Object relatives, which contain a gap in an object position, are marked with a pre-verbal marker that can be decomposed into two pieces: a class-marker agreeing with the head noun followed by the vowel /e/ (boldfaced in (46b)).

(46) Object relative:

- a. abawala ba-a-luka emikeeka
2.girl 2-pst-plait 4.mat
‘The girls plaited the mats.’
- b. emikeeka abawala **gye** ba-a-luka te-gi-gasa
4.mat 2.girl **4.REL** 2-pst-plait neg-4-be.of.use
‘The mats that the girls plaited are not suitable.’ (Ashton et al. 1954: 144)

(47) Decomposition of class 4 relative marker:

class-4 **gi** + /e/ → **gye**

In some tenses, the RC verb also has a ‘suffixal H tone’ which shows up e.g. if the verb doesn’t already have underlying tone (Hyman and Katamba 1993).

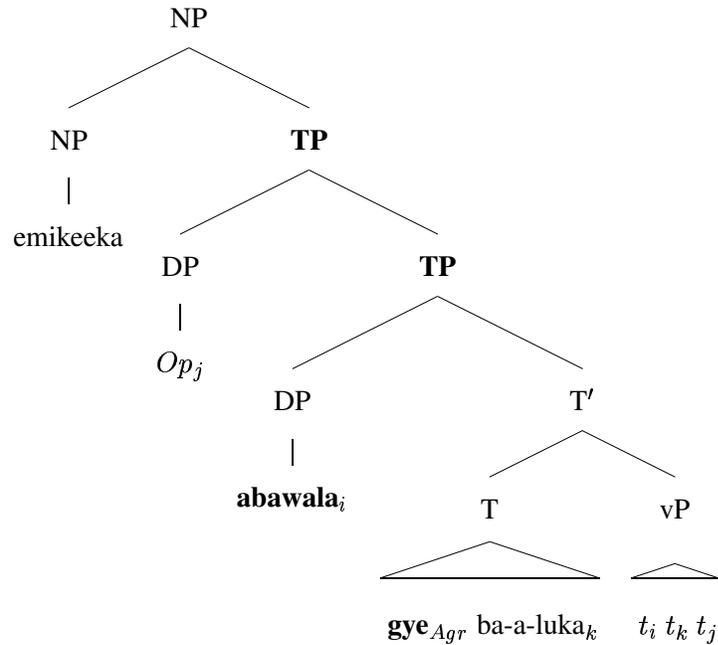
Notice that when the relative clause contains its own overt subject (e.g. *abawala* in (46b)), the relative marker obligatorily *follows the subject* (Walusimbi 1996). This pattern is also found in Ikalanga (Letsholo 2002), spoken in Botswana, but is otherwise unusual both cross-linguistically and within Bantu. The more well-known pattern in Bantu is for the relative marker either to be an ‘independent word’ preceding the subject (Sesotho, Tswana, Tsonga), or a prefix on the verb with subject-verb inversion (Chishona, Nsenga) (Demuth and Harford 1999). It is worth pointing out, too, that neither type of relative clause in Luganda contains anything that looks like a complementizer (*nti, nga*) or demonstrative.

As a preliminary observation, then, Luganda relative clauses have unique word-order properties that make the reduced-clause analysis at least feasible. Unlike in English, where the relative pronoun and complementizer both precede the RC subject (48), there is no overt evidence for functional material above the subject in Luganda RCs.

(48) the mats $_{CP}$ [**which**_{*i*} / Op_i $_{C}$ [**that** / \emptyset] $_{TP}$ [**the girls** plaited t_i]]

In §4.3.2 above I argued that overt *main-clause* subjects in Luganda are in Spec,CP. I made this proposal based on both phonological evidence (the fact that preverbal subjects always phrase separately for HTA) and distributional evidence (the fact that preverbal subjects can precede complementizers and are freely ordered with respect to left-dislocated objects and topic adverbs). This evidence is not available in the RC context, however – we have seen that RC subjects do not phrase separately and that RCs do not contain complementizers, and we will see below that pre-subject adverbs and objects within RCs are very tightly restricted. I will therefore argue that Luganda RC subjects are generated in Spec,vP and move via A-movement to some position *lower than C* – either Spec,TP or Spec,XP, where XP is a functional projection between TP and CP. A possible structure is given in (49):

(49) **TP structure** for Luganda restrictive RC:



(50) *emikeeka abawala gye-ba-a-luk-a*
 4.mat 2.girl **4.REL**-2-pst-plait-ind
 'the mats that the girls plaited'

In this analysis the Luganda relative clause is a TP, with the T head driving both \bar{A} -movement (of the relative operator) and A-movement (of the subject from Spec,vP). Specifically:

- the relative-clause subject move from Spec,vP to inner Spec,TP;
- there is null-operator movement to an outer Spec,TP position;
- the relative marker is a piece of agreement inflection inserted on the verbal complex in T;
- the head noun *emikeeka* is base-generated in the main clause and coindexed with the null operator in the relative clause.

Another possibility is that the relative clause is an XP – where XP is a projection between TP and CP. The RC subject would move to Spec,XP and an overt relative-marker would move to Spec,TP. Other variations are possible as well (e.g. a head-raising analysis, where *emikeeka* moves to its final position from within the relative clause). The crucial point here is that the RC does not contain a CP projection.

Some additional facts that are consistent with the reduced-clause treatment of Luganda relatives is found in the domain of the verbal morphology. Luganda relative-clause verbs have the usual subject-agreement and tense prefixes, but negation is marked a bit differently – instead of the ‘peripheral *te-*’ prefix that appears at the leftmost edge of the verbal head in main clauses and full complement clauses, relative-clause verbs require a *-ta-* prefix that *follows* subject-agreement.

- (51) a. (y-a-gamba nti) abasajja **te**-ba-a-leeta emigugu jjo
 (sbj1-pst-say comp) 2.man **neg**-2-pst-bring 4.bundle yesterday
 ‘(S/he said that) the men didn’t bring the bundles yesterday.’
- b. i. abasajja a-ba-**ta**-a-leeta migugu jjo
 2.man REL-2-**neg**-pst-bring 4.bundle yesterday
 ‘the men who didn’t bring bundles yesterday’
- ii. *abasajja e-**te**-ba-a-leeta jjo
- iii. *abasajja **t’**-a-ba-a-leeta jjo
- c. i. emigugu abasajja gye ba-**ta**-a-leeta jjo
 4.bundle 2.man 4.REL 2-**neg**-pst-bring yesterday
 ‘the bundles that the men didn’t bring yesterday’ (Ashton:144)
- ii. *emigugu abasajja gye **te**-ba-a-leeta jjo
- iii. *emigugu abasajja **te**-gye-ba-a-leeta jjo

Interestingly, peripheral *te-* is also unavailable in infinitives (which require *-ta-*, like RC verbs) and subjunctives (which require periphrastic negation with *ku-lemma* ‘to fail to’). The basic observation seems to be that peripheral *te-* is only available in full clauses. This is a

fairly common pattern in Bantu (see e.g. Gueldemann 1999). One possibility is that there are two positions for NegP (see Letsholo 2002, Ngonyani 2002) and that the higher NegP, like CP, is simply absent in reduced clauses. While the negation facts are not conclusive in themselves, they are at the very least consistent with the reduced-clause hypothesis for Luganda relative clauses.

4.4.2 Further evidence: (non-)availability of the Spec,CP position

If the current hypothesis is on the right track – i.e., if Luganda RC subjects are in Spec,TP and there is no CP projection immediately above them – then we make the following prediction:

- (52) Material that can *only* be in Spec,CP – e.g. left-dislocated direct objects and certain topic adverbs – will not be able occur within a Luganda relative clause.

This prediction appears to be borne out. First of all, there are some adverbs that cannot precede the subject within a RC even though they can precede the subject in a ‘think/say’ complement:

- (53) a. Mukasa a-lowooz-a nti **mpozzi** omulenzi y-a-bba olulagala
 1.Mukasa sbj1-think-ind that maybe 1.boy sbj1-pst-steal 11.banana.leaf
 ‘Mukasa thinks that maybe the boy stole the banana leaf.’
- b. nj-oger-a ku-lulagala (***mpozzi**) omulenzi lwe y-a-bba
 1s-talk-ind loc-11.banana.leaf maybe 1.boy 11.rel sbj1-pst-steal
 ‘I’m talking about the banana leaf that (maybe) the boy stole.’
- (54) a. **o-ku-mala essaw’ emu** y-a-kwat-a omulenzi
 iv-inf-finish 9.hour 9.two sbj1-pst-hold-ind 1.boy
 ‘For two hours s/he held the boy.’
- b. nj-agal’ omulenzi (***o-ku-mala essaw’ emu**) gwe y-a-kwat-a
 1s-like 1.boy iv-inf-finish 9.hour 9.two 1.rel sbj1-pst-hold-ind
 ‘I like the boy that for two hours s/he held.’

- (55) a. **essaw’ etaano** Mukasa y-a-fuumb-ir-a-mu lumoonde
 10.hour 10.five 1.Mukasa sbj1-pst-cook-appl-ind-loc 1a.potato
 ‘In five hours Mukasa cooked the potatoes.’
- b. n-gul-a lumoonde (***essaw’ etaano**) Mukasa gwe y-a-fuumb-ir-a-mu
 1s-buy 1a.potato 10.hour 10.five 1.Mukasa 1.rel sbj1-pst-cook-appl-ind-loc
 ‘I bought the potatoes that in five hours Mukasa cooked.’

Under the full-CP analysis of Luganda RCs, the ungrammaticality of the (b) examples above would be mysterious. We know that the RC subject can freely precede the relative marker. If the RC were a CP, then the relative marker would probably be in either C (as suggested for other Bantu languages by Demuth and Harford (1999)) or Spec,CP, with the subject in an outer Spec,CP. It is not clear, then, why this Spec,CP position would *only* be available for subjects and not for adverbials, or why this would be the case only within RCs.

Left-dislocation of an object internal to a RC is also degraded or rejected ((56)–(58)), even though objects can be left-dislocated in a ‘think/say’ complement or in a non-restructured infinitive. This contrast is exactly what we expect under the assumption that (i) fronted/left-dislocated objects are in Spec,CP, and (ii) Luganda RCs are smaller than CPs.¹³

- (56) a. (n-dowooza nti) omwaana amata tw-a-ga-mu-wa
 1s-think comp 1.child 6.milk 1p-pst-obj6-obj1-give
 ‘(I think that) the baby, milk, we gave it to him.’
- b. Musoke y-a-kwat’ omwaana gwe tw-a-wa amata
 1.Musoke sbj1-pst-hold 1.child 1.REL 1p-pst-give 6.milk
 ‘Musoke held the baby we gave milk to.’
- c. ?* Musoke yakwat’ omwaana amata gwe tw-a-ga-wa
 1.Musoke sbj1-pst-hold 1.child 6.milk 1.REL 1p-pst-obj6-give

¹³One of my consultants has accepted examples like (56)–(58). I assume that for this speaker, and possibly for all speakers under certain discourse conditions, fronted objects can be pronounced in Spec,TP as well as Spec,CP. Independent diagnostics for the two positions remain to be explored.

‘Musoke held the baby (who) the milk, (who) we gave it to (him).’

- (57) a. (n-dowooza nti) omukyala ebinnyanja y-a-bi-fuumba
 1s-think comp 1.woman 8.fish sbj1-pst-obj8-cook
 ‘(I think that) the woman, the fish, she cooked them.’
- b. Walusimbi y-a-sanga omukyala e-y-a-fuumba ebinnyanja
 1.Walusimbi sbj1-pst-meet 1.woman REL-sbj1-pst-cook 8.fish
 ‘Walusimbi met the woman who cooked the fish.’
- c. ?* Walusimbi y-a-sanga omukyala ebinnyanja e-y-a-bi-fuumb-a
 1.Walusimbi sbj1-pst-meet 1.lady 8.fish REL-sbj1-pst-obj8-cook-ind
 ‘Walusimbi met the woman (who) the fish, (who) cooked them.’
- (58) a. n-a-gend-a ku-ssomero ebimuli bino o-ku-bi-w’ omusomesa
 1s-pst-go-ind loc-school 8.flower 8.dem iv-inf-8-give 1.teacher
 ‘I went to school, these flowers, to give them to the teacher.’
- b. n-a-sang’ omusomesa gwe tw-a-w’ ebimuli bino
 1s-pst-meet 1.teacher 1.rel 1p-pst-give 8.flower 8.dem
 ‘I met the teacher who we gave these flowers to.’
- c. ?* n-a-sang’ omusomesa ebimuli bino gwe tw-a-bi-wa
 1s-pst-meet 1.teacher 8.flower 8.dem 1.rel 1p-pst-8-give
 ‘I met the teacher who these flowers, we gave them to him/her.’

An alternative explanation for the ungrammaticality of (56c)–(58c) is that these examples are independently ruled out by some kind of pragmatic constraint against topicalizing within a relative clause. The examples below, however, show that this approach cannot be correct, since left-dislocated relative-clause objects *can* go in the *matrix* Spec,CP position, where they are judged as perfectly acceptable:

- (59) a. amata Musoke y-a-kwata omwaana gwe tw-a-ga-wa
 6.milk Musoke sbj1-pst-hold 1.baby 1.REL 1p-pst-6-give
 ‘The milk, Musoke held the baby that we gave it to.’
- b. ebinnyanja Walusimbi y-a-sanga omukyala e-y-a-bi-fuumba
 8.fish Walusimbi sbj1-pst-meet 1.woman REL-sbj1-pst-8-cook
 ‘The fish, Walusimbi met the woman who cooked them.’

- c. ebimuli bino, n-a-sanga omusomesa gwe tw-a-bi-wa
 8.flower 8.dem 1s-pst-meet 1.teacher 1.REL 1p-pst-8-give
 ‘These flowers, I met the teacher we gave (them to).’

Recall that unlike relativization, left-dislocation does not leave a gap; instead, there is an obligatory object prefix between tense and the verb root. Furthermore, left-dislocation is not subjected to island constraints, unlike relativization:

- (60) a. ekitabo kino, omulenzi y-ebaka bwe n-a-**ki**-mu-som-era
 7.book 7.dem 1.boy sbj1-sleep when 1s-pst-7-I.obj-read-appl
 ‘This book, the boy fell asleep when I read it to him.’
- b. cf. *n-jogera ku kitabo omulenzi kye-y-ebaka bwe n-a-(ki)-mu-som-era
 Lit: ‘I’m talking about the book that the boy fell asleep when I read (it) to him.’ (repeated from (43b) above)

Based on these facts, I conclude that left-dislocation is not a case of \bar{A} -movement in Luganda. These structures most likely do not involve movement at all; rather, the left-dislocated object is base-generated in Spec,CP and coindexed with an incorporated pronoun in the verbal complex. For present purposes, the important point is that the problem with (56c)–(58c) cannot be explained as a case of ‘crossing \bar{A} chains,’ since left-dislocation does not involve \bar{A} -movement in the first place. In contrast, the unavailability of (56c)–(58c) receives a natural explanation under the hypothesis that Luganda RCs are TPs rather than CPs. If left-dislocated objects are base-generated in Spec,CP, the only place they can surface in these structures is in the *matrix* Spec,CP position, as in (59).

4.5 Discussion: the broader picture

4.5.1 Differences between Huave and Luganda domains

In Chapters 3 and 4, we looked at two phrasal rules from unrelated languages whose domains show the same basic relationship to the underlying syntax. Specifically:

- (61) Domains for Huave tone and Luganda HTA:
- (62) a. In monoclausal sentences, preverbal subjects, adverbs, and other ‘peripheral’ material (e.g. left-dislocated objects in Luganda) form their own tone domains, while the verb and all following material forms a single tone domain.
- b. In multiclausal sentences, each clause forms a separate tone domain. Within each clause, generalization (a) holds.

I explained this pattern by arguing that:

- (63) Proposal for and Huave and Luganda spellout:
 - a. Matrix-clause preverbal subjects, left-dislocated objects, and ‘topicalized’ adverbials obligatorily occupy Spec,CP.
 - b. Sentences with multiple preverbal constituents have multiple (recursive) CPs.
 - c. Spellout is triggered at each CP; the C head and CP specifier (‘edge’) are spelled out on a separate cycle.
 - d. Huave tone rules and Luganda HTA apply to the Chains that are produced internal to each cycle.

While the Huave and Luganda case studies look very similar, I have proposed that the two rules are in fact associated with *different stages* in the PF derivation: Luganda HTA applies to linearized Chains *internal* to spellout domains, while Huave tone rules apply later, when separate spellout domains have been linearized with respect to each other. In

other words, Luganda HTA is a Chaining rule and Huave tone is a Late-Linearization rule. The primary motivation for making this distinction is that, as discussed at length in Chapter 3, Huave tone domains are *variable*, so that a prosodically heavy verbal tone domain may be broken down into two units; Luganda HTA domains, on the other hand, do not appear to have this property. No examples of the type in (65) have been observed, either in my corpus of elicited sentences (which is over 10 times the size of my Huave corpus) or in previously published work (Snoxall 1967, Ashton et al. 1954, Hyman 1982 et seq.).

(64) ‘Chain-splitting’ in Huave tone domains

a. (V DO IO) or (V)(DO IO)

i. ... (ap-m-úúch ákókiáw chípín mí-kwál xé-kómbúl)
 fut-sub-give five tomato poss-son 1.poss-friend
 ‘...[he] will give five tomatoes to my friend’s son’

ii. ... (ap-m-úùch) (àkòkiáw chípín mí-kwál xé-kómbúl)

b. (V DO) or (V)(DO)

i. (t-àpééd chípìn)
 pst-cut tomato
 ‘S/he picked tomatoes.’

ii. (t-àpèht-îus) (à chípîn)
 pst-cut-1s det tomato
 ‘I picked the tomato.’

(65) No variation in Luganda HTA domains

a. (V IO DO), *(V)(IO DO), *(V IO)(DO)

i. (n-gúl-ír-á Múkásá kááwà)
 1s-buy-appl-ind 1.Mukasa 1a.coffee
 ‘I’m buying Mukasa some coffee.’

ii. * (ngùlirà) (Mùkásá kááwà)

iii. * (ngùlirà Mùkàsà) (kááwà)

- b. (V DO), *(V)(DO)
- i. (m-pándík' ébbálúwà)
 1s-write 5.letter
 'I'm writing a letter.'
- ii. * (m-pàndik') (èbbàlúwà)

On the other hand, we saw that variability *is* attested with another phrasal rule in Luganda: Final Vowel Elision, as we saw in Chapters 1 and 2, sometimes applies across spellout domains (Chain-merging) and sometimes fails to apply within a spellout domain (Chain-splitting).

- (66) a. *Chain-merging*: omulenzì a-génz-è
 1.boy sbj1-go-perf
 'The boy has gone.'
- b. → òmùlènz' àgènzè (one Elision domain, two HTA domains) (Cole 1967: 19)
- (67) a. *Chain-splitting*: nj-agal-a ekitabò Wálúsimbi kye y-a-gúl-à
 1s-want-ind 7.book 1.Walusimbi 7.rel sbj1-pst-buy-ind
 'I like the book that Walusimbi bought.'
- b. → njágálá ékítábó Wálúsimbi kyè yàgúlà
 (two Elision domains, one HTA domain)

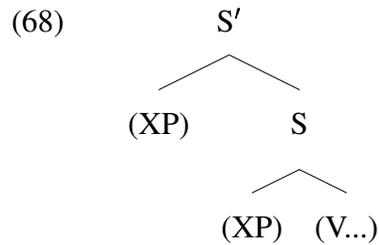
In sum, then, even though Huave tone and Luganda HTA work with the same basic objects, they are distinguished by the property of variability – a difference that results from the fact that they apply at different stages in PF.

4.5.2 Some other (possible) Chaining rules

In this final section, I provide an overview of some phrasal rules from other languages whose domains appear to roughly correspond to 'minimal clauses,' much like Luganda HTA domains. The authors do not report on whether or not these phonological domains

are variable or not (i.e. whether they behave like Huave tone domains or Luganda HTA domains); in the former case, I would hypothesize that they were Late-Linearization rules rather than Chaining rules.

- **Kinande H-spread and boundary tone:** (Hyman 1990: 114) argues that the ‘Phonological Phrase’ in the Bantu language Kinande is defined as follows:



Descriptively, the generalization is the same as in Huave: the verb groups together with all following material within the same clause, while each constituent at the left edge of the clause phrases separately. There are two phonological rules that operate on these domains – (i) a H% boundary-tone placement rule; and (ii) a rule of leftward H-spread, which applies across M-words within but not across these phrasal domains.

- (69) H% boundary tone links to toneless final mora of phrasal domain:

- (èkìryàtù) (kì-kâ-w-â)
7.shoe 7-prs-fall-ind
‘The shoe is falling.’
- (èkìryàtù kì-rítò)
7.shoe 7-heavy
‘heavy shoe’
- (èkìryàtù èkyó) (tù-ká-làngìr-á) (kì-kâ-w-â)
7.shoe 7.rel 1p-prs-see-ind 7-prs-fall-ind
‘The shoe that we see is falling.’

- (70) Leftward H-tone spread onto toneless final mora of M-word

- a. (tùm-á kátsùbà)
send-ind Katsuba
'Send Katsuba!'
- b. (òmùtùtùtù) (kátsùbà) (á-lyà-w-à)
morning Katsuba 3s-pst-fall
'In the morning Katsuba fell.'

- **Slave boundary tone:** A phrase-final L tone in the Athapaskan language Slave applies to domains that are derived as follows, according to Rice (1987):

(71) Insert a phonological domain boundary at the left edge of any daughter of S or S'

In the following example (p. 45), the preverbal subject *ehté* always receives a phrase-final L tone. The locative PP *met'áh* 'in it' shows up with a phrase-final L tone in (a), where it precedes the subject, but not in (b), where it follows the subject. The idea is that the PP is adjoined to a clause-edge position in (a) but to a lower position, e.g. vP, in (b):

- (72) a. (mét'áh) (t'ásì) (éhtè)
in.it things are.frozen
'In it, things are frozen.'
- b. (t'ásì) (métáh éhtè)
things in.it are.frozen
'Things are frozen in it.'

Slave resembles Huave and Kinande in its basic pattern – clause-edge items are separate, while items below the C' level phrase together. Interestingly, however, embedded clauses are reported to group together with the matrix verb, contrary to what is expected if they are full CPs (this is why Rice refers to the *left* edge of S in her algorithm in (71); note that Slave is OV):

- (73) a. (gùwóhyá ènìdhè)
 1s.optative.be.wise 3.think
 ‘He thinks he is smart.’
- b. (sétthíghà) (néneh àdàni)
 1s.hair 3.long 3.become
 ‘My hair is getting long.’

Within the current proposal, where spellout is automatically triggered at every CP level, (73) would be taken as an indication that these embedded clauses are not full CPs or that some kind of ‘clause union’ has occurred. A wider range of examples, including various kinds of matrix verbs and complements with overt subjects, would need to be examined in order to test this hypothesis.

- **Tohono O’odham** has a H-plateau rule that groups an entire clause together and assigns a (L)HL melody to it – as long as the default (Aux-S-O-V) word order is used (74a). If adjuncts or arguments are moved to the right of the verb, however, they form their own tone domains (74b).

- (74) a. (nó g wákíál g wísíló g wíjíná-káj wúpdà)
 aux det cowboy det calf det rope-with rope.imp
 ‘Is the cowboy roping the calf with a rope?’
- b. (nó wúpdà) (g wákìàl) (g wísìlò) (g wíjìnà-kàj)
 aux rope.imp det cowboy det calf det rope-with
 ‘Is the cowboy roping the calf with a rope?’ (Hale and Selkirk 1987: ex. 10)

Hale and Selkirk (1987) argue that the postverbal constituents in (74b) are extraposed and therefore ungoverned; the phrasing is then predicted by a constraint that matches right edges of ungoverned XPs with Intonational Phrase boundaries. Phillips (1996) accounts for the pattern with a constraint that defines a tone domain as the minimal constituent containing both Aux and V; in an incremental (top-down) structure-

building grammar, this constituent will be defined before further arguments and adjuncts are merged to the right of V.

These facts are also amenable to a treatment in the current framework. The basic idea would be that the entire utterance in (74a) – perhaps a TP, with an empty Q-morpheme in C – is spelled out as a single unit, and that the (L)HL melody is assigned to Chains. In (74b), either the postverbal constituents would have moved outside of the spellout domain by extraposition, or the verb and other arguments would have raised leftward to phase-edge positions. There is also some evidence that each clause forms a separate tone domain in Tohono O’odham multicausal structures, as expected under this type of treatment:

- (75) a. (pì ’àñ máàc) (m-ás hédái gátwì) (g sîki)
 neg aux know comp-aux who shoot.perf det deer
 ‘I don’t know who shot the deer.’ (Hale and Selkirk 1987: ex. 17)
- b. (’é’dà) (’ànt ò cípk) (má-nt hékíd ó ’í wàm)
 then aux.1s fut work.perf comp-aux.1s when fut incep wake.perf
 ‘Then I will work, when I wake up.’ (Phillips 1996: 234)

Again, we would need to examine a larger corpus, including different kinds of complement and adjunct clauses, in order to determine if the Tohono O’odham facts were consistent with the analysis proposed here.

Chapter 5

An early phrasal rule in Luganda

5.1 Introduction

In addition to the H-tone anticipation (HTA) rule we focused on in Chapter 4, Luganda has another phrasal phonological rule that also happens to result in H-plateaus, but in a more restricted set of morphosyntactic contexts. This rule (discussed in some depth in Hyman et al. 1987, Hyman and Katamba 1993, 2004, and others) applies between two H_nL_n words with the relevant morphosyntactic properties and can be decomposed into two steps: first the L tone on Word 1 is deleted, and then an H plateau is created between the H on Word 1 and the H on Word 2.

- (1) tú-làba Walúsìmbi → tú-láb-á Wálúsìmbi (HL HL → HHHHHL)
1pl-see Walusimbi
'We see Walusimbi.' (Hyman et al. 1987: 92)

Since the two steps of this rule – deletion of L and creation of a H-plateau – always occur in tandem, I will treat them as a single process and refer to them collectively as *LTD*.

The **phonological conditions** on LTD and HTA are summarized below (see also Chapter 4 §4.1):

(2) **Phonological conditions on LTD:**

- a. applies between two H_nL_n words
- b. deletes L on Word 1
- c. then assigns H to all toneless moras between H on Word 1 and H on Word 2

- (3) tú-làb-a Nakátò → tú-lab-a Nakátò → túlábá Nákátò
1p-see-ind 1.Nakato
'We see Nakato.'

(4) **Phonological conditions on HTA:**

- a. applies when a word with a toneless final mora is followed by a H_nL_n word
- b. no L tones are deleted
- c. spreads H from Word 2 leftward onto any toneless moras (potentially spreading through multiple toneless M-words), stopping short of first mora of domain
- d. spreads H only if M-word boundary is crossed (no HTA onto initial mora of *Nakato* in (5b))

- (5) a. nj-agal-a Nakátò → njágálá Nákátò
1s-like-ind 1.Nakato
'I like Nakato.'
- b. o-ku-láb-à Nakátò → òkùlábà Nàkátò
iv-inf-see-ind 1.Nakato
'to see Nakato'
- ↗ * òkùlábà Nákátò

As in Chapter 4, the 'source' H tone that spreads leftward in HTA contexts is underlined in all examples. (See §4.2.2 for an explanation of how H and L tones are assigned within M-words.)

The **syntactic conditions** on LTD and HTA are also distinct. To a first approximation, *LTD applies in a subset of the syntactic contexts that permit HTA* – not only is it subjected

to a variety of morphosyntactic conditions that do not play a role in HTA (see §5.2.1), but its domains appear at first sight to correspond to smaller syntactic objects than HTA domains. The following pair demonstrates this second point. While both HTA and LTD apply can apply between a verb and an in situ direct object ((3), (5a)), only HTA applies in right-dislocation structures like (6):

(6) HTA applies between verb and right-dislocated subject (a), but LTD is blocked (b):

a. HTA:

a-mu-sisinkana Walúsìmbi → (à-mú-sísínkáná Wálúsìmbi)
 sbj1-obj1-meet Walusimbi
 ‘He’s meeting him/her, Walusimbi.’

b. LTD:

a-mu-kúbà Walúsìmbi → (à-mù-kúbà)(Wálúsìmbi), *(à-mú-kúbá
 sbj1-obj1-hit Walusimbi
 Wálúsìmbi)

‘He’s hitting him/her, Walusimbi.’

Hyman and Katamba (2004) argue that the domain for LTD is defined (in part) by *c*-command relations – LTD applies between two words only if Word 1 is a head that *c*-commands Word 2. Assuming that the right-dislocated subject in (6b) is right-adjoined to TP, LTD fails to apply because the verb (in T) does not *c*-command *Walusimbi*. While this explanation seems to be on the right track descriptively, it raises an important question for the *direct spellout hypothesis* I put forth in Chapter 1:

- (7) **Direct spellout hypothesis:** Syntactic structures are built up and processed in phases, or designated subparts, instead of all at once. Phonological rules apply *directly* to the material that is spelled out at each syntactic cycle/ phase.
- (8) If phonological domains are simply spell-out domains, how can a single language have two phrasal rules with different-sized domains, one restricted to *c*-command

configurations (LTD) and the other applying throughout an entire CP complement regardless of its internal constituency (HTA)?

In answering this question I will return to another one of the core ideas advanced in Chapter 1: that *spellout* is not just a one-step conversion but a complex derivation involving a series of operations, crucially including different steps of linearization interleaved with different types of phonological rules.

The previous chapter showed that Luganda HTA, like Huave phrasal tone rules, applies to Chains – fully linearized strings of M-words produced internal to each CP spellout domain. In this chapter I will argue that Luganda LTD applies at an earlier stage in PF, to partially linearized structures – specifically, to **binary Concatenation statements** of a particular type. We will see that the way this kind of Concatenation works automatically restricts LTD to contexts where Word 1 is a head that c-commands Word 2. The basic idea is that while LTD and HTA apply within the same spellout domains, they apply at *different stages during spellout* – LTD applies at an early stage, to partially linearized structures, and thus can only ‘see’ a subset of the phonological material that is visible when HTA applies.

5.2 The relation between syntax and LTD

As noted above, the syntactic conditions on LTD are more restrictive than the conditions on HTA. Hyman (1987:154) identifies only two possible contexts for LTD:

LTD applies...

1. between a noun and a following noun/pronoun that includes a possessive marker (*wa, kya, bya, etc.*) – i.e., within a possessive DP:

(9) ebikópò **byá**-Nakátò → (èbìkópó byá-Nákátò)
8.cup 8.poss-1.Nakato

‘Nakato’s cups’

2. between a verb and the first word to its right, as long as (i) the verb is not an infinitive, negative, imperative, persistive, or inceptive; and (ii) the following word does not begin with an initial vowel:

(10) Verb + Object

n-a-wúlir-a kaamukúúkùlu → (nàwúlírá káámúkúúkùlù)
1s-pst-hear-ind 1a.dove
‘I heard the dove.’

(11) Verb + Adverb

a-yîmb-a bulúngì → (àyímbá búlúngì)
sbj1-sing-ind well
‘S/he sings well.’

As we will see in the course of this chapter, LTD is indeed blocked in all syntactic contexts except the two listed above – it cannot apply, for example, between a preverbal subject and a verb, between a noun and an adjective, or between two objects in a double-object structure. The question is what the generalization is behind these conditions, if there is one at all. I will examine a number of additional contexts where LTD could in principle apply, and will arrive at the following generalization (momentarily setting aside the verb-tense and initial-vowel conditions in Item 2, (i)–(ii) above):

- (12) LTD applies between a head X and a following word Y, only if:
- a. Y is in the same ‘minimal clause’ as X; and
 - b. Y is in the complement of (i.e. c-commanded by) X.

The ‘minimal clause’ condition in (a) is our indication that LTD is working with the same basic syntactic units as HTA – namely, the CP spellout domain. The c-command condition in (b) follows from the hypothesis that LTD is an early Concatenation rule. I provide a detailed analysis in §5.2.4 and show that the current model makes some unique predictions that are also borne out.

5.2.1 Apparent visibility of morphosyntactic features

Before we turn to our main discussion, the morphosyntactic conditions listed in Item 2 above (restated below in (13)) deserve some attention.

- (13) a. LTD fails to apply between a verb and a following word if the verb is a negative, imperative, infinitive, persistive, or inceptive.
 b. LTD fails to apply between any two words if the second word begins with an initial vowel. (Hyman and Katamba 2004, Hyman et al. 1987)

The ‘initial vowel’ referred to in (13b) (also called an ‘augment’ or ‘pre-prefix’) is a harmonizing /e/, /o/ or /a/ that shows up word-initially on nouns and modifiers in certain contexts. These contexts are somewhat difficult to summarize (see Ashton et al. 1954, Pilkington 1967:14–15, Welmers 1973:§6.7); to take just one example, the initial vowel is generally required on direct objects in ‘equal-focus’ contexts, but is prohibited in object-focus contexts:

- (14) a. bá-á-làb-à **o**-musáwò → (báálàb’) (òmùsáwò) (no LTD)
 3p-pst-see-ind iv-1.doctor
 ‘They saw a doctor.’
 b. bá-á-làb-à musáwò → (báál**á**bá **m**úsáwò) (LTD applies)
 3p-pst-see-ind 1.doctor
 ‘They saw a DOCTOR.’

Although the initial vowel usually surfaces as L (cf. (14a)), Hyman and Katamba (1990:31) argue that it is underlyingly H, and that it is automatically lowered to L due to a ‘widely attested... dispreference for beginning a domain on a H-tone vowel.’¹ Crucially, LTD can only apply between two H_nL_n words. If the second of two words begins with an initial vowel (15), it will be LH_nL_n instead of H_nL_n , and LTD will consequently be blocked. In (14b), on the other hand, the object does not have an initial vowel and is therefore HL instead of LHL – thus permitting the rule to apply.

- (15) bá-á-làb-à ò-musáwò (HL LHL) (no LTD)
 3p-pst-see-ind iv-1.doctor
 ‘They saw a doctor.’

One point worth noting is that the derived L that blocks LTD does not have any apparent effect on HTA, suggesting that this tone might be deleted at some intermediate stage in the derivation:

- (16) HTA is not blocked by initial vowel:

 m-pandik-a e-bbalúwà → (m-pándík’ ébbálúwà)
 1s-write-ind iv-5.letter
 ‘I’m writing a letter.’

¹The initial vowel can surface with its H tone intact if it is ‘protected’ by a proclitic like the possessive marker (*wa, bya, kya*, etc.).

- (1) é-bikópò bya-ó-mulimi ‘cups of the farmer’
 a. → è-bikópò bya-ó-mulimi (after lowering of H tone on initial vowel *e*)
 b. → èbikópò byómulimi (after word-internal Elision)
 c. → èbikópó byómulimi (after LTD)
 d. → èbikópó byómùlimì (after Default L assignment)

Otherwise, Hyman and Katamba’s phonological analysis works well for the cases I have observed, and I will adopt it here without further comment. I have minimized the effects of the initial-vowel condition in many of the subsequent examples in this chapter by using class 1a nouns and proper names, which never take the initial vowel and thus do not categorically block LTD.

The conditions in (13a) remain to be explained. Example (17) shows nine verb forms that undergo LTD with a following word, and (18) shows each of the contexts for LTD *non*-application listed in (13a) (examples from Hyman et al. 1987: 92–94):

(17) Verb forms that allow LTD:

- a. Present: tú-làb-a Wálúsìmbi → túlábá Wálúsìmbi ‘we see W.’
- b. Perfect: tú-làb-yè → túláyé Wálúsìmbi ‘we have seen W.’
- c. Near Past: tw-á-láb-yê → twáláyé Wálúsìmbi ‘we saw W.’
- d. Distant Past: tw-á-láb-à → twálábá Wálúsìmbi ‘we saw W.’
- e. Near Future: tú-náá-láb-à → túnáálábá Wálúsìmbi ‘we will see W.’
- f. Distant Future: tú-lì-láb-a → túlílábá Wálúsìmbi ‘we will see W.’
- g. Subjunctive: tu-lab-ê → tùlàbé Wálúsìmbi
‘let’s see W.; (that) we might see W.’
- h. Conditional: tw-áándí-láb-yê → twáándíláyé Wálúsìmbi
‘we would have seen W.’

(18) Verb forms that block LTD:

- a. Negated: tè-tú-làb-a Wálúsìmbi
neg-1p-see-ind 1.Walusimbi
‘We don’t see Walusimbi.’
- b. Imperative: kúb-à Wálúsìmbi ‘hit Walusimbi!’
- c. Infinitive: (o)-ku-láb-à Wálúsìmbi ‘to hit Walusimbi’

- d. Persistentive: tú-kyáá-láb-à Wàlúsìmbi ‘we still see Walusimbi’
- e. Inceptive: tw-aka-láb-à Wàlúsìmbi ‘we have just seen Walusimbi’

Hyman argues that the various verb forms listed in (13a) are marked with a [+F] feature (Hyman et al. 1987:94, Hyman and Katamba 1990/1991:16),² and that this [+F] feature is visible to the phonological rule of LTD. Another possibility is that the verbs in (17) have all moved to T, while those in (18) have moved to some other projection, (e.g. NegP, AspP, vP), and that LTD applies specifically to T heads. I will not make arguments for either proposal here. The important point for our purposes is that, unlike the ‘exclusively phonological’ treatment of the initial-vowel condition from Hyman and Katamba (1990/1991), both of these proposals hinge crucially on the idea that at least some phonological rules can ‘see’ morphosyntactic features or node labels. This is a problematic idea within many instantiations of Prosodic Hierarchy Theory (see Chapter 6 for more discussion), although it does not necessarily pose a problem for the model advanced here – as pointed out in Chapters 2 and 6, Concatenation rules can refer to specific morphosyntactic features and/or node labels. We will return to this point briefly at the end of this chapter.

5.2.2 LTD is clause-bounded

Recall from (9)–(11) that Hyman (1987) identifies only two syntactic contexts that allow LTD:

- (19) LTD applies...
 - a. within a possessive DP
 - b. between a verb and the first word to its right

²See Hyman and Watters (1984) for the possibility that these verb tenses might have formed a natural class at some point in the history of Bantu.

Notice that this list does not include any statement about whether two words that undergo LTD must belong to the *same clause* or not. (19b), for example, does not rule out LTD application between the verb *túlòwooza* and the embedded subject *Kaséddè* in (20):

- (20) $CP[\text{tú-lòwooza-a } CP[\text{Kaséddè a-som-a }]]$
 1p-think-ind 1.Kasedde subj1-read-ind
 ‘We think Kasedde is reading.’

As we will see below, however, LTD does not apply in (20) or similar structures. Rather, *in every syntactic context where HTA is blocked, LTD is blocked as well* (cf. Chapter 4):

- between a preverbal subject, object, or adverb and the following verb;
- between each preverbal constituent in a sentence with multiple ‘topics’;
- between full clauses.

Likewise, LTD applies freely in many of the contexts where HTA applies freely:

- between a matrix-clause verb and an restructured infinitival complement;
- between a matrix-clause verb and a reduced subjunctive complement;
- between a matrix clause and a relative clause (RC).

The basic generalization is that LTD domains are constrained by the same ‘minimal CP’ boundaries as HTA domains. This is what we expect within the model developed here, where both Concatenation and Chaining work initially with the same chunks of spelled-out structure. In the following subsections I look at each of these cases in turn. In §5.2.4 I turn to cases where HTA applies but LTD is blocked, which will allow us to look more closely at the unique properties of Concatenation rules.

LTD is blocked between the CP edge and the C complement

Hyman and Katamba (2004) show that LTD, like HTA, is systematically blocked between a subject and a verb in an SV(O) sentence.

- (21) a. (òmusáwò) (y-à-géèndà)
1.doctor sbj1-pst-go
'The doctor left.' (RV030607)
- b. (Wàlúsìmbì) (à-kólá nnámúzígà)
Walusimbi sbj1-make 1a.wheel
'Walusimbi is making a wheel.' (SM020208)

The phonological conditions on LTD are satisfied in (21a), since both the subject and the (unaccusative) verb in (21a) are HL. However, LTD does not apply in this context: the L tone at the end of *omusáwò* is preserved and no H-plateau is created. Preverbal subjects always form their own domains for LTD, just as they do for HTA. Example (21b) shows the same pattern in an SVO sentence; notice that LTD applies between the verb and the following object, but not between the subject and the verb.

Similarly, LTD is blocked between a preposed object and a verb (22a), between a preverbal subject and a preverbal object (in either order) (22b), and between multiple preverbal objects (22c):

- (22) a. (Nàkátò) (n-à-mú-fúmb-ír-á nnámúnyè)
1.Nakato 1s-pst-obj1-cook-appl-ind 1a.cranberry.beans
'I cooked Nakato some cranberry beans.' (SM020208)
- b. (Wàlúsìmbì) (Nàkátò) (y-à-mú-kwát-ír-á Iwéwúnzíkâ)
1.Walusimbi 1.Nakato sbj1-pst-obj1-hold-appl-ind 1a.banana
'Walusimbi held the bananas for Nakato'
OR 'Nakato held the bananas for Walusimbi.'
- c. (Iwèwúnzíkâ) (Nàkátò) (bá-ágál-á kú-mú-mù-kwàt-ìr-à)
1a.banana 1.Nakato 2-want-ind inf-obj1-obj1-hold-appl-ind
'They want to hold the bananas for Nakato.' (SM020708)

These findings are what we expect given what we discovered in the last chapter with HTA – subjects and fronted objects consistently form their own spellout domains, by virtue of being in the CP ‘edge.’ As such, they should form separate phonological domains for LTD as well.

LTD is blocked between CPs

A further prediction of the current model is that LTD (like HTA) should be blocked across CP boundaries in structures containing more than one CP. This prediction is borne out. I show this first with ‘think/say’ complements, then with secondary predicate constructions, and finally with ‘if/when’ adjuncts.

(23a) shows non-application of LTD between the matrix verb ‘think’ and the embedded finite verb in its (CP) complement; (23b) shows non-application between the matrix verb ‘say’ and the *subject* of the embedded CP; and (23c) shows non-application between matrix ‘think’ and an embedded preposed object.

- (23) a. (tú-lòwòòzà) _{CP}[(tú-náá-lábá Nákátò)]
 1p-think 1p-fut-see Nakato
 ‘We think we’ll see Nakato.’
 ↗ *túlówóózà túnáálábá...
- b. (Kàsédde) (y-à-gámbà) _{CP}[(Nàkátó) (à-yímbá búlúngì)]
 Kasedde sbj1-pst-say Nakato sbj1-sing well
 ‘Kasedde said Nakato sings well.’
 ↗ *...yàgámbá Nákátò...
- c. (tú-lòwòòzà) _{CP}[(Nàkátò) _{CP}[(tú-náá-mú-lábà)]]
 1p-think Nakato 1p-fut-I.obj-see
 ‘We think we’ll see Nakato.’ (We think Nakato, we’ll see her.) (SM021608)
 ↗ *túlówóózà Nákátò...

In Chapter 4 I showed that HTA is also blocked in these three contexts. I argued that clauses with multiple preverbal constituents have multiple recursive CPs, with the

topmost CP containing nothing but a (possibly null) complementizer; this explained why each preverbal constituent formed its own HTA domain. The LTD facts in (23) are exactly what we expect given this hypothesis. It is particularly important to recognize that LTD would not be expected to be blocked in these examples given the description in (19) alone.

As expected, LTD can be used to distinguish the structure of two otherwise identical strings. (24) is segmentally identical to (23b), but the tones are different – LTD applies between the matrix verb *yagamba* and *Nakato*. Crucially, there is a corresponding change in interpretation – *Nakato* now belongs to the main clause.

- (24) (Kàsédde) (y-à-gám**á** Nákátó) *CP*[(à-yímbá búlúngì)]
 Kasedde sbj1-pst-say Nakato sbj1-sing well
 ‘Kasedde told Nakato that s/he sings well.’

Moving on to other kinds of CP complementation, recall that Luganda has a **secondary predicate** construction with the following components: a tensed matrix verb that agrees with the matrix subject; a lower predicate that has a subject-agreement prefix but no tense marker; an optionally expressed subject of the embedded predicate, which normally precedes the embedded predicate; and an optional complementizer *nga*. Like HTA, LTD fails to apply between the two verbs in a secondary-predicate construction.

- (25) a. (n-à-bá-sáng-à) (ngà) (bá-kààb-à)
 1s-pst-2-find-ind comp 2-cry-ind
 ‘I found them crying.’
 b. (n-à-bá-sáng-á) (b!á-kààb-à)
 1s-pst-2-find-ind 2-cry-ind
 ‘I found them crying.’

In (25a), the toneless complementizer *nga* appears between the two H_nL_n verbs. The fact that LTD fails to apply here could be attributed to the presence of *nga*, since Concatenation rules can only ‘see’ two M-words at a time (i.e. *nabásáànga* and *bákààba* never occur in the same Concatenation statement; see §5.3.1).

In (25b), *nga* is no longer present but LTD is still blocked. What we find instead of LTD is a rule of **Downstep**, which appears, according to Hyman (2007), in ‘cases where surviving final HL falling tones in a HL##H... sequence simplify to H-!H (in other cases the L of HL is lost by plateauing).’ In my observations, Downstep occurs when there is HL at the right edge of one spellout domain (i.e. on the final mora or two moras), followed by H at the left edge of the next spellout domain – i.e. in clash or ‘near-clash’ contexts (see Chapter 4 §4.3.3 for further discussion). I assume that Downstep applies late in PF (after both Concatenation and Chaining have applied internal to each spellout domain), when separate spellout domains are linearized with respect to each other. This is also the stage when Vowel Elision applies (see Chapter 1); (27) below is an example that shows both Downstep and Vowel Elision.

An additional example of Downstep from an object-fronting structure is given below; here, the final HL on *lwewunzikâ* and the initial H on *twáágàla* are immediately adjacent:

- (26) (lwèwùnziká) (tw-!áágál-á kú-mú-kwàt-ìr-à) (Nàkátò)
 1a.banana 1p-want inf-obj1-hold-appl-ind 1.Nakato
 ‘The bananas, we want to hold them for Nakato.’ (SM020708)

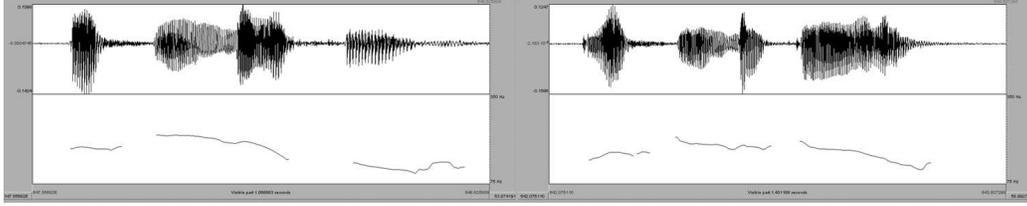
The important thing to be aware of is that cases where Downstep applies are clearly distinguishable from cases where LTD applies. The following pitchtracks show this distinction with a near-minimal pair (notice the application of Elision as well as Downstep in (27)):

(27) Downstep

w-à-fúúmbà ò-káàb-à
 2s-pst-cook 2s-cry-ind
 → wàfúúmbók!áàbà
 ‘You cooked crying.’

(28) LTD

w-à-fúúmb-à kááwà
 2s-pst-cook-ind 1a.coffee
 → wàfúúmbákááwà
 ‘You made coffee.’



In (27), another secondary-predicate construction, we see a pitch drop between the H on *wafuumba* and the !H on the embedded verb *okaaba*. In (28), a verb-direct object construction, the H on *wafuumba* extends through the first two moras of *kaawa*, showing that the verb and its object have grouped together for the purposes of LTD. The two verbs fail to group together in this way in (27) because they are spelled out separately, by virtue of belonging to separate CPs.

As noted above, the second clause in a secondary-predicate construction may contain its own overt subject. In such cases, the subject forms its own domain for both HTA and LTD, as expected if secondary predicates are full CPs. (Note that in these examples, the subject of the lower predicate obligatorily controls it; i.e. Walusimbi is hitting and Mukasa and Nakato are crying.)

(29) a. LTD:

(n-à-sáng-á) CP [(Wàlúsìmbì) CP [(à-kúb-á Nákátò)]]
 1s-pst-find-ind 1.Walusimbi sbj1-hit-ind 1.Nakato
 ‘I found Walusimbi hitting Nakato.’ (SM020708)

b. HTA:

i. (ò-lék-á) CP [(Nàkátò) CP [(à-káàb-à)]]
 2s-leave-ind 1.Nakato sbj1-cry-ind
 ‘You leave Nakato crying.’ (SM020708)

ii. (ò-lék-á) CP [(Mùkàsà) CP [(à-káàb-à)]]
 2s-leave-ind 1.Mukasa sbj1-cry-ind
 ‘You leave Mukasa crying.’ (SM020708)

The initial L tones on *Walusimbi* in (29a) and *Nakato* in (29b-i) indicate that these embedded subjects have been spelled out separately from the matrix verb. (The matrix verb gets

its H tones by Boundary H%; see Chapter 4 §4.2.2 for details.) (29b-ii), where the embedded subject is *Mukasa* underlyingly toneless, shows that the *embedded* verb is spelled out in its own domain; otherwise, we would expect its H tone to spread onto the toneless word *Mukasa*.

Perception-verb structures have the same basic ingredients as secondary-predicate structures: a matrix verb (in this case, *ku-lábà* ‘see’ or *ku-wúlira* ‘hear’; a lower predicate that has a subject-agreement prefix but no tense marker; an optionally expressed subject of the embedded predicate, which normally precedes the embedded predicate; and an optional complementizer *nga*. As with secondary predicates, the two verbs in perception constructions undergo spellout separately whether or not *nga* is present, and if the embedded predicate has its own overt subject, that subject is spelled out separately as well:

(30) Perception verb structure with null-pronominal embedded subject:

- a. (n-à-lábà) (ng’) (à-kwátá lwéwúnzíkà)
1s-pst-see comp sbj1-hold 1a.banana
‘I saw him hold the bananas.’
- b. (n-à-láb’) (á-kw!átá lwéwúnzíkà)
1s-pst-see sbj1-hold 1a.banana
‘I saw him/her hold the bananas.’

(31) Perception verb structure with full-DP embedded subject:

- a. (n-à-lábà) (ngà) (Nàkátò) (à-kwátá lwéwúnzíkà)
1s-pst-see comp Nakato sbj1-hold 1a.banana
‘I saw Nakato hold the bananas.’
- b. (n-à-lábá) (Nàkátò) (à-kwátá lwéwúnzíkà)
1s-pst-see Nakato sbj1-hold 1a.banana
‘I saw Nakato hold the bananas.’

Notice that there is an option of having the embedded-clause subject controlled by an *object* in the matrix clause; in this case, LTD applies between the matrix verb and the object, and *nga* obligatorily follows the object:³

- (32) (n-à-lábá Nákátò) (ng') (à-kwátá Iwéwúnzíkà)
 1s-pst-see Nakato comp sbj1-hold 1a.banana
 'I saw Nakato hold the bananas.'

Finally, it was shown in Chapter 4 that HTA is blocked across **clausal adjunct** boundaries, e.g. before 'if/when' or 'so that' clauses:

(33) HTA

- a. i. (òmwàànà) (à-sék-á) CP [(kàmújjè) (bw-à-bbâ) (lùmóóndé)]
 1.child sbj1-laugh-ind 1a.squirrel when-sbj1-steal 1a.potato
 'The child laughs when the squirrel steals potatoes.'
- ii. (òmwàànà) (à-sék-á) CP [(bw-ò-zín-à)]
 1.child sbj1-laugh-ind when-2s-dance-ind
 'The child laughs when you dance.'
- b. i. (Kàsédde) (à-gúl' ékítábó) CP [(Wàlúsìmbì) (à-sèk-ê)]
 1.Kasedde sbj1-buy 7.book 1.Walusimbi sbj1-laugh-subj
 'Kasedde is buying a book so that Walusimbi will laugh.'
- ii. (Kàsédde) (à-gúl' ékítábó) CP [(n-sèk-ê)]
 1.Kasedde sbj1-buy 7.book 1s-laugh-subj
 'Kasedde is buying a book so that I will laugh.'

The (i) examples above show that an underlying H tone on the subject of an 'if/when' or 'so that' adjunct cannot spread onto the matrix-clause verb. The (ii) examples show that HTA fails to cross this boundary even when the adjunct does not contain an overt subject; the H-tone on the verb does not spread either.

³It is unclear at this point why *nga* is obligatorily present in structures like (32). One possibility is that the embedded CP here is an adjunct rather than a complement ('I saw Nakato as she was holding the bananas') and that *nga* can only be null if it is immediately c-commanded by a licensing verbal head, perhaps like the English complementizer *that*. I leave this question open for future work.

As expected, LTD is also blocked across ‘if/when’ and ‘so that’ adjunct boundaries:

(34) LTD

- a. i. (òmwáànà) (y-à-sék-à) $_{CP}$ [(kàmújjè) (bwè-y-à-bbâ)
 1.child sbj1-pst-laugh-ind 1a.squirrel when-sbj1-pst-steal
 (lùmóóndé)]
 1a.potato
 ‘The child laughed when the squirrel stole the potatoes.’
- ii. (òmwáànà) (y-à-sék-à) $_{CP}$ [(bwè-w-à-zín-à)]
 1.child sbj1-pst-laugh-ind when-2s-pst-dance-ind
 ‘The child laughed when you danced.’
- b. i. (Kàsédde) (à-zín-à) $_{CP}$ [(Wàlúsìmbì) (à-sèk-ê)]
 1.Kasedde sbj1-dance-ind 1.Walusimbi sbj1-laugh-subj
 ‘Kasedde is dancing so that Walusimbi will laugh.’
- ii. (Kàsédde) (à-zín-à) $_{CP}$ [(n-sèk-ê)]
 1.Kasedde sbj1-dance-ind 1s-laugh-subj
 ‘Kasedde is dancing so that I will laugh.’

The boldfaced L-toned vowels in these examples show that LTD has not applied between the H_nL_n matrix verb and the initial H_nL_n M-word in the adjunct clause. Again, the non-application of LTD here is expected, given that we already know from HTA that these adjunct clauses are spelled out separately from the main clause (see Chapter 4 §4.3.3).

5.2.3 LTD is not blocked by (all) sub-CP boundaries

Both HTA and LTD can apply between a **restructuring predicate** like ‘want,’ ‘go,’ ‘can’ and a complement infinitive. In the minimal pair below, the matrix verb *njagala* ‘I want’ in (a) is toneless, providing a context for HTA, while *twágàla* ‘we want’ in (b) is HL, providing a context for LTD. As we can see, both rules apply.

(35) a. HTA:

nj-agala ku-kwáàta lwewunzikâ → (nj-ágálá kú-kwáàtà lwèwùnzìkâ)
 1s-want inf-catch 1a.banana

‘I want to hold the bananas.’

b. LTD:

tw-ágàla ku-kwáàta lwewunzikâ → (tw-ágálá kú-kwáàtà) (lwèwùnzikâ)
1p-want inf-catch 1a.banana
‘We want to hold the bananas.’

Consistent with (13b) above, LTD does not apply between a matrix verb and an infinitive if the infinitive has an *initial vowel* (*o-ku-* instead of *ku-*). The initial vowel appears optionally under restructuring verbs like ‘want’ and ‘go(ing to)’; in other contexts (e.g. under ‘try,’ ‘learn,’ etc.) it is obligatory. Even in contexts where the initial vowel is absent, as in (35), LTD and HTA apply variably rather than across the board. This is expected under the assumption that such ‘restructured’ infinitives can appear either as full CPs, which will be spelled out separately from the matrix verb, or as reduced sub-CPs, which will be spelled out together with it. Notice that if an object is left-dislocated within an infinitive – an option that presumably requires a full CP structure (see Chapter 4 §4.4.2) – both the infinitive and the object are spelled out separately:

(36) (tú-gènd-à) (Wàlúsìmbì) (ò-kú-mú-wándíík-ír-á)
1p-go-ind 1.Walusimbi iv-inf-obj1-write-appl-ind
‘We’re going to write to Walusimbi.’ (SM020708)

Recall that **subjunctive complements** behave like infinitival complements for the purposes of HTA – i.e., a H tone on the subjunctive complement spreads leftward onto a toneless matrix verb, through toneless embedded subjects when present.

(37) HTA:

- a. (nj-ágál’ á-sék-ê
1s-want sbj1-laugh-subj
‘I want him/her to laugh.’
- b. (nj-ágál’ ómúlénzí á-wándíík-ér-ê Mùkàsà èbbàlúwà)
1s-want 1.boy sbj1-write-appl-subj Mukasa 9.letter
‘I want the boy to write Mukasa a letter.’

Likewise, for the purposes of LTD, a H_nL_n matrix verb like *twágàla* ‘we want’ can group together with a H_nL_n subjunctive-verb complement:

(38) LTD:

(tw-ágál’ á-kááb-ê)
 1p-want sbj1-cry-subj
 ‘We want him to cry.’

Furthermore, when a subjunctive complement contains its own overt subject, the matrix verb can group together with this subject:

- (39) a. (tw-ágál-á Bábíryè) (à-làb-é Nákátò)
 1p-want-ind 1.Babirye sbj1-see-subj 1.Nakato
 ‘We want Babirye to see Nakato.’ (RV021407)
- b. (n-étáágá Wálúsimbì) (à-kwàt-é kámúkúúkúlù)
 1s-need-ind 1.Walusimbi sbj1-catch-ind 1a.dove
 ‘I need Walusimbi to catch the dove.’ (RV041108)

But notice that LTD fails to apply between the subject of the subjunctive complement and the subjunctive verb (e.g. between *Babíryè* and *alabê*). Since we know from (37) and similar examples that the entire subjunctive ‘clause’ is spelled out together with the main verb, there must be an independent reason why LTD is blocked in these examples. In §5.2.4 I argue that LTD is blocked here because of the way Concatenation works.

Relative clauses (RCs) are the final context where we found that HTA applied between verbs in Chapter 4. Notice that the H tone on the RC verb spreads through both the toneless RC subject *and* the toneless head noun in this (40a), all the way up to the matrix verb. The source H tone does not have to be located on the RC verb, however; HTA will also spread up to the matrix verb if it originates on the head noun (40b) or RC subject (40c):

(40) HTA application within a RC:

- a. (nj-ágál' ékítábó ómúlénzì kyé y-à-láb-à)
 1s-like 7.book 1.boy 7.rel sbj1-pst-see-ind
 'I like the book the boy saw.'
- b. (nj-ágál' ékíkópò òmùlènzì kyè y-à-láb-à)
 1s-like 7.book 1.boy 7.rel sbj1-pst-see-ind
 'I like the cup the boy saw.'
- c. (nj-ágál' ékítábó Nákátò kyè y-à-láb-à)
 1s-like 7.book 1.Nakato 7.rel sbj1-pst-see-ind
 'I like the book Nakato saw.'

Turning now to LTD, (41) is an object RC with an overt head noun and overt RC subject. The first three M-words are HL, and LTD could in principle apply between all three of them. However, the rule only applies once – between the matrix verb and the head noun:

(41) LTD application within a RC:

n-a-láb-à nnawólòvu Kaséddè gwe y-a-kwát-à
 1s-pst-see-ind 1a.chameleon 1.Kasedde 1.rel sbj1-pst-catch-ind
 'I saw the chameleon that Kasedde caught.'
 → (nàlábá nnáwólòvù) (Kàséddè) gwè yàkwátà

The question is why LTD fails to apply between the head noun *nnawolovu* and the RC subject *Kasedde*, when HTA freely applies through an entire RC string.

One possibility that arises at this point might be that LTD is bounded not only by CP spellout domains but also by some smaller spellout domain as well, e.g. a sub-structure that is merged as an adjunct rather than a complement. The idea would be that certain sub-CP categories can trigger 'partial spellout,' so that only a subset of PF operations apply within them (cf. Kratzer and Selkirk's 2007 proposal, discussed in Chapter 2 §2.3.2, that spellout at different categories creates different levels of prosodic structure). In this case, the RC adjunct would undergo partial spellout – which would include Concatenation but not Chaining – and full spellout would be delayed until the CP level was reached. The RC

subject would then be ‘trapped’ in its own partial-spellout domain and therefore could not group together with higher or lower material for the purposes of the Concatenation rule LTD.

- (42) n-a-láb-á nnáwólòvù _{RC}[Kàsédde gwè y-à-kwát-à]
 1s-pst-see-ind 1a.chameleon 1.Kasedde 1.rel sbj1-pst-catch-ind
 ‘I saw the chameleon that Kasedde caught.’

Notice, however, that if the RC head noun is null, the RC subject *does* group together with the matrix verb:

- (43) (n-à-lábá ∅) _{RC}[Nákátò) kyè y-à-gúlà]
 1s-see 1.Nakato 7.rel sbj1-pst-buy
 ‘I saw (the thing) Nakato bought.’

I take such examples to indicate that the RC subject *is* spelled out together with the matrix verb for the purposes of both HTA and LTD. The nonapplication of LTD between an overt RC head and RC subject will be attributed to an independent factor having to do with the nature of Concatenation: the first M-word in the pair must be a *head* that c-commands the second (see §5.2.4).

Finally, consider the following examples, where the RC subject is null:

- (44) a. n-a-láb-à nnawólòvu gwe y-a-kwát-à → (nàlábá nnáwólòvù) gwè
 1s-pst-see-ind 1a.chameleon 1.rel sbj1-pst-catch-ind
 yàkwátà
 ‘I saw the chameleon that s/he caught.’
- b. n-a-láb-à gwe y-a-kwát-à → (nàlábà) gwè yàkwátà
 1s-pst-see-ind 1.rel sbj1-pst-catch-ind
 ‘I saw the thing/person that s/he caught.’
- c. n-a-láb-à e-y-a-ly-â lwewunzíkâ → (nàlábà) (èyàlyá lwéwúnzíkâ)
 1s-pst-see-ind rel-sbj1-pst-eat-ind 1a.banana
 ‘I saw the thing/person that ate the banana.’

Examples (44b) and (44c) show that a matrix verb cannot form an LTD domain with an RC verb, even when there is no intervening subject. I assume that LTD is blocked in (44b) because the relativizer *gwe* is a separate M-word, which is toneless and therefore cannot undergo LTD with either word flanking it (see §5.3.1 below for further evidence that LTD can only ‘see’ two M-words at a time).⁴ In (44c), LTD is blocked by the *initial vowel* on the RC verb (see §5.2.1 above).

5.2.4 The head-complement (c-command) condition on LTD

We have now established that LTD is blocked in all of the contexts where HTA is blocked. There are some additional contexts, however, where LTD is forbidden even though HTA is freely allowed; these are enumerated below:

Contexts where HTA applies but LTD is blocked:

- between a verb and a right-dislocated subject (repeated from (6)):

(45) a-mu-kúbà Walúsìmbi → (à-mù-kúbà) (Wàlúsìmbi)
 sbj1-obj1-hit Walusimbi
 ‘He’s hitting him/her, Walusimbi.’

- between an embedded subject (*Walúsìmbi* here) and a following subjunctive verb (*akwatê* here; example repeated from (39)):

(46) (n-étáágá Walúsìmbi) (à-kwàt-é kámúkúúkúlù)
 1s-need-ind 1.Walusimbi sbj1-catch-ind 1a.dove
 ‘I need Walusimbi to catch the dove.’ (RV041108)

- between a relative clause head and a following word (repeated from (41));

⁴Hyman and Katamba (1990/1991) argue that the relative marker is a separate word based on the fact that it undergoes final vowel shortening (*kʏee* → *kʏe*).

(47) (n-à-láb-á nnáwólòvu) (Kaséddè) gwe y-a-kwát-à
 1s-pst-see-ind 1a.chameleon 1.Kasedde 1.rel sbj1-pst-catch-ind
 ‘I saw the chameleon that Kasedde caught.’

- between the subject of a relative clause and the following verb (see (47));
- between an indirect object and a direct object (discussed below):

(48) (àbàlènzì) (bá-á-lág-á Bábíryè) (nnàwólòvù)
 2.boy 2-pst-show-ind 1.Babirye 1a.chameleon
 ‘The boys showed Babirye a chameleon.’

- between an object and an adverb, in either order (discussed below):

(49) a. (Katonga) (y-a-kwátá nnáwólòvù) (bùlúngì)
 1.Katonga sbj1-pst-catch 1a.chameleon well
 ‘Katonga caught a chameleon well/easily.’

b. (Katonga) (y-a-kwátá bùlúngì) (nnàwólòvù)
 1.Katonga sbj1-pst-catch well 1a.chameleon
 ‘Katonga caught a chameleon well/easily.’

- between a noun and a following adjective, numeral or demonstrative (discussed below);

(50) a. (bìkópò) (bì-nénè)
 8.cup 8-big
 ‘(They are) big cups.’

b. (bìfáánànyì) (bì-táànò)
 8.picture 8-five
 ‘(They are) five pictures.’

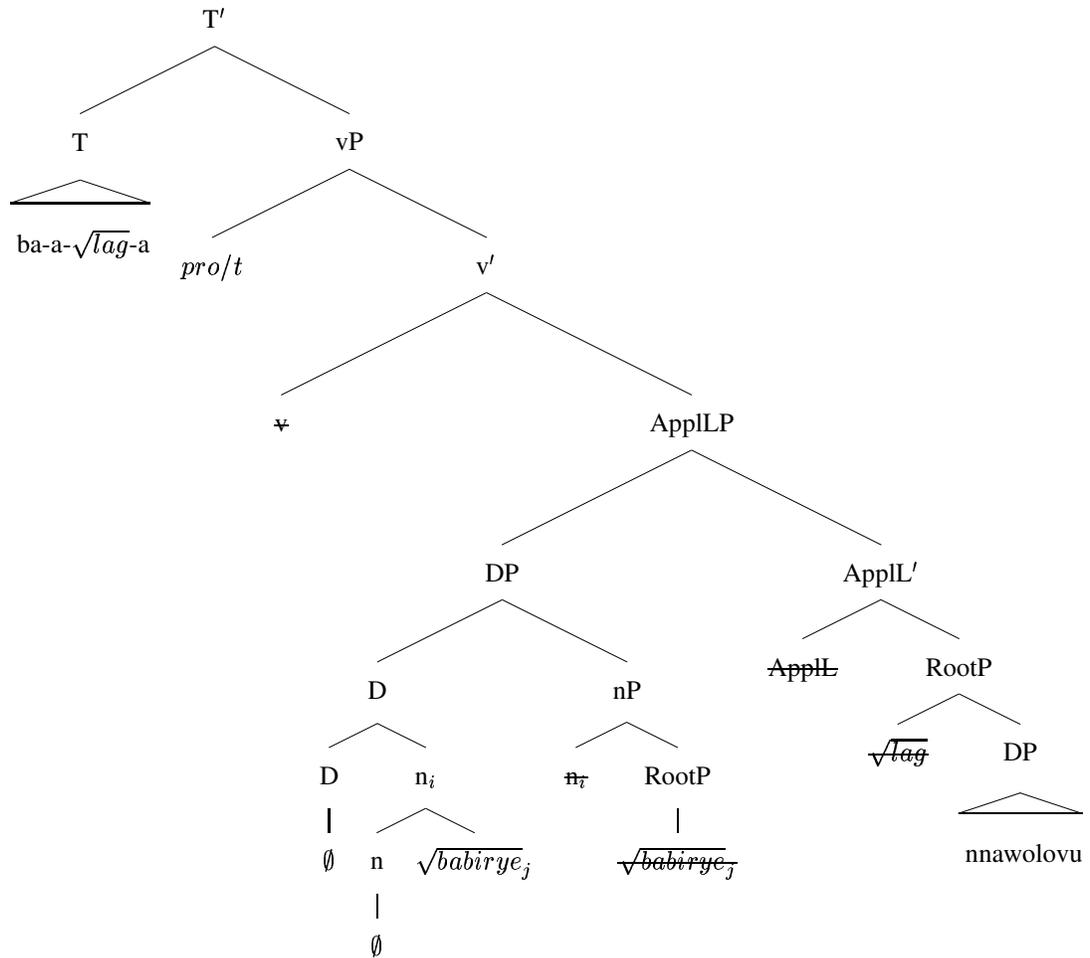
c. (èkìkópò) (kì-rí) (kì-rúngì)
 7.cup 7-dist.dem 7-good
 ‘That cup is nice.’

In this section I will show that all of these contexts can be derived from a single condition – namely, that LTD apply only between a *head* and a following word in its complement.

This condition will be derived in turn from the way that Concatenation works in the model developed here. I argue that Concatenation statements are produced over only a *subset* of the M-words in a given spellout domain – namely, Concatenation works by identifying an overt M-word X and searching for the immediately following M-word Y *within X's complement*. A Concatenation rule like LTD, then, will only apply between two M-words if the second is in the complement of the first.

As discussed in Chapter 1, I assume that linearization takes place in a series of steps during spellout. I illustrate this below with a ‘low applicative’ structure (I have shown the structure only up to the T' level, for simplicity):

- (51) ba-a-lag-a Babirye nnawolovu
2-pst-show-ind 1.Babirye 1a.chameleon
'They showed Babirye a chameleon.'



Key properties of this structure are listed below. Many of these assumptions are not crucial to the present analysis; I have noted those points that are:

- The objects *Babirye* and *nnawolovu* are internally complex DPs. The D and *n* heads are null in these particular words, but would be occupied by the initial vowel /a/ and class prefix *ba-* if the indirect object were e.g. *a-ba-lenzi* ‘boys’. (Note furthermore that nothing hinges on these particular categories (it is possible, for example, that the noun-class system is decomposed into categories for Person, Number, and Gender).
- The noun Root is assumed to raise to *n* and then to D by head-movement. The bold-faced uppermost D head is a maximally complex head, or M-word – the domain for

the word-internal rules discussed in Chapter 4 §4.2.2, which are assumed to precede all phrasal rules.

- The verbal head raises by head movement from Root to T, picking up affixes along the way. I assume that the final vowel *-a* spells out the *v* head and that the subject-agreement prefix *ba-* realizes an Agr head that is inserted late, but again these assumptions are not required (there could be MoodP between vP and TP, for example, where the final vowel is spelled out).

Now let us consider how this structure is linearized. The first two steps involved in linearization are LIN and Concatenation, described in Chapter 1 and below:

Step 1: LIN visits each branching node of a structure and produces a statement of left-adjacency between its two daughters, drawing upon language-specific principles about e.g. headedness in order to select the correct order.

(52) LIN (*) statements produced in (51):

- LIN[T'] → T[**ba-a-lag-a**] * vP
- LIN[vP] → *pro/t* * v'
- LIN[v'] → **v** * ApplLP
- LIN[ApplLP] → DP * ApplL'
- LIN[DP] → D[**Babirye**] * nP
- LIN[nP] → **n** * ~~RootP~~
- LIN[ApplL'] → ~~ApplL~~ * RootP
- LIN[RootP] → $\sqrt{\text{lag}}$ * DP
- LIN[DP] → D[**nnawolovu**] * nP
- LIN[nP] → **n** * ~~RootP~~

The *-operator in these statements is read as ‘is left-adjacent to.’ Notice that most of these *-statements include at least one element that is not actually pronounced overtly, either because it is a trace/copy or other silent element like *pro*, or because it is internally complex (i.e. a ‘phrasal’ category that is decomposed into one or more additional *-statements). The three overt (boldfaced) M-words *baalaga*, *Babirye*, and *nnawolovu* appear in three separate *-statements; additional steps are required in order to determine how they are linearized with respect to each other.

Step 2: Concatenation. Notice that (32a) tells us that the M-word *baalaga* is adjacent to a phrasal category vP, but we do not yet have a direct statement about which *M-word(s)* *baalaga* is adjacent to. This information is provided by a second operation, Concatenation, which has the effect of ‘looking inside’ the members of a *-statement and producing a corresponding statement of left-adjacency between M-words only.

I assume that there are two steps involved in Concatenation, which I will call *Head-left* (or ‘early’) Concatenation and *Phrase-left* Concatenation. We will focus on Head-left Concatenation here.

Head-left Concatenation works by:

- identifying a *-statement $X*Y$ whose left-hand member is an overt M-word X (rather than a phrasal category or null head);
- searching within the right-hand member Y for the next overt M-word Z ; and
- creating a binary statement of left-adjacency between the two M-words $(X \hat{\ } Z)$.

In other words, Head-left Concatenation identifies pairs of M-words X, Y where (i) X is left-adjacent to Y , and (ii) X c-commands Y .

An illustration is given below with the example from (51). The algorithm here is shown beginning with the topmost node in the structure shown, but this does not necessar-

ily have to be the case – the algorithm can start with any *-statement derived in the spellout domain, as long as it ends up visiting them all.

- (53) a. Begin with $\text{LIN}[\text{T}'] \rightarrow \text{T}[\mathbf{ba-a-lag-a}] * \text{vP}$
 vP is internally complex. Locate *-statement for vP.
- b. $\text{LIN}[\text{vP}] \rightarrow \text{pro}/t * \text{v}'$
 pro/t is a silent element; v' is internally complex. Locate *-statement for v'.
- c. $\text{LIN}[\text{v}'] \rightarrow \text{v} * \text{ApplLP}$
 v is a silent element; ApplLP is internally complex. Locate *-statement for ApplLP.
- d. $\text{LIN}[\text{ApplLP}] \rightarrow \text{DP} * \text{ApplL}'$
 Both DP and ApplL' are internally complex. Locate *-statement for lefthand member (DP).
- e. $\text{LIN}[\text{DP}] \rightarrow \text{D}[\mathbf{Babirye}] * \text{nP}$
 D[Babirye] is an overt M-word. Concatenate T[baalaga] and D[Babirye].
- f. $\mathbf{T[baalaga]} \cap \mathbf{D[Babirye]}$

The head-left Concatenation algorithm has not searched through the entire tree yet. There are two more *-statements in the list in (52) whose left-hand members are M-words, namely $\mathbf{D[nnawolovu]} * \mathbf{nP}$ and $\mathbf{D[Babirye]} * \mathbf{nP}$. However, the algorithm will not be able to produce any further Concatenation statements when it searches within these *-statements. This is shown below for $\mathbf{D[Babirye]} * \mathbf{nP}$:

- (54) a. Begin with $\text{LIN}[\text{DP}] \rightarrow \text{D}[\mathbf{Babirye}] * \text{nP}$
 nP is internally complex. Locate *-statement for nP.
- b. $\text{LIN}[\text{nP}] \rightarrow \mathbf{n} * \mathbf{RootP}$
 Both **n** and **RootP** are silent elements.

The Head-left Concatenation algorithm comes to a stop as soon as it encounters a *-statement $X*Y$ whose right-hand member Y is not internally complex. In other words, this algorithm does not contain a *backtracking* mechanism. Given the spellout domain in (51), only one head-left Concatenation statement can be produced: **T[yalaga]∧D[Babirye]**. There is no way for a corresponding Concatenation statement **D[Babirye]∧D[nnawolovu]** to be produced, because the head-left Concatenation algorithm does not provide a way to ‘pop back’ from an internally complex structure (e.g. the indirect-object DP). Another kind of linearization operation is required in cases like this, where the *left*-hand member of a *-statement is internally complex; I call this operation *Phrase-left Concatenation*, and include some relevant discussion and examples at the end of this chapter.

Since the only Concatenation statement produced internal to this spellout domain is **T[baalaga]∧D[Babirye]**, the prediction is that LTD – as a head-left Concatenation rule – will apply between *baalaga* and *Babirye*, but not between *Babirye* and *nnawolovu*. This prediction is borne out:

- (55) (àbàlènzì) (bá-á-lág-á Bábíryè) (nnàwólòvù)
 2.boy 2-pst-show-ind 1.Babirye 1a.chameleon
 ‘The boys showed Babirye a chameleon.’

This is consistently the case, with both low and high applicatives: in a (S)-V-IO-DO sentence, the indirect object groups together with the verb, while the direct object groups separately.

- (56) a. (n-à-gúlír-á lújújú) (káàwà)
 1s-pst-buy-appl-ind 1a.drunkard 1a.coffee
 ‘I bought the drunkard some coffee.’
- b. (Nàkátò) (à-kwát-ír-á Wálúsìmbì) (Iwèwùnzìkâ)
 1.Nakato sbj1-hold-appl-ind 1.Walusimbi 1a.banana
 ‘Nakato is holding the bananas for Walusimbi.’ (SM020208)
- c. (máàmà) (y-à-síg-á Nákátò) (ssàbùùni)
 1.mom sbj1-pst-rub-ind 1.Nakato 1a.soap

‘Mom rubbed Nakato with soap.’

- d. (n-à-lís-á Wákáyìmà) (dòòdô)
1s-pst-feed-ind 1a.Mr.Rabbit 1a.greens
‘I fed Mr. Rabbit some greens.’

Recall from Chapter 4 that the IO and the DO do group together with the verb for the purposes of the Chaining rule HTA:

(57) HTA:

- a. (n-dág-á Múkásá nnáwólòvù)
1s-show-ind 1.Mukasa 1a.chameleon
‘I’m showing Mukasa a chameleon.’
- b. (a-gúl-ír-á ábálénzí káàwà)
sbj1-buy-appl-ind 2.boy 1a.coffee
‘S/he is buying the boys some coffee.’
- c. (ò-s-éér-á Músóké káàwà)
2s-grind-appl-ind 1.Musoke 1a.coffee
‘You’re grinding coffee for Musoke.’

While the examples in (57) show that IO and the DO belong to the same TP spellout domain in both low and high applicatives, examples (55)–(56) show that the IO and DO cannot group together for the head-left Concatenation rule LTD. This is attributed to the nature of head-left Concatenation itself – as shown above, no Concatenation statement can be produced between the IO and the DO because the IO is an internally complex DP.

Some evidence that this analysis is on the right track comes from structures where the IO ‘gets out of the way’ – by either passivization, object-fronting, or relativization. As predicted, the verb *does* group together with the DO when there is no intervening IO. Compare (56a) with (58), for example:

- (58) a. (lùjúùjù) (n-à-mú-gúl-írà káàwà)
1a.drunkard 1s-pst-obj1-buy-appl-ind 1a.coffee
‘The drunkard, I bought him coffee.’

- b. (lùjúùjù) (y-à-gúl-ír-w-á kááwà)
 1a.drunkard sbj1-pst-buy-appl-pass-ind 1a.coffee
 ‘The drunkard was bought coffee.’
- c. (w-à-láb-á lùjúùjù) (Kàsédde) (gwè) (y-à-gúl-ír-á káàwà)
 2s-pst-see-ind 1a.drunkard 1.Kasedde 1.rel sbj1-pst-buy-appl-ind 1a.coffee
 ‘You saw the drunkard that Kasedde bought coffee for.’ (sk2)

In (58), the verb in T does group together with the direct object *kaawa* for LTD, unlike in (56a), where the verb groups together only with the IO. These examples suggest that the domain for LTD cannot be e.g. a vP/AplP that undergoes ‘partial spellout’ (cf. the hypothetical alternative discussed above (42)), since the tensed verb and the theme in (58) are presumably separated by more than one vP boundary. On the other hand, these facts are straightforwardly predicted by the current analysis. In structures like (58) where the IO is a silent trace, copy, or *pro*, the head-left Concatenation algorithm will ‘skip over’ this empty element – just as it skips over the *pro* in Spec,vP in (51) – and will consequently yield e.g. the Concatenation statement $\mathbf{T[n-a-mu-gul-ir-a]} \cap \mathbf{D[kaawa]}$.

We can now also see why LTD never applies between an RC head and an RC subject, or between an RC subject and an RC verb, as shown earlier in example (42). The DPs *lujuuju* and *Kasedde* are both internally complex, like the DP *Babirye* in (51), and no Concatenation statements will be able to include them as their first member. The same analysis can be used to explain why LTD fails to apply between the subject of a subjunctive complement and its verb, as shown in example (39), repeated below:

- (59) (tw-ágál-á Bábíryè) (à-làb-é Nákátò)
 1p-want-ind 1.Babirye sbj1-see-subj 1.Nakato
 ‘We want Babirye to see Nakato.’ (RV021407)

Another prediction of the current analysis is that if the RC head is null, the matrix verb *will* be able to group together with the RC subject for Concatenation and LTD. As shown in (43), repeated below in (60a), this prediction is borne out:

- (60) a. (n-à-lábá ∅ Nákátò) kyè y-à-gúlà
 1s-see 1.Nakato 7.rel sbj1-pst-buy
 ‘I saw (the thing) Nakato bought.’
- b. (w-à-láb-á ∅ Káséddè) gwè y-à-gúl-ír-á káàwà
 2s-pst-see-ind 1.Kasedde 1.rel sbj1-pst-buy-appl-ind 1a.coffee
 ‘You saw the one that Kasedde bought coffee for.’

The RC head here is an empty category; as such, it ‘gets out of the way’ for LTD in the same way as the indirect objects in (58) above.

Finally, it is now evident why LTD fails to apply in right-dislocation structures like (61), repeated from (6b):

- (61) [[(a-mú-kúb-à) (Wálúsìmbì)]_{TP}]_{TP}
 sbj1-obj1-hit-ind 1.Walusimbi
 ‘He’s hitting him/her, Walusimbi.’

If the right-dislocated subject *Walusimbi* is right-adjoined to TP, the Concatenation algorithm will come to a stop when it reaches the final silent element within the inner TP.

Manner adverbs

Backing up a bit, Hyman (1987), Hyman and Katamba (1990/1991, 2004) have shown that LTD (like HTA) applies freely between a verb and a DO (62a) and between an intransitive verb and a manner adverb (62b):

- (62) LTD:
- a. Verb-object:
 tú-làb-a Walúsìmbì → (tú-láb-á Wálúsìmbì)
 1p-see-ind 1.Walusimbi
 ‘We see Walusimbi.’ (Hyman et al. 1987: 92)
- b. Verb-adverb:
 tw-áá-gèènd-a tútùtu → (tw-áá-gééend-á tútùtu)
 1p-pst-go-ind slow

‘We went slowly.’ (Hyman et al. 1987: 95)

(63) HTA:

a. Verb-object:

nj-agal-a Walúsìmbì → (nj-ágál-á Wálúsìmbì)
1s-like 1.Walusimbi
‘I like Walusimbi.’

b. Verb-adverb:

a-yoger-a bulúngì → (à-yóger-á búlúngì)
sbj1-talk-ind well
‘S/he talks well.’

Taken by themselves, these facts do not indicate any difference between LTD and HTA, or between Concatenation rules and Chaining rules. Notice, however, that if a TP contains *both* a manner adverb and an object (in either order), LTD cannot apply between them. Instead the verb in T groups together with the first item to its right, whether that is an adverb or an object, and the remaining M-words phrase separately:

(64) LTD:

- a. (Kàtóngà) (y-à-kwátá nnáwólòvù)
1.Katonga sbj1-pst-catch 1a.chameleon
‘Katonga caught a chameleon.’
- b. (Kàtóngà) (y-à-kwátá nnáwólòvù) (bùlúngì)
1.Katonga sbj1-pst-catch 1a.chameleon well
‘Katonga caught a chameleon well/easily.’
- c. (Kàtóngà) (y-à-kwátá búlúngì) (nnàwólòvù)
1.Katonga sbj1-pst-catch well 1a.chameleon
‘Katonga caught a chameleon well/easily.’

HTA, on the other hand, can apply freely throughout a vP containing a manner adverb, as shown in Chapter 4:

(65) HTA:

- a. (Wàlúsìmbì) (à-yógér-ér-á wággúlú ábǎ̀à̀nà)
1.Walusimbi sbj1-talk-appl-ind loudly 2.child
'Walusimbi is speaking loudly for the children.' (S-V-Adv-Obj)
- b. (Wàlúsìmbì) (à-yógér-ér-á ábálímí búlú̀ngì)
1.Walusimbi sbj1-talk-appl-ind 2.farmer well
'Walusimbi is speaking well for the farmers.' (S-V-Obj-Adv)

The pattern in (64) is of course part of the same pattern as what we saw above with applicative and RC structures. Assuming that adverbs like *bulungi* are internally complex – a fairly uncontroversial assumption, given that the root \sqrt{lungi} shows up as a predicate 'to be good/nice' and an adjective 'good/nice' – the head-left Concatenation algorithm will yield only a single Concatenation statement for each of the structures above: between T[y-a-kwat-a] and the next overt M-word.

The current analysis also accounts for applicative constructions with manner adverbs. In the examples below, the manner adverb *bulungi* can appear either before both objects, after both objects, or between the two objects. Whatever word order is used, the same pattern is found – the verb groups together with the first following item for LTD, and everything else phrases separately. (All of the following sentences mean 'S/he carried the bananas (*lwewunzika*) well for Nakato.')

- (66) a. (V IO) (DO) (Adv): (y-à-kwát-írá Nákátò) (lwèwùnzìkâ) (bùlú̀ngì)
- b. (V IO) (Adv) (DO): (y-à-kwát-írá Nákátò) (bùlú̀ngì) (lwèwùnzìkâ)
- c. (V Adv) (IO) (DO): (y-à-kwát-írá búlú̀ngì) (Nákátò) (lwèwùnzìkâ)

Possessive DPs

As shown below, LTD fails to apply between a noun and a following adjective, numeral, demonstrative, or other modifier (Hyman et al. 1987: 95; Cole 1967:66):

(67) LTD:

- a. (bikópò) (bì-nénè)
8.cup 8-big
'(They are) big cups.'
- b. (bifáánànyì) (bì-táànò)
8.picture 8-five
'(They are) five pictures.'
- c. (èkìkópò) (kì-rî) (kì-rúngì)
7.cup 7-dist.dem 7-good
'That cup is nice.'

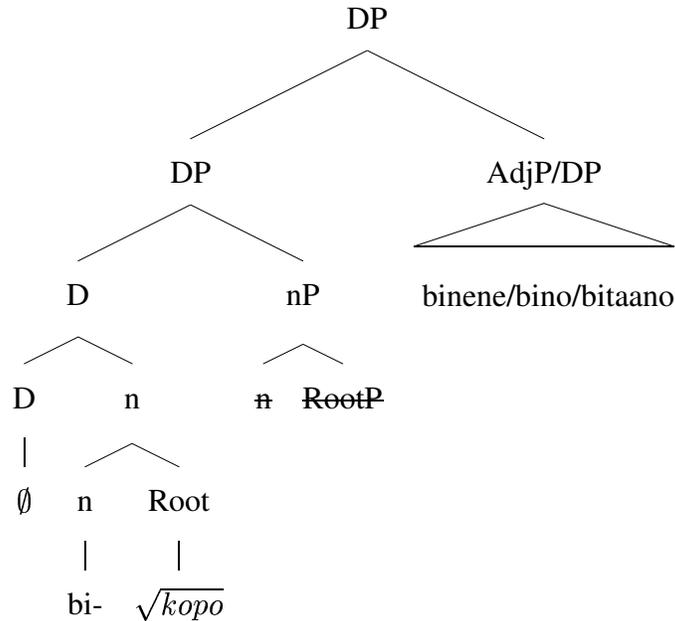
HTA, on the other hand, does apply within these structures, indicating that nouns and following modifiers group together into a single spellout domain:

(68) HTA:

- a. (bítábó bí-nénè)
8.book 8-big
'(They are) big books.'
- b. (bìrémbwé bí-táànò)
8.ant 8-five
'(They are) five ants.'
- c. (èbímúlí bí-rî) (bì-rúngì)
8.flower 8-dist.dem 8-good
'Those flowers are nice.' (Ashton et al. 1954: 41)

In each of these cases, LTD presumably fails to apply because the modified noun is an internally complex DP, with the postnominal modifier adjoining to DP.

(69)



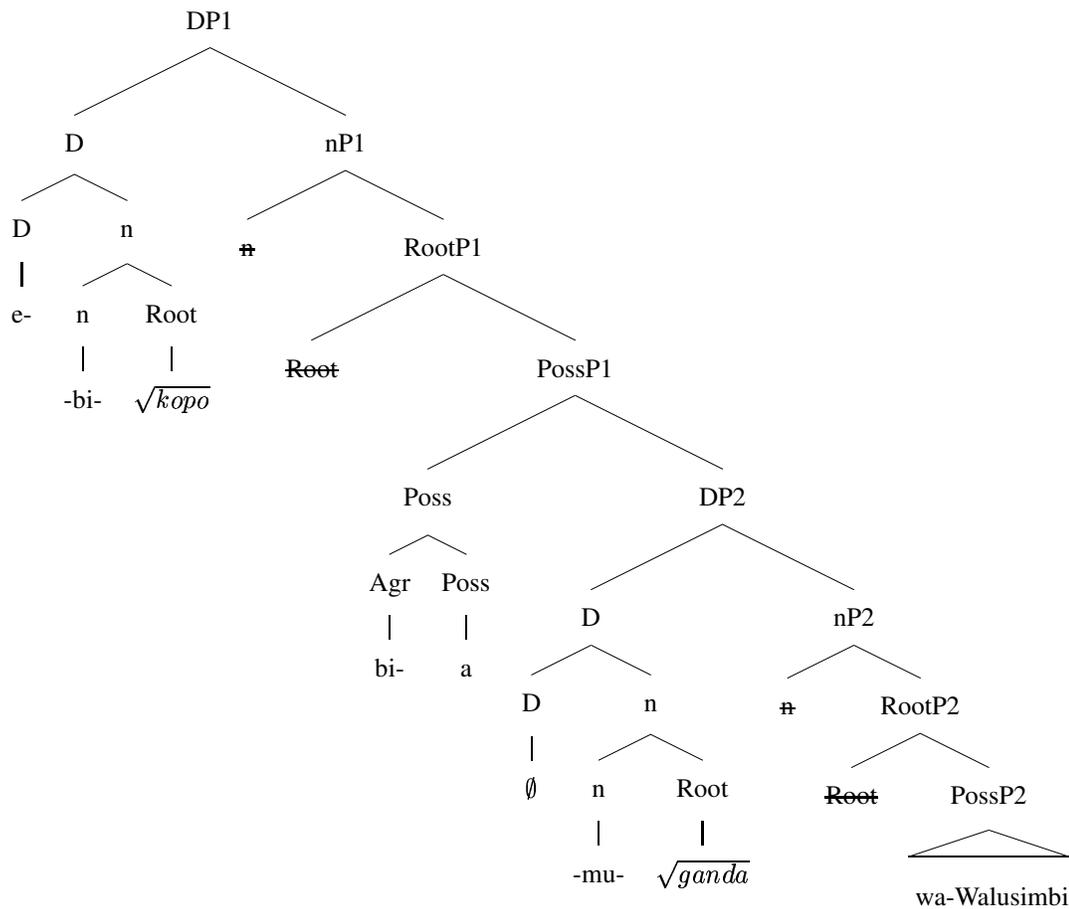
Other treatments are possible – e.g., the demonstrative could be a head that takes its complement on the left, rather than a right-adjoined pronoun as it is shown here. In either case, the fact that the noun *bikopo* is an internally complex DP prevents it from grouping together with any DP-external material to its right for the purposes of head-left Concatenation and LTD.

There is one case, however, where a noun does group together with following M-words for the purposes of LTD – namely **possessive** structures, where LTD can apparently apply across a string of indefinite length:

- (70) a. (òmùbíníkíró gwá-Wálúsìmbì)
3.funnel 3.poss-Walusimbi
'Walusimbi's funnel'
- b. (bi-kópó byá-mú-gáándá wá-Wálúsìmbì)
8.cup 8.poss-1.brother 1.poss-1.Walusimbi
'Walusimbi's brother's cups'
- c. (tw-á-láb-á nnáwólóvú w'-abááná bá-múgándá wá-Wálúsìmbì)
1p-pst-see-ind 1a.chameleon 1.poss-2.child 2.poss-1.brother 1.poss-1.Walusimbi
'We saw Walusimbi's brother's kids' chameleon.'

If the analysis pursued here is correct, then the fact that LTD applies continuously throughout these examples must be taken as an indication that these structures are uniformly right-branching, unlike e.g. adjectival modification structures. I assume the following structure for Luganda possessives, adapted from Ritter (1991) and others, where the noun Root takes a PossP complement:

(71) Structure for (70):



Crucially, the possessive marker *bya* is in the *complement* of the possessee D head *ebikopo* here, and the possessor DP *muganda...* is in turn in the complement of the possessive marker *bya*. All of the M-words in this structure can therefore be included in Concatenation statements, as shown below:

- (72) a. Begin with $\text{LIN}[\text{DP1}] \rightarrow \text{D}[\text{ebikopo}] * \text{nP}$
 nP is internally complex. Locate *-statement for nP.
- b. $\text{LIN}[\text{nP1}] \rightarrow \text{\#} * \text{RootP1}$
 \# is a silent copy/trace; RootP1 is internally complex. Locate *-statement for RootP1.
- c. $\text{LIN}[\text{RootP1}] \rightarrow \text{\textcircled{R}} * \text{PossP1}$
 \textcircled{R} is a silent copy/trace; PossP1 is internally complex. Locate *-statement for PossP1.
- d. $\text{LIN}[\text{PossP1}] \rightarrow \text{Poss}[\text{bi-a}] * \text{DP2}$
 Poss[bi-a] is an overt M-word. Concatenate D[ebikopo] and Poss[bi-a]:
 $\text{D}[\text{ebikopo}] \hat{\ } \text{Poss}[\text{bi-a}]$
 DP2 is internally complex. Locate *-statement for DP2.
- e. $\text{LIN}[\text{DP2}] \rightarrow \text{D}[\text{mu-ganda}] * \text{nP2}$
 nP2 is internally complex. Locate *-statement for nP2.
- f. $\text{LIN}[\text{nP2}] \rightarrow \text{\#} * \text{RootP2}$
 \# is a silent copy/trace; RootP2 is internally complex. Locate *-statement for RootP2.
- g. $\text{LIN}[\text{RootP2}] \rightarrow \text{\textcircled{R}} * \text{PossP2}$
 \textcircled{R} is a silent copy/trace; PossP2 is internally complex. Locate *-statement for PossP1.
- h. $\text{LIN}[\text{PossP2}] \rightarrow \text{Poss}[\text{w-a}] * \text{DP3}$
 Poss[w-a] is an overt M-word. Concatenate D[mu-ganda] and Poss[bi-a]:
 $\text{D}[\text{mu-ganda}] \hat{\ } \text{Poss}[\text{w-a}]$
 etc...

At the end of this stage of the derivation, we will have four Concatenation statements – **ebikópò**ˆ**byâ**, **byâ**ˆ**mugándà**, **mugándà**ˆ**wâ**, and **wâ**ˆ**Walúsìmbi** – each of which provides an environment for LTD. A H-plateau is therefore correctly predicted to be formed over the entire possessive structure.

The syntactic analysis in (71), where the possessor is a complement of the possessee, makes a prediction that a possessee cannot be phrasal in Luganda. In other words, it should not be possible to say the equivalent of ‘Walusimbi’s five cups’ or ‘Walusimbi’s big cups’, at least not with normal possessive syntax. This prediction appears to be borne out. When such phrases are elicited, the possessive marker consistently surfaces with an initial vowel (and is judged to be ungrammatical without it) – suggesting that the possessor is now an RC adjunct rather than a complement.⁵

- (73) a. (òlùgóyé lwá-Nákátò) (ò-lù-myúùfù)
 11.dress 11.pos-1.Nakato iv-11-red
 ‘Nakato’s red dress’
- b. (òlùgóyè) (ò-lù-myúùfù) (*ò)-lwá Nákátò
 11.dress iv-11-red iv-11.pos 1.Nakato
 ‘Nakato’s red dress’
- (74) a. (èbìfáánányí byá-kápà) (bì-táànò)
 8.picture 8.poss-1a.cat 8-five
 ‘five pictures of cats’ OR ‘the cats’ five pictures’
- b. (èbìfáànànyì) (bì-táànò) (*è)-byá kápà
 8.picture 8-five iv-8.poss 1a.cat
 ‘five pictures of cats’ OR ‘the cats’ five pictures’
- (75) a. (èbìkópó byá kááwá w’ ómúsáwò)
 8.cup 8.poss 1a.coffee 1.poss 1.doctor
 ‘cups of the doctor’s coffee’

⁵These findings are at odds with Hyman (1987), who report that LTD applies whether the possessive structure is right- or left-branching. I have not been able to replicate LTD application in left-branching structures, however.

- b. (èbikópó byá kááwà) *(è)-by' ómúsáwò)
 8.cup 8.poss 1a.coffee iv-8.poss 1.doctor
 'the doctor's cups of coffee'

As expected, LTD does not apply between the possessee and the possessor in the (b) examples.

5.3 Predictions: LTD as an early Concatenation rule

One of the main predictions of this thesis is that a single language may have more than one phrasal phonological rule, with each rule applying at a different stage in PF and consequently having access to different kinds of structural objects. I am arguing that Luganda is one such language: it has one rule that applies to Chains of M-words (HTA, see Chapter 4) and another rule that applies earlier, to head-left Concatenation statements (LTD). In this section I provide some further evidence in support of this treatment.

5.3.1 LTD sees only two M-words at a time

One property that distinguishes Concatenation rules from Chaining rules is that Concatenation rules can only 'see' two M-words *at any given time*. For example, LTD cannot apply throughout (76), where there is a toneless M-word in the middle of the string (see Hyman et al. 1987).

- (76) tú-làb-a mulimi wa-ó-musáwò → túlàbà mùl`ìmì w-ómúsáwò
 1p-see 1.farmer 1.poss-1.doctor
 'We see the doctor's farmer.'
 ↯ *túlábá múlímí w-ómúsáwò

(76a) is a verb followed by an object noun followed by a possessor. If we look at the tonal tier associated with all three of these M-words at once, we seem to have an environment

for LTD: the HL verb *túlàba* is followed by the H from the initial vowel on *ó-musáwò* and therefore we might expect the L to be deleted, resulting in a surface string *túlábá múlímí w'ómúsáwò*. The fact that *mulimi* consists of three toneless moras is not in itself a problem, since we know that LTD can ‘see across’ stretches of toneless moras in e.g. *túlàba lwewunzikâ* ‘we see bananas,’ yielding *túlábá lwéwúnzíkâ*. However, LTD does not apply at the beginning of the string in (76); instead, the L tone on *túlàba* is preserved and the toneless noun *mulimi* surfaces with all L tones. This is in fact what we expect if LTD is a Concatenation rule, which can never see more than two M-words at a time. The H tones on *túlàba* and *w'ómúsáwò* never occur in the same Concat statement, because the toneless M-word *mulimi* intervenes between them; thus, the environment for LTD is not met.

By the same token, it can be shown that HTA – the Chaining rule examined in the last chapter – *cannot* be a Concatenation rule, because it *does* need to see more than two M-words at a time. In (77), for example, the H tone on *Walúsìmbi* spreads leftward through two toneless M-words. If the rule applied to the Concatenation statements in (78), however, there would be no way to derive the correct phonological output for the Concatenation statement in (78a) without ‘knowing’ that the $H_n L_n$ *Walusimbi* occurs somewhere to its right.

(77) a-gul-a ebitabo Walúsìmbi → agúl' ébítábó Wálúsìmbi
 sbj1-buy-ind 8.book 1.Walusimbi
 ‘he buys books, Walusimbi’

(78) a. agula[^]ebitabo
 b. ebitabo[^]Walúsìmbi

Unlike LTD, HTA needs to have access to the entire linearized Chain of M-words within a given spellout domain in order to apply. LTD, on the other hand, applies only when *two adjacent* M-words have the relevant phonological properties – a fact that is explained automatically if we assume that LTD applies to partially linearized structures after Concatena-

tion. In the following section we will see further indications that LTD is a Concatenation rule, also discussed at the end of Chapter 1.

5.3.2 LTD precedes HTA

The current model makes a strong prediction that in cases where a single language has two phrasal rules applying to different-sized objects, the rule with the smaller domain will *precede* (and potentially feed or bleed) the rule with the larger domain.

The Luganda facts are consistent with this prediction. As I pointed out at the end of Chapter 1, there are some contexts where either LTD or HTA could apply – namely, cases where a H-L- \emptyset word is followed by a H-L word. The prediction made here is that LTD should apply, since Concatenation rules systematically precede Chaining rules. This prediction is borne out: LTD takes precedence.

- (79) túgùla káàwa ‘we buy coffee’
↯ *túgùlá káàwa (by HTA)
→ túgùlá káàwa (by LTD)

This prediction follows from the interleaving of phonological rules with other operations in a derivational PF component – a key feature of the current model. It is not necessarily made in other theories of the syntax-phonology interface, e.g. prosodic hierarchy theory. While e.g. Nespors and Vogel (1986) assume that the prosodic hierarchy is constructed from the bottom up, with Prosodic Words being used as building blocks for Phonological Phrases and so on up the hierarchy, this assumption is by no means entailed by the theory – other instantiations of prosodic hierarchy theory have assumed ‘top-down’ or combined ‘bottom-up’ and ‘top-down’ structure-building (e.g. Condoravdi 1990; see also Jun 1998, McCarthy 2002); and OT-based versions of the theory assume no ordering at all.

Furthermore, even if it is assumed that the prosodic hierarchy is built from the bottom up, it does not follow that the *rules associated with each level* must be ordered in the same way. That is, nothing in the theory makes it necessary for for all Phonological Phrase-level rules to apply immediately after the Phonological Phrase is constructed and before the Intonational Phrase is constructed. Again, there are particular instantiations of the theory that incorporate this assumption (e.g. Hyman 1990: 119, McHugh 1990), but the core notion that phonological rules apply only to a hierarchically ordered set of prosodic constituents theory can be maintained independently of any hypotheses about where the prosodic hierarchy comes from. Within the current model, on the other hand, these ordering effects are directly predicted, and it would be a problem if e.g. a Chaining rule turned out to precede (and feed or bleed) a Concatenation rule.

Evidence for rule ordering in the phrasal phonology is somewhat sparse, and the fact that LTD apparently precedes HTA in Luganda does not of course constitute compelling evidence for the current model. However, it is worth pointing out that the ordering prediction is one way in which the current model is distinct from other models of the syntax-phonology interface. An additional example showing the expected ordering effects, from the Bantu language Zinza, is discussed at the end of Chapter 1.

5.4 Other Concatenation rules

I have devoted this chapter to a detailed investigation of Luganda LTD, which I believe belongs to a class of rules that apply to partially linearized (Concatenated) structures relatively early in the PF derivation. I have been assuming that there are two separate steps involved in Concatenation:

- *Head-left Concatenation* begins with a *-statement whose left-hand member is an overt M-word X (rather than a phrasal category or null head), and searches within its

right-hand member until it identifies the overt M-word Y that appears immediately to the right of X.

$$\{(X * YP1), (YP2 * W), (Y * Z)\} \rightarrow \mathbf{X} \frown \mathbf{Y}, \mathbf{Y} \frown \mathbf{Z}$$

In other words, Head-left Concatenation identifies pairs of M-words X, Y where (i) X is left-adjacent to Y, and (ii) X c-commands Y.

- *Phrase-left Concatenation* begins with a *-statement whose left member is a phrasal category; it then searches within the left-hand member until it identifies the right-most M-word, and within the right-hand member until it identifies the left-most M-word. In other words, it identifies pairs of M-words X, Y where (i) X is left-adjacent to Y, and (ii) X *does not* c-command Y.

$$\{(X * YP1), (YP2 * W), (Y * Z)\} \rightarrow \mathbf{Z} \frown \mathbf{W}$$

If the model advanced in this thesis is on the right track, we should be able to identify other possible examples of early Concatenation rules, and such examples do appear to exist: In Chapter 1 I analyzed frequent/obligatory French liaison and Zinza H-Deletion as early Concatenation rules, and in Chapter 6 we will see two other candidates for this kind of analysis – Hausa final vowel shortening and Lekeitio Basque elision. Other possible early-Concatenation rules include Igbo downstep (Kenstowicz and Kisseberth 1977:138–40, Kaisse 1985:129), Tangale vowel elision and tone shift (Kenstowicz 1987), and certain kinds of vowel deletion in Greek (Condoravdi 1990, Kaisse 1985, 1990).

If it is true that there is a class of phonological rules that apply to head-left Concatenation statements, we might expect to find another set of rules that identify phrase-left Concatenation statements as their domains. Given a V-IO-DO structure, for example, such rules would apply *only* between the indirect object and the direct object, and not between the verb and the indirect object. One candidate for such a rule is Welsh consonant mutation,

which affects a set of initial consonants on words that appear in certain morphosyntactic contexts. (In the following examples, the mutated form is boldfaced and the non-mutated form is given in parentheses to the right.)

Tallerman (2006) and Borsley (1999) show that the initial consonant of a word undergoes mutation if it is *immediately preceded by a phrasal constituent XP*. These environments include not only the well-known VSO cases, where the initial consonant of the object DP is mutated (e.g. (80a)), but also when a DP is preceded by an adverbial PP (80b), an object DP (80c), a locative predicate PP (80d), or an indirect-object PP (80e):⁶

- (80) a. prynodd _{XP}[y ddynes] **feic** (<beic)
 bought.3s the woman bike
 ‘The woman bought a bike.’
- b. yr oedd Prŷs yn rhagweld _{XP}[yn 1721] **dranc** yr iaith Gymraeg
 part was Prŷs prog forsee.nonfin in 1721 death the language Welsh
 (<tranc)
 ‘Prŷs foresaw in 1721 the death of the Welsh language.’
- c. taflodd _{XP}[Aled] _{XP}[**bêl**] **ddwy** droedfedd tuag at Mair (<pêl, dwy)
 threw.3s Aled ball two foot towards Mair
 ‘Aled threw the ball two feet towards Mair.’
- d. mae _{XP}[yn yr ardd] **gi** (<ci)
 is in the garden dog
 ‘There’s a dog in the garden.’
- e. mae Emrys wedi rhoi _{PP}[i Megan] **ddarlun** o Gwyn (<darlun)
 is Emrys after give to Megan picture of Gwyn
 ‘Emrys has given to Megan a picture of Gwyn.’ (Borsley 1999: 274)

⁶There is another class of environments for Welsh consonant mutation, sometimes described as having specific ‘lexical’ triggers – e.g. the preposition *i* ‘to’ and the possessive pronoun *dy* ‘your’ always trigger mutation on their following complement. This type of mutation could plausibly be treated as a head-left concatenation rule, which applies between a head and the first word in its complement when certain morphosyntactic conditions are met.

In all of these contexts, the M-word that undergoes mutation is preceded by an M-word that is *embedded within a separate XP phrase*. The Concat statement [ddynes \wedge beic] that provides the domain for mutation in (80a), for example, is derived from a *-statement DP*DP. Both members of the *-statement are searched until their peripheral M-words are identified (the right-most M-word within the left-hand member of the *-statement, and the left-most M-word within the right-hand member of the *-statement).

Phonological rules that apply after phrase-left Concatenation apply at the junctures between XP constituents, but not (necessarily) within XPs. Within the current account, we would expect these rules to also be blocked by spellout domain boundaries, since Concatenation is a strictly phase-internal phenomenon. If the current treatment of Welsh consonant mutation is on the right track, then we should be able to identify cases where mutation fails to apply to a given word even though it is preceded by a separate XP. Some evidence in support of this idea is given in Hannahs (1996), who claims that mutation does not apply across clause boundaries:

- (81) gyn _{XP[i]} CP[*pwy a ddaeth yn ôl*] ($\not\propto$ *bwy)
 know I who prt came back
 ‘I know who came back.’ (Hannahs 1996: 56)

Although some questions remain to be answered regarding e.g. the exact position of the *wh*-word in this example,⁷ the Welsh mutation case appears to have the expected properties of a phrase-left Concatenation rule within the proposal laid out here – it applies to an M-word that follows a separate XP, within the same spellout domain. Other candidates for phrase-left Concatenation rules include unconditional vowel deletion in Greek (Condoravdi 1990, Kaisse 1985, 1990), Phrasal Tone Insertion in Kimatuumbi (Odden 1990), and Chaozhou and Xiamen tone sandhi (Bao 1996, Chen 1987).

⁷See Chapters 3 and 4 for further discussion of ‘phase-edge’ material and its relationship to the next-higher clause.

Chapter 6

Alternative multiple-stage models

6.1 Introduction

As I have emphasized throughout the dissertation, research in the syntax-phonology interface is faced with a basic tension:

(1) GENERALIZATIONS:

- a. Phrasal phonological rules are on the one hand *sensitive to the syntactic structure* in a way that strongly suggests that they are working directly off syntactic cycles.
- b. On the other hand, the phrasal phonology is *variable* in a way that cannot be accommodated by a one-to-one cycle-to-domain mapping system – because a single language can have *multiple* phrasal domains of different sizes, and some phrasal domains vary in size from utterance to utterance.

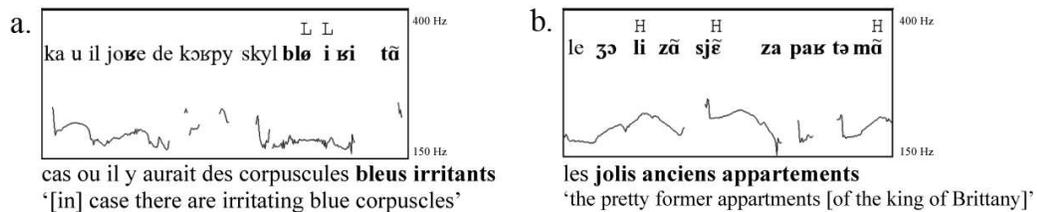
The model developed here accounts for this tension as follows:

(2) HYPOTHESIS:

- a. The spellout domains of syntactic cycles provide the basic units that phonological rules apply to; but
- b. within the PF module, the linearization procedure creates ‘sub-domains’ of various sizes, which serve as domains for different kinds of phonological rules.

In Chapter 2 I showed that my model successfully captures many of the insights of Prosodic Hierarchy Theory (PHT), including the fact that multiple phrasal domains within a single language are usually related to one another by *exhaustive containment*. However, I showed that these containment relations are not necessarily consistent from utterance to utterance – instead, languages like French and Luganda show that the domain for one rule can be sometimes larger and sometimes smaller than the domain for another, against one of the core predictions of PHT.

(3)



- (4) *Accent:* (...bleus irritants) (jolis anciens)(appartements)
Liaison: (...bleus)(irritants) (jolis anciens appartements)

In my model, these kinds of containment-reversals are found just in case one of the two rules (here, French phrasal accent) is a Late Linearization rule, whose domains may be merged together in faster speech and/or split apart in slow speech. More specifically:

(5) PROPOSAL: PHRASAL ACCENT AS A LATE-LINEARIZATION RULE:

- a. French Liaison is an early Concatenation rule, which applies to partially linearized structures between M-words within a spellout domain.

- b. French Phrasal Accent is a late-linearization rule, which applies as separate spellout domains are being linearized with respect to one another.
- c. At the point when late-linearization occurs, speech rate and other performance-related factors may cause domains to be split apart or merged together. Phrasal Accent domains may therefore be ‘merged’ or ‘split’ spellout domains.
- d. Liaison is unaffected by speech rate because it has already applied at the time when chain-splitting or chain-merging takes place.

In the next two sections I consider two alternative proposals, both of which pursue the idea that French phrasal accent is a ‘true’ phonological rule while Liaison is an atypical case – either a rule of allomorphy (§6.2) or a ‘lexical’ phonological rule (§6.3). These proposals are similar to my account in that they postulate *distinct stages* of rule application, but unlike the current model, they associate the rules in question with *distinct modules* of the grammar and thus predict (among other things) that their domains will be completely independent of each other. I examine some further questions raised by these proposals, and their relation to larger questions about how my model compares with other ‘multiple-stage’ models, in the course of the discussion.

6.2 Could some phrasal rules be cases of allomorphy?

In this section I examine an alternative to (5) that is based on the idea that Liaison is an *allomorphic* alternation, rather than the output of a phonological rule. The proposal basically goes as follows:

- (6) COUNTERPROPOSAL: LIAISON AS A RULE OF ALLOMORPHY

- a. Rules of allomorphy apply in the Morphology, a component of the grammar that precedes and feeds the Phonology.¹
- b. Morphological and phonological alternations have different sets of properties and are subjected to independent locality conditions. (Morphological alternations apply under one set of structural conditions while Phonological alternations apply under another.)
- c. If liaison is a morphological alternation and phrasal accent is a phonological alternation, there is no expectation that their domains will be related to one another in any way. The containment-reversal in (4) is therefore unsurprising.

As precedent for the idea that French liaison is not a ‘purely phonological phenomenon,’ it has been noted that liaison applies under a restricted set of morphosyntactic conditions, produces alternants that are not phonologically predictable, and is style-sensitive and influenced by speakers’ metalinguistic knowledge (see e.g. Tseng 2003). In §6.4 we will look more closely at the role of these kinds of properties in distinguishing morphological from phonological alternations. In the meantime, it is worth noting that none of these properties hold of Luganda HTA or Elision, which also become involved in containment-reversal configurations (see Chapter 1 §1.3.4). Presumably, then, even if the counterproposal in

¹There are, of course, frameworks in which allomorphic and phrasal-phonological alternations do not necessarily apply in separate, serially ordered components of the grammar. In the optimality-theoretic treatment advanced by Steriade (1999), for example, the forms /pʁəmʒɛt/ (as in *premier ami* ‘first friend’) and /pʁəmʒɛ/ (as in *premier syndicat* ‘first union’) are treated as separate allomorphs, but their selection depends in part on whether they are located at the edge of a *phonological* domain, the ‘Accentual Phrase’; moreover, the selection of the liaison allomorph is driven by phonological principles, namely a high-ranking *HIATUS constraint. This proposal runs into the same containment-reversal problem we started with – liaison and phrasal accent are expected to be bounded by the same Accentual Phrase constituent, and there is no way to explain why their domains do not maintain a consistent containment relationship (other than by allowing the Layeredness and Headedness constraints to be violated, contra Selkirk 1995).

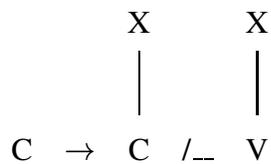
(6) could be shown to work for the French case, the Luganda facts would remain to be explained.

To begin, let us consider exactly what the ‘phonological’ and ‘morphological’ treatments of liaison might look like.

6.2.1 Phonological analysis of liaison

Phonological analyses of liaison are generally based on the idea that certain morphemes in French end with a consonant specified as ‘latent’ (or ‘floating,’ or ‘unsyllabified’), which must be somehow licensed in order to be phonetically realized. Tranel (1990), for example, suggests that latent consonants underlyingly lack skeletal X-slots, and that Liaison assigns an X-slot to a latent consonant immediately followed by a vowel (abstracting away from the structural status of the following vowel-initial item):

(7) Latent-consonant approach to Liaison:



Tranel argues that Liaison is followed by Syllabification. In the normal case (‘forward syllabification’), the liaison consonant becomes an onset for the following syllable, but ‘backward syllabification’ into coda position is also possible, as shown by the possibility of a glottal stop or silent pause between a liaison consonant and a following vowel (e.g. *il faut (pause) interdire*; see Encrevé 1988, Miller and Fagyal 2005, and others). Segments that have not been assigned X-slots by the end of the derivation are presumably deleted, or simply fail to be made available for prosodic processing. A sample derivation with the adjectival suffix *-ant* is shown in (8), with parentheses indicating a latent consonant:

		méchant $\hat{\ } \text{voleur}$	méchant $\hat{\ } \text{ami}$
(8)	underlying	ã(t)	ã(t)
	liaison	ã(t)	ãt
	surface	ã	ãt

A number of variations on the exact mechanics of liaison and syllabification have been proposed, most of them centering around the question of whether latent consonants are licensed by X-slot insertion or direct association with a metrical position within the syllable or mora (see Tranel 1995 for a review).² The differences among these proposals

²An alternative to the latent-consonant approach, which would still treat liaison as the result of a phonological rule, would be to argue that the consonants that participate in liaison (/n/, /z/, /t/, /p/, /r/, possibly /k/) are never realized unless they are immediately followed by a vowel. Words with non-alternating ‘stable’ final consonants (e.g. *jeune*, *apte*) are then represented as containing an underlying abstract vowel, which Valdman (1970) indicates with E (*jeunE*, *apEtE*). Any consonant that is not followed by a vowel by the end of the derivation is deleted (C-deletion), followed by deletion of any abstract vowels:

(1) Abstract-vowel approach to liaison:

	jeune voleur	méchant voleur	méchant ami
underlying	jeunEv...	ãtv...	ãta...
C deletion	jeunEv...	ãv...	ãta...
E deletion	jeunv...	ãv...	ãta...

As I have sketched it here, this approach does not include a specific ‘rule of liaison’ – instead, the relevant work is done by C-deletion. The interaction of C-deletion with syllabification is negotiable, as in the latent-consonant treatment. The important point for present purposes is that C-deletion, like liaison, is a phonological rule that applies to domains that are sometimes larger and sometimes smaller than French accent domains. Conceptual arguments could be made for either the latent-consonant approach or the abstract-vowel approach, but our discussion will primarily be concerned with what these treatments have in common: the idea that liaison consonants are present underlyingly but need to be made phonetically available by some kind of phonological rule.

will not concern us here except where noted, and I will refer to them collectively as ‘latent-consonant approaches.’

6.2.2 Allomorphic analysis of liaison

In a purely allomorphic analysis of French liaison, there is no rule of liaison or (C-deletion) and correspondingly no underlying distinction between consonants that are and are not phonetically available. Instead, the two different pronunciations of *-ant* in (8) – /ã/ and /ãt/ – are taken to be distinct allomorphs whose insertion is conditioned by the presence or absence of a following vowel. Instead of having the single vocabulary item in (9) below for the relevant adjectival suffix, we have the two competing allomorphs in (10), where [...] are the syntacticosemantic features that trigger insertion of the particular suffix *-ant*:

(9) Phonological treatment with a single vocabulary item:

a. $\text{adj}[\dots] \leftrightarrow \tilde{a}(t)$

(10) Allomorphic treatment with two competing allomorphs:

a. $\text{adj}[\dots] \leftrightarrow \tilde{a}t / _ V$

b. $\text{adj}[\dots] \leftrightarrow \tilde{a} / \text{elsewhere}$

The /ãt/ allomorph (10a) is inserted if followed by a vowel (again, abstracting away from the structural status of the vowel-initial item). Otherwise – i.e., if the following item begins with a consonant, or if there is no following item – the elsewhere allomorph /ã/ is inserted (10b). Crucially, the two allomorphs are not related by a phonological rule; the /ã/ in (10b) does not contain a latent /t/ at any point in the derivation. Morphologically simplex words with alternating final consonants, e.g. *petit*, would be derived by root allomorphy under this treatment:

(11) Root allomorphy for *petit*:

- a. $\sqrt{Root} \leftrightarrow \text{p} \acute{\text{e}} \text{t} \text{i} \text{t} / _ \text{V}$
- b. $\sqrt{Root} \leftrightarrow \text{p} \acute{\text{e}} \text{i} / \text{elsewhere}$

6.2.3 Problem 1: Nonlocality and countercyclicity

Notice that the contextual conditions on (10a) are essentially the same as those on (7): the following item must be vowel-initial. Furthermore, as demonstrated by *méchant ami*, this conditioning vowel characteristically belongs to a *separate word* from the consonant involved in the alternation. This brings us to what is perhaps the most pressing issue raised by allomorphic treatments of French liaison – to what extent they require us to revise our existing assumptions about *locality conditions* on allomorphic alternations (see Embick 2008 for relevant discussion).

While there appear to be cases of suppletive allomorphy conditioned by material across the word boundary – the English *a/an* alternation being a well-known example – these cases are relatively few in number compared with, say, the number of phonological rules that apply across words. There are no attested cases of allomorphy across a parenthetical boundary, for example, or allomorphy whose phonological trigger is *more* than one word away. Example (12), adapted from (Kaisse 1985: 12–13) and Rotenberg (1978), illustrates this point with English *a/an*:

- (12) a. We saw **an** octopus.
- b. We saw **a(*n)** very large **o**ctopus
- c. We saw **a(*n)**, although I hate to admit it, very large octopus

In fact, English *a/an* is subjected to a strict set of morphosyntactic locality constraints:

- (13) a. The indefinite determiner *a/an* is a single terminal – a morphologically simplex head.

- b. In order to be phonologically conditioned by a following item, the indefinite determiner *a/an* must:
 - i. immediately precede the following item, and
 - ii. c-command the following item within the same spellout domain.

The English *a/an* alternation can thus be argued to occur in the following environment:

(14) $D[-\text{def}] \leftrightarrow \text{ən} / _ \text{ } \hat{_} X$, where X is a vowel-initial M-word

Under this analysis, ‘allomorphy across the word boundary’ occurs just in case the alternating morpheme is an M-word composed of a single terminal. By virtue of being a single terminal, this M-word can enter into a Concatenation statement with a following M-word whose phonological contents have already been determined, *before it has undergone vocabulary insertion itself*. The fact that the two M-words must occur in a single Concatenation statement furthermore entails that they must within the same spellout domain, ruling out e.g. (12c).

If we were to try to extend this kind of allomorphic treatment to French liaison, as in the counterproposal in (6), the analysis would become considerably more complex. First, words that undergo liaison are not all morphologically simple. This means that there must be some way of isolating *only* the liaison-alternating morpheme *within* the relevant M-word, and preventing that morpheme from undergoing vocabulary insertion until M-word level Concatenation has taken place. There also must be some way to allow the liaison-alternating morpheme to ‘see outside’ of its M-word to the following M-word.³

³An alternative approach would be to argue that ‘phrasal’ liaison applies only when two separate words come to have the structure of a single word via adjunction (head-movement or lowering). It is true that many cases of obligatory liaison involve determiners and subject/object pronouns with ‘clitic’-like properties, such as monosyllabicity and inability to be stressed (*(un, des, les, on, vous, ils)*), perhaps consistent with the idea that they adjoin to the following word. However, liaison is also obligatory after polysyllabic numeral

A further complication with (6) is that the V-initial M-word that triggers liaison is not always immediately adjacent to the liaison allomorph; instead, the rule in (10) is required to ‘see through’ at least one intervening agreement head in order to determine whether the following word is vowel-initial or not. This point can be illustrated with a closer examination of the French adjectival agreement system (see also Valdman 1970, Féry 2003).

French adjectives agree with nouns in gender and number. With respect to gender agreement, French adjectives can be divided into two broad classes: those with non-alternating final segments (*poli, correct, jaune, fatigué*) and those with alternating final segments. This latter class can in turn be divided into adjectives with ‘regular’ alternations and adjectives with an assortment of irregular alternations. The ‘regular’ class is probably the largest: it contains adjectives with common derivational suffixes (*-ant, -eux, -ain, -ien, -ais*) as well as several monomorphemic adjectives (*petit* ‘small,’ *gris* ‘gray,’ *plein* ‘full’). Gender and number exponents for this regular class are given in Table 6.1.

Table 6.1: ‘Regular’ adjectival agreement endings in French

AGR features	phon. context	ending	example
masc sg	non-prevocalic	∅	méchant/ancien/fameux directeur
	prevocalic	t, n, z...	mechant/ancien/fameux artiste
fem sg	non-prevocalic	t, n, z...	mechante/ancienne/fameuse directrice
	prevocalic	t, n, z...	mechante/ancienne/fameuse amie
masc pl	non-prevocalic	∅	mechants/anciens/fameux directeurs
	prevocalic	z	mechants/anciens/fameux artistes
fem pl	non-prevocalic	t, n, z...	mechantes/anciennes/fameuses directrices
	prevocalic	tz, nz, zz...	mechantes/anciennes/fameuses amies

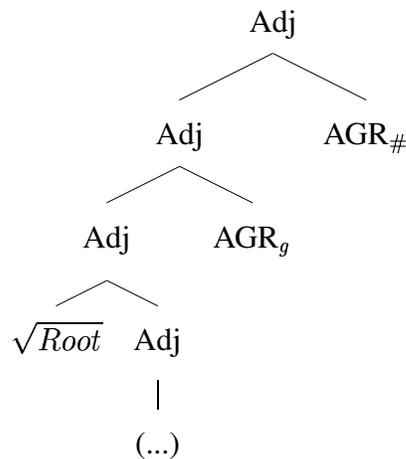
Some generalizations that are apparent in this data set include:

and quantifier determiners (*soixante-deux, quatre-vingt-trois, neuf-cent(s), innombrables, nombreux*) and frequent after prenominal adjectives, even when several of them are stacked up in front of a noun. In order to pursue this alternative analysis, we would need to argue that e.g. *d’innombrables anxieux employés* formed a single M-word, even though there is no other evidence to support such a claim as far as I am aware.

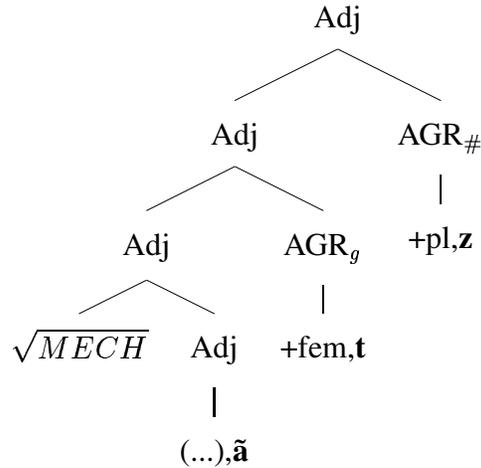
- (15) a. The feminine-plural prevocalic ending is always composed of two pieces.
- i. The second piece is always /z/ – the same as the prevocalic masculine-plural.
 - ii. The first piece is always identical to the feminine-singular exponent; e.g., there are no cases where the feminine singular ends in /t/ and the feminine plural ends in /nz/.
- b. The consonant that emerges in the feminine form is always the same as the consonant that emerges in the prevocalic masculine form; i.e., we don't have alternations like *mécha/n/ enfant* – *mécha/t/ directrice*.

In order to capture these generalizations, I will assume that there are two agreement nodes – one for gender and one for number – following the Adj node. The abstract structure is given in (16a) below (again, [...] stands for an unspecified feature bundle that triggers insertion of *-ant*), and two examples of structures after Vocabulary Insertion are given in (16b) and (16c).

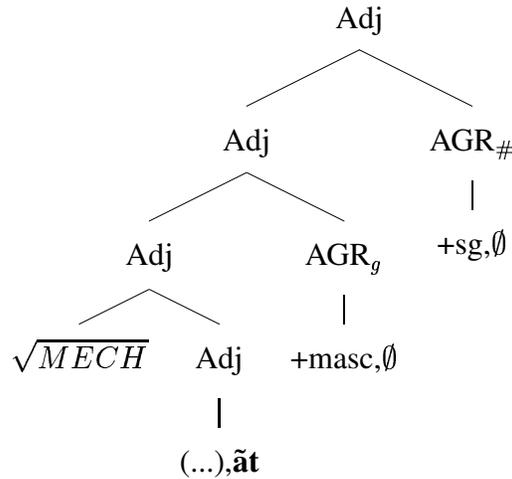
- (16) a. Abstract structure:



b. méchantes amies:



c. méchant enfant:



As the (c) example shows, the vocabulary insertion rules for the Adj node must be able to ‘see through’ two null AGR nodes in order to ‘know’ whether the following item is vowel-initial or not. This kind of allomorphy is therefore nonlocal in two senses: (i) it sees beyond the M-word boundary from within a complex M-word, and (ii) it sees through phonetically null exponents within the M-word.

Under the phonological treatment in (9), the structure for *méchant* is the same as in (16a), but the adjectival suffix is invariably *-ã(t)*. The phonological rule needs to be able to ‘see across’ the zero morphemes just as the allomorphy rule does, but there is a

fairly uncontroversial way to encode such effects – we can argue that zero morphemes are deleted after the internal contents of each M-word have undergone vocabulary insertion and linearization. There is abundant evidence that something like this zero-deletion step is necessary before phrasal phonological rules can apply. Phonological rules are characteristically able to apply across zero morphemes, particularly word-internal zero morphemes – we saw in Chapter 5 that Luganda LTD applies between a verb and a direct object when the indirect object is passivized or relativized; and we know that e.g. English Flapping applies in *I bet a hundred dollars*, where the Tense and Agreement morphemes on the verb are both \emptyset (see also Nespor and Scorretti 1985 for discussion). This would give us what seems to be the correct generalization: that it's only zero morphemes that are invisible to the phonology in this way, and that we don't find phonologically conditioned segmental alternations with *overt* material intervening between the items in question.

Under the allomorphic analysis in (10), on the other hand, zero-deletion cannot be implemented without introducing a kind of countercyclicity – the higher, peripheral AGR nodes need to have undergone Vocabulary Insertion, and then had their \emptyset exponents deleted, before Vocabulary Insertion can take place on the lower Adj node. At the same time, the lower Adj node must be able to 'see' across the word-boundary in order to know whether the following word is V-initial or not, as noted above. This introduces a further kind of countercyclicity: before the Adj suffix can undergo Vocabulary Insertion *internal* to the adjective M-word, the adjective M-word has to have been linearized with respect to the following M-word (which, in turn, must have also received all of its internal phonological content). For example, in the context (16c) *méchant enfant*:

1. Do M-word internal vocabulary insertion and linearization internal to *enfant*. Linearize the M-words *méchant* and *enfant*.
2. Do Vocabulary Insertion on AGR_# (\emptyset) internal to *méchant*.

3. Do Vocabulary Insertion on AGR_g (\emptyset) internal to *méchant*.
4. Delete zero morphemes internal to *méchant*.
5. Do Vocabulary Insertion on Adj (*-ât*) internal to *méchant*.

That is, in order for the allomorphic treatment in (10) to work out, operations must proceed in a very particular way – neither uniformly inside-out nor uniformly outside-in, but a hybrid mix of these.

The questions raised in this subsection primarily involve the presence of the gender and number Agreement nodes. We could try to avoid of these problems by arguing that these AGR nodes are not present in the structure and that all of the agreement features are bundled together on the Adj suffix node, so that e.g. *-â*, *-ât*, and *-âtz* would be atomic units competing for insertion at Adj. We could even argue that there is no separate Adj suffix node, and that e.g. *méchantes* is a single atomic terminal. The problem with this approach, however, is that the regularities noted below Table 6.1 would become completely coincidental. There would be no reason why prevocalic plural adjectives always end in /z/, whether they are feminine or masculine, for example, or why the same consonant is realized in the feminine singular and the feminine plural. If we tried to treat *méchant* as a single atomic allomorph, furthermore, there would be no reason why the pronunciation of the root *méch* would remain constant throughout its paradigm instead of undergoing suppletion comparable to English *go/went*. I will therefore continue to treat French prenominal adjectives as internally complex in the analyses sketched below.

6.2.4 Problem 2: Identifying a default allomorph

Recall from (15b) that in the French adjectival agreement system, the feminine ending is always identical to the prevocalic masculine ending. Again, this appears to be a very

regular pattern in the grammar that ideally will not be treated as coincidence. This pattern can be accounted for in phonological approaches, where the /t/ in *méchante amie* and the /t/ in *méchant ami* can both be treated as an underlying part of the *-ant* suffix. In the strictly allomorphic approach, however, it is not clear how to get ‘the same’ /t/ to show up in these two environments. I will go through each analysis in turn.

In the phonological approach, a vocabulary item inserts $-\tilde{a}(t)$ in the Adj node for *méchant*, as shown in (9) above. The AGR_g exponent is \emptyset . However, the feature [+fem] at the AGR_g node is associated with a Readjustment Rule – a special phonological rule that applies in the context of a particular set of roots or features during word formation (see Embick and Halle (in preparation)):

(17) Readjustment Rule:

$$\begin{array}{c} X \\ | \\ C \rightarrow C \ / _ AGR_g [+fem] \end{array}$$

This rule is basically ‘phonologically context-free liaison’ – it is the same rule as (7), but without the requirement that the following item be vowel-initial. The rule in (7) still exists, but it applies later, after Concatenation of M-words, to assign an X-slot to a latent consonant in the prevocalic environment.⁴

⁴As noted by Embick and Halle (in preparation), many questions about the role of Readjustment Rules in the grammar remain to be answered. It is not clear exactly when they apply or what the possible range of contextual conditions on them is, although as a working hypothesis we might assume that they cannot see outside the M-word; see also Kiparsky (1994) for discussion. The abstract-vowel approach described in note 2 does not require this particular Readjustment Rule and may therefore appear to be an attractive alternative (although it comes at the cost, noted earlier, of having abstract vowels throughout the vocabulary). Under this analysis, the Adj exponent is $\tilde{a}t$, the [+masc] exponent is \emptyset , and the [+fem] exponent is the abstract vowel E. This abstract vowel causes any preceding consonants to be phonetically realized, but has no effect on preceding vowels – the desired outcome from what we have seen so far. Masculine adjectives either

Under the allomorphic treatment, this generalization cannot be as easily captured. Pursuing the analysis we started above, we have two competing vocabulary items for the Adj node (repeated from (10)) alongside a vocabulary item for the AGR_g node (18c):

- (18) a. $adj[...]\leftrightarrow \tilde{a}t / _ V$
 b. $adj[...]\leftrightarrow \tilde{a} / \text{elsewhere}$
 c. $AGR_g[+fem]\leftrightarrow t / _ [...]$

There is no explanation under this treatment for why /t/ shows up in both (18a) and (18c) – or for why the given consonant is *always* identical in these two environments.

One possibility worth exploring is that the /t/ I’ve shown as part of the exponent $-\tilde{a}t$ in (18a) might actually belong to a separate node – namely, the gender node – so that the feminine /t/ and the prevocalic masculine /t/ are in fact the same item. The question is how to get the gender node to be realized as /t/ vs. / \emptyset / in just the right cases. The problem is that both /t/ and \emptyset are inserted under disjoint conditions, as shown informally below (see also Asudeh and Klein 2002, Tseng 2003):

- (19) a. $AGR_g\leftrightarrow t$, if:
 i. AGR_g is [+fem]; **or**
 ii. AGR_g is [+masc], $AGR_{\#}$ is [+sg], and a V-initial M-word follows
 b. $AGR_g\leftrightarrow \emptyset$, if AGR_g is [+masc] **and**
 i. a C-initial M-word follows, **or**
 ii. there is no following M-word.

There is no obvious way to get just one of these allomorphs to be the ‘elsewhere’ case. If we treat /t/ as the elsewhere case we have to have two zero allomorphs, one inserted if a word undergoes liaison with a following vowel-initial word or loses its final consonant. As in the latent-consonant treatment, the identity between the consonants realized in the feminine and the prevocalic masculine-singular is straightforwardly predicted.

consonant-initial M-word follows and one inserted if nothing follows. Conversely, if we treat \emptyset as the elsewhere case, we have to have two /t/ allomorphs, one inserted for [+fem] and one inserted for [+masc +sg] in the prevocalic environment.

6.2.5 Interim discussion

So far I have pointed out three problems encountered by the purely allomorphic treatment of liaison: it requires reference to nonlocal information; it is potentially countercyclic, since the prevocalic masculine-singular exponent is only inserted if the following AGR nodes are zeros; and it threatens to miss out on the identity of the feminine and prevocalic masculine-singular exponents. At the very least, these observations show that the allomorphic treatment of liaison is not a simple, straightforward way to solve the ‘containment-reversal’ problem we started with (see (4)); on the contrary, it introduces its own set of complications that are by no means trivial. On the other hand, these problems are avoided if we adopt a phonological approach to liaison within the model developed in this thesis.

Before moving on, I would like to look at a class of four irregular adjectives in French that are particularly relevant for morphological treatments of liaison, listed in Table 6.2.

Table 6.2: Four ‘irregular’ adjectives in French

AGR features	phon. context	beau	nouveau	fou	vieux
masc sg	non-prevocalic	bo	nuvo	fu	vj \emptyset
	prevocalic	b ϵ l	nuv ϵ l	f \emptyset l	vj ϵ j
fem sg	non-prevocalic	b ϵ l	nuv ϵ l	f \emptyset l	vj ϵ j
	prevocalic	b ϵ l	nuv ϵ l	f \emptyset l	vj ϵ j
masc pl	non-prevocalic	bo	nuvo	fu	vj \emptyset
	prevocalic	boz	nuvoz	fuz	vj \emptyset z
fem pl	non-prevocalic	b ϵ l	nuv ϵ l	f \emptyset l	vj ϵ j
	prevocalic	b ϵ lz	nuv ϵ lz	f \emptyset lz	vj ϵ jz

These alternations are irregular in at least two respects: their final-consonant alternations involve consonants that do not usually undergo liaison (/l/ and /j/), and the final rime shows

Finally, consider the case of pronominal possessive determiners in French, which show the following distribution:

- (21) First-singular possessive determiners:
- a. **me(z)** / [+pl] (e.g. *mes amis* ‘my friends’)
 - b. **ma** / [+fem] preconsonantal (e.g. *ma famille* ‘my family’)
 - c. **mō(n)** / elsewhere (e.g. *mon fils* ‘my son,’ **mon amie** ‘my girlfriend’)

The noteworthy point here is that the normal [+fem] exponent, *-a*, cannot not be used if the following word is vowel-initial – instead, the masculine-singular exponent *-ō(n)* surfaces.

Notice that this is a different pattern from the one we observed above with pronominal adjectives (see Table 6.1). With pronominal adjectives like *méchant*, the prevocalic ‘liaison’ form is homophonous with the *feminine* form; with possessive determiners, however, it is homophonous with the masculine form. Furthermore, in the possessive-determiner environment, neither the feminine-singular nor the masculine-singular exponent appears to be related to the plural in a predictable way – there is one plural form *me(z)*, rather than feminine *ma(z)* and masculine *mō(z)*. For these reasons, a different analysis is motivated from the one I have advanced for adjectival liaison – one that does rely in part on suppletive allomorphy.

One possibility is that an *Impoverishment* rule deletes the [+fem] feature from the possessive determiner if the following M-word is vowel-initial (shown below, where [...] stands for the syntacticosemantic features for a first-person singular possessive determiner):

- (22) a. Vocabulary items for first-singular possessive determiner:
- i. $D[...,+pl] \leftrightarrow me(z)$
 - ii. $D[...,+fem] \leftrightarrow ma$
 - iii. $D[...] \leftrightarrow mō(n)$

b. Impoverishment rule:

+fem $\rightarrow \emptyset / D[\dots] \wedge X, X$ vowel-initial

The vocabulary items in (a) are ordered by the elsewhere principle. Once the [+fem] feature has been removed by the impoverishment rule in (b), the context for the vocabulary item in (a-ii) will no longer be met, and the default form in (a-iii) will be inserted instead.⁵

My goal in this section has been to point out some non-trivial difficulties that arise when French liaison is treated as an allomorphic alternation. The proposal advanced here avoids these difficulties, while still allowing certain sub-cases of ‘liaison’ (e.g. possessive determiner alternations) to be treated allomorphically.

6.3 Phrasal liaison as a lexical rule

At the beginning of this chapter I pointed out that treating French liaison as a case of allomorphy might provide an independent explanation for the containment-reversal effects shown in (4) and discussed in Pak and Friesner (2006). The background assumption behind this line of argument is that ‘the morphology’ is a distinct component of the grammar, separate from and preceding the ‘regular’ phonology. In much work, including the treatments of liaison proposed in Hayes (1990), Post (1999), De Jong (1990) and Tranel (1990), the engine at work in the morphological component is the Lexicon, which includes combinatory rules for putting together roots and affixes, allomorphy rules determining which

⁵An additional question has to do with the internal composition of the possessive determiner – whether e.g. *ma* should be broken down as /m/+a/. I leave this question open for now. While *m-*, *t-*, and *s-* are found elsewhere in French with the same distribution (e.g. ‘clitic’ pronouns, possessive pronouns), the monomorphemic analysis might be preferable because it avoids introducing the problem of ‘seeing outside’ an internally complex M-word (see §6.2.3). On the other hand, it would be the Impoverishment rule that was able to see outside the M-word here, rather than the allomorphy rule itself; furthermore, the problems of countercyclicity and seeing across zeros would not arise in this case.

alternant will be selected in a given case, and a special set of *lexical phonological rules* that are triggered by affixation at different stages of the derivation.

One possibility we might wish to entertain at this point is that liaison could be such a lexical phonological rule. This might be a way to avoid some of the problems that arise with the purely allomorphic approach, while still treating liaison as a ‘morphological’ phenomenon separate from other (postlexical) phonological rules. We would, however, be faced with the problem of how to get liaison to ‘see across’ word boundaries, since Lexical rules are traditionally assumed to be word-bounded.

I am aware of two formalizations of the idea that lexical rules and other morphological operations are not necessarily word-bounded: Odden (1990) and Hayes (1990).

6.3.1 Lexical Sandhi Theory (Odden 1990)

In Odden’s Lexical Sandhi Theory, ‘syntactic structures are in place throughout phonology and both lexical and postlexical rules have access to these structures’ (p. 268). The requirement that lexical rules be word-bounded is abandoned – in fact, the proposal as it stands removes *all* locality restrictions on lexical rules. Without further elaboration, the theory predicts that lexical rules could apply across parenthetical junctures, or be conditioned by phonological features separated by multiple intervening words, or have *larger* domains than postlexical rules in the default case. The criteria used to determine whether a given rule is lexical or postlexical are (i) whether it requires reference to labeled syntactic structure and/or morphological structure; and (ii) whether it has other characteristic properties of lexical rules (structure preservation, categoricity, etc.). We will see in see §6.4, however, that these properties do not cluster in a consistent way and therefore cannot be used as reliable diagnostics at the phrasal level.

6.3.2 Precompilation theory (Hayes 1990)

Another formalization of phrasal lexical rules is Hayes' (1990) theory of Precompiled Phrasal Phonology. The principal motivation behind this theory is to provide an account of 'phonosyntactic' phrasal rules – i.e., phrasal rules that require reference to particular morphosyntactic labels or features. The idea is that 'true phrasal rules' cannot distinguish between e.g. vPs and DPs but instead apply indiscriminately throughout syntactic objects of a given size; any phrasal rule that *does* make category- or feature-based distinctions must then be a precompiled phrasal rule.

Precompilation theory essentially works as follows, using Hausa final vowel shortening (which shortens the final vowel on a verb that takes a full NP direct object) as an illustration:

1. Each language has available a set of frames that identify special syntactic contexts. An additional (homophonous) allomorph is automatically generated for every item in the lexicon that could potentially appear in a given frame:

- (23) a. Frame 1: $VP[_ _ NP \dots]$, NP non-pronominal
b. ka:ma: 'catch' \rightarrow ka:ma:, ka:ma:[*Frame1*]

2. Some lexical rules are specified to apply to allomorphs associated with particular frames:

- (24) a. Final vowel shortening: $V: \rightarrow V / \dots _ _ [Frame1]$
b. ka:ma:[*Frame1*] \rightarrow ka:ma[*Frame1*]

3. At the end of the syntactic derivation, the Frame 1 allomorph is inserted wherever the context specified in Frame 1 is met; otherwise, the default form is inserted.

- (25) a. Frame 1 context: $VP[_ _ NP[ki:fi:]]$ as in ‘I have caught a fish’
 Inserted form: **ka:ma**_[Frame 1]
- b. Other context: $VP[_ _ NP[si]]$ ‘I have caught it’ (pronominal object)
 Inserted form: **ka:ma:**

The end result is that Hausa final vowel shortening can be treated as a lexical rule, which applies before it ‘knows’ whether the affected word will be followed by a full-NP object or not. This treatment can also be used for cases of pure allomorphy (e.g. English *a/an*; the frames work in the same way, but the allomorphs are listed on a case-by-case basis instead of being produced by a phonological rule.

Hayes argues that precompilation can be extended to French liaison, and Post (2000) takes up this suggestion as a way to account for an observed mismatch between Liaison and Clash Resolution domains (similar to the liaison-accent domain mismatch shown in (4)). The precompilation treatment of liaison has an advantage over the purely allomorphic treatment outlined in §6.2 insofar as it allows the alternation to be treated phonologically – liaison is a straightforward rule of latent-consonant syllabification. However, this rule is treated as context-free, applying blindly in the lexicon without ‘knowing’ what will eventually precede or follow the resulting form. Sensitivity to the vowel-initial status of the following item is encoded as part of the *allomorph insertion* rule, rather than as part of the phonological rule. In other words, the phonological rule is divorced from its phonological context – nothing rules out a hypothetical situation where a liaison allomorph is inserted preconsonantly rather than prevocally, for example, or where a liaison allomorph is inserted if the following word *ends* with a vowel:

- (26) Hypothetical ‘reverse liaison’: Insert the liaison allomorph if the following word ends with a vowel.
- a. *peti/t/ stylo* ‘little pen’

- b. peti/∅/ auteur ‘little author’

A number of potential problems with precompilation theory have been addressed in the literature. One problem has to do with the generation of homophonous allomorphs. In French, for example, Frame 1 allomorphs would be generated for *all* prenominal adjectives, even those with non-alternating final segments (e.g. *joli*, *correct*, etc.). In such cases, where the Frame 1 allomorph is never distinguishable from the elsewhere allomorph, we might ask what would motivate a learner to posit both forms. This complication becomes even more pronounced when the alternation involves multiple allomorphs in multiple syntactic contexts – as in Lekeitio Basque, where the initial vowel of a function word (auxiliary or determiner) assimilates to the final vowel of its complement under specific morphosyntactic conditions (Elordieta 2007):

- (27) a. ekarrí **eb**ésen edarídxak → ekarrí **ib**ésen edarídxak
bring aux drinks
‘They brought the drinks.’
- b. saldú **eb**ésen etxíak → saldú **ub**ésen etxíak
sell aux houses
‘the houses they sold’

In order to treat this rule as precompiled (as we would be expected to, since it applies only under certain morphosyntactic conditions), we would need to postulate four frames for each auxiliary – one for each potential preceding vowel, minus the default /a/ (Step 1 above). We would thus generate five allomorphs for each auxiliary – *including consonant-initial auxiliaries that would never participate in assimilation* – and an additional set of frames would be required for noun-determiner contexts. Again, the question is whether we want the system to generate this many homophonous allomorphs. Within the current treatment, this problem is avoided. French liaison, Basque vowel assimilation, and Hausa final vowel shortening apply to partially linearized structures after Concatenation; while they

may only apply under certain morphosyntactic conditions, they are otherwise treated as ‘true’ phrasal phonological rules that do not rely on the generation of multiple allomorphs.

Precompilation also becomes unwieldy when the output of one alternation feeds another alternation in a noncyclic fashion. Bao (1996) discusses a case of this type from Chaozhou Chinese. The domains for tone sandhi in this dialect look very similar to the tone-sandhi domains for Xiamen Chinese, discussed in Chen (1987); crucially, they require a distinction between adjunct and complement XPs which is, according to Hayes, sufficient grounds for classifying the rule as precompiled. But unlike in Xiamen, Chaozhou tone sandhi involves *multiple* sandhi ‘allomorphs,’ and the selection of a particular form depends in some cases on the phonological properties of the following word, which could itself be a sandhi allomorph. Furthermore, Chaozhou tone sandhi applies strictly from right to left across a string of words within a given domain, regardless of the syntactic bracketing:

(28) a. Tone sandhi rules (subset):

i. $213 \rightarrow 42 / _ 213$

ii. $213 \rightarrow 53 / _ 53$

b. Examples:

i. $[\text{ho}_{213} \text{sio}_{213}] \rightarrow \text{ho}_{42} \text{sio}_{213}$ ‘to take pictures’

ii. $[[\text{ho}_{213} \text{sio}_{213}] \text{kuang}_{53}] \rightarrow \text{ho}_{53} \text{sio}_{53} \text{kuang}_{53}$ ‘studio’

iii. $[[\text{ho}_{213} \text{sio}_{213}] \text{kuang}_{53}] \not\rightarrow * \text{ho}_{42} \text{sio}_{53} \text{kuang}_{53}$ ‘studio’

In order for precompilation to work for Chaozhou tone sandhi, allomorph insertion must proceed strictly from right to left, regardless of the internal syntactic constituency of the string. This kind of enforced countercyclicality would be an extremely odd property for an allomorph-insertion rule to have. It is not at all unusual for phrasal phonological rules to proceed in this way, however; in the current analysis, for example, Chaozhou tone sandhi

would most likely be a Chaining rule that applies after the M-words within a given spellout domain have formed a stringlike n -ary object.

Perhaps the most pressing issue for our purposes is the fact that precompilation theory does not include an explicit statement of what frames can look like, beyond the Adjacency Condition stated below:

- (29) **Adjacency condition on precompilation theory:** ‘The triggering context for a precompiled allomorph must always lie in an adjacent word.’ (Hayes 1990: 106)

Hayes acknowledges that the frames used in precompilation theory cannot be typical sub-categorization frames, and this leaves us without an obvious way to restrict the *syntactic relationship* between the trigger and the allomorph. This means that in addition to cases like French and Hausa (where the trigger is a head that c-commands the allomorph), pre-compilation theory can also be extended to cases like Xiamen tone sandhi (Chen 1987), where the relevant allomorphs are inserted ‘at the right edges of non-adjunct maximal projections’ (Hayes 1990: 104). This suggests that lexical insertion frames can not only ‘see’ linearly adjacent words, but also have access to nonlocal information about syntactic structure – what kind of XP contains the allomorph, and whether that XP is incorporated in the rest of the structure as an argument or an adjunct. The theory could therefore potentially rule in cases like the following:

- Insert allomorph X at the right edge of a clausal adjunct, if the following word is a vowel-initial adjective.
- Insert allomorph Y at the left edge of a parenthetical XP, if the word preceding the parenthetical is a bimoraic noun.

But as far as I am aware, such cases are not attested in the phrasal phonology literature. There are numerous examples of alternations that occur at clause or adjunct edges, but

these alternations are crucially unable to see across the clause/adjunct boundary to the following M-word. Likewise, there are numerous examples of alternations that are conditioned by particular morphosyntactic features and categories, but these alternations are always localized to a particular domain size and cannot e.g. apply across clause boundaries.

Finally, returning to the liaison case we have been discussing, notice that the ‘adjacent-word’ condition on phrasal allomorphy potentially admits frames like (30), for liaison on the adjectival suffix *-ant*:

(30) Frame 1:

$DP[... AP[... -- ADJ [+masc]_{AGRg} [+sg]_{AGR\#}] [Y...]$, where Y is vowel-initial

As we saw above, liaison in the prevocalic masculine-singular must ‘see across’ null agreement nodes in order to determine whether the following word is vowel-initial or not.⁶ Correspondingly, the trigger Y in (30) is separated from the target by a gender-agreement and a number-agreement morpheme. If (30) is a legitimate frame, however, then we should also expect to find precompiled rules where the target and the trigger are separated by *overt* material. A hypothetical example of such an alternation would be one where a suffix /is/ had a voiced alternant /iz/ if the following M-word was vowel-initial – regardless whether any intervening suffixes were overt or null:

(31) $\sqrt{Root-is-\emptyset} /t.../$
 $\sqrt{Root-iz-\emptyset} /a.../$
 $\sqrt{Root-is-a} /t.../$
 $\sqrt{Root-iz-ta} /a.../$

⁶Treating the adjective as a single atomic unit avoids this problem but at the cost of treating all the regularities in the paradigm as completely coincidental, as noted above.

I am not aware of any such cases. Presumably they should be ruled out, but it is not obvious how they would be under precompilation theory.

6.4 Stages, modules, and rule diagnostics

6.4.1 The current proposal: multiple stages in a single module

In the distributed-morphology framework I am assuming, word-formation is not restricted to its own module of the grammar, but is done by a combination of syntactic and post-syntactic (PF) operations. PF operations include linearization, vocabulary insertion (the engine that drives allomorphy), and various types of phonological rules, which are ordered with respect to one another in a specific way. Within this architecture, ‘the Morphology’ and ‘the Phonology’ are *not* separate components of the grammar. Instead, allomorph-insertion rules and phonological rules apply within the same PF component, and are thus able to use some of the same objects as their domains.

Since I have focused on phrasal phonological interactions in this thesis, I have not devoted much attention to the nature of allomorphy and other word-formation processes. However, the basic proposal advanced in this thesis – that phonological rules may be interleaved with linearization operations – may be assumed to apply *within* M-words as well as across them. More explicitly:

- Internal to each complex head, individual terminals are linearized with respect to one another. The steps involved in word-internal linearization are by hypothesis similar to the steps involved in phrasal linearization (i.e., Concatenation, Chaining).
- Word-internal Concatenation statements may serve as domains for both (i) certain kinds of phonological rules, and (ii) rules of allomorphy (i.e. Vocabulary Insertion).

- Some ‘morphological’ rules (impoverishment, local dislocation, vocabulary insertion) apply after separate M-words have been Concatenated. Certain kinds of ‘phrasal’ phonological rules may use these same Concatenation statements as their domains, although they necessarily apply after vocabulary insertion is complete.

The basic idea is that phonological rules and ‘morphological’ rules make use of *the same kinds of domains* – i.e. the various linearization statements that are produced in the course of the PF derivation. The main difference between them is that ‘morphological’ operations are completed in the earlier part of the PF derivation while phonological rules may continue to apply as linear order is established over larger and larger objects. Consequently, rules of allomorphy apply to a *subset* of the domains that are available for phonological rules. They do not, however, apply to an entirely independent set of domains, as they might be expected to if the morphology and the phonology were separate components of the grammar.

This means that even if it were desirable to treat e.g. French liaison as an allomorphic alternation, this would not provide a solution to the containment-reversal problem we started with in (4). Within the current proposal, containment reversals are predicted to occur only if one of the two rules is a late-linearization rule, which has the freedom to split apart or merge together spellout domains under certain performance-related conditions. In general, though, the current model predicts that phonological rule domains will be related by exhaustive containment, even if these containment relations are not consistent from utterance to utterance. Other kinds of domain mismatches – like the ‘misaligned’ domain configuration shown in (32a) – should not occur at all.

	a. Misaligned boundaries:	b. Containment reversal:	
(32)	(----) (----)		<i>Utterance 1</i> <i>Utterance 2</i>
	... (----) ...	rule A	(---) (---) (-----)
		rule B	(-----) (---) (---)

Whether or not cases like (32a) are attested is an important question for future work. I am aware of one possible case, reported by Chen (1987). The phonological rule in question is Xiamen tone sandhi, where there is an alternation between ‘citation’ forms (which appear at the end of a domain) and ‘sandhi’ forms (which appear internal to a domain). I have not included tone diacritics below, but the domains are marked with parentheses. Although sandhi domains are generally smaller than domains for pause insertion, Chen points out that they are not always exhaustively contained within them. In the following utterance, for example, parentheses demarcate sandhi domains while ‘%’ indicates an intonational break marked by ‘prolongation and/or pausing’ (p. 143):

- (33) (lao tsim-a-po) (m siong-sin % ying-ko) (e kong-we)
 old lady neg believe parrot can talk
 ‘The old lady doesn’t believe parrots can talk.’

This domain mismatch evidently arises because pause insertion is variable while tone sandhi domains remain constant. This is also the case in the closely related Haifeng dialect, where ‘even if there is a pause after the verb, the verb must be linked to the following object in one single tone group’ (Yang and Chen 1981, cited and translated in Chen 1987: 143).

Another possibility, though, is that Xiamen tone sandhi is a phrase-left Concatenation rule of the type described at the end of Chapter 5. Phrase-left Concatenation rules apply internal to a spellout domain between two concatenated M-words X and Y, where X precedes and does not c-command Y. The set of phrase-left Concatenation statements produced in the example above would be as follows:

- (34) a. tsim-a-po^ˆm
 b. ying-ko^ˆe

‘Tone sandhi’ would thus apply in exactly these contexts. Under this analysis, the sandhi form is underlying and the citation form is the output of the rule – a proposal independently made in Tsay and Myers (1996). If this idea is on the right track, then the pause in this example does not necessarily break apart a spellout domain, or the domain for another rule; the ‘tone-sandhi’ domains are those listed in (34) rather than those shown with parentheses in (33).

Another possible explanation for the apparent mismatch in (33) is that the pause that has been inserted here is a special kind of pause – either the result of an unexpected interruption, like a hiccup, or (more likely) a case where the speaker pauses to search for a particular vocabulary item whose phonology will not affect the pronunciation of previous words – as would be the case in Xiamen, where the sandhi rule is phonologically context-free. A number of examples of this type are found in our Huave corpus, where H-Tone Spread appears to ‘apply across’ a pause:

- (35) (tàmàhàwûw) (ngiánê) (ngìneáy ámb áágá ... mítón nèh)
 pst.see.3p where how go det tone.poss 3s.pro
 ‘They were seeing where, how its tone goes.’

The ‘...’ in this example is a 354-ms silence, which occurs in the middle of the possessive-DP postverbal subject. The H-plateau that begins on the final heavy syllable of *ngineay* continues ‘across’ this silence to the end of the sentence.

Huave H-tone plateau, like Xiamen tone sandhi, is a phonologically context-free rule; once an H-plateau has begun, it will continue until the end of the spellout domain is reached, irrespective of the phonology of the individual vocabulary items within the domain. Under this hypothesis, then, the type of apparent mismatch produced by ‘pause insertion’ in (33) will only be possible under specific circumstances – when the rule is phonologically context-free and the speaker knows enough about the structure to know that the rule will continue onto the next word, whatever that word is. The need to distin-

guish among different types of pauses is also discussed in Rotenberg (1978) and Kaisse (1985).

The question of how to determine whether a given alternation is produced by a phonological rule or by allomorphy in the current model remains open. At least the following factors may be considered in such a case:

1. how closely related the alternants are phonologically
2. whether the alternation applies predictably in a wide range of contexts or is restricted to a highly specific context
3. whether the alternation is gradient or categorical, and whether it is structure-preserving or not
4. whether the alternation is influenced by speech rate
5. how much structural material is involved in the alternation (i.e. whether the alternation is word-bounded, cyclic, able to see across \emptyset morphemes, etc.)

It is important to understand, however, that while phonological alternations are more likely to be gradient, structure-changing, phonetically ‘natural,’ rate-sensitive, and non-local than morphological alternations, this is not taken as evidence that morphological alternations belong to a *separate module* in the grammar. Vocabulary insertion and phonological rules both work off the same syntactic structures in the architecture I am assuming, and both apply in the same PF derivation. The differences in their properties are derivative of the fact that they (i) are fundamentally different kinds of operations (suppletive vs. non-suppletive), and (ii) apply at different stages in PF (Vocabulary Insertion is restricted to the early part of the derivation, when the internal structure of words is being determined, while phonological rules may apply throughout the derivation). We will look more closely at the status of some of these diagnostics in the next subsection.

6.4.2 Rule diagnostics in other multiple-stage models

Within any theory that postulates multiple stages of phonological rule application, the following question arises: Given a particular phonological rule, how do we know what stage it applies at? Put differently, how do we know what kind of rule it is?

Within the current proposal, we answer this question by looking carefully at the structural contexts where the rule may and may not apply. For example:

- If a rule applies strictly right-to-left or left-to-right in a way that requires reference to an n -ary string of linearized words, it must apply after Chaining (e.g. Chaozhou tone sandhi, Luganda HTA).
- If a rule only needs to see two adjacent M-words at any given time, it may apply any time after Concatenation.
- If a rule can optionally apply across what appear to be separate spellout domains, it is a Late-Linearization rule.

The idea that different phrasal rules have are subjected to different *locality restrictions* is of primary importance here.

Within other multiple-stage models, this question is approached somewhat differently. For example:

- Nespor and Vogel (1986) argue that ‘phonosyntactic’ rules apply in an early stage of the derivation, while other phrasal rules apply to prosodic constituents after the Prosodic Hierarchy is constructed. If a phrasal rule requires reference to a particular morphosyntactic feature or category, it is a phonosyntactic rule; otherwise, it applies to the Phonological Phrase or other prosodic constituent.

- Hayes (1990) also distinguishes between phonosyntactic and prosodic-hierarchy rules, but in his model, phonosyntactic rules apply in the Lexicon (see above). Therefore, phonosyntactic rules are expected to have the other characteristic properties of lexical rules, like structure-preservation and insensitivity to rate (Kiparsky 1985 et seq.; see Table 6.3). Furthermore, since phonosyntactic rules are implemented with allomorph-insertion frames, they cannot involve the spreading of autosegments over both adjacent words.
- Kaisse (1985) does not postulate a Prosodic Hierarchy. Instead, Kaisse distinguishes between ‘P1’ external sandhi rules and ‘P2’ fast-speech rules. P1 rules apply directly to pairs of words where either (i) word 1 c-commands word 2, or (ii) both words are at the edge of a syntactic XP. P2 rules are structure-blind, and are primarily influenced by nonsyntactic factors (rate, pause, etc.). Kaisse adopts many of the traditional diagnostics from Lexical Phonology and Morphology to distinguish P1 from P2 rules, arguing that P1 rules are ‘closest to the lexicon and thus share many characteristics with lexical rules’ (p. 130)). For example, P1 rules are all predicted to be structure-preserving, categorical, and insensitive to rate.
- Elordieta (1999) adopts Prosodic Hierarchy Theory for most phrasal rules, but argues for a special class of rules that apply to ‘feature chains’ – pairs of heads in a set of privileged syntactic relationships (C/T, T/v, T/D, v/D, D/N). The Basque vowel assimilation rule discussed above is a rule of this type. There is no prediction about whether properties like rate-sensitivity and structure-preservation will cluster around one set of rules as opposed to another.
- Seidl (2001), like Kaisse (1985), argues that there is no Prosodic Hierarchy. In Seidl’s proposal there are two kinds of phrasal rules – (i) early rules, which apply to a vP or CP phase, and (ii) late rules, which apply to a syntactic object called the

‘theta-domain’ (which includes a head plus its theta-marked arguments). As in the current proposal, the primary means of distinguishing the two types of rules is by examining their syntactic locality properties.

One important difference between my proposal and those listed above has to do with the number of stages allowed – the proposals above argue for a two-way split between ‘early’ and ‘late’ rules, while my model incorporates four distinct stages of phrasal rule application. I believe this level of articulation is necessary, both because linearization requires multiple steps and because this proposal is supported by attested facts. Luganda, for example, has three structure-sensitive phrasal rules (LTD, HTA, and Elision) whose domains may reverse their containment relationships; it is unclear how these facts would be explained under any of the models reviewed above.

Another property that distinguishes the current model from e.g. Hayes (1990) and Kaisse (1985) is that it does not entail that nonsyntactic properties like structure-preservation and categoricity will cluster in any particular way. The only exception is rate-sensitivity: I have argued that late-linearization rules are unique in having access to information about speech rate, so that their domains may be optionally broken apart or merged together. Otherwise, the model does not directly predict that rules applying at different stages will have characteristic sets of nonsyntactic properties. In the next subsection I will consider whether this is an advantage or a drawback of the current model.

6.4.3 Conflicting diagnostics

While Hayes (1990) and Kaisse (1985) appear to be fairly successful in accounting for the rules like Hausa final vowel shortening, many other phrasal rules yield conflicting results. For example:

Table 6.3: Lexical and postlexical rule diagnostics (Kiparsky 1985)

Lexical rules:	Postlexical rules:
a. word-bounded	not word-bounded
b. access to word-internal structure assigned at the same level only	access to phrase structure only
c. precede all postlexical rules	follow all lexical rules
d. cyclic	apply once
e. apply in derived environments	apply across the board
f. structure-preserving	not (necessarily) structure-preserving
g. apply to lexical categories only	apply to all categories
h. may have exceptions	automatic
i. not transferred to L2	transferable to L2 (Rubach 1984)
j. outputs subject to lexical diffusion	subject to neogrammarian sound change (Kiparsky 1988)
k. apply categorically	may have gradient outputs

- English rhythm rule (Kaisse 1991) makes lexical exceptions (failing to apply to e.g. *superb*, *grotesque*), applies cyclically (see below), and yields outputs that may be lexicalized (*áabstract* < *áabstract art*)—all properties of ‘early’ rules. However, it also applies gradiently, becoming less likely as the number of intervening syllables increases—a ‘late’ rule property.
- Basque vowel assimilation (Elordieta 1997) applies to some roots but not others (i.e., it makes lexical exceptions), and it is structure-preserving and apparently non-gradient—all properties of early rules. At the same time, the rule applies to non-lexical categories – auxiliaries and other functional heads – against Kiparsky’s condition (g) in Table 6.3.
- Chaozhou tone sandhi (Bao 1996) applies in the same syntactic environments as Xiamen tone sandhi and should therefore also be treated as an early rule (see Hayes’ (1990:104–105) discussion of Xiamen tone sandhi). However, the rule is strongly countercyclic, applying from right to left regardless of the syntactic bracketing and

requiring reference to the output of one application in order to produce the correct output on the next application.

And finally, as I pointed out at the beginning of the chapter, neither HTA nor Elision in Luganda have the characteristic properties of ‘lexical’ or ‘morphological’ alternations – in fact, it would be extremely difficult to analyze HTA as such, since it is a spreading rule that affects an *n*-ary string of words. As shown in Chapter 1, however, these rule domains can be involved in containment-reversal configurations. This shows that there are cases of ‘domain mismatches’ where the rules in question do not appear to belong to different modules of the grammar by any of the diagnostics proposed above.

The reliability of the diagnostics in Table 6.3 has been questioned even within the lexical phonology framework. Sproat (1993), for example, shows that /l/ darkening in English is sensitive to word-internal structure but is also gradient and non-structure-reserving. At the very least, these cases indicate that the basic idea pursued by Odden, Hayes, and Kaisse – that early phrasal rules should look like lexical rules and late phrasal rules should look like postlexical rules – does not correspond straightforwardly with the range of attested phenomena.

6.4.4 The role of various rule properties in the current model

While I do not use the properties in Table 6.3 as rule diagnostics, I acknowledge that they may play a role elsewhere in the grammar. I would like to close this chapter with some preliminary hypotheses relevant to these rule properties, in order to point out areas for future investigation.

To begin with, **structure preservation** may be a property that distinguishes allomorphic alternations from phonological rules – if a vocabulary item inserted e.g. aspirated /t/ for English past-tense and non-aspirated /t/ for English present-tense, for exam-

ple, we would probably incorporate this contrast into the underlying inventory of English phonemes rather than make a case for ‘structure-violating allomorphy.’ Furthermore, it is probably the case that very different phenomena have been grouped together under the rubric of ‘lexical exceptions’ even though they may have a very different status in the grammar. For example, some apparent lexical exceptions may be attributable to a frequency effect (with rules applying less often to infrequent words); this in turn might be correlated to a shift in style or formality. Other apparent lexical exceptions might involve an entire class of items that turn out to have phonological or structural properties in common.

As noted above, both Hayes and Kaisse assume that information about **speech rate** does not become available until late in the derivation – later, crucially, than the stage when their early rules apply – and this assumption plays a central role in my proposal as well. Specifically, I claim that late-linearization domains have the potential to become systematically larger in fast speech and smaller in slow speech, while other rule domains do not.

Although rate and **style** are often assumed to have parallel effects on phonological rule application (with fast/informal speech on one end of a continuum and slow/formal speech on the other), Kaisse 1985, following Hasegawa (1979), shows that style can in fact have the reverse effect on early rule application: French liaison, for example, applies more frequently in formal speech. I separate the effects of style and rate as well, but without making style into a determining factor—in other words, I assume that style *can* play a role in both early and late rule application, so that style-sensitivity alone cannot be used to distinguish the two rule types.⁷

Hayes argues that sensitivity to **trace** might be used as a further diagnostic, under the assumption that traces (and perhaps other empty categories as well) are invisible to late

⁷A further question that remains to be addressed is whether style can also play a role in allomorphy—e.g., whether the choice of /m/ over /ɱ/ for the English present-participle exponent is directly influenced by the style of speech.

phonological rules. I leave this question open for now. As far as I am aware it is difficult, if not impossible, to provide compelling evidence that any kind of phonological rule is blocked by traces or other empty categories (see Nespor and Scorretti 1985 for relevant discussion): we have seen, for example, that liaison applies across null AGR heads. My intuition is that both early and late rules will pattern alike in ignoring empty categories.

I do, however, believe that early and late rules pattern differently with respect to **pause**. The basic claim in Hayes 1990 and Kaisse 1985 is that ‘pause insertion’ takes place late in the derivation, so that early rules are less likely to be blocked by intervening silences than late rules. I believe that this basic intuition is correct, but that there are in fact *different kinds of pauses* that are inserted at different points and therefore have distinct effects on early and late rules. For example, pauses associated with unexpected interruptions – where the utterance is planned and in the midst of being executed but then the speaker e.g. hiccups – will not be predicted to block rules at any stage of the derivation. On the other hand, pauses associated with ‘rhythmic restructuring’ – where a prosodically heavy chain is broken apart late in the derivation – will potentially block late-linearization rules but not earlier rules. Another kind of pause, discussed above, is associated with contexts where a speaker is searching for a particular vocabulary item; certain kinds of phonologically context-free suprasegmental rules, like Huave tone plateau, will potentially ‘apply across’ these pauses as well.

On a related point, it is possible that **pause fillers** like English *um*, *uh* are not present in the structure when Concatenation rules apply and are therefore only predicted to condition (or undergo) late-linearization rules. See the appendix for a more detailed preliminary breakdown; see also Rotenberg (1978) and Kaisse (1985) for some precedent for these ideas.

6.5 Conclusion

The question I began with here is whether it is possible to treat liaison as entirely non-phonological, i.e. the product of suppletive allomorphy rather than phonological rule. If a purely allomorphic approach is found to account for the relevant phenomena satisfactorily, it might provide an alternative explanation for liaison/accent domain mismatches – the idea being that allomorphy is handled in a separate component of the grammar (‘the morphology’) and is therefore not expected to respect phonological domains in the first place. In laying out the mechanics of an allomorphic approach, we saw that a number of larger questions and problems were raised by the background assumptions behind this line of inquiry.

The current model accounts for a range of otherwise unexplained phenomena by allowing phrasal rules to apply at *multiple stages* in the derivation. Some of the predictions of this model are:

- some phrasal rules are sensitive to rate while others are not;
- rate-sensitive rule domains tend to have larger domains than non-rate-sensitive rules;
- rules that apply to smaller domains will precede, and potentially (counter-)feed or (counter-)bleed, rules that apply to larger domains.

Multiple-stage models have been proposed in many other theories of the syntax-phonology interface, sometimes in conjunction with Prosodic Hierarchy Theory (Hayes 1990, Odden 1990) and sometimes independently of it (Kaisse 1985, Seidl 2001). I reviewed some of these alternative multiple-stage models in light of our findings from previous chapters. Unlike the current model, what many of these models have in common is the idea that phrasal rules may apply in different modules or components of the grammar, e.g. the morphology vs. the phonology, or the Lexicon vs. the postlexical component. I showed

that, despite what these proposals predict, there is no clear partition we can use to separate ‘typical’ from ‘special’ phrasal phonological rules, and thus no *compelling* evidence for the idea that phrasal rules apply in two separate modules. My broader goal was to call attention to an additional set of questions that are raised by dual-module approaches – namely, questions about how to define the locality conditions that govern *each* module independently, in a way that still accounts for the generalizations we started with:

(36) GENERALIZATIONS:

- a. Phrasal phonological rules are on the one hand *sensitive to the syntactic structure* in a way that strongly suggests that they are working directly off syntactic cycles.
- b. On the other hand, the phrasal phonology is *variable* in a way that cannot be accommodated by a one-to-one cycle-to-domain mapping system – because a single language can have *multiple* phrasal domains of different sizes, and some phrasal domains vary in size from utterance to utterance.

Chapter 7

Conclusion

In the introduction of this thesis I set out to explain the following basic tension:

- On the one hand, phrasal phonological rules are cross-linguistically *constrained by the syntactic constituent structure* in a way that supports a *direct-spellout* model of the interface:
 - (1) **Direct-spellout hypothesis:** Syntactic structures are built up and spelled out in phases, and phonological rules apply directly to the material that is spelled out at each phase.
- ...but on the other hand, there is too much *variability* in the phrasal phonology for there to be a simple one-to-one mapping between spelled-out phases and phonological domains. For example, the direct-spellout hypothesis alone cannot explain either of the patterns in (2):
 - (2) a. **Multiple-domain effects:** Some languages (e.g. Luganda and French) have multiple phonological rules applying to domains of different sizes.

- b. **Variable-domain effects:** Some phonological domains vary in size depending on phonological weight, rate and style of speech, and other factors, even given what appears to be the same basic syntactic structure (e.g. English ‘intonational phrasing,’ Luganda elision, French phrasal accent).

This basic tension is reflected in the syntax-phonology interface literature as well. The idea that phonological rules apply directly to spelled-out phases (1) has enjoyed much attention recently (see Adger 2006, Cheng and Downing 2007, Dobashi 2004a, Downing 2008, Henderson 2005, Ishihara 2004, Kratzer and Selkirk 2007, Legate 2003, Kahnemuyipour 2005, Marvin 2002, Scheer 2008, Seidl 2001, Tokizaki 2006, Wagner 2005; among others), but most of these studies focus on a *single* phonological phenomenon in a given language, and do not provide an account for languages like Luganda that have multiple phrasal rules (see Chapter 1). On the other hand, the prevailing theory that is equipped to model multiple-domain and variable-domain effects – namely Prosodic Hierarchy Theory (Nespor and Vogel 1986, Selkirk 1986, Inkelas and Zec 1995, among others) – runs the risk of introducing too much variability, with its premise that the phonology operates on its own set of structures derived by independent principles (Chapter 2). The goal of this thesis has been to develop a model of the interface that maintains a direct and transparent interface between the syntax and the phonology, but can also accommodate attested cases of variability.

My proposal has two components: alongside the hypothesis in (1), I argue that:

- (3) Linearization takes place in the PF component, and it takes place in steps. Internal to each spellout domain, objects created at different stages of linearization create sub-domains for various phonological rules.

In the course of the PF derivation, linear order is imposed over objects of gradually increasing size – pairs of words, then longer chains of words, then even larger objects as separate spellout domains are linearized with respect to each other. Phonological rules are interleaved with these linearization operations, so that different rules can apply to different-sized domains. Furthermore, a special class of ‘late-linearization’ rules has access to speech rate and other performance-related factors, so that they can e.g. merge spellout domains together in fast speech or split them apart in slow speech.

Chapters 3–5 of the thesis presented detailed case studies of Huave phrasal tone-assignment, Luganda H-Tone Anticipation, and Luganda L-Tone Deletion (rsp.), each of which applies at a different stage of the derivation in the current model. For each case study I examined a variety of monoclausal and multiclausal structures in order to determine (i) what kind of constituent the basic spelled-out chunk is (i.e. what ‘counts as a phase’ in the given language); (ii) whether smaller domains need to be defined internal to this basic chunk, and (iii) whether these chunks can be merged or split apart at e.g. different speech rates. In each case, we saw that syntactic and phonological evidence for e.g. the ‘full vs. reduced clause’ distinction converged in ways that might have gone unnoticed within other frameworks. We also saw examples of containment-reversal and rule-ordering effects that Prosodic Hierarchy Theory cannot explain. In Chapter 6 I returned to some of the points raised in Chapters 1–2, and looked at how my model compares with other proposed multiple-stage models.

In applying the current proposal to further cases, it is important to keep in mind that variation can be attributed to multiple sources in this model: (i) languages may vary with respect to what kinds of syntactic objects count as phases; (ii) there are various possible points in PF where a given rule may apply; and (iii) certain rules (late-linearization rules) have domains that vary in size with speech rate and other nonsyntactic factors. The direct-spellout hypothesis in (1) is believed to play a fundamental role in constraining *all* phono-

logical interactions, however, so that certain kinds of hypothetically possible systems will never occur (see Chapter 1).

A number of questions remain open, of course. In addition to unresolved facts about the individual case studies examined here, some of which I noted in the discussion, there are questions about whether the specific linearization algorithms I use here are required, or whether other theories of linearization could work as well. Broader questions raised by the thesis have to do with the scope of phase theory itself. I have tried to take very seriously the idea that the breakdown of structures into phases should have reflexes in the phonology, all else being equal. In the Huave and Luganda cases examined here, this relationship appears to be quite transparent – phonological domains are CP spellout domains, and CPs are uncontroversially phases. But even these cases have raised questions about the status of the phase edge and phase head, the role of ‘tree geometry’ (e.g. adjunct vs. argument CPs) in spellout, and perhaps most importantly, the range of phenomena that phase theory is equipped to account for. We know, for example, that Luganda relative clauses involve A-bar movement but are not spelled out separately, indicating that the various phenomena that have been analyzed under phase theory (reconstruction, island/CED effects, phonological spellout, etc.) may not all converge on the same set of syntactic heads. I hope to have provided a working model for investigating some of these questions in future work.

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