OPTIMAL DOMAINS THEORY AND BANTU TONOLOGY:
A CASE STUDY FROM ISIXHOSA AND SHINGAZIDJA

FARIDA CASSIMJEE
Ben Gurion University of the Negev
and
CHARLES W. KISSEBERTH
Tel Aviv University

0. Introduction.

To a very considerable extent, the study of Bantu tonology over the past couple decades has been a "success story"; there is no doubt that our understanding of how tone works in Bantu has improved significantly (particularly as a result of the development of the notion of "autosegmental representations" and the recognition that there are deep connections between tone and other prosodic phenomena). The researcher who embarks on the study of the tone system of a previously unstudied Bantu language has a good idea of the type of phenomena that (s)he is likely to encounter and has a number of theoretical concepts and notational devices that (s)he can invoke in extracting the appropriate generalizations from the data.

At the same time, this success story is not an unqualified one. The study of Bantu tonology, like the study of all aspects of phonology, has been carried out within a rule-based model of phonology. In rule-based theories, analyses are tightly linked to phenomena (alternations, distributional patterns). If a phenomenon is observed in a language, a rule is proposed to "predict" the occurrence of the phenomenon. While considerations of "naturalness" are held to be fundamental in selecting the best analysis, the only real means for invoking naturalness within the rule-based model resides in the development of (a) a system of representation and (b) a notation for writing rules which are sufficiently restrictive as to rule out unnatural analyses. While proposals concerning the nature of representations and rule formats have certainly made it possible to treat various "natural" phenomena in a relatively simple fashion, it is by no means clear that within the same system of representations and rule notation it is not also possible to treat unnatural phenomena in a relatively simple fashion. Furthermore, it is not clear that choices about representations/rule formats are sufficient to reveal the deeper connections between superficially different phenomena.

For example, in the Eerati dialect of Emakhuwa,[1] there is a phenomenon whereby (in autosegmental terms) High tone associated underlyingly with one mora spreads onto the following mora. Call this High Tone Doubling. Now, ordinarily (in Eerati) once a High tone has doubled, it is no longer heard on the mora that underlyingly bears the High tone. In autosegmental terms, the High tone delinks from the mora to which it was underlyingly associated. Call this phenomenon Delinking. Delinking does not occur, however, when the mora in question is itself immediately preceded by a High-toned mora. In other words, a preceding High mora "protects" (see below, as well as Cassimjee (1997), for discussion of a similar phenomenon in Isixhosa) a mora from being subject to Delinking. Now, keeping in mind these Eerati facts, consider what happens in the Pemba variety of the Imeetto dialect of Emakhuwa. In this dialect one finds High Tone Doubling **in just one context**: when the mora that is the target of the doubling is followed by a High-toned mora! In other words, a doubled High appears just when it is "protected" (so to speak) by a following High tone. It seems obvious that there is a single principle that (a) blocks Delinking in Eerati and (b) permits High Tone Doubling to surface in the Pemba variety of Imeetto. But it is not clear how **rules** describing alternations reveals that principle. How is unity to be expressed when one of the rules delinks a High tone and the other adds an association line?[2]

During most of the 1980's, the dictum that reigned supreme in phonology was: if the representations are gotten right, there will be little need for rules -- i.e. the phenomena of phonology will essentially be the consequence of the representations. The rich literature on autosegmental representations, feature geometry, underspecification attests to the prevalence of this dictum. In hindsight, this literature seems to have essentially ignored certain insights from an earlier stage in the development of generative phonology. For example, Kisseberth (1970) noted that in generative phonology particular rules are postulated to predict certain alternations and distributional patterns, but observed that a variety of different rules might in some sense "conspire" to yield outputs that have some desirable phonological property. Kisseberth (1976) argued that there is a "polarity" underlying language: phonological elements are present in underlying representation to provide the basis for semantic (lexical and grammatical) contrast. Thus, from a semantic point of view, it is best if the contrasts in the underlying representation are reflected in the output. However, there are phonological principles -- e.g. ease of articulation -- which would, if given free reign, eliminate contrast. The phonological

[1] The Emakhuwa facts referred to in the text are discussed in detail in Cassimjee and Kisseberth (forthcoming)

[2] This is of course an instance of the "conspiracy" argument against the rule-based model of phonology presented in Kisseberth (1970).

pattern of a language reflects the **tension** that obtains as a result of the conflict between these two broad aspects of language. How this tension is negotiated in different phonological systems is at the crux of phonology. Kisseberth (1973a,b) argued that the applicability of phonological rules is wrapped up in the above-mentioned tension; specifically, it was suggested that phonological rules may be "global" in the sense that whether they apply to a particular input may be dependent on the underlying nature of that input as opposed to the structure of that input at the point of application of the rule.

Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993, and many subsequent references) offers a radical alternative to the rule-based model of phonology, an alternative that (a) appeals directly to phonological universals (rather than trying to express them **through** representation and rule formats) and that (b) recognizes in an explicit fashion the importance of the observations made in Kisseberth (1970, 1973a,b, 1976). We assume familiarity here with the basic tenets of OT. From the perspective of the present discussion, some of the most essential aspects of OT are that it (properly in our view) distinguishes between the "phenomena" (what happens to a given morpheme/word in a given context, how certain sounds are distributed in phonetic representation) and the motivations for the phenomena -- i.e. the constraints which outputs better satisfy by virtue of exhibiting these phenomena. There is no one-to-one relationship between a phenomenon and a constraint; phenomena result from the interaction of a set of constraints. Consequently, several phenomena may all ultimately reflect a single constraint (the notion of "conspiracy" mentioned earlier); a single phenomenon results from a variety of constraints whose interaction rules out all other candidates except the observed one and thus rules out all other phenomena except the observed one. OT takes these constraints to be universal, and assumes that there are only universal constraints and not language-particular constraints that are divorced from the set of universal constraints. This point of view requires that no matter how diverse the phenomena, the researcher must (like the langauge learner) seek an understanding of the phenomena in terms of how the universal constraints interact.

One of the predictions of Optimality Theory is that since closely related languages share essentially the same sorts of inputs on the whole, the variations in the phenomena across related languages should be readily seen as simply the consequence of somewhat different rankings of the constraints. The Bantu languages are very obviously closely related, and there are very many of them. They thus provide an exceptionally rich set of data against which to test Optimality Theory.

When one examines the tonal patterns of various Bantu languages, one quickly notices many similarities in the phenomena observed. When one looks at particular analyses of Bantu tonal systems within the rule-based

generative paradigm, one finds radical differences in analyses (purely autosegmental versus accentual analyses, for example). Furthermore, even when one looks at analyses that use the same general approach (for example, autosegmental analyses that do not appeal to accentual or metrical structure), one rarely finds that the differences between languages resides in a difference in the ordering of the rules, but rather resides in differences in the shapes of the rules or the inventory of rules invoked. It is fair to say that the rule-based model did not succeed in reaching any significant understanding of the **diversity** of tonal patterns observed in Bantu languages, a diversity that at the same time reflects a core **sameness** as well.

The issue that confronts us then is whether Optimality Theory can provide the means for understanding the ways in which Bantu tonal systems differ from one another; specifically, can the differences across Bantu languages be seen as essentially variations in the ranking of a set of universal constraints? We shall attempt to suggest in the present paper that the answer to this question is a positive one. We do this by, first of all, sketching a proposed set of universal constraints in terms of which we can begin to make sense out of various well-known phenomena in Bantu. In this part of the paper we utilize only snippets of data from various Bantu languages that have been discussed in the literature (or that we have personally investigated). In addition to suggesting a variety of universal constraints, we also show how differences in the ranking of these constraints will account for the differences among the languages discussed. The major part of the paper consists of a detailed (but not comprehensive) examination of two languages: Isixhosa and Shingazidja. We shall demonstrate how two rather different-looking systems can be understood in terms of ranking differences among a limited number of constraints.The conclusion that we draw is that the proposed set of constraints poses a promising beginning to the study of the universal constraint system, a system that will simultaneously explain the unity of Bantu languages and their diversity.

The version of OT that we assume is one that we refer to as **Optimal Domains Theory** (=ODT). ODT adopts an approach to featural phonology that critically employs the notion of **featural domains** instead of autosegmental representations. In section 1, we discuss some of the basics of both Optimality Theory and the ODT version of OT. The remainder of the paper will provide a detailed exemplification of the ODT version of OT. In section 2, we provide an overview of the types of phenomena in Bantu that we explore here and the set of constraints that we propose. Section 3 analyzes a major fragment of Isixhosa tonology in terms of the proposed constraints, and section 4 analyzes the Shingazidja tonal pattern in terms of these same constraints. Section 5 compares the results of the analyses of Isixhosa and Shingazidja and concludes that constraint set proposed goes a

long ways towards achieving the goal of explaining tonal diversity in Bantu through differences in the ranking of universal constraints.

1. Some basics of OT and ODT.

In Optimality Theory, the phonological component of a language consists of a set of universal **constraints**. These constraints require that phonological outputs have certain properties (for example, a syllable must have an onset), or they ban certain structure from outputs (e.g. a syllable may not have a coda).[3] The constraints are universal (that is, the phonological component of one language does not differ from another language by virtue of the inventory of constraints -- all languages have all constraints). But constraints in OT are **violable**. They are violable because they are **rankable**. An output may violate a particular constraint in order to better satisfy a more highly ranked constraint. Languages differ then in the way that constraints are ranked. (Of course, they also differ in terms of the nature of the input representations.)

In most work in OT, phonology is taken to be **non-derivational**. Specifically, given an input, there is a set of possible output candidates (this set is defined by an algorithm referred to as GEN (erator) which for any given input defines the range of possible output structures which are consistent with the inviolable principles of phonological representations). Each of these output candidates is evaluated to determine which best satisfies the set of constraints (i.e. is **optimal**). The procedure for determining the optimality of a candidate well be spelt out in detail in the course of the paper. In this paper we will assume the non-derivational nature of the evaluation of output candidates in OT; there is, of course, much to be learned yet about these matters. The reader is referred, for example, to Cassimjee (1997) for a detailed study of Isixhosa tonology where the complexities of the behavior of so-called “depressor consonants” appears to require a limited degree of “serialism” in the evaluation of outputs.

There are two classes of constraints in OT that require mention here: (a) faithfulness constraints and (b) alignment constraints. The idea of

[3] The OT literature has for the most part assumed the existence of both negative and positive constraints. In particular, "alignment" constraints are often of a positive character: the Right edge of category **x** is aligned with the Right edge of category **y**, while what might be referred to as "markedness" constraints are given a negative character: *Nasal (i.e. the presence of a nasal feature is non-optimal). It remains to be seen what the ultimate use of negative versus positive constraint formulations in OT will be.

faithfulness constraints is a fundamental one that goes back to the original OT manuscripts. Its implementation has undergone some radical revisions recently (cf. McCarthy and Prince 1995). We shall summarize the more recent implementation in what follows. Faithfulness constraints are essentially constraints that demand that the input and the output be identical. Phrased somewhat differently, faithfulness constraints are ones that say that sounds that are crucially present in underlying representation have contrastive value and the best outputs are the ones that faithfully employ the sounds for the purposes intended (i.e. to contrast that word with all other words). It is faithfulness that so often over-rides the phonological constraints that militate against particular sounds or particular distributions of sounds -- e.g. while *Coda says that outputs should not have codas, anti-deletion and anti-insertion faithfulness constraints may require that an underlying consonant has to be made the coda to a syllable.

McCarthy and Prince (1995) [=M&P] recognize three aspects to faithfulness (specifically, MAX-IO -- which requires every segment of the input to have a corrospondent in the output; DEP-IO -- which requires every segment of the output to have a corrospondent in the input; and IDENT-IO -- which requires that every feature on an input segment be specified on the corresponding output segment as well, and every feature in an output segment have the same feature in the input candidate). Since IDENT-IO really has two aspects to it, one could replace the M&P classification with the following: MAX-IO (segment), MAX-IO (feature), DEP-IO (segment), DEP-IO (feature).

Optimal Domains Theory adopts OT in all its essential aspects, but adds one additional ingredient: it assumes that just as segments are organized into domains (syllables), so features are also organized into domains ("featural domains" or "F-domains"). Just as a segment that is not in a syllable cannot be pronounced, so a feature that is not in a domain cannot be pronounced. The domain "licenses" the feature so to speak.

Adopting a suggestion from Jennifer Cole, we might use the following analogy: Think of the domain as a plan for the articulation of the feature. Just as a plan may not be executed perfectly, or even at all, due to external forces, so it is not necessarily the case that every element in the domain of the feature actually expresses the feature. A higher ranked constraint may prevent realization. But the plan exists regardless of the implementation of the plan. And one plan may be affected by another plan and not necessarily only by the way that this other plan is in fact implemented -- in just the same way that, for example, one person’s planned action may be in response to a second person’s **planned** action rather than her actual action.

In this paper we do not intend to enter into a detailed comparison of a domains-based OT approach to features and an autosegmental-based OT approach (see Myers 1993 for an autosegmental OT analysis of the OCP in Bantu tonology, as well as the Odden and Poletto papers in the present

volume). But it will perhaps to be useful to sketch the relationship between domains and autosegmental representations. ODT and autosegmental representations are both rooted in the same basic concept as Zellig Harris' "long components" (cf. Harris 1944) and the "prosodies" of Firthian linguistics (cf. Firth 1948). All of these approaches recognize that a sequence of segments, each bearing a phonetic feature F, may represent a **unit** of structure. They differ in their visual representation of this unit of structure and they differ as well in their overall conception of phonology and how this notion of multisegmental unity should be interpreted.

In ODT, segments may or may not be specified with a particular feature F in underlying structure. We call the segment that is specified with F the **sponsor** of F. If we examine output structures, it is clear that features often have a "sphere of influence" (what we shall refer to as the feature's **domain**) that potentially extends beyond the sponsoring element itself. ODT takes a feature's sphere of influence, i.e. its domain, to be **an aspect of the structure of output candidates** (we leave open the issue of whether domain structure may be present in inputs as well -- this matter is entirely analagous to the issue of whether syllablic structure and foot structure may be present in inputs). We shall represent the domain of a feature F by placing the left bracket of an F-domain at the left edge of the leftmost segment in the domain and a right bracket at the right edge of the rightmost segment in the domain. In this view, a single segment may be internal to several different domains (minimally, as many different domains as required to give a phonetic characterization of the segment). In other words, a single sequence of segments is organized into a domain structure for feature F, and also for feature G, and also for feature H, etc. The way that this sequence of segments is parsed into F-domains is not necessarily paralleled by the G-domain parsing; the way that the sequence of segments is parsed into G-domains is not necessarily paralleled by the H-domain parsing; and so on.

Let us illustrate. The domain structure for an output **bãm** deriving from an input /bam/ would be as in (1) under the assumption that while nasality has a "wide" domain (extending beyond the sponsor) none of the other features have wide domains.

(1)

b	ã	m	
(x)	x	(x)	Labial
x	(x	x)	Nasal
x	(x)	x	Low
etc.			

Each line in (1) represents the way that the sequence of segments in **bãm** is organized ("scored") with respect to the feature in question. In the

case of (1) all of the segments in each domain actually realize the feature in question. More on this point immediately below.

There is no significant difference between an F-domain structure where each feature in the domain realizes the feature (we indicate that a given segment "x" phonetically bears the feature F by locating a superscript ^{f} after the symbol "x")

(2) $(x^{f}\ y^{f}\ z^{f})_{\text{f-domain}}$

and the autosegmental notion of a feature F linked to **x**, **y**, and **z** (call this a "feature span")

(3)
```
      f
    / | \
    x y z
```

In (3), realization of the feature F on a "segment" (more precisely, the root node or skeletal position, depending on one's theory, which is taken to be the "organizing" unit for features)) **x** is indicated by the association line between the feature specification and **x**.

A representation such as (3) is, within the autosegmental approach, just one possible representation for a sequence of three segments bearing feature F. Another possible representation for such phonetic data is that in (4), where there are a sequence of autosegments each associated with just one anchor.

(4)
```
    f   f   f
    |   |   |
    x   y   z
```

It is clearly the case that the contrast that autosegmental phonology makes between (3) and (4) is a critical one for phonology. We have indicated that the ODT structure in (2) is equivalent to (3). The ODT equivalent of (4) is shown in (5):

(5) $(x^{f})\ (x^{f})\ (x^{f})$

In (2), the fact that a segment is realized with a given feature F is indicated by the fact that this segment bears an F-specification; the unity of these specifications is expressed by the inclusion of **x**, **y**, and **z** in a single domain (visually indicated by enclosure within a single pair of parentheses). The domain structure itself -- i.e. the parentheses -- has no phonetic content. The

parentheses do not say anything about the phonetic realization of the segments which are enclosed within it. (5) is not phonetically different from (2); the difference is an abstract one, at the level of domain structure – just as in autosegmental phonology, there is no phonetic difference between (3) and (4).

As so far developed, domain theory might appear to be simply a notational variant of autosegmental representations -- and clumsier to boot! But there is more to domain theory than so far indicated. While ODT does allow the possibility of a representation like ($x^{f}\ y^{f}\ z^{f}$), it allows other possibilities as well. Specifically, it allows the possibility that one or more of the segments inside a domain do not realize F:

(6) (a) $(x^{f} yz)$

(b) $(x\ y^{f`}\ z)$

(c) $(xy\ z^{f})$

(d) $(x^{f} y\ z^{f})$

(e) $(x^{f}\ y^{f} z)$

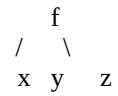
(f) $(x\ y^{f}\ z^{f})$

(g) (xyz)

In ODT, all of these representations are licit due to the fact that while there is a constraint that requires every element in the F-domain to express F (we call this constraint Express (F) – see below), nevertheless Express – like other constraints -- is **violable**. Thus it may be even more optimal (due to constraint ranking) for one or more of the segments in a domain to fail to bear the feature in question. The constraint that bars realization of a feature is often a constraint that says F cannot be realized simultaneously with G -- cf. Archangeli and Pulleyblank's **Grounded Phonology** (1994) for extensive discussion of such "clash" constraints.

Let us turn now to the matter of whether autosegmental theory provides representational alternatives to (6). Consider first (6d). Autosegmental representations equivalent to (6d),

(7)

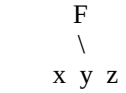


are banned in an important recent work in autosegmental phonology, Archangeli and Pulleyblank (1994); an inviolable No Gapping constraint is proposed that would bar representations where an element not specified

with F occurs between two members of an F-span. If No Gapping were in fact rigorously adhered to, we would have a major difference between licit ODT representations and licit autosegmental representations. However, Archangeli and Pulleyblank (1994) permit "exceptions" to No Gapping; more precisely, No Gapping is not violated if **y** (in (7) above) is "invisible" (e.g. by being segregated into a different tier from **x** and **z**) or if **y** is intrinsically unable to bear the feature in question). Although No Gapping may have exceptions of the above-mentioned types, neverthless it does bar many examples which ODT takes to be possible. It is likely, however, that most proponents of an autosegmental-based OT approach to phonology would opt to move No Gapping into the category of a violable constraint. If so, ODT and autosegmental approaches to ODT would be equivalent on this point.

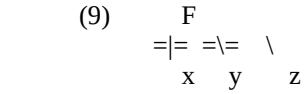
Consider next the ODT representations in (6a-c, e-f). In these representations, there is at least one element at the edge of an F-domain that does not bear F. We will see below that such ODT representations usually involve a case where the sponsor of F is one of the elements in the domain and some alignment constraint C_1 demands a domain that is wider than the sponsor, but some other constraint C_2 has prevented Express from being fully satisfied. The autosegmental equivalent of this scenario involves an underlying F specification spreading from the sponsor onto some adjacent elements, but then being forced to delink due to the influence of a rule that forbids the resulting multi-linked F specification.

There is no **single** autosegmental representation that corresponds to an ODT representation such as (6c), e.g. (8) encodes the fact that in the output **z** bears the feature F.

(8)


but does provide any information about the fact that this feature F was originally linked elsewhere (e.g. on **x**) and spread to **y** as well as to **z**.

A representation such as (9),

(9)


is not a valid **representation** at all, but rather an "abbreviation" for two related representations: (4) and (8). In rule-based autosegmental theory, (4) and (8) simply represent different steps in a single derivation. But in autosegmental-based OT, (4) exists neither in the output nor the input

(assuming e.g. that **x** is the sponsor of F in the hypothetical case under discussion).

We have shown that ODT provides representations that are quite distinct from those allowed for in autosegmental phonology. The extreme case of this is (6g) where **no segment in the domain actually realizes the feature**. The question that the ODT approach must ultimately address is this: are all of the above domain representations motivated? do they have explanatory value? As we proceed through our ODT discussion of Bantu tone in this paper, we will see examples where structures like those in (6) play a critical role in the analysis. Specifically, there will be constraints that refer to F-domain edges where the element at that edge in fact does not bear the feature F on the surface. We do not wish to suggest, however, that autosegmental-based OT could not explore alternative means to try to obtain the same generalizations that we express in terms of our notion of a featural domain (for example, constraints might be formulated so as to refer not just to the output structure, but both to the output and corresponding elements in the input). We believe that when one explores these matters in detail, the domain structure approach turns out to not only be more elegant than the autosegmental approach, but in fact deals more adequately with the empirical data by providing an understanding of phonological opacity (see McCarthy 1995) not available to autosegmental-based OT. However, we do not develop these matters in the present paper, which rather is focused on proposing a set of universal constraints in terms of which the unity underlying Bantu tonal diversity can be revealed.

The introduction of the notion of F-domains has significant consequences for the analysis of faithfulness to featural specifications. ODT views faithfulness to an underlying feature as being more complex than M&P acknowledge. Specifically, in ODT there are **degrees of faithfulness** which must be gotten at; faithfulness is not an all or none proposition. Given an input ...**x** $^{\mathbf{f}}$ **y**... (where $\mathbf{x}^{\mathbf{f}}$ is a sement bearing feature **f** and **y** does not bear **f**), and an output of the shape ...$\mathbf{x}^{\mathbf{f}}\mathbf{y}$..., we have perfect faithfulness to **f**. But suppose that the output candidate is ...**xy**$^{\mathbf{f}}$..., then there is a **degree** of faithfulness to **f**, surely, in comparison, say, with an output candidate ...**xy**... ODT attempts to provide an explicit characterization of the notion of degrees of faithfulness.

Specifically, ODT replaces IDENT-IO with a more complex set of constraints. ODT proposes the following faithfulness constraints:

The first faithfulness constraint is **Dom[ain] Cor[respondence] (F)**. DomCor (F) says that there is a one-to-one correspondence between input F-specifications and output F-domains. Phrased differently, each underlying F-specification is uniquely "matched" by an F-domain in the output. (Note that our use of the term "correspondence" in this context is not an instance of the correspondence relationships defined in M&P, where correspondence

refers to the relationship between segments in two different representations, such as input and output or base and reduplicant.) DomCor simply says that if there is an underlying feature F, then there must be a plan to express that F. Since in ODT there must be a domain in order for a feature to be realized, then satisfying DomCor (F) is an essential aspect of achieving full faithfulness. But notice that DomCor (F) does not require that the element that is specified with F (we call this the F-sponsor) is **in** the domain. DomCor (F) simply requires that for every F-specification, there is a unique corresponding domain.

A second faithfulness constraint, **Incorporate (F-sponsor)**, is required. Incorporate (F-sponsor) says that every F-sponsor is in a domain. At first glance, one could imagine combining DomCor (F) and Incorporate (F-sponsor) into a single constraint. ODT separates them because of various cases of partial faithfulness. For example, in the arena of tone, we have cases where it can be argued that the domain does not include the sponsor. In other words, the underlying High tone has been "displaced" elsewhere in the representation -- the language is faithful to the tone, but not to the relationship of the tone to the sponsor of the tone. Incorporate (H-sponsor) is violated, but not DomCor (H). We can argue in other cases that two High sponsors may yield an optimal output where there is one domain containing both of these sponsors (in the autosegmental literature, this is referred to as the "fusion" of High tones). This is a violation of DomCor (H), but not of Incorporate (H-sponsor).

A third aspect of faithfulness is **Uniqueness (F-sponsor)**. This constraint says that there is only one sponsor of F in a domain. DomCor (F) and Incorporate (F-sponsor) could be satisfied without necessarily satisfying Uniqueness (F-sponsor). For example, if we underline the sponsors of High tone and use parentheses to indicate domains, then both of the following outputs satisfy DomCor (H) and Incorporate (H-sponsor): **(a) (b)c(d)** and **(ab) (c)(d)**. Uniqueness (F-sponsor) on the other hand is satisfied by the former candidate output but not the latter. We take the former candidate to be the more faithful candidate, and consider Uniqueness (F-sponsor) to be the constraint that guarantees that this candidate is evaluated as most faithful to the input. Our analysis of Shingazidja below relies critically on Uniqueness (F-sponsor).

The final faithfulness constraint is **Express (F)**. This constraint simply says that every element in the F-domain capable of expressing the feature F should realize (express) F. This constraint is the one that actually requires the presence of a phonetic feature. Express (F) will be violated if elements in the F-domain cannot bear the feature due to some other constraint that is more highly ranked than Express (F). Express (F) is actually a family of constraints, and it is Express (F on sponsors) that is strictly speaking a "faithfulness" constraint. Express (F on sponsors) says that when a sponsor is in an F-domain, it is required to realize the feature F. In the present work

we do not require distinguishing Express (F) in its general form from Express (F on sposnors), so this point will not be elaborated upon further.

If all of the above faithfulness constraints are satisfied, we have **perfect faithfulness** (with respect to the underlying specification F). Imperfect faithfulness results when one or more (but not all) these constraints are violated. Total infidelity to an underlying feature specification results when both DomCor (F) and Incorporate (F-sponsor) are violated.

We have not yet said anything about violations of faithfulness that arise from the **insertion** of a feature. We utilize a constraint family **Basic Alignment (F-domain)** as a means of characterizing the ban on the insertion of features. Basic Alignment of an FD involves two independently rankable constraints:

(10) Align the L edge of an FD with the L edge of the F-sponsor to which it "corresponds".
Align the R edge of an FD with the R edge of the F-sponsor to which it "corresponds".

(We should emphasize again that the word "corresponds" is used here in quite a different sense from the use of the term in M&P; in (10), the term "correspond" simply refers to the fact that the presence of a feature in the input triggers the formation of a feature domain that will permit the realization of that feature. A domain is motivated by the presence of an underlying feature specification – in other words, there is (in the optimal case) a domain corresponding to each feature specification in the underlying representation.)

Basic Alignment says that an FD consists just of the sponsor to which it corresponds (that motivates it). In other words, unless some other constraint drives a violation of Basic Alignment, an FD will not include anything other than the sponsor. Thus segments that are not sponsors are not expected to be in F-domains (by virtue of Basic Alignment) and thus are not expected to bear the feature in question since a segment can bear a feature only if it is in an F-domain.

Basic Alignment is violated most often as a consequence of alignment constraints. Specifically, the Right or Left edge of a featural domain may be required to be aligned with the Right or Left edge of a prosodic or morphological category (e.g. the syllable, the stem, the prosodic word, the prosodic phrase, etc.). For detailed discussion of alignment constraints, see McCarthy and Prince (1993); for alignment as a vehicle to for achieving autosegmental spreading, see Akinlabi (1994, 1995a,b); Kirchner (1993); Myers (1993), and Pulleyblank (1994a,b); for discussion of alignment as a

vehicle for achieving “wide” featural-domains in ODT, see Cassimjee (1997) and Cole and Kisseberth (1994, 1995a,b,c). In ODT, alignment constraints requiring wide domains are viewed as being motivated by articulatory and perceptual considerations. Both the principle of Articulator Stability (pronunciation is "easier" when articulators are stably in one position as opposed to when they must shift back and forth into different positions) and the principle of Perceptibility (a feature is more easily perceived if it has greater "duration" across a sequence of segments) are better satisfied by outputs where a feature's domain is wide. In this view, then, alignment constraints driving wide domains are *motivated* by phonetic principles; indeed, alignment constraints are an interesting means for characteriing phonological phenomena only to the extent that they can be shown to have articulatory, acoustic, or functional motivation.

It is generally the case that a feature's domain extends in only one direction. In Isixhosa, "spreading" is to the Right. If an alignment of the F-domain with the Right edge of the word, for example, dominates Basic Alignment Right (i.e. Align the R edge of an F-domain with the R edge of the sponsor to which it corresponds), then violations of Basic Alignment Right will be optimal to the extent that they better satisfy this alignment constraint. Alignment of the F-domain with both the Right and also the Left edge of some prosodic domain will – if ranked above Basic Alignment – result in bidirectional spreading. In the next section we discuss in greater detail how alignment constraints drive wider tonal domains than predicted by Basic Alignment, and we also explore various constraints that limit the extension of tonal domains in Bantu.

2. Universal constraints and their ranking in Bantu tonal system.

In this section of the paper we propose a number of the major constraints that are visible (i.e. ranked in a fashion such that they lead to observable phenomena) in Bantu tonal systems. Besides the Faithfulness constraints presented in section 1, we will also discuss a number of constraints that lead to outputs that are less than perfectly faithful. We attempt to show that on the basis of assuming this particular set of universal constraints, diverse differences among a variety of Bantu languages can be seen as involving differences in the ranking of this constraint set. It should be emphasized that we are not proposing that these are the only constraints relative to Bantu tonology, only that they represent a significant fragment. It also should be emphasized that we do not touch on some very critical aspects of Bantu tonology such as: (a) “imposed” or “grammatical” tone in contrast to lexical tone; (b) depressor consonants and their effect on tonal shapes; (c) the occurrence of contour tones on short vowels; (d) how to get at the predictable location of High tones in some Bantu languages. The present

paper represents the beginning of the establishment of a set of universal constraints rather than the end of the project!

In (11), we cite some of the recurring phenomena that are found in autosegmental analysis of Bantu tonology:

(11) (a) the "spreading" of a High tone rightward (or sometimes leftward, though leftward spreading is most frequently invoked in analyses of "imposed" or "grammatical" tone)
(b) the "shifting" of a High tone rightward
(c) spreading/shifting may affect just an immediately adjacent tone-bearing unit, or it may affect a succession of units
(d) a range of OCP (=Obligatory Contour Principle) effects such as:
  (i) fusion of adjacent H tones into a single H tone
  (ii) deletion or lowering of a H tone adjacent to a H tone
  (iii) failure of a H tone to spread if it would yield adjacent H tones
(e) a range of effects associated with "final" position such as:
  (i) failure of a H to spread onto a final syllable
  (ii) failure of a H tone to be realized on a final syllable
  (iii) failure of a final H to undergo "fusion" of Highs
(f) a range of "decontouring" effects such as:
  (i) rising tone simplification
  (ii) falling tone simplification
  (iii) "plateauing" or "bridging", where H0H surfaces as HHH

Our goal in this section is to suggest the main outlines of the ODT approach to accounting for these phenomena, and to establish how the different interweavings of these phenomena in particular languages can be understood as differences in the ranking of the constraints proposed.

We propose that the "spreading" and also the "shifting" of High tone critically involve a violation of the Basic Alignment aspect of faithfulness; generally, both spreading and shifting involve the formation of wider domains than are demanded by faithfulness alone. We suggest that two different universal constraints are at the source of the phenomenological contrast between languages where High tone spreads/shifts only onto an adjacent tone-bearing unit and languages where the spread/shift is unbounded. We analyse the difference between spreading and shifting as residing in the arena of constraints on the expression of High tone. The OCP is viewed in Optimal Domains Theory as a constraint family barring

adjacent domains of at least two different types. Effects associated with final position are seen as reflecting a “Nonfinality” constraint family, where domain edges or High tone may not be aligned with Right edge of a word/phrase, etc. In ODT, inclusion in a domain is necessary in order for a mora to express High tone. The failure of a mora to express a feature may be due to either (a) the mora’s being excluded from a domain or (b) the mora’s being included in a domain but blocked from expressing the feature. Thus in ODT, decontouring effects involve the interplay between expression and domain formation.

We begin our examination of the constraint set by examining the issue of narrow versus wide domains in Bantu.

2.1. Narrow domains.

Bantu tonal systems can be divided first of all into languages which have **narrow** domains and languages which have **wide** domains. By a narrow domain we mean, essentially, a domain that does not extend beyond the sponsoring mora. Languages that have narriw domains are ones that do not violate the Basic Alignment aspect of faithfulness -- i.e. the principle that excludes morae that do not sponsor High tone from being inside a High Domain. In these languages, Basic Alignment dominates any constraints whose satisfaction would necessitate incorporating non-sponsors into a HD.

An example of a language with narrow domains is Ruciga (cf. Kisseberth and Ndabarasa 1993). In Ruciga, a High tone can be located on any syllable in the noun stem, but there can be only one High tone per stem. A stem does not have to contain a High-toned syllable. There is no extension of the High tone onto an adjacent syllable. The validity of these remarks is clearest for toneless nominals when they are in final position in the phrase, and is clearest for nominals with a High tone when they occur in medial position before a toneless modifier. This context is indicated by "..." in the following examples:

(12) ebi-takuri ‘sweet potatoes’
e-ságama... ‘blood....’
en-tabíre... ‘cultivated plot...’
oru-kagaté... 'sp. plant...'

omu-gano ‘bamboo’
omu-kázi... ‘woman...’
ei-papá... ‘wing....’

en-gwe ‘leopard’

en-kú.... ‘firewood...’

From these data it is clear that in Ruciga there are no domains that extend beyond the H-sponsor. This will follow if in Ruciga DomCor (H), Incorporate (H-sponsor), Uniqueness, Express (H), and Basic Alignment -- the “Faithfulness” constraints -- are all undominated. The constraints which drive widescope domains in other Bantu languages are, in Ruciga, subordinate to the Faithfulness constraints. Later we will show that there is one constraint in Ruciga that does drive a violation of faithfulness.

2.2. Wide-domain languages.

While there are some Bantu languages that have narrow (faithful) domains like Ruciga, the hallmark of Bantu tonal systems is the “mobility” of High tone, i.e. the phenomenon whereby a High tone is not necessarily heard (only) on the sponsor but may (also) be heard some distance to the Right (or sometimes to the Left) of the sponsor. Bantu languages with wide domains seem to fall into two basic categories. Rule-based, autosegmental models of phonology get at this fundamental division by postulating two distinct types of High tone spreading: spreading from one mora/syllable onto the immediately adjacent mora/syllable (=**bounded spreading**), or an iterative spreading (=**unbounded spreading**). We suggest that, from an ODT perspective, there at least two distinct constraints that lead to wide domains. One of these constraints involves a ban on monomoraic/monosyllabic domains (necessitating an expansion of otherwise faithful domains, although the violation of faithfulness is minimal); the other constraint is one that seeks to align the edge of the domain with some prosodic edge (e.g. the edge of a prosodic word or a prosodic phrase). These two constraints will serve as the basis for understanding most of the cases of wide domains in Bantu. (We know of one major phenomenon that is not immediately explicable in terms of these two constraints: in some languages there are domains that are maximally trimoraic -- e.g. the dialect of Setswana described in Creissels (this volume) as well as Sukuma (cf. Richardson 1959, Sietsema 1989). The proper characterization of these systems remains a matter for research.)

2.2.1. Wide-domain languages driven by *MonoHD.

We propose that what autosegmental analyses describe as bounded spreading is, in ODT terms, the extension of a HD motivated by the need to avoid a violation of the following constraint:

(13) *MonoHD
A HD should not be monomoraic/monosyllabic.

If monomoraic (alternatively, monosyllabic) HD's are nonoptimal, and if *MonoHD outranks Basic Alignment, then it will be optimal to extend a domain onto a mora that is not a sponsor. One language which exhibits this phenomenon is Setswana (a Bantu language spoken in South Africa and Botswana). The data and analysis of Setswana are from Mmusi (1992).

The following data set illustrates that Setswana "doubles" a High tone to the right.

(14) gofa@ 'to die'
gorE@ka@ 'to buy'
gobo@la@ya 'to kill'
goa@gi@sanya 'to live in harmony'
gokhu@ru@mElEtsa 'to cover for'

cf.

gowa 'to fall'
golema 'to plow'
gotsamaya 'to walk'

The infinitives in (14) consist of a toneless prefix **go** and a following verb stem; the verb stems in the first group are High-toned and the verb stems in the second group are toneless. We see that in the case of High verb stems, there is always a High tone on the first stem mora. We assume that this is the mora that sponsors High tone in the input representation. If there is a second vowel in the verb stem, it is also High-toned. (In the case of examples like **gorE@ka@**, there is a possible alternative pronunciation where the final vowel is not High-toned. We ignore this variation here; its occurrence is obviously connected to the "Nonfinality" constraint family discussed later in this section.) No vowel that is past the second syllable of the stem is realized with a High tone.[4] Thus we have a clear situation where

[4] Not all Setswana dialects restrict the spreading of the High tone in this fashion -- cf. Creissels, this volume.

the HD initiated by the first stem mora extends just to the immediately following mora.

High-toned subject prefixes in Setswana also provide evidence that HD's extend one mora to the right of the sponsor.

(15) ke a wa 'I am falling' o@ a@ wa '(s)he is falling'
ke a lema 'I am cultivating' o@ a@ lema '(s)he is cultivating'
ke a tsamaya 'I am walking' o@ a@ tsamaya '(s)he is walking'

These examples demonstrate that the High Domain initiated by the subject prefix extends through the following **a** morpheme, but no further. These facts will follow from a constraint ranking where Faithfulness constraints are undominated, except that *MonoHD outranks the Align R member of Basic Alignment.

Notice that as long as the Align L member of Basic Alignment is undominated (in contrast to Align R), then a domain cannot be expanded leftwards in order to avoid a violation of *MonoHD. The domain can only extend rightwards. (Thus if we are dealing with a language where a HD is in fact extended one mora to the left rather than to the Right, we would be dealing with a situation where the Align R member of Basic Alignment is undominated and *MonoHD dominates Align L.) The domain can only extend **one** mora to the right because Align R dominates any other constraint that might demand wide domains (see below). Given this high ranking of Align R, then Align R will be **minimally violated** -- i.e. violated just enough to avoid a violation of *MonoHD. The following tableau illustrates. "Faithfulness constraints" in (16) refers to all Faithfulness constraints **other than Align R**. Following usual OT practice, a violation is indicated by an asterisk; a fatal violation (i.e. a violation which removes a candidate from contention as the optimal output) is indicated by an exclamation after the violation mark. A shaded cell in the tableau indicate that, for the candidate in that row, the constraint in question is irrelevant to the evaluation since the candidate has already been assigned a fatal violation mark.

(16)

Candidates	Faithfulness constraints	*MonoHD	Align R
oatsamaya	*! (DomCor)		
(ó)atsamaya		*!	
o(á)tsamaya	*! (Incorp)	*	σ

(óátsámáyá)			σ σ!
(oá)tsamaya	*! (Express)		σ
∅ (óá)tsamaya			σ

The first candidate is nonoptimal since it violates the undominated Faithfulness constraint DomCor (H), which requires that there be a HD corresponding to every High specification in the input. The second candidate is perfectly faithful, but violates *MonoHD; this is fatal since *MonoHD outranks the Faithfulness constraint Align R. The third candidate has a domain, but both fails to be faithful (it does not obey the constraint that demands the sponsor be in a domain) and is not bisyllabic. The fourth candidate has a wide domain; *MonoHD is of course satisfied here, as are all of the Faithfulness constraints except Align R. But since Align R is violated by there being two syllables between the R edge of the domain and the sponsor, this candidate will be non-optimal since there is a competing candidate where Align R is violated by only one syllable. The last two candidates have the same domain structure; however, the candidate **(oá)tsamaya** violates the undominated Faithfulness constraint Express (H), which demands that every mora in the domain expresses the High tone feature.

Some dialects of Emakhuwa (a Bantu language spoken in Mozambique and Tanzania) exhibit this same "doubling" phenomenon. Cheng and Kisseberth (1979, 1980, 1981) describe one of these dialects, the Ikorovere dialect spoken in southern Tanzania, in some detail. The reader is referred to these papers for detailed motivation of the generalizations we make about the data. In our discussion, we ignore one significant point: the location of High-sponsors in Ikorovere is largely predictable on morphological grounds. We do not deal with the issue of how to characterize the fact that the distribution of High tone in the inputs to the constraint system is not free. We have underlined the sponsors of a H tone in our examples. The placement of three dots after the item is meant to indicate that the item is in medial position in the phrase. (The significance of this will be dealt with later.)

In (17) we show that the mora after a H-sponsor is regularly High in Emakhuwa:

(17) inúpá... 'house'
nttúndá... 'hill'
nrérémélá... 'eel'
nthóndóro... 'a long rope'
umórá... 'to fall'

ulúpáttha... ‘to hunt’

urúkúnúsá...’to turn over’

(We have not, of course, tried here to justify the claim that the underlined vowels in (17) are the sponsors and the following vowels the doubles.)

The Emakhuwa situation as illustrated above is captured by exactly the same constraint system as discussed above for Setswana. We shall return later to discuss further aspects of Emakhuwa.

2.2.2. Wide domains motivated by Align X R.

“Unbounded” spreading of High tone is viewed, from the ODT perspective, as involving wide domains motivated by an alignment constraint demanding that the Right (or Left) edge of a HD be aligned with the Left (or Right) edge of some prosodic category -- either the Prosodic Word or the Prosodic Phrase or the Intonational Phrase. We label this constraint family as: Align X R or Align X L, where X refers to the three prosodic categories mentioned above. Since all of the languages that we discuss here have a rightward movement of High tone, we shall discuss only Align X R. If Align X R dominates the Align R member of Basic Alignment, then we will have violations of perfect faithfulness in the interest of obtaining domains that end closer to the Right edge of X. Let us now turn to some Bantu languages that evidence this constraint.

If X in Align X R refers to the Prosodic Word, we will have domains extended in an unbounded fashion, but circumscribed by the word edge -- i.e. the domain will not cross over into the next word. Kibondei, a Bantu language spoken in Tanzania, represents a language that has Align Prosodic Word R (=Align PW R).[5] Kibondei is also a “shifting” rather than a “spreading” language (see below). The difference between a shifting and a spreading language is, in our view, simply a matter of whether there is a constraint dominating Express (H) that effectively limits expression of High tone to the last mora of the domain. We discuss this matter in detail later. The present discussion ignores the issue of the expression of the feature High tone and concentrates instead on domain structure.

In Kibondei, there is clear evidence that if there is just one sponsor of High tone in the word, the domain initiated by that sponsor will extend as far as the penult syllable of the word. In (18) we cite examples of the present tense form of toneless verb stems, contrasting forms where the subject prefix is toneless with forms where the subject prefix sponsors a

[5] This discussion of Kibondei is based on fairly extensive data that we have collected from Josephine Yambi and her uncle, David Kishe. We thank both of them for their assistance. We plan a comprehensive description of Kibondei in the near future.

High tone. Vowels in brackets are underlying vowels that have been deleted.

(18) n[i]-a-ia ‘I am crying’ [a]-a-ía ‘(s)he is crying’
n[i]-a-senga ‘I am cutting’ [a]-a-sénga ‘(s)he is cutting’
n[i]-a-bawa ‘I am stealing’ [a]-a-báwa ‘(s)he is stealing’

n[i]-a-vunganya ‘I am mixing’ [a]-a-vungánya ‘(s)he is mixing’
n[i]-a-ambika ‘I am cooking’ [a]-a-ambíka ‘(s)he is cooking’
n[i]-a-fefea ‘I am dancing’ [a]-a-feféa ‘(s)he is dancing’

n[i]-a-digadiga ‘I am going here and there looking for something’
[a]-a-digadíga ‘(s)he is going here and there looking for something’

High-toned verb stems also exhibit this same extension of the HD through the penultimate syllable:

(19) n[i]-a-bundúga ‘I am pounding’
n[i]-a-hagía ‘I am sweeping’
n[i]-a-kaánga ‘I am frying’
n[i]-a-bindiíza ‘I am finishing’

We can account for these data in Kibondei by assuming that Align PW R dominates Align R, and that there is a constraint that bars a HD from extending to the final syllable of the word. (See below for a discussion of “Nonfinality” effects from an ODT perspectives.) The following tableau illustrates:

(20)

Candidates	Nonfinality	Align PW R	Align R
(a)senga		se nga!	
(asenga)	*!		senga
∅(ase)nga		nga	se

When words like those in (18) and (19) have a toneless noun as complement, then the HD does **not** extend from the sponsor in the verb through the penultimate syllable of the complement. Rather it extends only as far as the penult of the verb. Some relevant examples:

(21) aséngа nyama ‘(s)he is cutting meat’

*asenga nyáma

nabindiíza kuhanda ‘I am finishing planting’

*nabindiiza kuhánda

Thus we have evidence Kibondei aligns HD's with the Prosodic Word and not the Prosodic Phrase (since in all of the Bantu languages so far studied, a verb and its complement are -- in the unmarked case -- gathered into a single Prosodic Phrase).

The data in (21) suggest that a constraint that aligns an F-Domain edge with a category X is satisfied only by an output structure where the F-Domain does not cross an edge of type X. Thus Align PW R can be satisfied in Kibondei by a candidate such as **(asé)nga nyama** and not ***(asenga nyá)ma**. There are, however, some complexities that eventually must be addressed. Consider the data in (22).

(22) n[i]-a-da 'I am eating'

n[i]-a-da nyáma 'I am eating meat'

The verb stem /da/ sponsors a High tone. When this stem occurs in Intonational Phrase-final position, there is no surface High tone. (This is obviously a Nonfinality effect, though its correct analysis is not entirely obvious.) When a complement follows, the verb's High Tone-sponsor triggers a domain that aligns as close to the Right edge of the complement noun as possible (i.e. consistent with avoiding an IP-final HD). **If** the HD-structure of 'I am eating meat' is **n[i]-a-(da nyá)ma**, then we would have a case where the evaluation spans two prosodic words in order to avoid a violation of Nonfinality. Of course, in ODT it is possible that the correct domain structure is **n[i]-a-da (nyá)ma**, with a violation of Incorporate (H-sponsor). We leave the interpretation of the data in (22) unresolved, pending further exploration of Kibondei tonology. The ultimate issue here is whether the "domain of evaluation" is itself a violable constraint -- an interesting question that is however beyond the scope of this paper.

While in Kibondei Align X R refers to the Prosodic Word, in a number of other languages the alignment is with either the Intonational Phrase or Prosodic Phrase. In order to distinguish between these two cases in a given

language it is necessary to undertake a detailed study of the syntax-phonology interface in that language. In our detailed study of Shingazidja below, we show that in this language it is the Prosodic Phrase that Align X R refers to rather than the Intonational Phrase. In the examples below we are interested only in illustrating the existence of languages where domains extend rightwards in a unit larger than the word and thus do not distinguish between Align PP R and Align IP R.

In Xitsonga (a Bantu language spoken in Mozambique and South Africa) a H tone will "spread" (using autosegmental terminology) in an unbounded fashion (see Kisseberth (1994) for extensive discussion). Consider the following examples. The left-hand column shows toneless verb stems in the first person singular present tense, while the right-hand column shows the corresponding third person plural forms.

(23)	ndzati:rha	vátí:rha	(work)
	ndzatsutsu:ma	vátsútsú:ma	(run)
	ndzatlomute:la	vátlómúté:la	(fish)
	ndzixava nya:ma	váxává nyá:ma	(buy meat)
	ndzixava tingu:vu	váxává tínngú:vu	(buy clothes)
	ndzixava xihlambetwa:na	váxává xíhlámbétwá:na	(buy pot)

From these data, we see that the High tone of the third person subject prefix spreads through the penultimate syllable of the phrase (the last three examples cited show that the spreading crosses from the verbal word to a following complement). We thus propose that in Xitsonga it is Align PP R that is active (i.e. highly enough ranked to have an effect on the selection of optimal outputs).

(24) Align PP R
Align the R edge of a HD with the R edge of a Prosodic Phrase.

(See Kisseberth (1994) for discussion of the notion “Prosodic Phrase” in Xitsonga.) If Align PP R is ranked above the Align R part of Basic Alignment, we will characterize the situation where a High tone spreads as far as possible towards the Right edge of a PP.

Shambaa (Odden 1982) provides another example of a Bantu language with wide domains formed in response to Align X R (where X is larger than the word). In Shambaa, if a mora is specified as High in the input, then it and following morae (not themselves the sponsors of High) will also be High in the output. Some examples are given in (25) (sponsors are

underlined). Notice that wide domain may be internal to the word or cross word boundaries.

(25) ma-we ‘stones’ — nḯ má-we ‘they are stones’
i-nu ‘this (Cl.9)’ — nyumbá́ ínu ‘this house’
ku-ghoshoa ‘to do’ — ku-ví́-ghóshóa ‘to do them (Cl.8)’
ku-ghoshoaghoshoa ‘to do repeatedly’
ku-chí́-ghóshóághóshóa ‘to do it (cl. 7) repeatedly’
za-wa-ghanga ‘of the doctors’
nyumbá́ zá-wá-ghánga ‘houses of the doctors’

Clearly, in Shambaa Align X R outranks Align R. Notice that (just as in Kibondei and Xitsonga) the HD does not extend onto the final vowel. We will examine this phenomenon below in detail, but for the moment we shall just invoke a constraint called Nonfinality in order to explain data such as these. Nonfinality is a constraint that bars the Right edge of a High Domain from being aligned with the Right edge of a prosodic word (or phrase etc.). From these data we see that Nonfinality must dominate Align X R in Shambaa.

There is some reason to believe that even if a language has a visible Align X R constraint, the *MonoHD constraint may play a visible role as well. This will be seen in detail when we discuss Isixhosa in section 3. But Shambaa also seems to evidence the same point. In Odden’s (1982) autosegmental analysis, he proposed two separate rules spreading High tone rightwards (it should be noted that this is a frequent feature of autosegmental analyses of Bantu tone in a rule-based model: there are often two or even three rules spreading High tone -- cf. Hyman and Mathangwane (this volume)). One rule he calls “Spreading” and the other he calls “Tone Copy”. The former rule is barred from spreading a High onto a word-final (see examples above); the latter specifically spreads from a penult vowel to a word-final vowel.

Odden’s evidence for Tone Copy is provided by the observation that there are words with successive High-toned syllables over the final two syllables. For example, we have bisyllabic High-toned verbs like **ku-fúá** ‘to wash’ and **ku-kómá** ‘to kill’ (in contrast to trisyllabic forms where the final syllable is not High: **ku-táhíka** ‘to vomit’. The High tone on the final syllable in **ku-kómá** is, in Odden’s (1982) analysis, the consequence of Tone Copy; there is no final H in the trisyllabic case because Spreading will extend a H onto the penult syllable but no further due to the fact that Spreading cannot go onto a word-final syllable. Since Tone Copy precedes

Spreading in the ordering, the output of Spreading (where there is a penult High tone) will not be subject to Tone Copy.

Odden's solution to the problem of the final High in **ku-kómá** (which orders Tone Copy before Spreading) actually necessitates the claim that Spreading is a cyclic rule since it must also apply **after** Tone Copy since Tone Copy **feeds** Spreading. This is shown by the fact that a word-final High resulting from Tone Copy will spread onto a following word! Thus we find examples like **ku-já nyáma** 'to eat meat' and **ku-kómá síyáfu** 'to kill ants' where **nyama** and **siyafu** are underlyingly toneless (examples provided by D. Odden, personal communication).

We suggest that Shambaa represents a case where *MonoHD outranks Nonfinality but Nonfinality outranks Align X R. Given this ranking, an underlying word-penult High-sponsor will trigger a HD that includes the final vowel, in response to the highly ranked *MonoHD: thus, **ku(kómá)** will be preferred to ***ku(kó)ma**. Given a High sponsor that is antepenult, then *MonoHD will be satisfied by extending the domain through the penult, and the fact that Nonfinality outranks Align X R will prevent the domain from extending through the final mora: thus, **ku(táhí)ka** will be preferred over ***ku(táhíká)**.

Nonfinality in Shambaa refers to the word. Consider for example the verb **ku-káánga** 'to fry'. In Shambaa, *MonoHD refers to the **mora**. Thus *MonoHD is satisfied by extending the domain from the stem initial mora, the sponsor, to the following mora (which forms a long vowel with the sponsor). Nonfinality prevents the final mora from being included in the domain. But the isolation form of this word does not tell us whether the final mora is excluded because it is word-final or because it is phrase-final. The example **káánga nyama** 'to fry meat' shows that Nonfinality must refer to the word. Otherwise we would expect ***káángá nyáma**.

Consider the example **ku-kómá síyáfu**. The candidate **ku(kó)ma siyafu** is ruled out since it violates *MonoHD; the candidate **ku(kómá síyáfú)** violates Nonfinality, the next more highly ranked constraint; the optimal candidate **ku(kómá síyá)fu** is better than **ku(kómá) siyafu** or **ku(kómá sí)yafu** since of the three, it violates Align X R the least.

2.3. Spreading versus shifting languages.

A "spreading" language is one where a single underlying High tone sponsor results (some of the time) in a **sequence** of High-toned syllables in the optimal output. In autosegmental terms, spreading involves the creation of a multi-linked High tone by the addition of association lines between a H tone and some succession of morae. In ODT, a spreading language is one where there are High Domains and where Express (H) is undominated, meaning that High tone is expressed on all the morae in the HD. (ODT is neutral as to whether each mora is individually specified as High, or

whether there is one High specification multiply linked. In ODT, this representational contrast places no role whatsoever and the choice of one representation over the other is of no consequence.)

In contrast, a "shifting" language is one where a single underlying High tone results in an output where there is just a single High-toned mora, but the mora that expresses the High tone is not the sponsor. For convenience, we shall refer to the mora where the High tone surfaces as the **targetted mora**. In autosegmental terms, shifting is often viewed as a two-step phenomenon where a H tone first spreads to the targetted mora and then delinks from all morae except the targetted one. Shifting, however, has also been viewed as a reassociation of a High tone from the sponsor to the targetted mora. In ODT, there are also essentially two possible accounts of apparent shifts. It is important at this juncture to remind the reader of why this is necessarily so.

In ODT, there are **always** two logically possible explanations for why a given element does not express a certain feature F: (a) the element is not in an F-domain (recall, a feature F cannot be expressed on an element unless that element is in an F-domain); or (b) the element is in an F-domain, but there is some constraint that is ranked above Express (F) and bars the expression of F on that element. These two explanations involve different domain structure. One can tell the difference between these explanations only in terms of whether there are other constraints active in the language that would be affected in some way by virtue of the claimed differences in constraint structure. A simple example will perhaps help make this point clear. Compare the following two candidates: **(tátá)ta** and **(tátá)(ta)**. In the former candidate, the last sponsor is not organized into a domain and thus does not express High tone. In the latter candidate, the last sponsor is organized into a domain but does not express the feature High tone due to some other constraint. Now, we shall suggest later that there is a constraint barring adjacent domains: *)(. The former candidate (**(tátá)ta**) would not violate *)(, while the latter candidate (**(tátá)(ta)**) would. Thus if we needed to reject the tonal output **tátáta** as nonoptimal, we could invoke *)(to obtain this result, but only if we assumed the analysis where the last sponsor is inside a domain.

ODT thus provides two possible analyses of shifting. In one account, the HD extends from the sponsor to the targetted mora, but there is a constraint that prevents expression of High tone on any mora except the targetted one. Call this approach the **Sponsor Included but Imperfect Expression** (=SIIE) analysis. The second approach is to claim that the constraint set bars the sponsor from the domain as well as all the intervening morae up to the targetted mora. Call this approach **Sponsor Excluded but Perfect Expression** (=SEPE). Most of the cases that we have explored of shifting have required SIIE. See our discussion of Isixhosa and Shingazidja below for extensive discussion. We take this to reflect the

fact that Incorporate (H-sponsor) tends to be a very highly ranked constraint across Bantu. Nevertheless, we predict that there will be cases where SEPE is needed.

We will discuss here only SIIE. We adopt the following analysis of the blockage of expression of High tone in shifting languages. We assume that domains are (Right or Left) **headed** and that headedness is in general correlated with the direction of the expansion of a HD; i.e., if domains expand rightward, the domain is Right-headed, and if the domain expands leftwards, the domain is Left-headed. We then propose the following constraint:

(26) *(H,nonhead)

which bars the expression of High tone on a nonhead. If *(H,nonhead) dominates Express (H) in the constraint ranking, then only the head of the domain will realize the feature H. This represents a shifting language. If Express (H) dominates *(H,nonhead), then all morae in the domain will be realized as H. This represents a spreading language.

Whether a language is spreading or shifting is independent of whether it has domains expanded under the pressure of *MonoHD or domains expanded under the pressure of Align X R. Below we catalogue this independence.

2.3.1. Spreading language, domains expanded by *MonoHD.

The Setswana and Emakhuwa examples discussed above represent this type.

2.3.2. Shifting language, domains expanded by *MonoHD.

Kijita (see Downing 1990) represents an example of this type.[6] In Kijita, a High tone "spreads" (in autosegmental parlance) one mora to the Right, but "delinks" from its original mora. (The High does not spread onto a IP-final mora. See below for discussion of this phenomenon.)

---

[6] David Odden, private communication, reports that the initial mora in the HD in Kijita is not **fully** low -- rather, just not as high in pitch as the second mora. We have encountered a similar phenomenon in the Imitthupi dialect of Emakhuwa, where the first mora in the HD is pronounced at a mid pitch (if not protected by a preceding High tone) and the second mora at a high pitch. We have also encountered a dialect of Emakhuwa – Eerati – where (when unprotected by a preceding High tone) the first mora in the domain is indeed fully low and the second mora High. In the present paper, we have presented Kijita as described in Downing (1990).

(27) okufwá ‘to die’
kumugera ‘by the river’
okufwa kúmugera ‘to die by the river’
okuBóna ‘to see’
okuBonána ‘to see one another’
okuBoná i:nyonyi ‘to see a bird’
cf.
okuBuma 'to hit'
okuBumana 'to hit one another'

A word with a final High tone, like **okufwá** (we ignore a phonetic rule that make a final H falling in Kijita), will retain the H on this syllable in IP-final position, but the H will "shift" onto the following syllable in IP-medial position (cf. **okufwa kúmugera**).

Verbs in Kijita are either High-toned or toneless (cf. **okuBóna** vs. **okuBuma**); the High toned verbs will have the High tone dock to the first stem syllable (cf. **okuBóna**). When the first stem syllable is penult in the IP, then the H will remain on that syllable, since the H will not "shift" onto the final syllable of the IP. However, once the word is IP-medial, then "shift" can occur. This explains the contrast between **okuBóna** and **okuBoná i:nyonyi** as well as between **okuBóna** and **okuBonána**.

Kijita shows *MonoHD dominating Align R, but a Nonfinality constraint dominating *MonoHD. In addition, Kijita shows *(H,nonhead) dominating (Express,H). Our analysis of this language type is illustrated by the following tableaux:

(28)

Candidates	Non-finality	*(H,non-head)	*MonoHD	Align R	Express (H)
oku(Bóná)	*!	*		na	
oku(Boná)	*!			na	*
oku(Bo)na			*		*!
∅oku (Bó)na			*		

(29)

Candidates	Non-finality	*(H,non-head)	*Mono HD	Align R	Express (H)
oku(Bónáná)	*!	**		nana	
oku(Bonaná)	*!			nana	**
oku(Bó)nana			*!		
oku(Bóná)na		*!		na	
∅oku(Boná)na				na	*

Notice that *MonoHD must dominate Express (H). If the ranking were the reverse, then it would be better to have a perfectly expressed but monomoraic domain as in **oku(Bó)nana** than to have an imperefectly expressed bimoraic domain as in the optimal **oku(Boná)na**.

2.3.3. Spreading language, domains expanded by Align X R.

Xitsonga and Shambaa represent examples of this type.

2.3.4. Shifting language, domains expanded by Align X R.

We have seen that Kibondei is a language with an active Align X R constraint and that it is a shifting rather than a spreading language. In Kibondei, Align X R refers to the Prosodic Word. Mijikenda, a group of nine dialects spoken along the Kenyan coast and extending to northern Tanzania) represents another shifting language, but one where Align X R refers to the Prosodic Phrase rather than the Prosodic Word. (The data cited here is from work in progress; see Kisseberth (1984) for extensive discussion of Digo, one of the Mijikenda dialects.)

Mijikenda is like Xitsonga in that a H tone that originates to the left in the word will surface on the penultimate mora. However, whereas in Xitsonga all the morae from the point of origin to the penult vowel are High, in Mijikenda only the penult vowel is High.

(30)			
	ninarima	yunaríma	(cultivate)
	ninagula	yunagúla	(buy)
	ninalamusa	yunalamúsa	(greet)
	ninavumikiza	yunavumikíza	(agree)

ninagula nyama	yunagula nyáma	(buy meat)
ninalamusa muganga doctor)	yunalamusa mugánga	(greet

We assume that in Mijikenda Nonfinality outranks Align PP R, and Align PP R outranks Align R. *(H,nonhead) will be ranked above Express (H), and Align PP R will be ranked above Express (H). As a consequence, the domain will be as wide as possible (even though Express (H) is grossly violated and only the head of the domain is realized on a High tone). The following tableau illustrates:

(31)

Candidates	Non-finality	*(H,non-head)	Align PP R	Express	Align R
(yunalamusa mugangá)	*!			*******	*******
(yú)nalamusa muganga			**!*****		
(yunalamú) sa muganga			**!**	***	***
(yúnálámúsá múgá)nga		*!*****	*		******
∅(yunalamusa mugá)nga			*	******	******

2.4. The OCP.

The Obligatory Contour Principle (=OCP) has been a much-discussed concept in the autosegmental literature. Roughly speaking, the OCP bans representations where two identical specifications are adjacent. The OCP did not fit comfortably into the rule-based model of phonology that forms the background to the development of autosegmental phonology. Thus the literature is replete with evidence that there are a **variety** of OCP effects -- the OCP may trigger a "repair" of an offending structure (e.g. fusion of two High tones into one, deletion or lowering of one of the High tones, retraction of one High tone away from the other, etc.); the OCP may block the application of a rule (e.g. a High tone may fail to spread when spreading would yield a violation of the OCP). In the rule-based model, it is not evident how the unity underlying this variety is to be expressed. Another area of controvery surrounding the OCP in rule-based phonology is its

status. In the rule-based model of phonology, constraints -- to the extent that they are explicitly recognized -- are **inviolable**. The OCP is perplexing in that there are a variety of languages in which the OCP is violated in one form or another. How to explain the violable nature of the OCP?

In OT, we would **expect** the OCP to have a variety of effects and to be violable. There is nothing particular unusual about the OCP in comparison with other constraints. Our task, in ODT, is simply to define precisely the form that this constraint takes. We would argue that the OCP is in fact a **constraint family**. One of the principal members of the OCP constraint family is a constraint that we refer to as No Adjacent Edges. No Adjacent Edges is a ban on the structure *)(-- i.e. two domains may not be adjacent to one another. No Adjacent Edges is particularly pervasive in Bantu, where it is frequently ranked above the widescope-driving constraints.We shall begin our discussion by looking at examples from different languages where No Adjacent Edges is an active constraint. One important point that we wish to make is that No Adjacent Edges may be active independently of whether a language has wide domains driven by *MonoHD or Align X R and independently also of whether the language is a spreading language or a shifting language.

2.4.1. Bantu languages exhibiting the effects of No Adjacent Edges.

Setswana provides evidence of an active No Adjacent Edges. Recall that in Setswana (see above) a High tone spreads one mora to the right. We characterized this by ranking *MonoHD above Align R. This ranking explains why in a verb with a High-toned subject prefix and no other high tones, there will be a HD extending from the subject prefix to the immediately following mora: **o@a@lema** '(s)he is plowing'. Notice that **o@a@lema** involves a toneless verb stem located after the prefix **a**. When a High verb stem follows, as in (32), no doubling occurs:

(32) o@ a rE@ka@ '(s)he is plowing'
o@ a bo@la@ya '(s)he is killing'

A High tone does not double onto a vowel that is **followed by a High-toned mora**.

If No Adjacent Edgesvis ranked above *MonoHD, then we will account for the Setswana data. The following tableau illustrates.

(33)

Candidates	No Adj Edges	*MonoHD	Align R

(o a)(bola)ya	*!		σ / σ
(o) a (bo)laya		**!	
∅ (o) a (bola)ya		*	σ

In the Setswana dialect described above, it is *MonoHD that drives wide domains. In Xistonga (see above), Align PP R drives wide domains, but – just as in Setswana – formation of these wide domains is restricted by No Adjacent Edges. The examples in (34) illustrate this point.

(34) ndzixava ta:ndzá 'I am buying an egg'
váxává ta:ndzá 'they are buying an egg'

ndzixava mata:ndza 'I am buying eggs'
váxává máta:ndzá 'they are buying eggs'

These examples illustrate the case where a noun with a final High tone follows a verb. They show that the HD initiated by the subject prefix of the verb extends as far to the Right as possible in the Prosodic Phrase. However, No Adjacent Edges constrains the alignment to the Right in this language.

The following tableau illustrates the analysis of Xitsonga. As usual, we ignore those constraints that are not directly pertinent to the present discussion, and therefore we also ignore candidates that violate those constraints.

(35)

Candidates	NoAdjacent Edges	Align PP R	Align R
(váxává mátá:)(ndzá)	!*	ndza	xavamata
(vá)xava mata: (ndzá)		xavama!ta: ndza	

(váxá)va mata:(ndzá)		vamata:!ndza	xa
(váxává) mata:(ndzá)		mata: ndza!	xava
∅(váxává máta:(ndzá)		ta:ndza	xavama

(In the colum dealing with Align PP R, we indicate the extent to which the first HD fails to be aligned with the R edge of the prosodic phrase. The second HD is of course perfectly aligned.)

Xitsonga is a "spreading" language. In our detailed study of Isixhosa and Shingazidja below we will see that these are both "shifting" languages and they both have wide domains driven by Align X R. They also have an active No Adjacent Edges constraint. As we will see, shifting languages that exhibit No Adjacent Edge effects are particularly useful in motivating domain structure.

2.4.2. Bantu languages where No Adjacent Edges is not active.

While No Adjacent Edges has widespread effects in Bantu, there are many languages where it fails to constrain the extension of a HD. We cite some examples to illustrate the violability of No Adjacent Edges. Emakhuwa provides an example of a language where No Adjacent Edges is not active. Specifically, in Emakhuwa, *MonoHD drives wide domains. Given an input, a̲aa̲aa, *MonoHD will drive a domain structure (a̲a)(a̲a)a even though the result is a violation of No Adjacent Edges.

For example, in many Emakhuwa dialects, there is a pattern whereby a primary High tone is placed on the first and the third mora of the verb stem. The first primary High tone doubles onto the following vowel, even though this creates adjacent High Domains. Some examples from the Ikorovere dialect.

(36) u(kú̲má)(á̲ní)hera 'to cause two things to meet'
u(hó̲kó)(lyá̲á)niha 'to go and return the same day'
u(ló̲kó)(tá̲ní)ha 'to pick up several things'
u(mó̲ngó)(nyó̲lá)… 'to break s.t. off'

Another case illustrating the violability of No Adjacent Edges in Emakhuwa comes from cases where there is a prefix with a primary High tone. Examples from the Ikorovere dialect in (37) and the Imitthupi dialect in (38):

(37) k-aa-(hóó)-(rú)pa ‘I was asleep’
k-aa-(hóó)-(tthá wá)-ru ‘although I ran away’
k-aa-(hóó)-(tthúkí)(há-rú) n-(cá)na ‘although I tied it very well yesterday’

(38) (k-á-hó)-(kávíha ‘I helped’
(k-á-hó)-(váhá)…. ‘I gave…’
(k-á-hó)-(límá)… ‘I cultivated’

Kijita also provides an example where No Adjacent Edges is violated. Recall that in Kijita, like Emakhuwa, wide domains are driven by *MonoHD. Kijita, however, is a shifting language (unlike the dialects of Emakhuwa cited above). In the negative present continuous, the morpheme **ta** sponsors a High tone. The examples in (39) involve a toneless verb stem. (Examples from Downing 1990.)

(39) a(takú)gwa ‘(s)he isn’t falling’
a(takú)liya ‘(s)he isn’t paying’
a(takú)goso:ra ‘(s)he isn’t unweaving’

We see that in (39) the HD extends from the **ta** through the following prefix **ku** (with *(H,nonheads) preventing a High tone from being heard on the initial mora in the domain).

In (40) we have examples of High verb stems.

(40) a(takú)(lyá) ‘(s)he isn’t eating’
a(takú)(Bó)na ‘(s)he doesn’t see’
a(takú)(si:ndí)ka ‘(s)he isn’t pushing’

These examples show that the HD initiated by **ta** extends to the syllable **ku** regardless of the fact that there is a following HD (and regardless of whether the initial mora in that HD is realized on a high pitch or not).

In Shambaa, a HD triggered by high-ranking Align X R will extend rightward even if this leads to a violation of No Adjacent Edges. Evidence

that No Adjacent Edges does not restrict Align X R is provided by examples like the following:

(41) ni-o(n-íyé má)(k!ú)i 'I saw dogs'
ni-o(n-íyé nyú)(mb!á) 'I saw the house'

The High Domain initiated by the verb extends into the following nominal complement. There is a downstep between these two HD's (we do not discuss in this paper the ODT analysis of downstep), but it is clear that No Adjacent Edges did not in any way bar the extension of the first domain.

A significant point needs to be made at this juncture. We have seen abundant evidence that a typical "response" to a potential No Adjacent Edges violation is to avoid the violation by not allowing the domain to extend as far to the right as would be demanded by Align X R. There are other responses possible. In our study of Shingazidja below, we will argue that in this language No Adjacent Edges is avoided by a failure to parse the second H sponsor into a domain rather than by inhibiting the extent of the domain of the first sponsor.

2.4.3. On the insufficiency of No Adjacent Edges.

There is abundant evidence establishing No Adjacent Edges as an active constraint in the Bantu language; clearly, this constraint is responsible for many of the OCP effects that have been noted in the autosegmental literature. In this section we wish to present some evidence that No Adjacent Edges is not **sufficient** to account for all OCP effects. We propose that there is in fact a more restricted version of No Adjacent Edges, one that we shall refer to as No Adjacent Sponsors. We compare No Adjacent Edges and No Adjacent Sponsors in (42) below:

(42) (a) No Adjacent Edges
*)(

(b) No Adjacent Sponsors
* μ)(μ

No Adjacent Sponsors bars adjacent domains, but just when the adjacent domain edges separate two sponsors (indicated by the underlined morae).

Emakhuwa provides striking evidence for the necessity of invoking No Adjacent Sponsors as a distinct constraint from No Adjacent Edges. We noted above that in Emakhuwa, No Adjacent Edges must be ranked below *MonoHD. Domains are expanded in order to avoid a monomoraic HD even if the result is a violation of No Adjacent Edges. Notice that one does

not in Emakhuwa fail to parse one of the sponsors into a HD in order to have an output that both lacks a monomoraic HD and also does not have adjacent HD's; i.e. from underlying /k-a-ho-kaviha/ one does not get ***(káhó)kaviha**. Thus we know that DomCor (H) and/or Incorporate (H-sponsor) must dominate No Adjacent Edges.

There is evidence however that there **is** an OCP constraint in Emakhuwa that leads to a failure to provide a domain corresponding to one of the High-sponsors. To illustrate this point, we need to make a few general observations. There is a tense/aspect marker **ho** in Emakhuwa that is used in various verbal formations. In one of these formations, **ho** is preceded by a subject prefix and followed immediately by what we shall refer to as the **macrostem**. The macrostem consists of the object prefix, if there is one, and the **verb stem**. When the **ho** marker is used, there is always a primary High tone located on the first vowel of the macrostem. Thus we have verbal formations like **kihorúpa** 'I was asleep', **ahokíváha** '[cl.2] gave me'. When the verb stem is sufficiently long, there may be another primary High tone later in the verb, but we ignore the details of this. Now, in Ikorovere there is another formation where an **a** vowel is located between the subject prefix and the verb stem. In this construction, the **ho** bears a primary High tone. (This contrasts with Imitthupi, where the **a** element bears the High tone – see (38) above.) When this High-toned **ho** is used, there is no primary High tone on the first mora of the macrostem -- rather the first vowel of the macrostem receives a doubled High from the **ho**. Some examples:

(43) a-hó-thúmela (not: * a-hó-thúméla) '[cl.1] bought for'
a-hó-kí-thumela (not: *a- hó-kí-thúmela) '[cl.1] bought for me'
a-hó-káviha (not: * a-hó-kávíha) '[cl.1] helped'
a-hó-kí-kaviha (not *a- hó-kí-káviha) '[cl.1] helped me'

These data involve cases where there are two sponsors in succession. In the optimal output, there is a sequence of two High-toned morae. We know that the second of these morae must actually bear a doubled High; if it expressed a primary High, then we would expect it to be followed by a double (cf. the ill-formed examples to the right of the well-formed examples in (43)). There is thus no doubt that the second High in the input has not been parsed into a HD.

If, then, there is a single binary HD in the case of examples like (43), we must explain why two successive sponsors in the input results in an optimal output with one HD. We suggest that No Adjacent Sponsors is at work. A candidate such as **a(hó)(kíthú)mela** would violate No Adjacent Sponsors. If No Adjacent Sponsors dominates DomCor (H), while DomCor

(H) dominates No Adjacent Edges, we would predict an optimal output where DomCor (H) is violated in order to avoid a violation of No Adjacent Sponsors. Recall that No Adjacent Edges, on the other hand, does not -- in Emakhuwa -- drive a violation of DomCor (H).

We should observe that while No Adjacent Sponsors will explain the ill-formedness of **a(hó)(kíthú)mela**, it does not tell us why **a(hókí)thumela** is more optimal than **aho(kíthú)mela**. This is the familiar problem of **directionality** – given that successive High sponsors are not each parsed into a HD, is it the rightmost or the leftmost that will fail to be parsed? We forego any discussion of the directionality problem here, but it is obviously a general problem within OT that requires detailed study.

There is an additional problem that will not be pursued here, but requires careful study. When there are three or more successive High-toned sponsors, there appears to be two possible outcomes in Bantu. One possibility is that the language forms as many domains as possible without having adjacent domains. This would yield an **alternating** pattern. In other words, every other High-sponsor would form a domain. A second possibility is that only the sponsor at the edge of the sequence of High-sponsors will form a HD. As matters stand now, our analysis predicts only the alternating pattern. An additional constraint will be required to yield the pattern where only one of the sponsors forms a domain. Discussion of this problem would take us far afield, but the problem remains a matter of some importance for the analysis of No Adjacent Sponsors.

2.5. Nonfinality.

We have already encountered in various languages discussed above a particularly important constraint: Nonfinality. Nonfinality is actually, we suggest, a constraint family; members of this famil may constrain (a) how wide domains may be, (b) whether we indeed have a domain at all, and (c) whether High tone is expressed in a domain. Nonfinality effects can be observed independently of whether a language has narrow, binary, or wide domains, and independently of whether it is a “spreading” or “shifting” type.

2.5.1. Nonfinality effects: restricting the extension of High Domains.

Perhaps the most common Nonfinality effect is the case where a HD fails to extend onto a final mora. We explain these effects in terms of the following constraint type:

(44) Nonfinality X (HD)
The R edge of a HD may not be aligned with the R edge of X, where X may be any of the following: Prosodic Word, Prosodic Phrase, Intonational Phrase.

If Nonfinality (HD) dominates Align X R or *MonoHD it will have the effect of blocking the extension of domains in response to the need to satisfy Align X R or *MonoHD.

In Kibondei, the Nonfinality PW (HD) submember of Nonfinality X (HD) is critically ranked above Align PW R. Therefore when a H-sponsor in subject position is followed by a toneless verb stem, the HD will extend only as far as the penult syllable of the word: **(agú)a nyama** '(s)he is buying meat'. Kibondei is a shifting language, therefore the High tone is heard only on the penult vowel of the word. Shambaa, a language closely related to Kibondei, is of the spreading rather than the shifting type. But it is like Kibondei in barring the extension of a HD onto a Prosodic Word-final mora. Thus in an example like **ku-káánga** nyama 'to fry meat', the HD initiated by the initial mora of the verb stem, although it would prefer to align with the Right edge of the word, fails to do so due to the constraint Nonfinality PW (HD). In our discussion of Isixhosa below, we will see that it is a shifting language with HD's driven both by Align PW R and also by *MonoHD, and that it is Nonfinality PW (HD) that is active in the language.

In Emakhuwa the Nonfinality IP (HD) member of Nonfinality X (HD) is critically ranked above *MonoHD. Thus in Emakhuwa, the HD does not extend onto an IP-final vowel in the case of **ki-ho-thúma** but does extend onto a word-final vowel that is not IP-final, as in **ki-ho-(thúmá) me(é)le** 'I have bought millet'. Emakhuwa is a spreading language where HD's are driven by *MonoHD. A "shifting" language like Kijita also has HD's driven by *MonoHD, and Kijita is entirely parallel to Emakhuwa in the way that Nonfinality IP (HD) works. Like most Bantu languages, verbs in Kijita are either High-toned or toneless (cf. **okuBóna** vs. **okuBuma**); the High toned verbs will have the High tone dock to the first stem syllable (cf. **okuBóna**). When the first stem syllable is penult in the IP, then the H will remain on that syllable -- i.e. the H will not "shift" onto the final syllable of the IP. However, once the word is IP-medial, then "shift" can occur. This explains the contrast between **okuBóna** and **okuBoná i:nyonyi** as well as between **okuBóna** and **okuBonána**.

We have referred to Emakhuwa and Kijita as having Nonfinality IP (HD) active rather than Nonfinality PP (HD) due to the fact that we have no

evidence bearing upon whether there is a Prosodic Phrase level of structure in these two languages. In our discussion of Shingazidja later, we will see that it is a shifting language with domains driven by Align X R, and that (a) there is a contrast between Prosodic Phrases and Intonational Phrases and that (b) Nonfinality IP (HD) is critically the active constraint and not Nonfinality PP (HD). In Xitsonga, the Nonfinality PP (HD) member of Nonfinality X (HD) must dominate Align PP R. For example, an example such as **vá<u>a</u>xává nyáma** shows that a HD may extend onto a word-final vowel that is in medial to the clause. However, in a double object construction, the verb and the first object form a separate Prosodic Phrase from the second object. As a consequence, we see that a HD extends only as far as the penult mora of the first object. This is shown by the data in (45):

(45) ndzixavela xiphukuphuku fo:le 'I am buying tobacco for a fool'

v<u>a</u>xávélá xíphúkúphúku fo:le 'they are buying tobacco for a fool'

We see that the High Domain initiated by the subject prefix **v<u>a</u>** in the second example is prevented from going onto the final vowel of the first object. This is the effect of Nonfinality. The noun **xiphukuphuku** does not stand at the end of an Intonational Phrase (if it did, its penult vowel would be automatically lengthened) – rather it stands at the end of a Prosodic Phrase. Nonfinality in Xitsonga thus must refer to the Prosodic Phrase and not the Intonational Phrase.

2.5.2. Nonfinality effects: violations of faithfulness.

We have illustrated above all three members of the Nonfinality X (HD) constraint type. In each of these examples, **the Nonfinality effect noted was the failure of a HD to expand**. But there are other Nonfinality effects as well. The issue that we must address is whether Nonfinality X (HD) is alone sufficient to account for the full range of Nonfinality effects.

In addition to barring the expansion of a HD, Nonfinality may lead to violations of faithfulness . We observed earlier that Kibondei provides an interesting example of such a violation of faithfulness. First of all, remember that in Kibondei, Nonfinality PW (HD) and Align PW R are active in the language: **(<u>a</u>gú)a nyama** '(s)he is buying meat'. The phenomenon that we must look at next involves a verb stem such as /d<u>a</u>/ 'eat'. In our earlier discussion of Kibondei, we noted that in **n[i]-a-d<u>a</u>** 'I am eating', the word-final H-sponsor does not lead to an overt High tone. In the phrase **n[i]-a-d<u>a</u> nyáma**, however, a High tone is heard on the penult vowel of the complement noun. If , however, the verb is followed by a nominal that has an initial High tone, then **d<u>a</u>** will surface with a High tone (and the

following word's High will be downstepped -- we do not undertake a study of downstepping here): **n[i]-a-(dá)!(nkhá)nde** 'I am eating food'.

The phrasal examples show that Nonfinality PW (HD) does not lead to a failure to provide a domain corresponding to the verb stem High-sponsor. Thus, on the basis of the phrasal evidence, Nonfinality PW (HD) must be dominated by DomCor (H). As observed earlier, it is not obvious whether the structure of **nada nyáma** is **n[i]-a-(da nyá)ma** or **n[i]-a-da (nyá)ma**; thus it is not clear whether Incorporate (H-sponsor) dominates Nonfinality PW (HD). While the phrase-medial examples all show faithfulness to the High-sponsor, the IP-final example **nada** does not have a High tone in the output. Indeed, when one examines Kibondei, it is the case that **there are no IP's that end in a High tone**.

As we have emphasized repeatedly, in ODT, the failure of an underlying specification to lead to a High tone may be due to the fact that there is no HD corresponding to that sponsor, or there may be a HD corresponding to the sponsor, but there is some constraint that bars realization of the feature. In the case of the IP-final pronunciation of **nada**, then, either of the following would characterize the surface form: **nada** (no domain) or **na(da)** (a domain where the High tone is not expressed). If the former characterization is correct, then we would need to construct a ranked constraint system that would prevent a HD from being formed for /da/ when it is IP-final. We can achieve this result by appealing to the Nonfinality X (HD) constraint family. Specifically, we could claim that while DomCor (H) dominates Nonfinality PW (HD), Nonfinality IP (HD) dominates DomCor (H)! In other words, Nonfinality IP (HD) will bar a HD aligned with the Right edge of IP even though this means that no domain will be formed, producing **nada** (which cannot realize the input High tone since there is no HD).

The following tableaux illustrates:

(46)

Candidates	Nonfinality IP	DomCor	Nonfinality PW
n[i]a (dá)	*!		*
∅n[i]ada		*	

(47)

Candidates	Nonfinality IP	DomCor	Nonfinality PW
∅n[i]a(dá) (nkhá)nde			*
n[i]ada (nkhá)nde		*!	

There is, however, another possible analysis: one might claim that there is a domain, i.e. **n[i]-a-[da]** but that Express (H) is contradicted by a constraint barring High tone in IP-final position. Call this constraint Nonfinality X (H).

(48) Nonfinality X (H)
A High toned mora may not be aligned with the R edge of X, where X= Prosodic Word, Prosodic Phrase, Intonational Phrase.

Nonfinality X (H) would be another member of the Nonfinality constraint family in addition to Nonfinality X (HD). The following tableau illustrates this account. Note that in this analysis DomCor is an undominated constraint.

(49)

Candidates	DomCor	Nonfinality IP (H)	Express
n[ik]ada	*!		
n[i]a(dá)		*!	
∅n[i]a(da)			*

It is only the Nonfinality IP (H) member of Nonfinality X (H) that would outrank Express; Express would dominate Nonfinality PW (H), resulting in the appearance of a word-final High tone when that word is not IP-final: **n[i]-a-(dá) !(nkhá)nde**.

In Kibondei, we cannot determine for certain whether **n[i]-a-da** or **n[i]-a-(da)** is the best characterization of the facts. In our analysis of Isixhosa below, we suggest that in this language there is evidence for optimal outputs like **n[i]-a-(da)** and therefore evidence for extending Nonfinality to include Nonfinality X (H) as well as Nonfinality X (HD).

In Kibondei, an IP-final High tone is not pronounced and thus there is a violation of faithfulness. In Ruciga, an IP-final High tone appears to "retract", thereby avoiding a violation of Nonfinality but retaining a degree of faithfulness. Let us consider the analysis of this phenomen.

Recall that Ruciga has narrow domains. We have seen that in noun stems, any vowel in the stem may sponsor a High tone. This is evident in the phrase-medial pronunciation of nouns. But there is one complication of immediate relevance. If the stem has a final High tone, and if the stem appears in phrase-final position, then that High tone "retracts" to the penultimate syllable.

(50) én-k<u>u</u> 'firewood' (cf. enk<u>ú</u>...)
ei-pép<u>a</u> 'wing' (cf. ei-pap<u>á</u>...)
oru-kagát<u>e</u> 'sp. plant' (cf. oru-kagat<u>é</u>...)

This retraction is clearly a Nonfinality phenomenon.

Once again there are two output candidates that would be consistent with the pronunciation: **oru-ka(gá)t<u>e</u>** or **oru-ka(gát<u>e</u>)**. The former candidate would involve a violation of Incorporate (H-sponsor); the latter candidate would involve a violation of Express (H). There is no evidence in Ruciga that will establish clearly which of these outputs is actually the optimal one. Below we consider how the constraint set of Ruciga might be structured to achieve these two phonetically indistinguishable outputs.

The following constraint system would select **oru-ka(gá)t<u>e</u>** as optimal.

(51) DomCor (H), Express (H), Nonfinality IP (HD) -- **undominated**
Incorporate (H-sponsor) -- **dominated** by Nonfinality IP (HD)
Basic Alignment -- **dominated** by Nonfinality IP (HD)

In this analysis, the underlying High must trigger a HD, due to the high ranking of DomCor (H). But by ranking Nonfinality IP (HD) above Incorporate (H-sponsor), it is more important to avoid an IP-final HD than to satisfy Incorporate (H-sponsor). This ranking thus leads to "retraction": the penultimate syllable constitutes a HD rather than the final syllable (the H-sponsor is not inside the HD that it triggers). Note that the High tone only "retracts" one syllable. The reason is clear. Compare two output candidates, one where the H has retracted one syllable and the other where it has retracted two syllables. Both candidates satisfy DomCor (H) and Nonfinality IP (HD) and both violate Incorporate (H-sponsor); but retraction by two syllables is a greater violation of Basic Alignment than retraction by a single syllable. The following tableau illustrates. (In the interest of economy, we omit the Express constraint and candidates that would violate it. This analysis assumes that Express is undominated in Ruciga.)

(52)

Candidates	Dom Cor	Nonfinality IP (HD)	Incorporate	Align L/R
orukagate	*!		*	
orukaga(té)		*!		
∅oruka (gá)te			*	s (L) s (R)
oru(ká)gate			*	ss! (L)! ss (R)

The above discussion has revealed that there is a quite natural means whereby Nonfinality X (HD) may lead to a (partial) violation of faithfulness in Ruciga. It is not, however, clear that an output candidate such as **oruka(gáte)** is incorrect. Therefore we must explore how such a candidate could be evaluated as optimal. First of all, we would have to see Nonfinality IP (HD) as a lowly ranked constraint that is not active in the language since we want to derive a HD at the Right edge of an IP. Second, we would require Nonfinality IP (H) to be active -- i.e. ranked above Express (H) -- since we want to prevent a High tone at the R edge of an IP. But these two moves are not by themselves sufficient. We must still force the domain to extend over not just the last mora but also the penultimate mora in the IP so that this penultimate mora may surface with a High tone. **Since Ruciga does not otherwise have wide domains**, we know that Basic Alignment must be assumed to dominate both *MonoHD and Align X R. So how do we explain the wide domain just at the Right edge of the IP?

We suggest that perhaps another member of Nonfinality constraint family could be at work. Specifically, a constraint such as (53) might be employed to achieve the desired outcome.

(53) Nonfinality X (monomoraic/monosyllabic HD)
A monomoraic or monosyllabic HD may not be aligned with the R edge of X, where X= Prosodic Word, Prosodic Phrase, Intonational Phrase.

The constraint in (53) is, of course, a more specific version of Nonfinality X (HD). Nonfinality X (HD) bans all HD's from being aligned with the Right edge of X. (53) bans monomoraic/monosyllabic HD's from this position. One means of satisfying (53) would be to **expand a final HD so that it is not monomoraic/monosyllabic**. In other words, (53) could trigger a domain expansion. Thus an output like **oru-ka(gáte)** would be optimal if (a) Nonfinality IP (monomoraic HD) outranks the Align L submember of Basic Alignment, (b) Nonfinality IP (H) dominates Express,

and all other Faithfulness constraints are undominated. Given these rankings, and given an input **oru-kagat<u>e</u>**, there must be a HD, the sponsor must be in the HD, there cannot be an IP-final monomoraic/monosyllabic HD, Align L must be minimally violated, and the IP-final vowel may not be High but all other morae in a HD must be High. The output **oru-ka(gát<u>e</u>)** is the candidate that meets all of these conditions.

If there were no other evidence favoring the inclusion of (53) in the universal constraint system, we might be content to simply assume an analysis where **oru-ka(gá)t<u>e</u>** is optimal. However, Haya -- a language closely related to Ruciga -- lends support to the idea that Nonfinality X (monomoraic/monosyllabic HD) must be a member of the Nonfinality family of constraints (cf. Hyman and Byarushengo 1984). Let us look at the Haya data. Haya nominals are roughly like those in Ruciga. We do not consider here the fact that nominal preprefixes in Haya sponsor a High tone but do not realize this High tone when they stand in IP-initial position (though this phenomenon clearly suggests that there is a need for Noninitiality as well as Nonfinality!). The data in (54) show that a High sponsor may appear anywhere in the stem in the underlying representation of Haya nominals, just as in Ruciga::

(54) <u>e</u>-n-fulu... ‘fish’
<u>e</u>-n-j<u>ó</u>ka... ‘snake’
<u>o</u>-bu-gol<u>ó</u>... ‘snuff’

However, the pronunciation **<u>o</u>-bu-gol<u>ó</u>** is correct only for cases where this word appears internal to a phrase. When this word is at the end of an Intonational Phrase, we find the pronunciation **<u>o</u>-bu-gól<u>o</u>**. This is entirely parallel to Ruciga and does not provide us with any new information. However, Hyman and Byarushengo (1984) show that in Haya, there is a distinction in pronunciation among three contexts: phrase-medial, end of a Prosodic Phrase, and end of an Intonational Phrase. When the noun in question is at the end of a Prosodic Phrase that is not also the end of an Intonational Phrase, then we find the pronunciation: **<u>o</u>-bu-gól<u>ó</u>**. This form shows a HD that extends over the final two mora!

The Haya data can be accounted for, then, if we assume that in Haya the constraint Nonfinality PP (monomoraic/monsyllablic HD) dominates Align L. This means that a HD that stands at the end of a Prosodic Phrase will expand to cover two mora. If, however, Nonfinality IP (H) outranks Express (H), then the second mora of the domain will be unexpressed when the word stands at the end of a Prosodic Phrase that is also at the end of an Intonational Phrase. However, when the word is at the end of a Prosodic Phrase that is not at the end of an IP, then both morae in the domain will be realized on a High tone since there is no constraint that prevents satisfaction

of Express (H). Haya thus provides some evidence that both Nonfinality X (monomoraic/monosyllabic HD) and also Nonfinality X (H) are part of the Nonfinality family of constraints. Obviously, much more research on these matters is required, but we hope to have shown that there is some reason to explore the idea that Nonfinality is not simply a ban on aligning F-domain edges with the edges of categories such as Prosodic Word, Prosodic Phrase, and Intonal Phrase.

2.6. Some constraints relevant to the expression of features.

Recall that Nonfinality X (H) is a member of the Nonfinality constraint family that refers directly to the **realization of High tone**. In this section we briefly survey the fact that there are other constraints (besides *(H,nonheads) and Nonfinality X (H)) that seem to be directly connected with the expression of the High tone feature. Specifically, there appear to be some very prevalent **decontouting** phenomenon that may be viewed as reflecting constraints on the phonetic tone realization. We discuss here two of these constraints: *Rise (more generally, *0H) and *Fall (more generally *H0).

There is evidence from Bantu that rising tone (a 0H sequence on a single mora or syllable is nonoptimal). Let us propose the following constraint:

(55) *0H (=*Rise)
No 0H on a single mora or a single syllable.

Shambaa provides some evidence for *0H. Recall that Shambaa is a spreading language. It is also a language where wide domains are driven by Align PW R and by *MonoHD. It is also subject to Nonfinality PW (HD); however, *MonoHD dominates Nonfinality PW (HD), while Nonfinality PW (HD) dominates Align PW R. In Shambaa, an input /ku-ona/ results in a surface form **kwoonáa**. This pronunciation is consistent with any of the following outputs: **kwo(onáa)** or **(kwoonáa)** or **kwoo(náa)**. Let us consider each of these possibilities.

Suppose that **kwo(onáa)** is optimal. This first of all involves a case where Align L dominates the constraint that wants a HD to be aligned with a syllable edge. *MonoHD dominates Align R and forces the domain to extend through the final vowel. The correct output results from ranking *0H above Express (H).

If **(kwoonáa)** were the optimal output that we want to achieve, we would have a problem. To get this domain structure, we would first of all need a constraint aligning HD edges with syllable edges. Call this Syllable Alignment. There is reason to believe that such a constraint indeed is among the universal constraint set (we have implicitly assumed this

constraint since we have also shown HD-structures where an onset consonant is included in the HD). In order to get **(kwo<u>o</u>ná)** as optimal, Syllable Alignment would have to dominate Align L. Now, if *0H is ranked above Express (H), the optimal output will be one that does not have a Rising tone. **(kwo<u>o</u>ná)** does indeed represent one output that avoids a violation of *0H. But there is another candidate that would also avoid a violation of *0H: namely, **(kwó<u>ó</u>ná)**. And this candidate not only does not violate *0H, it also does not violate Express (H), unlike **(kwo<u>o</u>ná)**. So **(kwó<u>ó</u>ná)** would necessarily be the optimal output. Consequently, we predict that in a language where HD's are optimally aligned with syllables, we will avoid a violation of *0H by getting a level High level tone rather than a low level tone. If Align L dominates Syllable Alignment, then **(kwo<u>o</u>ná)** will be ruled out. There thus seems no way for **(kwo<u>o</u>ná)** to be optimal in any language.

Finally, suppose that **kwo<u>o</u>(ná)** is the optimal output. This output would result if *0H is undominated (specifically, if *0H dominates Incorporate (H-sponsor) and Align L) and Express (H) is undominated (specifically, Express (H) is more important than *MonoHD). Given these rankings, it will be best to misalign the HD with the sponsor and thereby avoid a violation of *0H.

Our knowledge of Shambaa is not sufficient to determine whether there is any evidence for one or the other of the above outputs as being optimal. But nevertheless it seems apparent that Shambaa supports a *0H constraint. (See Poletto (this volume) for another language where *0H seems to be at work.)

Ciyao provides evidence for both *OH and also *H0. The following material is drawn from the Tanzanian dialects described by Odden (this volume); we have found the same phenomena as well in our as yet unpublished work on a Malawian dialect. Ciyao has wide domains driven by *MonoHD rather than by Align X R. The following verbal forms illustrate this point. In Ciyao, all verb stems in the infinitive (and various other tenses) have a High tone specified on the first stem mora. The following examples show that Ciyao is a spreading language where Align R is dominated by *MonoHD. The left bracket in these examples indicates the beginning of the verb stem.

(56) ku[k<u>á</u>múla 'to grab'
ku[t<u>á</u>tánika 'to hesitate'
ku[p<u>í</u>líkanila 'to listen'

Nonfinality IP (HD) outranks *MonoHD, as shown by the fact that while a HD may extend onto the second vowel of the stems /l<u>i</u>me/ 'cultivate' and

/tave/ ‘build’ when they are phrase-medial, the HD will not extend onto the second vowel when the word is IP-final:

(57) chá[á]ji[lí]mé miguunda ‘he will cultivate the fields’

vs.

chá[á]ji[lí]me ‘he will cultivate them’

chí[n]ási[tá]vé pe ‘I will merely build them’

vs.

chí[n]ási[tá]ve ‘I will build them’

With this much background, we can consider first the evidence for *0H. When the infinitive prefix /ku/ stands in front of a vowel-initial verb stem, the prefixal vowel surfaces as **w** before non-round vowels and deletes before round vowels -- but in both cases the initial vowel of the verb stem is lengthened.

(58) kwi[ináma ‘to bend’

ko[onjéchesya ‘to increase’

Notice that (in the absence of a decontouring effect) we would have expected ***kwiínáma** not **kwiináma**.

Recall that Ciyao is a "spreading" rather than a "shifting" language. This means that Express (H) outranks *(H,nonheads).In order to account for the data in (58), we would only need to rank *0H above Express (H). This means that realization of High tone in a HD will be sacrificed in order to avoid a Rising tone.

It is not the case, however, that Ciyao lacks rising tones on long vowels. For example, there are words like **ndaávi** ‘story’. Unlike Shambaa, where *MonoHD outranks Nonfinality PW (HD), in Ciyao, Nonfinality IP (HD) outranks *MonoHD. This means that in isolation, a word like **ndaávi** cannot expand its HD to the final vowel. When the domain fails to expand, a rising tone occurs in the optimal output. When **ndaávi** is located in medial position -- cf. **ndaaví jaangu** ‘my story’ -- the HD does expand and the rising tone disappears.

In order to explain the pronunciation **ndaávi**, we must (a) rule out a candidate like ***(ndáá)vi** -- this can be done by ranking the Align L submember of Basic Alignment above *0H so that one cannot expand a HD to the Left in order to avoid a violation of *0H; and (b) rule out a candidate like ***nda(a)vi** -- where there is no High tone on the surface. Notice that

given our discussion of (58), the ranking of *0H above Express (H) would predict that ***nda(a)vi** should be optimal.

What appears to be the case is simply this: while a High tone on a nonhead mora will be sacrificed in order to avoid a violation of *0H, a High tone on the head of the domain will not be. Phrased differently, if there is a choice between a HD with a Rising tone and a HD where no mora realizes High , then Ciyao prefers to have the Rising tone. In order to achieve an evaluation where **nda(á)vi** is optimal, we propose that Express (H) is actually a constraint family consisting of both Express (H) and Express (H,head). In other words, while there is a preference for all morae in a HD to be High-toned, there is also a separate (independently rankable) preference for the head of a HD to express the feature High. Now, if Express (H,head) outranks *0H, and if Nonfinality IP (HD) outranks *MonoHD, and if Align L is undominated, then **nda(á)vi** is the optimal output.

The ranking of *0H above the general Express (H) constraint means High tone on a nonhead will not be expressed if a Rising tone is thereby avoided -- thus **ndaaví jaangu** will be accounted for.

Let us turn now to evidence for *H0 in Ciyao. Consider the following infinitive forms of the verb:

(59) ku[víláanga ‘to call’

ku[váláanga ‘to count’

but:

ku[sápáángula ‘to take apart’

When the long vowel in a verb of the structure CVCVV... occurs in penultimate position, then this vowel is falling-toned. But when the long vowel is in a syllable before the penult, it is level High.

Odden (this volume) suggests that the falling tone in **ku[víláanga** and other words like it is the effect of being in IP-final position. As support for this, he cites the fact that when these words are phrase-medial, the long vowel assumes a level High shape: e.g. **chíínjikáláánje nyama** ‘I will fry the meat’. We believe that Odden is correct in assuming that there is some IP triggered principle that prefers Falling tones on IP-penult syllables. We do not explore this principle here, and will simply refer to it as IP-Fall.[7]

[7] We will cite just two other examples which are connected to the Ciyao data. Recall that in Emakhuwa (which belongs to the same subgroup of Bantu as Ciyao) *MonoHD dominates Align R. We have seen that Nonfinality IP (HD) dominates *MonoHD and thus prevents the domain from extending to an IP-final vowel. But in an example like **o-máala** ‘to be quiet’, we see that the HD does not extend to the second mora of the long penult syllable. When **o-máala** is medial in an IP, then the

In order to guarantee that *H0 in Ciyao does not affect IP-penult long vowels, we must rank Fall-IP over *H0. In environments where Fall-IP is not relevant, then *H0 must be satisfied. We do not want to satisfy *H0 by keeping the HD from extending onto the first mora of the long vowel: i.e., ***ku(sá)paangula** is incorrect. We can exclude this output by ranking *MonoHD above *H0. We must also rule out a candidate such as ***ku(sápa)angula**, where we do have a bimoraic domain but do not realize H on the final vowel of the domain. An undominated Express (H,head) ensures that this is not an optimal output. The only alternative is to extend the domain further to the right: **ku(sápáá)ngula**. This will be possible if *H0 dominates Align R.

There are other aspects to *H0 in Ciyao that would require treatment in a full study of the language. Specifically, Odden notes that *H0 affects only sequences inside a stem. This limitation on the role of *H0 is part of a more general issue: how precisely do we distinguish the "domain of application" of particular constraints. For example, a constraint against **xy** may in some languages be violated only when **x** and **y** are in the same word, whereas in another language the constraint may be violated even when **x** and **y** are in different words. The Ciyao data suggest that "stem" may be an applicational domain just like "Prosodic Word" or "Prosodic Phrase". We have more to say about the domain of application of constraints in our discussion of Shingazidja later in the paper.

The above examples of decontouring effects were fairly simple. Much more complex situations can be isolated. The reader is referred to Cassimjee (1997) for detailed discussion of a constraint she refers to as Plateau, where a sequence H0 is banned not on a single syllable, but rather across syllables (see also below for a much briefer discussion of Plateau in Isixhosa). Similar examples can be found, we believe, in Siswati (cf. Cassimjee and Kisseberth (1992)), Mijikenda (cf. Kisseberth 1984), and Chizigula (cf. Kisseberth 1992), but the papers just cited all present the data in an autosegmental, rule-based framework. To provide a treatment of these

---

extension of the domain does occur: **o-máála**... In order to explain **o-mála**, the proposed constraint (IP-Fall) requiring a Fall on the penult syllable of the IP must outrank *MonoHD. Setswana (see Creissels (this volume)) provides a second example related to Fall-IP; in Sestswana, the penult vowel of an IP is lengthened, and when this vowel is High-toned, it is realized as a falling tone.

It is of some interest that in the Malawian dialect of Ciyao that we have studied, the same data as in (59) occurs, but the falling tone in words like **ku[víláanga** remains even in medial position. Despite this complication, we do believe that Odden's suggestion that the motivation for the phenomenon in question **does** have to do with IP-final position (and that the extension of this constrait to medial position in the Malawian dialect may be the effect of "output-output" faithfulness -- i.e. the optimal phrase-medial output mirrors the optimal IP-final pronunciation).

more complex cases here would be inappropriate. We do, however, believe that these data suggest that constraints like *H0 and *0H may be bans on such sequences either in a single syllable or across syllables.

We have provided in this section a basic introduction to the ODT treatment of a wide range of Bantu tonal phenomena. In the remainder of the paper, we examine two tonal systems: that of Isixhosa (an Nguni language spoken in South Africa) and Shingazidja (a language closely related to Kiswahili, spoken on Ngazidja in the Comoros Islands). We show that while these two languages share certain general similarities (they are both shifting languages, they both have wide domains driven by Align X R, they both reveal that No Adjacent Edges plays an essential role), they do not -- on the surface -- appear to be particularly similar in their tonology. We provide an ODT analysis where the two languages differ only in their ranking of the same universal constraint system. Their superficial dissimilarity masks a deeper unity.

3.0. Isixhosa.

Our discussion of Isixhosa will concentrate on the verbal system (though the same general principles can be motivated on the basis of nominals as well). We consider just three verbal constructions here: the “long” present, the “short” present, and the perfective.

3.1. Long form of the present tense.

As in most Bantu languages, there are two principal types of verb stems in Isixhosa: (a) toneless verb stems and (b) High verb stems. The characteristic feature of the toneless type is that do not contribute a High tone to the input representation. The High verbs do. There are two types of subject prefix: toneless subject prefixes like **ndi- ‘**I’, **u**-‘you (sg.)’, **si**- ‘we’, and **ni**- ‘you (pl.)’, and subject prefixes that sponsor a High tone like **u**- ‘(s)he’, **ba**- ‘they’, and **zi**- ‘they [class 10]’. The long form of the present tense locates a toneless prefix **ya** between the subject prefix and the verb stem.

In (60) we illustrate toneless verb stems in the long form of the present with a toneless subject prefix. There are of course no High tones in these forms. (All examples will be cited as though the example constitutes a complete utterance. In particular, our transcriptions will reflect the automatic lengthening that affects the penultimate syllable of a word that stands in utterance-final position. We indicate a lengthened syllable by doubling the (vocalic) nucleus of that syllable.)

(60) ndiyacacisa ‘I am explaining’
ndiyaxoleela ‘I forgive’
ndiyachukumiisa ‘I am provoking’
siyalindeela ‘we are waiting for’
siyamoneela 'we are jealous'
niyashukumiisa 'you pl. are shaking'
niyakhohlakaleela 'you pl. are being cruel for'
niyaqonondiisa 'you pl. are making clear, emphasizing'

Since these examples have no High tone sponsors in underlying representation, DomCor (H) does not necessitate the appearance of a High Domain in the optimal output candidate. OT assumes a general constraint type *Structure which militates against any phonological structure that is not required in order to satisfy Faithfulness constraints or Phonological constraints. The *Structure constraint will reject, in the case of the items in (60), all candidate outputs where Gen has provided a HD-structure.

When the subject prefix sponsors a High tone, we find surface forms with a High tone, but **this High tone is not located on the subject prefix**:

(61) b<u>a</u>yacáciisa ‘they explain’
b<u>a</u>yamóneela ‘they are jealous’
b<u>a</u>yaxóleela ‘they forgive’
b<u>a</u>yachukúmiisa ‘they provoke’
b<u>a</u>yaqononóndiisa ‘they emphasize’

In these examples (all involving trisyllabic or longer stems), we see that the High tone appears on the antepenult syllable of the word rather than on the subject prefix. These data provide clear evidence that Isixhosa is a “shifting” rather than a “spreading” Bantu language (but see later for some qualification on this point) and that some form of the Align X R constraint is highly ranked. Let us begin the process of exploring how we can achieve the result that antepenult High tone is optimal in these forms.

The fact that Isixhosa is a shifting language establishes that *(H,nonheads) outranks Express (H), and that domains in Isixhosa are Right-headed. The fact that Isixhosa has widescope domains that extend rightwards over a number of morae indicates that Align X R outranks Align

R (the member of Basic Alignment that requires the Right edge of a HD to be aligned with the R edges of the H-sponsor that it "corresponds" to). From the data in (61), we cannot determine whether the High Domain is trying to align with the Prosodic Word or the Prosodic Phrase; examination of Isixhosa sentences reveals that High tones do not (in general) shift from one word to the next word. Thus we will assume that the Align PW R version of the constraint is ranked above Align R (and that the Align PP R version of the constraint is ranked below Align R and thus invisible in the language).

From the examples in (61), it is clear that there must be one or more constraints that in Ixixhosa outrank Align PW R and prevent the HD from extending all the way to the Right edge of the Prosodic Word. We suggest that one such constraint is:

(62) Nonfinality
The Right edge of a HD may not be aligned with the Right edge of a Prosodic Word.

If Nonfinality is ranked higher than Align PW R, then in the optimal outputs, a HD initiated by a High-toned subject prefix wll not be able to extend onto the final syllable of the Prosodic Word. All of the data in (61) are consistent with this prediction.

If we are correct in assuming that Nonfinality plays an active role in the grammar of Isixhosa, then we must determine whether there is any constraint that dominates Nonfinality. If Nonfinality were an undominated constraint, we would not be able to have High tone expressed on a final syllable. Nouns such as those in (63) and High-toned verbs such as those in (64) demonstrate that word-final High tones are possible in Isixhosa:

(63) isíhlaangú 'shoe'
amáceephé 'spoons'
úbooyá 'wool'
íkomaaní 'Queenstown'

(64) ndiyaatyá 'I am eating'
siyaafá 'we are dying'
niyaakhá 'you pl. are drawing (water)'

These examples all violate Nonfinality. They all involve forms where the High-sponsor is word-final. Clearly DomCor (H) and Incorporate (H-sponsor) -- i.e. the most essential Faithfulness constraints -- must outrank

Nonfinality. Faithfulness requires that a word-final sponsor be organized into a HD even if the consequence of so doing is to violate Nonfinality. Were DomCor (H) to outrank Nonfinality and not Incorporate(H-sponsor), then there would be a HD but it would avoid the final mora (=retraction of High). Thus in Isixhosa both DomCor (H) and Incorporate(H-sponsor) dominate Nonfinality since there is no retraction of the High tone off the word-final mora.

Let us summarize the dominance hierarchy so-far established:

(65) DomCor (H), Incorporate(H-sponsor), Align L -- **undominated**
*Structure-- **dominated** by DomCor (H) or Incorporate(H-sponsor)
Nonfinality -- **dominated** by DomCor (H) and Incorporate(H-sponsor)
Align PW R) -- **dominated** by Nonfinality
Align R -- **dominated** by Align PW R

The analysis developed so far incorrectly predicts the following domain structure as optimal: ***(bayacacii)sa**. The final constraint required to get the prefix H to the antepenult syllable is one that at the present point in time is the most speculative. We call it Avoid Prominence.

(66) Avoid Prominence
A prominent syllable may not be internal to a HD.

In Isixhosa, the penult syllable of a Prosodic Word in phrase-final position is lengthened and considered prominent.

The suggestion that HD's might avoid prominent syllables at first glance seems to run counter to the claim that has sometimes been made in Bantu tone studies that High tone is "attracted" to the stress position. In languages like Xitsonga and Mijikenda (see above), as well as Chizigula (see Kisseberth (1992)), one does indeed find HD's extending to tbe stressed penultimate syllable. There is not, however, clear evidence that the HD is directly being aligned with the stressed syllable. It is possible to take the position that the HD is trying to align with the Right edge of the word/phrase and the fact that it ends up aligned with the penult is due to the ranking of Nonfinality above Align X R. In this view, alignment with the penult is a by-product of constraint interaction rather than the direct alignment of a HD with the penult. It remains to be seen then whether there is any real evidence that HD's align directly with the edge of a stressed syllable.

If it should turn out that there is evidence that HD's **do** align directly with prominent syllables (such as the penult in Bantu languages), would it not be contradictory to postulate Avoid Prominence as a universal

constraint? Contradictory constraints are not, in OT, particularly alarming in and of themselves. They represent part of the tension of phonology. The question is really whether Avoid Prominence can be motivated, not whether HD's may align with prominent syllables. Our interpretation of Avoid Prominence is that it reflects the fact that less prominent syllables are universally more prone to assimilation than are prominent syllables. On this view, a prominent syllable may be in a F-domain for the sake of Faithfulness; but in the absence of Faithfulness considerations, a prominent syllable will be excluded from F-domains. Our proposed Avoid Prominence is then just this very general principle restricted to tone. As such, it appears to us a perfectly viable constraint.

Let us assume this viability of Avoid Prominence as a constraint and examine how it must be ranked in Isixhosa in order to achieve the correct outputs in (61). Clearly, Avoid Prominence must dominate Align PW R; otherwise we would have wider domains even if it meant including the prominent syllable in the domain. It is not necessary to rank Nonfinality with respect to Avoid Prominence. (In fact, given that Avoid Prominence dominates Align PW R, there is no need – given the data in (61) -- to invoke Nonfinality at all and no need to rank it above Align PW R. Later data will however motivate the active role of Nonfinality and the need to rank it above Align PW R.)

(67) DomCor (H), Incorporate(H-sponsor), Align L -- **undominated**
Avoid Prominence [we will see below that it is **dominated** by DomCor (H) and Incorporate (H-sponsor)]
*Struc -- **dominated** by DomCor (H) or Incorporate(H-sponsor)
Nonfinality -- **dominated** by DomCor (H) and Incorporate(H-sponsor)
Align PW R -- **dominated** by [Nonfinality – see below], Avoid Prominence
Align R -- **dominated** by Align PW R

The following tableau illustrates how the appropriate domain structure for the forms in (61) are selected as optimal by the above constraint hierarchy. We have omitted various candidates. Specifically, we have not illustrated cases where additional HD's occur beyond the one motivated by the underlying High tone. We have presented only one of the possible candidates violating Incorporate (H-sponsor) while satsifying DomCor (H). We have also ignored the fact that, due to Syllable Alignment, HD's violate Align L to a minor extent. (When there is a HD, we show that HD leading to one violation of *Structure. We ignore all other violations of *Structure.) We have omitted the Align R constraint which is too lowly ranked to play a role in the evaluation.

(68)

Candidates	Dom Cor	Incor	Align L	*Stru	Non-final	Avoid Prom	Align PW R
a. (bayacaciisa)				*	!(*)	!(*)	
b.(bayacacii)sa				*		!*	sa
c. ∅(bayaca)ciisa				*			cii sa
d. (baya)caciisa				*			ca cii !sa
e. (ba)yacaciisa				*			ya ca !cii sa
f. ba(yaca)ciisa		*!	ba	*			ciisa
g. bayacaciisa	*(!)	*(!)					

So far in our discussion DomCor (H), Incorporate (H-sponsor), and Align L are undominated; and *Structure is dominated by either DomCor (H) or Incorporate (H-sponsor). Thus candidates like **bayacaciisa** (which violates DomCor (H) and Incorporate (H-sponsor) and **ba(yaca)ciisa** (which violates Incorporate (H-sponsor) are immediately rejected as nonoptimal. Candidates (68a-e) are equal with respect to DomCor (H), Incorporate (H-sponsor), Align L, and *Structure. They all satisfy the first three constraints and all violate *Structure to the same extent.(68a), where all the syllables in the word following **ba** are gathered together into a HD, violates both Nonfinality and Avoid Prominence. Since these constraints are more highly ranked than the remaining constraints, the candidate **(bayacaciisa)** is evaluated as nonoptimal. (Given that there is no necessary ranking between Nonfinality and Avoid Prominence, either constraint can be regarded as providing the fatal mark to **(bayacaciisa)**.)

(68b-e) all satisfy Nonfinality. (68b), where the HD extends through the penult syllable, violates Avoid Prominence, whereas (68c-e) do not. Since Avoid Prominence is ranked above Align PW R and Align R, this violation is fatal for **(bayacacii)sa**. Candidates (68c-e) all satisfy both Nonfinality and Avoid Prominence. All three of them also violate Align PW R. Nevertheless they differ in the extent to which they violate Align PW R. The Right edge of the Prosodic Word in the optimal representation (68c) is misaligned with the HD by virtue of the two syllables **cii sa**.

However, the remaining two candidates are misaligned by three (**ca cii sa**) or four (**ya ca cii sa**) syllables. Consequently, candidates (68d-e) fail to be optimal. It is, of course, totally irrelevant that (68e) is the only candidate to satisfy the lowest-ranked constraint, Align R. Since Align PW R prefers **(bayaca)ciisa** to ***(ba)yacaciisa**, it is immaterial whether a lower ranked constraint is violated by the former and satisfied by the latter.

We have now postulated a set of constraints that will evaluate as optimal an output candidate where a HD extends from the sponsor through the antepenult. The fact that a High tone is heard only on the final mora of the domain follows of course from the fact that domains are Right-headed and *(H,nonheads) dominates Express (H). Notice that if Express (H) were ranked above Align PW R, then it would be better to have domains where all the morae are specified with a H tone than to have widescope domains. In other words, Express (H) would be better satisfied by ***(bá)yacaciisa** than by the correct **(bayacá)ciisa**. Thus it is necessary that Align PW R be ranked higher than Express (H).

We review again the constraint system we have motivated.

(69) DomCor (H), Incorporate(H-sponsor), Align L, *(H,nonhead) -- **undominated**
Avoid Prominence [we will see below that it is **dominated** by DomCor (H) and Incorporate (H-sponsor)]
*Struc -- **dominated** by DomCor (H) or Incorporate (H-sponsor)
Nonfinality -- **dominated** by DomCor (H) and Incorporate (H-sponsor)
Align PW R -- **dominated** by [Nonfinality], Avoid Prominence
Align R -- **dominated** by Align PW R
Express (H) -- **dominated** by Align PW R and *(H,non-head)

All of our example so far have involved trisyllabic or longer verb stems. In (70) we illustrate bisyllabic toneless verb stems.

(70) ndiyafiika, bayáfiika (arrive)
ndiyabaala, bayábaala (count)
ndiyahlaaba, bayáhlaaba (stab)
ndiyaliima, bayáliima (cultivate)

These bisyllabic verb stems require no modification in the constraint system sketched above. The first and second person forms simply lack an underlying High tone and thus there is nothing that forces a violation of *Structure. When there is a High-toned subject prefix, the H tone surfaces on the element **ya**. We see that both syllables of the verb stem are excluded

from the HD initiated by the subject prefix due to the effect of Avoid Prominence.

We have not yet examined monosyllabic toneless verb stems.

(71) ndiyaalwa, b<u>a</u>yáálwa (fight)
ndiyaawa, b<u>a</u>yáálwa (fall)
ndiyaatsho, b<u>a</u>yáátsho (declare so)

These data require some discussion. Notice that in the third person case, the HD extends from the subject prefix to the penult syllable, in violation of Avoid Prominence. There must be a constraint therefore that is more highly ranked than Avoid Prominence that will force a wider domain. The constraint cannot be Align PW R, since we know that Avoid Prominence dominates Align PW R. There is only one other constraint that we have proposed that requires wide domains in order to be satisfied: *MonoHD. If *MonoHD outranks Avoid Prominence, then a HD will violate the latter constraint in order to have sufficient syllables in it to avoid violating *MonoHD.

Not only do these data show that *MonoHD dominates Avoid Prominence, they also show that there is a necessity for ranking Nonfinality above Align PW R. Suppose that Align PW R were above Nonfinality, then we would expect ***(b<u>a</u>yaalwa**) rather than the correct **(b<u>a</u>yaa)lwa**. In our discussion of longer stems, we did not need to rank Nonfinality because Avoid Prominence was sufficient to guarantee that a HD does not extend beyond the penult through the final syllable. But in the case of the data in (71), there must be a violation of Avoid Prominence in order to satisfy *MonoHD, therefore Avoid Prominence plays no role in explaining why the final syllable is outside the HD.

At this juncture, we do not have data that will indicate whether *MonoHD dominates Nonfinality or vice versa. In our discussion of High verb stems below, we will see that *MonoHD is dominated by Nonfinality.

The following tableau illustrates the selection of the optimal candidate for examples such as **b<u>a</u>yáálwa**. We illustrate only with reference to the domain structure and not with respect to the expression of the tone, and we ignore all candidates ruled out by DomCor (H), Incorporate (H-sponsor), Align L, and *Structure (this in the interest of conserving space).

(72)

Candidates	Nonfinality	*MonoHD	Avoid Prom	Align PW R
(b<u>a</u>yaalwa)	*!			
(b<u>a</u>)yaalwa		*!		yaa lwa

∅(b<u>a</u>yaa)lwa			*	lwa

We should mention one point concerning the expression constraints. *MonoHD is a widescope-driving constraint. It must outrank Express (H) since it is better to have an extended domain than to fully satisfy Express (H).We show the constraint hierarchy as it now stands in (73):

(73) DomCor (H), Incorporate (H-sponsor), Align L, Syllable Alignment, *(H,nonhead) -- **undominated**
*Struc -- **dominated** by DomCor(H) or Incorporate (H-sponsor)
Noinfinality -- **dominated** by DomCor (H)and Incorporate (H-sponsor)
*MonoHD -- [evidence below shows that *MonoHD is dominated by Nonfinality]
Avoid Prominence -- **dominated** by Syllable Alignment, *MonoHD
Align PW R -- **dominated** by Nonfinality, Avoid Prominence
Align R -- **dominated** by Align PW R
Express (H) -- **dominated** by *MonoHD, Align PW R and *(H,non-head)

The analysis developed so far accounts for all the data involving the long form of the present tense where the verb stem is toneless (and there is no object prefix -- see below). At this point we need to point out that there is an alternative story that one might tell which, while broadly similar, would differ in a crucial way. In the analysis developed above, a HD extends from a subject prefix to the antepenult (or penult in the case of shorter verb stems) of the word. However, only the last vowel in the domain actually bears the High tone in the optimal output. An alternative to this view would involve claiming that **the High-toned syllable is in fact the only syllable in the domain**. Let us look at how such outputs could be evaluated as optimal.

If the correct domain structure for **b<u>a</u>yacáciisa** is **b<u>a</u>ya(cá)ciisa** rather than **(b<u>a</u>yacá)ciisa**, then the optimal output is one that violates Incorporate (H-sponsor), since the subject prefix vowel is not in the domain. The question then is: what could be more important than Incorporate (H-sponsor)? The answer is clear: perfect satisfaction of Express (H) while at the same time having no violations of *(H, nonhead). By violating Incorporate (H-sponsor), the candidate **b<u>a</u>ya(cá)ciisa** succeeds in satisfying Express (H) perfectly as well as Align PW R, without having a High nonhead. But we must ask whether it is possible to derive all the data with

a constraint ranking where *(H,nonhead) is unviolated and Express (H) dominates Incorporate (H)? The constraint Nonfinality poses a problem.

We noted earlier that there are words with a final H-sponsor and this sponsor surfaces as High (i.e. is in a HD, since a segment can be High-toned only if in a HD) -- e.g.**ndiyaatyá** (see below for discussion of High verb stems). In order to have a HD on the last vowel, it is necessary that DomCor (H) outrank Nonfinality so that there will necessarily be a domain, and that Incorporate (H-sponsor) outrank Nonfinality so that the domain include the sponsor (i.e. so that the H does not "retract" back to the preceding syllable). Thus we have the constraint ranking: Incorporate (H-sponsor) > Nonfinality. But if Express (H) outranks Incorporate (H-sponsor), and if Incorporate (H-sponsor) outranks Nonfinality, then it follows (by the transitivity of constraint rankings) that both Express (H) and Incorporate (H-sponsor) should dominate all those constraints that Nonfinality dominates. In particular, Express (H) and Incorporate (H-sponsor) must outrank Align PW R! But this is disastrous. If Express (H) is more important than extending the domain to the R edge of the word, and if Incorporate (H) must be satisfied, and if only one syllable in a domain can be High tone (due to the fact that *(H,non-head) outranks Express (H)), then the optimal output would be one where the High tone surfaces on the sponsor. But this is entirely wrong.

We have shown that the constraints cannot in fact be ranked so as to get **baya(cá)ciisa** to be optimal rather than **(bayacá)ciisa**. Independently of the problem of ranking the constraints so as to achieve the correct results, we will see below further evidence that Isixhosa indeed has HD's where Express (H) is violated by all but the last mora in the domain. Thus we will continue to assume the correctness of candidates such as **(bayacá)ciisa**.

Let us now turn our attention to the High-toned verb stems. We must begin by noting that in Isixhosa, as in most if not all Bantu languages, the surface tonal shape of a High verb stem can be analyzed in terms of a single High tone specification located on the first mora of the stem. In other words, there are no lexical contrasts concerning hows many H-specifications the stem has or where the H-specification is located. As a consequence, in rule-based autosegmental analyses, High-toned verb stems have been viewed as lexically having a "floating" High tone. This sort of analysis then required the postulation of a rule of tone association which would locate the High tone on the first mora of the stem. Spreading and delinking rules would then account for the overt tonal shape.

Within ODT there are a variety of ways in which one might attempt to get at the predictability of the location of the High tone in the High verb stems in Isixhosa and other Bantu languages. We will not address this issue here; instead, we will assume inputs where the first mora of the High verb stems is specified as High and no other mora is (at least in the verb tense under discussion). We make this assumption in anticipation of the fact that

the first mora of a High verb stem does not behave differently from any other High sponsor in Isixhosa.

Quadrisyllabic or longer High verbs with a toneless subject prefix are shown in (74):

(74) niyabonísiisa (show clearly)
siyaphulápuula (listen)
siyasebénzeela (work for)
niyanyinyithékiisa (make slippery)
siyabonakáliisa (make visible)

Notice that the H tone located in the input on the first stem mora surfaces, as expected, on the antepenult syllable. The analysis so far developed obviously predicts this, and no tableau should be necessary.

Trisyllabic verb stems are more interesting. Consider the following data.

(75) ndiyabuláála (kill)
ndiyaqwebééla (accumulate)
siyazimééla (hide)
siyafinyééza (shorten)
ndiyasebéénza (work)
ndiyafumáána (get)
ndiyabonііsa (show)

Notice that in these examples, the H tone does not appear on the antepenult syllable but rather the penultimate syllable. The explanation for this phenomenon is simply the fact that *MonoHD dominates Avoiid Prominence. If the prominent syllable were excluded from the HD, the HD would consist of just the first mora of the stem, in violation of *MonoHD.

The following tableau illustrates.

(76)

Candidates	Nonfinality	*MonoHD	Avoid Prom	Align PW R
ndiya(sebeenza)	*!			
∅ ndiya(sebee)nza			*	nza
ndiya(se)beenza		*!		bee nza

No discussion is required.

Bisyllabic H stems with a toneless subject prefix are shown in (77):

(77) niyab<u>é</u>éka (place)
niyam<u>é</u>éma (invite)
ndiyaf<u>ú</u>únga (swear an oath)
siyab<u>ó</u>óna (see)
niyas<u>ú</u>úla (wipe)

These data provide evidence that Nonfinality must outrank *MonoHD. The HD initiated by the verb stem does not extend to the final syllable of the bisyllabic verb stem. *MonoHD would demand that this extension occur, but given a more highly ranked Nonfinality constraint, *MonoHD must be violated in order for Nonfinality to be satisfied. The following tableau illustrates.

(78)

Candidates	Nonfinality	*MonoHD	Avoid Prom	Align PW R
niya(s<u>u</u>ula)	*!			
∅niya(s<u>u</u>u)la		*	*	la

Notice that the optimal candidate violates three of the four constraints, and the non-optimal candidate violates only one constraint. However, the number of violations does not matter. The only important issue is which of the candidates best satisfies the most highly ranked of these constraints.

Avoid Prominence in (77) is violated **in order to be faithful to the High tone in the input**. There would be unfaithful ways in which Avoid Prominence could be satisfied. For example, one could simply fail to have any domain structure: ***niyas<u>u</u>ula.** The fact that this is a nonoptimal output shows that DomCor (H) must outrank Avoid Prominence. Another way of satisfying Avoid Prominence would be to "retract" the High Domain away from the penult: ***ni(ya)s<u>u</u>ula**. The fact that this is a nonoptimal form can be guaranteed by ranking either Align L or Incorporate (H-sponsor) above Avoid Prominence.

Let us review our constraint system once again:

(79) DomCor (H), Incorporate (H-sponsor), Align L, Syllable Alignment, *(H,nonhead) -- **undominated**
*Struc -- **dominated** by DomCor (H) or Incorporate (H-sponsor)

Nonfinality -- **dominated** by DomCor (H)and Incorporate (H-sponsor)
*MonoHD -- **dominated** by Nonfinality
Avoid Prominence -- **dominated** by Syllable Alignment, DomCor (H), Align L or Incorporate (H-sponsor), *MonoHD
Align PW R -- **dominated** by Nonfinality, Avoid Prominence
Align R -- **dominated** by Align Word R
Express (H) -- **dominated** by *MonoHD, Align PW R and *(H,non-head)

Next consider monosyllabic High verb stems with a toneless subject prefix:

(80) niyaatyá (eat)
siyaafá (die)
ndiyaaphá (give)
siyaakhá (draw water)

These data were mentioned earlier: they show that DomCor (H) and Incorporate (H-sponsor) must dominate Nonfinality. In other words, faithfulness considerations require that a word-final sponsor be organized into a HD even though this means that Nonfinality will be violated.

(81)

Candidates	DomCor (H)	Incorporate (H-sponsor)	Nonfinality	Align PW R
ndiyaafa	*(!)	*(!)		*
ndi(yaa)fa		*!		
∅ndiyaa(fa)			*	

Let us now turn our attention to the case of a High-toned subject prefix used in conjunction with a High-toned verb stem in the long form of the present tense. In (82) we give trisyllabic or longer verb stems, in (83) bisyllabic stems, and in (84) monosyllabic stems.

(82) báyafumáána (get)
báyasebéénza (work)
báyabonііsa (show)

	báyabalééka	(run)
	báyabonísiisa	(show clearly)
	báyanyinyithékiisa	(make slippery)

(83)	báyabóóna	(see)
	báyabúúza	(ask)
	báyasúúla	(wipe)
	báyamééma	(invite)

(84)	báyaatyá	(eat)
	báyaafá	(die)
	báyaaphá	(give)
	báyaakhá	(draw water)

Notice that in each case there is a High tone realized on the subject prefix, and the verb stem also has a High tone in the same position as it would be if there were a toneless subject prefix instead. In other words, **the subject prefix H tone does not affect the location of the stem H tone**.

These examples represent the first case we have encountered where there are two High tone sponsors (the subject prefix and the first stem mora). We have already determined how the constraint system will establish the domain of the second H-sponsor. But what about the first H-sponsor? Align PW R, as we formulated it, predicts that the domain initiated by the prefix should try to align with the R edge of the Prosodic Word. *MonoHD predicts that the domain should not consist just of the prefix. We thus have two different constraints which would work against the prefix constituting a HD by itself. But in fact the subject prefix **does** constitute the entire domain in the optimal output.

An undominated DomCor (H) predicts that that there will not be an output with just a single domain, e.g.***(bayaboni)siisa**, since DomCor (H) demands a (distinct) HD in the output corresponding to each High specification in the input. (We rule out an output like ***(baya (bonii)sa** on the basis of a constraint *Overlapping which militates against overlapping domains.) If there are necessarily two HD's in the case of third person subject prefixes co-occurring with High verb stems, and if overlapping domain structure is not an option, then we might reasonably expect

***(baya)(bonii)sa** as the optimal output, since this satisfies *MonoHD as well as having both domains aligned as far to the Right as possible in the Prosodic Word. But ***bayáboníísa** is incorrect. There must be a constraint that outranks *MonoHD and compels a "small" domain in violation of *MonoHD.

Notice that what is happening here is that the HD triggered by the subject prefix fails to extend onto a syllable that is itself followed by a HD. Clearly the constraint No Adjacent Edges (see 2.4 above) is at work here.

(85) No Adjacent Edges [=NAE]
*) (

As discussed earlier, No Adjacent Edges is actually an ODT implementation of the notion Obligatory Contour Principle [=OCP]. The idea behind the OCP is that adjacent High tones (at some level of representation) are avoided. If two HD's share an edge, then we have a situation where the High tones in these domains may be realized on adjacent morae. By ranking No Adjacent Edges above *MonoHD, it will be better to avoid adjacent domains than to satisfy *MonoHD. The following tableau demonstrates the point.

(86)

Candidates	Non-finality	NAE	*MonoHD	Avoid Prom	Align PW R
(baya)(sebeenza)	*!	*			
(baya)(sebee)nza		*!		*	nza
(baya)(se)beenza		*!	*		bee nza
(ba)ya(sebeenza)	*!		*		
∅(ba)ya(sebee)nza			*	*	nza
(ba)ya(se)beenza			**!		bee nza

The constraint system as it now stands:

(87) DomCor (H), Incorporate (H-sponsor), Align L, Syllable Alignment, *(H,nonhead), *Overlapping -- **undominated**
*Struc -- **dominated** by DomCor (H) or Incorporate (H-sponsor)

Nonfinality -- **dominated** by DomCor (H), Incorporate (H-sponsor)
No Adjacent Edges --**dominated** by *Overlapping
*MonoHD -- **dominated** by Nonfinality, No Adjacent Edges
Avoid Prominence -- **dominated** by Syllable Alignment, DomCor (H), Align L/Incorporate (H-sponsor), *MonoHD
Align PW R -- **dominated** by No Adjacent Edges, Nonfinality, Avoid Prominence
Align R -- **dominated** by Align PW R
Express (H) -- **dominated** by Align PW R, *MonoHD and *(H,non-head)

.

At this juncture let us go back to an issue raised at the end of our discussion of toneless verb stems in the long present. We discussed there the possibility of claiming that the HD consists just of the syllable that expresses a High tone. This sort of analysis would necessitate Express (H) being ranked above Incorporate (H-sponsor), and we argued that this ranking cannot be maintained (given transitivity of ranking). But suppose that there were some analysis whereby one could claim that surface structure domains were in fact limited to the syllables that manifest the High tone (call this the WYSIWYG analysis -- i.e. the "what you see is what you get" analysis). Let us consider what such an analysis would have to say about the data from High verb stems -- specifically, the data involving a High-toned subject prefix.

WYSIWYG would have to explain why the subject prefix High does not surface on the syllable **ya** in a form like **bá<u>a</u>nya<u>i</u>nyithékiisa**. Our analysis invokes No Adjacent Edges to account for this phenomenon. In WYSIWYG, the domain in the verb would be around the syllable **the**. Consequently, the syllable **ya** would not be next to another domain. No Adjacent Edges would not be relevant. So what constraint must the WYSIWYG analysis invoke? The constraint would have to appeal to the fact that the stem-initial syllable **nyi** sponsors a High tone in the input. Thus the following constraint would seem to be involved:

(88) A H-mora in the output may not be followed by a mora in the output whose correspondent in the input is High-toned.

This constraint would replace the No Adjacent Edges constraint that we invoked. Notice that this constraint introduces reference to the input structure into this member of the OCP constraint family. Our analysis, through domain structure, does not necessitate reference to the input. Whether this result of our analysis is decisive in its support depends of

course on the ultimate determination of the answer to the question: which constraints have access to the input and how?

But WYSIWYG is not yet home free even assuming (88). It must also explain why the High tone does not surface on say the second **nyi** syllable in **bá<u>a</u>nyi<u>i</u>nyithékiisa**. Our analysis explained this in terms of *Overlapping. But that analysis is not available to WYSIWYG. To effect the right results, WYSIWYG would have to propose something like the following:

(89) given an input **a** (which is a H-sponsor) located to the Left of **b** (which is a H- sponsor), an output mora bearing a High tone corresponding to the High tone on **a** may not have **b** as its input correspondent nor may it have any mora located to the Right of **b** as its input correspondent

(89) would prevent the High tone of the subject prefix from appearing on the first vowel of the verb stem (since its underlying correspondent is H-toned) or any vowel to the Right of the initial vowel of the verb stem (since these vowels have correspondents to the Right of the initial vowel of the verb stem). (89) depends on a theory where correspondence of features can be invoked independently of segments (contra the admittedly tentative McCarthy and Prince (1995) view of Correspondence Theory). But even so, it seems to be making a strikingly wrong prediction. For example, it predicts that if Isixhosa had an epenthetic vowel (which has no input correspondent) that appeared in the verb stem before the antepenult High tone, then the subject prefix H could indeed appear on it since there would be no violation of (89), **which refers only to a mora that has a correspondent in the input**! Epenthetic vowels are not characteristic of Bantu languages, thus we cannot point to evidence contradicting this prediction – but we think that the prediction is an absurd one.

WYSIWYG appears to us to end in a quagmire while offering no advantages to the analysis that we have developed. We will thus leave it to others who might find it attractive to see whether it can leap out of the quagmire and offer insights not otherwise available. We will simply note that the facts that (89) is trying to explain is, in our treatment, attributed to *Overlapping. The ODT account of Isixhosa based on domains where a number of elements in the domain may fail to realize the feature H is, we believe, a relatively elegant one where there are various faithfulness constraints that refer to the input structure and other constraints (such as No Adjacent Edges, *MonoHD, Nonfinality, Avoid Prominence, Align PW R, *H,non-heads) which do not. We shall assume this analysis throughout the remainder of this study.

We have so far surveyed the tonology of the long form of the present verb in fairly exhaustive detail, except that we have not yet looked at the

effects of placing an object prefix in front of the verb stem. We turn to this matter now. There is immediate evidence that object prefixes must sponsor a High tone in Isixhosa. Forms where both the subject prefix and the verb stem are toneless establish this point. Consider the examples in (90):

(90) ndiyay<u>i</u>sóndeela (approach it)
ndiyak<u>u</u>xóleela (forgive you)
siyaz<u>i</u>lúngiisa (fix them)
niyaw<u>a</u>báliisa (narrate them)
niyaw<u>a</u>shukúmiisa (shake them)
niyaw<u>a</u>namathéliisa (cement them)

First, we note that there is a High tone in these forms even though the subject prefixes are all toneless and the verb stems are all toneless. The object prefix must be the source of this High tone. Second, we see that the H tone sponsored by the OP "shifts" according to the very same principles as the H tone sponsored by a subject prefix. When the stem is sufficiently long, as in the above data, the H from the OP surfaces on the antepenult syllable. All these data follow directly from the constraint set we have developed above.

Bisyllabic toneless verb stems are examined next.

(91) ndiyay<u>i</u>phééka (cook it)
niyaw<u>a</u>báála (count them)
siyab<u>a</u>káába (kick them)
siyaz<u>i</u>bíila (boil them)

From these data, we see that again the object prefix contributes a H tone to the representation. Its HD extends to the initial syllable of the bisyllabic stem, in violation of Avoid Prominence. It is of course the constraint *MonoHD that explains this violation. No tableau should be necessary.

Let us now conclude our discussion of the effects of placing a High object prefix in front of a toneless verb stem. When the object prefix is located in front of a **monosyllabic** verb stem, then Nonfinality prevents the extension of the HD to the final syllable.

(92) siyay<u>í</u>ílwa (fight it)

ndiyay<u>í</u>ísa (take it to)
ndiyaz<u>í</u>ísa (take them to)

No tableaux should be necessary.

In our discussion of object prefixes, we have so far looked only at toneless verb stems and only at cases where the subject prefix is toneless. Now let us expand the discussion to include High-toned subject prefixes.

(93) b<u>á</u>yaw<u>á</u>álwa (fight them)
b<u>á</u>yaw<u>a</u>báála (count them)
b<u>á</u>yaw<u>a</u>báliisa (narrtate them)
b<u>á</u>yaw<u>a</u>shukúmiisa (shake them)
b<u>á</u>yaw<u>a</u>namathéliisa (cement them)

These data show nothing more than that No Adjacent Edges serves to provide a buffer between the HD initiated by the subject prefix and the HD initiated by the object prefix. In this respect, No Adjacent Edges has exactly the same effects as we saw in the case of High subject prefixes and High verb stems. No tableau is necessary.

At this juncture we turn to High-toned verb stems. We find that (generally) the H-toned object prefix and the H-toned verb stem result in the surfacing of a single H tone at the end of the domain of the stem H.

(94) niyaw<u>a</u>b<u>é</u>éka (place them)
niyab<u>a</u>m<u>é</u>éma (invite them)
siyay<u>i</u>b<u>ó</u>óna (see it)
siyaw<u>a</u>th<u>é</u>énga (buy them)

niyaw<u>a</u>b<u>o</u>níisa (show them)
siyay<u>i</u>g<u>a</u>wúúla (chop it)
siyaw<u>a</u>z<u>i</u>mééla (hide them)

niyay<u>i</u>b<u>o</u>nísiisa (see it clearly)
siyab<u>a</u>s<u>e</u>bénziisa (make them work)
niyab<u>a</u>ph<u>u</u>láphuula (listen to them)
siyay<u>i</u>ph<u>a</u>kámiisa (lift it up)

On the basis of just this much data, there are two possible HD structures that would yield the above phonetic realization pattern: **siyay<u>i</u>(p<u>a</u>ka)miisa** or **siya(y<u>i</u>p<u>a</u>ka)miisa**. Both candidates have a single domain and thus violate DomCor (H) once; the former leaves the object prefix H-sponsor outside the domain, thus violating Incorporate (H-sponsor) but not violating Uniqueness (H-sponsor); the latter places the object prefix H-sponsor inside the domain, thus satisfying Incorporate (H-sponsor) but violating Uniqueness (H-sponsor). We shall see below that the correct output structure is **siya(y<u>i</u>p<u>a</u>ka)miisa**.

Given the input **siyay<u>i</u>p<u>a</u>kamiisa**, the following outputs must be evaluated:

(95) (a) siya(y<u>i</u>p<u>a</u>ka)miisa -- the optimal output (ignoring the issue of expression)

(b) siyay<u>i</u>(p<u>a</u>ka)miisa

(c) siya(y<u>i</u>)p<u>a</u>kamiisa

(d) siya(y<u>i</u>)(p<u>a</u>ka)miisa

(e) siya(y<u>i</u>)p<u>a</u>(ka)miisa

(f) siya(y<u>i</u>)p<u>a</u>(kamii)sa

(g) si(ya)y<u>i</u>(p<u>a</u>ka)miisa

(95d) represents the output that is most faithful and accords best with the extension of HD's to the right. So why is (95d) not optimal? The answer seems to be that (95d) violates the OCP. We have argued that No Adjacent Edges is a form of the OCP and that it is active in Isixhosa. Since (95d) violates No Adjacent Edges, it may be this constraint that is important in ruling out (95d). However, we should note that No Adjacent Edges is not the only member of the OCP-constraint family. Recall from our discussion of Emakhuwa that there are languages which violate No Adjacent Edges but at the same time disallow adjacent H-sponsors to be organized into adjacent HD's. We thus suggested that No Adjacent Sponsors must be another member of the OCP-constraint family. No Adjacent Sponsors is also violated by (95d). We cannot therefore be sure which OCP constraint is at work here. For convenience, we will assume that it is the more general constraint No Adjacent Edges that is at work.

In order to rule out (95d), No Adjacent Edges must dominate certain aspects of the Faithfulness constraints. Notice that in the optimal output, (95a), there is only one HD, not two. Clearly, then, No Adjacent Edges must outrank DomCor (H). It is better to fail to have a domain corresponding to each sponsor than to have a violation of No Adjacent Edges. Notice, however, that the candidates (95e-g) have two HD's and

therefore do not violate DomCor (H), and they also do not violate No Adjacent Edges. So there must be some highly-ranked constraint that they violate that (95a) does not. The relevant constraint seems to be Incorporate (H-sponsor), since all these candidates fail to locate one of the sponsors in a HD. If Incorporate (H-sponsor) is undominated in Isixhosa, then we eliminate (95e-g) from consideration. Now notice that while (95b) and (95c) both have one HD like the optimal (95a), and consequently do not violate No Adjacent Edges, they do violate Incorporate (H-sponsor) and are ruled out on these grounds just like (95e-g). The optimal candidate does violate Uniqueness (H-sponsor) while the other candidates do not; this must follow from the fact that Incorporate (H-sponsor) dominates Uniqueness (H-sponsor).

These examples thus establish that No Adjacent Edges and Incorporate (H-sponsor) are undominated, and that No Adjacent Edges dominates DomCor (H), and that Incorporate (H-sponsor) dominates Uniqueness (H-sponsor).

There is one aspect of the data in (95) that merits discussion. Consider the example **niyaw<u>a</u>b<u>o</u>níísa**. Notice that when there is no object prefix, **niyab<u>o</u>níísa**, we invoke *MonoHD to explain why the HD structure is **niya(b<u>o</u>nii)sa** rather than ***niya(b<u>o</u>)niisa**. But when there is an object prefix, this object prefix is going to be fused into the same domain as the initial stem syllable. So, now, why is ***niya(w<u>a</u>b<u>o</u>)niisa** less optimal than **niya(w<u>a</u>b<u>o</u>nii)sa**? Both of these candidates satisfy *MonoHD, so Avoid Prominence should prefer ***niya(w<u>a</u>b<u>o</u>)niisa** over **niya(w<u>a</u>b<u>o</u>nii)sa**! We suspect that the proper solution to this problem involves a kind of faithfulness holding between the "simple" form of the verb stem (i.e. without object prefix attached) and the "derived" form of the verb stem (i.e. with object prefix attached). Such output-output constraints have been discussed in a number of places over the past few years (cf. Benua (1995), Kenstowicz (1995), Kraska-Szlenk (1995), McCarthy and Prince 1995). We do not attempt to develop this point of view fully here.

Monosyllabic High verb stems, however, pose a complication.

(96) niyaw<u>á</u>ty<u>a</u> (eat them)
siyab<u>á</u>ph<u>a</u> (give them)

We would predict the HD-structure: **niya(w<u>a</u>a)(ty<u>a</u>)** -- notice that the undominated Syllable Alignment will prevent **niya(wa)a(ty<u>a</u>)** -- were it not for No Adjacent Edges. But given that No Adjacent Edges dominate DomCor (H), and Incorporate (H-sponsor) dominates Uniqueness, we predict fusion of the object prefix and the verb stem into a single domain. But if this were to happen, we would have the incorrect output

*__niyawaatyá__. It seems apparent that Nonfinality must play some role in accounting for the output here. But how exactly?

Recall that given an input **aa#**, and the three output candidates in (97),

(97) (a) a(a)#
(b) (a)a#
(c) aa#

we want to select (97a) as optimal in Isixhosa. The ranking of Incorporate (H-sponsor) over Nonfinality guarantees this result. (The ranking of DomCor (H) over Nonfinality could also serve to guarantee (97a) as optimal over (97c), but does not guarantee that (97a) is preferred to (97b).)

But given an input **aa#** and the output candidates in (98),

(98) (a) (a)a#
(b) (aa)#
(c) a(a)#

we need Nonfinality to be more highly ranked than DomCor (H) and Incorporate (H-sponsor) so that (98a) -- which does not violate Nonfinality but does violate both DomCor (H) and Incorporate (H-sponsor) -- can be more highly valued than (98b), which just violates DomCor (H) once, and (98c), which violates both DomCor (H) and Incorporate (H-sponsor) once.

So we have a major dilemma. Nonfinality must be ranked above Incorporate (H-sponsor) in order to explain the selection of (a)a# as optimal, but it must be ranked below Incorporate (H-sponsor) to explain the optimality of a(a)#. A way out of this dilemma would involve exploding Nonfinality into two separate constraints:

(99) (a) Nonfinality (polysyllabic domain)
*(...σσ)#

(b) Nonfinality
*)#

The first member of the Nonfinality family (99a) says that is nonoptimal for a polysyllabic domain to be aligned with the Right edge of the word. The second member (99b) is more general and disfavors any domain at the Right edge of the word. Given this recognition of two constraints, we can locate (99a) above Incorporate (H-sponsor) and (99b) below Incorporate (H-sponsor) and DomCor (H). This ranking will allow us to select all the appropriate outputs. We demonstrate this below with sample tableaux for several critical cases.

First consider the case of **niyawáátya**.

(100)

Candidates	NoAdj Edges	(99a)	Incorpor	DomCor	(99b)
niyawaatya			**!	**	
niya(waa)(tya)	*!				
niya(waatya)		*!		*	*
niyawaa(tya)			*	*	*!
∅niya(waa)tya			*	*	

In this tableau we see that both members of the Nonfinality constraint family play a role in choosing **niyawáátya** as optimal. The constraint on polysyllabic domains rules out the fused domain in **niya(waatya)**. The more general constraint favors **niya(waa)tya** over **niyawaa(tya**).

Consider next the derivation of **niyaatyá**.

(101)

Candidates	NoAdj Edges	(99a)	Incorporate	DomCor (H)	(99b)
niyaatya			*!	*	
ni(yaa)tya			*!		
∅niyaa(tya)					*

The highly ranked constraint on polysyllabic word-final domains has no relevance to this case, where the sponsor is on the last mora of the word. The relatively lowly ranked general Nonfinality constraint has no effect since all the alternative candidates are rejected by the higher ranked Incorporate (H-sponsor).

The general Nonfinality constraint must of course be ranked above *MonoHD and Align Word R so that widescope domains cannot be extended to include word-final syllables.

We are not able presently to argue that there is general support inside Bantu for this explosion of the Nonfinality constraint. Since we have no alternative explanation for the facts of Isixhosa, we will assume this revised version of Nonfinality. However, it is worth noting that in Odden (1982), Shambaa is shown to have the same "fusion" of a H object prefix and a H verb as in Isixhosa, but also fails to fuse a High object prefix with a following monosyllabic High verb stem. This is illustrated by the data in (102)

(102) ku-kómá 'to kill'

ku-wá-kómá 'to kill them'

but:

ku-já 'to eat'

ku-chí-j!á 'to eat it'

In Shambaa, High Domains extend to the Right edge of the phrase. Downstep separates two adjacent High Domains. In the case of **ku-wá-kómá**, we see that the juxtaposition of a High object prefix and a bisyllabic High verb stems yields a single High Domain; but there are two separate HD's when the verb stem is monosyllabic.

However, in Shambaa there is evidence that *MonoHD dominates Nonfinality and thus bisyllabic HD's **do** occur word-finally. (See section 2 above.) Consequently, one cannot in Shambaa explain the unexpected failure of fusion in terms of a constraint against final polysyllabic HD's. In his rule-based account, Odden suggests that the stressed nature of the penultimate vowel is significant. Perhaps one might propose the following constraint:

(103) *Stressed Nonheads
Nonhead syllables in a HD are not stressed.

If (103) is indeed invoked for Shambaa, perhaps it could be invoked for Isixhosa as well as an alternative to the exploded Nonfinality constraint. We shall return to this point below when we examine the short form of the present tense.

In (104) we give the set of constraints governing HD structure that we have so far developed (assuming the exploded Nonfinality constraint).

(104) Syllable Alignment, Align L, *(H,nonhead), *Overlapping, (99a) – **undominated**
Incorporate (H-sponsor) – **dominated** by (99a)
No Adjacent Edges --**dominated** by *Overlapping

DomCor (H) – **dominated** by No Adjacent Edges
*Struc -- **dominated** by DomCor (H) or Incorporate (H-sponsor)
Nonfinality [=99b]-- **dominated** by DomCor (H), Incorporate (H-sponsor)
*MonoHD -- **dominated** by Nonfinality, No Adjacent Edges
Avoid Prominence -- **dominated** by Syllable Alignment, DomCor (H), Align L/ Incorporate (H-sponsor), *MonoHD
Align PW R -- **dominated** by No Adjacent Edges, Nonfinality, Avoid Prominence
Align R -- **dominated** by Align PW R
Express (H) -- **dominated** by Align PW R, *MonoHD and *(H,non-head)
Uniqueness (H-sponsor) – **dominated** by Incorporate (H-sponsor)

We have now explained the fusion of object prefixes with High-toned verb stems. But we have only looked at such configurations when the subject prefix is toneless. In (105) below we show the forms that occur when there is a High-toned subject prefix:

(105)	báyawáátya	(eat them)
	báyabamééma	(invite them)
	báyababóóna	(see them)
	báyababoníisa	(show them)
	báyawabonísiisa	(see them clearly)

These data indicate clearly that the object prefix is **inside** a HD, even though the object prefix is not pronounced on a High tone. The HD-internal character of the object prefix is reflected by the fact that the HD initiated by the subject prefix cannot extend onto the prefix **ya**. The only explanation for this failure is that No Adjacent Edges is barring this wide domain. This explanation would be unavailable if the object prefix were outside a HD. Thus (105) confirms our proposal that High-toned object prefixes and High verb stems are fused into a single domain.

3.2. Short form of the present tense.

In this section we will examine the tonology of the short form of the present tense. The short form of the present tense differs from the long form in lacking the prefix /ya/. As a consequence, in the short form, the subject prefix abuts directly the verb stem. Roughly speaking, the long form of the present tense is used when the verb is final in its clause; the short form is

used when the verb is non-final. We do not here explore the distribution of these two forms of the present tense.

We will first examine the shape of the verb as it would appear in phrase-initial position and ignoring its interaction with a following word. Later we will look at the interactions of the verb with a preceding word as well as with a following word.

In the non-third person short present tense form of toneless verbs, there is of course no overt High tone present in the verb.

(106) ndilwa... 'I fight...'
ndipheka... 'I cook...'
ndibala... 'I count...'
ndibalisa.. 'I narrate...'
ndicacisa...'I explain...'
ndimangalela.. 'I accuse...'

Nothing needs to be said concerning the above forms. There is no mora that sponsors a H in the underlying representation, consequently these verbal forms predictably lack any HD-structure.

When there is a High-toned subject prefix, and the verb stem is monosyllabic, we find data as in (107):

(107) bálwa... 'they fight...'
báwa... 'they fall...'

Notice that the domain initiated by the subject prefix sponsor does not extend onto tbe final syllable of the word. The result is that *MonoHD is violated on the surface. The reason for the failure of the HD to extend to the final syllable must be the high ranking of Nonfinality (polysyllabic domains) [=99a]. These examples establish that Nonfinality (polysyllabic domains) must refer to the edge of the **prosodic word** as opposed, say, to the edge of the **prosodic phrase**.

Bisyllabic stems used in conjunction with a High subject prefix appear in (108):

(108) baphéka... 'they cook...'
babála... 'they count...'
bahléka... 'they laugh...'

In these data we see that the HD initiated by the subject prefix extends through the penult syllable.This could reflect the fact that *MonoHD dominates Avoid Prominence. However, since the penultimate syllable is not lengthened in the medial position, it is not apparent whether extending the HD through the penult syllable is actually a violation of Avoid Prominence. Perhaps the penult syllable is simply not prominent in the short form of the present tense. If there is no violation of Avoid Prominence involved, then the extension of the domain is the optimal satisfaction of both *MonoHD and Align PW R. Nonfinality (polysyllabic HD) of course bars the extension of the HD through the final syllable of the word.

Turning to trisyllabic or longer stems, we find that these forms have two alternative pronunciations available:

(109)	babálisa... or babalísa...	'they narrate...'
	bacácisa... or bacacísa...	'they explain...'
	balúngisa... or balungísa...	'they repair...'
	baxólela... or baxoléla...	'they forgive...'
	bahlehlézela... or bahlehlezéla...	'they retreat hastily...
	baqonóndisa... or baqonondísa...	'they emphasize...'

We suggest that this variation has to do with the issue of whether Avoid Prominence has any role to play in the evaluation of the short present tense form of the verb. If Avoid Prominence is irrelevant (due to the lack of prominence on the penult vowel of the short form of the present tense), then we expect the HD to extend through the penult, correctly yielding pronunciations like **bacacísa**... However, if (somehow) Avoid Prominence plays a role, then pronunciations like **bacácisa**.. would be explained.

Since there is no overt evidence that the penult syllable is indeed stressed in the short form of the present tense (i.e. it is always a short vowel), we will assume that it is not stressed. Then how are we to explain **bacácisa**...? We suggest that the explanation for this pronunciation lies in a "transferral" of the the HD-structure of the long form of the verb to the short form. Specifically, we assume a correspondence relationship between the long and the short form of the verb and faithfulness constraints holding between these two forms. If one aspect of faithfulness between Long and Short forms is the requirement that domain structure in the Short form correspond with the domain structure in the Long form, and if this aspect of Long-Short faithfulness outranks Align PW R, then we can guarantee the optimality of **bacácisa**... If Long-Short faithfulness is ranked below Align PW R, then the HD will extend as far as possible in the short form, yielding **bacacísa**... This proposal is in the same spirit as a number of other suggestions in the OT literature favoring faithfulness holding between

separate words (see references earlier in this paper). We will not develop the proposal in detail here, but we do believe that it represents a viable explanation of the data above.

Turn now to the High verb stems in the short present tense form. We consider first toneless subject prefixes. If the verb is a monomoraic H verb, in the medial position the H tone is not retained.

(110) ndity**a**... (eat)
ndikh**a**... (draw water)
ndiph**a**... (give)

The issue in these data is how to account for the absence of the word-final High tone of the verb.

Recall that we proposd that Nonfinality (polysyllabicHD) is ranked higher than the other, more general version of this constraint, Nonfinality. This ranking explained why certain final High tones could not be incorporated into a HD, if to incorporate them would have required a polysyllabic HD aligned with the R edge of the word. At the same time, it allowed those final Highs that could be incorporated into a monosyllabic word-final HD to be optimal. Now we see that in phrase-medial position, the final H observed in the long form **ndiyaaty<u>á</u>** is missing in the short form **ndity<u>a</u>**... There are two possible explanations for this: either monosyllabic word-final domains are not allowed in phrase-medial position or their High is not allowed to be expressed. We believe that there is evidence that **the domain must exist but the H is not expressed**. The relevant data involves words of the structure CVCVCV. In phrase-final position, such words would have the HD structure (CV) CVV (CV) due to the fact that No Adjacent Edges outranks *MonoHD. But now consider the phrase-medial position. Assume that no domain structure were built over the word-final H-sponsor. Then No Adjacent Edges could not prevent the HD initiated by the first H-sponsor from extending to the penult. Thus it would be predicted that the optimal domain structure would be (CVCV)CV. If, on the other hand, the final mora of the word is organized into a domain, but fails to express the High tone phonetically, then we would get the domain structure (CV)CV(CV).

The nominal **<u>í</u>miity<u>á</u>** ‘straps’ represents an example of a word of the relevant structure. In medial position, this noun will be **<u>í</u>mity<u>a</u>**... and not ***<u>i</u>miítya**... This medial pronunciation shows that there must be a word-final HD to explain the applicability of No Adjacent Edges. We conclude then that the data in (110) involves not the failure to parse the H-sponsor into a domain, but rather the failure of Express (H) -- i.e. the existence of some constraint that outranks Express (H). The constraint obviously is an anti-expression constraint that bars word-final, phrase-medial morae from

expressing High tone. It is not clear to us, from a universal perspective, why final High's are not realized in Isixhosa in medial position while being realized in final position in the phrase and therefore we leave this matter open for further study. We should note, moreover, that there are clearly languages that are just the opposite of Isixhosa with respect to the realization of word-final High tones. For example, in Mijikenda there are no phrase-final High tones, but word-final High tones can be realized as long as the word is phrase-medial. (See Kisseberth (1984).) **What is important to emphasize here, however, is that it is possible to provide evidence as to whether a given mora is in a HD but fails to express the High tone or is not in a HD (and therefore does not express a High tone)**.

Let us now return to the presentation of the surface forms of High verb stems in the short present (when there is a toneless subject prefix). Consider next bisyllabic High verb stems:

(111) ndibóna... (see)
ndithénga... (buy)
ndifúnda... (learn)
ndidlála... (play)

If the verb stem is bimoraic and H, the H is linked to the first stem mora in the short form as in the long form. This is of course completely predictable, since Nonfinality (polysllabicHD) continues to delimit the scope of a HD regardless of the medial position.

Next consider trisyllabic or longer H verb stems:

(112) ndisebénza... (work)
ndigaléla... (pour)
ndibonísa... (show)
ndifumána... (get)
ndiphuláphula.../ ndiphulaphúla... (listen)
ndiqaqámbisa.../ ndiqaqambísa... (make ache)
ndisebénzela.../ ndisebenzéla... (work for)
ndibonakálisa.../ ndibonakalísa... (make visible)

The variation in the longer forms can be explained in the same fashion as the variation in the data in (109) above: namely, the possibility of Long-

Sort faithfulness to domain structure outranking Align PW R predicts the forms with antepenult High tone; the reverse ranking predicts the forms with penultimate High tone.

Let us now consider High verbs with High subject prefixes in the short form of the present tense. We begin with bisyllabic stems.

(113) ba<u>bó</u>na... (see)
ba<u>sú</u>la... (place)
ba<u>thé</u>nga... (buy)

We have only one HD in these examples, even though there are two underlying High tones. This is of course explained by the high ranking of an OCP constraint (either No Adjacent Edges or No Adjacent Sponsors -- for convenience, we continue to assume that No Adjacent Edges is the relevant constraint). Were it not for No Adjacent Edges, we would expect **(b<u>a</u>)(b<u>o</u>)na** as the HD structure. The fact that No Adjacent Edges and Incorporate (H-sponsor) dominates DomCor (H) means that the optimal output will have only one domain.

In the following tableau we illustrate various candidates provided by Gen. We include only the relevant constraints.

(114)

Candidates	No Adj Edges	Incorporate	DomCor
(a) b<u>a</u>b<u>o</u>na		*!*	**
(b)∅ (b<u>a</u>b<u>o</u>)na			*
(c) b<u>a</u> (b<u>o</u>)na		*!	*
(d) (b<u>a</u>)b<u>o</u>na		*!	*
(e) (b<u>a</u>)(b<u>o</u>)na	*!		

Candidate (e) is rejected since it violates the No Adjacent Edges. Candidates (a), (c), and (d) are rejected since they violate Incorporate (H-sponsor). (b) is the only remaining candidate and thus represents the optimal output.

The data cited do not in fact show that the HD is initiated by the subject prefix. In other words, (c) would explain the surface forms as well as (b). We shall see later that a candidate such as (b) is required in order to characterize data found in the phrasal tonology.

Next consider trisyllabic and longer stems.

(115) basebénza... (work)
bagaléla... (pour)
babonísa... (show)
bafumána... (get)

babonísisa.../ babonisísa... (see clearly)
baphuláphula.../ baphulaphúla... (listen)
basebénzela.../ basebenzéla... (work for)
baqaqámbisa.../ baqaqambísa... (make ache)

babonakálisa.../ babonakalísa... (make visible)
bashumayézana.../ bashumayezána... (preach to each other)

Again, we see that there is a single surface High tone which appears in the location where the verb stem High would be expected to appear. The subject prefix High does not surface. These data would be consistent with either an analysis where the two High-tone sponsors are fused into a single domain, or an analysis where the first High tone simply fails to parse. We propose that this is a case of fusion – i.e. that the high ranking No Adjacent Edges forces a violation of DomCor (H). The tableau in (116) illustrates **babonakalísa**..., but we omit from consideration all of those constraints that guarantee that the domain will extend as far Right as possible since they are irrelevant to the main point.

(116)

Candidates	No Adj Edges	Incorporate	DomCor (H)
(a) babonakalisa...		*!*	**
(b) ∅ (babonakali)sa...			*
(c) ba (bonakali)sa		*!	*
(d) (ba)bonakalisa		*!	*

(e) (ba)(bonakali)sa	*!		

We have note yet looked at the monosyllabic verb case.

(117) bátya... (eat)
bákha... (draw water)
bápha... (give)

Notice the problem posed by these data is the same problem that we discussed in the case where a High-toned object prefix is combined with a High-toned monosyllabic verb stem. We have an input where there are two adjacent sponsors, but the second is word-final. What we saw earlier was that in such cases the final High sponsor is not located inside a HD -- cf. **ndiyayíítya** and not the ***ndiyayityá** that would be predicted if both sponsors were parsed into a fused domain.

The analysis that we proposed above – appealing to an exploded form of Nonfinality -- will also account for the data in (117). The tableau in (118) demonstrates this point.

(118)

Candidates	No Adj Edges	(99a)= Nonfinal (poly)	Incorpor	DomCor	(99b) Nonfinal
(a) batya			**!	**	
(b) (ba)(tya)	*!				
(c) (batya)		*!		*	
(d) ba (tya)			*	*	*!
(e) ∅ (ba) tya			*	*	

Recall that earlier we suggested, following loosely on a proposal in Odden's anlysis of Shambaa, that there might be a constraint *Stressed Nonheads, banning stressed nonhead syllables in a HD. This constraint was suggested as a possible alternative to exploding Nonfinality. The data in (117) seem to argue against such an analysis, since *Stressed Nonheads would not rule out the canadidate **(batya)**…due to the fact that the initial syllable does not bear stress. To make *Stressed Nonheads work, it would be necessary to recognize the short form as bearing an **abstract** penultimate stress. Below, when we encounter additional data, we will continue to discuss both the possibility of an exploded Nonfinality constraint and a *Stressed Nonheads constraint.

At this juncture let us turn our attention to the inclusion of an object prefix in the short form of the present tense. We begin as usual with

toneless verb stems. The data in (119) illustrate the toneless subject prefix case.

(119) niyílwa... (fight it)
niwabála... (count them)
niyibálisa... or: niyibalísa... (narrate it)
niwashukúmisa... or: niwashukumísa... (shake them)
niwanamathélisa... or: niwanamathelísa... (cement them)

The data in (119) show that the object prefix initiates a HD. In the case of a monosyllabic stem like /lwa/, Nonfinality (polysyllabic HD) prevents the domain from extending onto the final vowel; thus we have **niyílwa**... In the case of the longer verb stems, the HD initiated by the object will extend some ways into the verb, limited only by Nonfinality (polysyllabic HD) and whether or not there is domain structure-faithfulness of the Long-Short Form variety.

Let us look next at the case where there is a High subject prefix in front of the object prefix attached to a toneless verb stem.

(120) bawálwa...
bawabála...
bawabálisa... or: bawabalísa...
bawashukúmisa... or: bawashukumísa...

What these data demonstrate is that No Adjacent Edges again bars a pronunciation where the subject prefix constitutes the head of a HD and thus is realized with a High tone. Rather the subject prefix and the object prefix are inside the same HD ("fusion"), as the following tableau illustrates:

(121)

Candidates	NoAdj Edges	Nonfinality (poly) = 99a	Incorporate	DomCor	*MonoHD
liwabala...			*!*	**	
(li)(waba)la..	*!				*
(li)wabala...			*!	*	*
li(waba)la...			*!	*	

∅(li̲wa̲ba)la.				*	
(li̲wa̲)bala...				*	*!
(li̲wa̲bala)...		*!		*	

Of course, the surface forms shown in (120) do not demonstrate that the correect domain structure is **(li̲wa̲bá)la**..., since **li̲ (wa̲bá)la**... would yield the same surface form. The phenomenon that we refer to as "protection" (see below) will establish that the former is indeed the correct representation. We return to this point later..

We have now covered the behavior of object prefixes with toneless verb stems. Let us look at High verb stems next. (122) shows what happens when the subject prefix is toneless.

(122) niwátya...

niwabéka...

niwabonísa...

niwabonísisa... or: niwabonisísa...

niwanyinyithékisa... or: niwanyinyithekísa...

In examples like **niwabonísa**..., the object prefix H-sponsor and the verb stem H-sponsor are fused into a single HD as a consequence of the high ranking of No Adjacent Edges. This is exactly what was observed in the long form of the present tense and requires no further discussion. When the verb stem is monomoraic, as in **niwátya**..., this fusion does not take place (just as we saw earlier it does not take place when a Hight subject prefix is placed in front of a H monomoraic verb stem in the short form of the present tense). Recall that we have been discussing two possible analyses of this phenomenon: an exploded Nonfinality constraint or a constraint barring stressed nonheads in High Domains. Once again, the latter analyses would work only if an abstract penultimate stress is recognized for the short present tense.

Turning to the case of a H subject prefix in front of an object prefix attached to a High verb stem, we find the following data.

(123) liwátya...

liwabéka...

liwaméma...

liwabonísa...

liwabonísisa... or: liwabonisísa...

liwanyinyithékisa... or: liwanyinyithekísa...

We see only one High tone on the surface in these forms, despite the fact that there are **three** High-tone sponsors in the representation (the subject prefix, the object prefix, and the verb stem's initial vowel). Obviously, this "reduction" in the number of High tones results from the "fusion" of elements into a single domain.

Consider first the example type **liwabéka**...

(124)

Candidates	NoAdj Edges	Nonfinal(poly)	Incorpor	Nonfinal	DomCor
liwabeka			*!**		***
(li)(wa)(be)ka	*!*				
(li)(wa)beka	*!		*		*
(li)wabeka			*!*		**
(liwabeka)		*!		*	**
(li)wa(be)ka			*!		*
∅(liwabe)ka					**

Here we have conclusive evidence that Incorporate (H-sponsor) must dominate DomCor (H). The optimal candidate **(liwabe)ka** has two violations of DomCor (H) while the nonoptimal candidate **(li)wa(be)ka** has only one -- but the nonoptimal candidate has a violation of Incorporate (H-sponsor) that the optimal candidate does not have. Thus by ranking Incorporate (H-sponsor) over DomCor (H) we can guarantee that the correct output will be the optimal one.

The evaluation of **liwaboníisa**... is shown in (125):

(125)

Candidates	No Adj Edges	Nonfinal (poly)	Incorp	Non-finality	DomCor	*Mono HD
liwaboniisa			*!**		***	
(li)(wa)(bonii)sa	*!*					**
(li)(wa)boniisa	*!		*		*	**
(li)waboniisa			*!*		**	*

(li̲wa̲bo̲)niisa					**	
∅(li̲wa̲bo̲nii)sa					**	
(li̲)wa̲(bo̲nii)sa			*!		*	*

(Notice that this tableau does not explain why **(li̲wa̲bo̲nii)sa**... is more optimal than **(li̲wa̲bo̲)niisa**... We noted earlier that we expect that the explanation lies in a requirement of Long-Short (form of the present tense) faithfulness. We do not explore this point in detail in the present paper.)

The monosyllablic verb case is more problematic. Recall that our account of monomoraic High stems has so far been based on the idea of either exploding the Nonfinality constraint or adopting a *Stressed Nonhead constraint. Both of these analyses run into difficulty in explaining why **li̲wá̲tya̲**... is optimal. Consider first the exploded Nonfinality analysis. Remember that the general Nonfinality constraint must be dominated by both Incorporate and DomCor since given an input **aa̲#**, it is required that the word-final H-sponsor be incorporated into a HD. However, this ranking leads to an incorrect evaluation in the case of **li̲wá̲tya̲**..., as the following tableau illustrates.

(126)

Candidates	No Adj Edges	Non-final (poly)	Incorpor	DomCor H	Non-finality
li̲wa̲tya̲			*!**	***	
(li̲wa̲tya̲)		*!		**	*
(li̲wa̲) tya̲			*	*!*	
li̲(wa̲) tya̲			*!*	**	
(li̲)wa̲tya̲			*!*	**	
(li̲)(wa̲)(tya̲)	*!*				*
(li̲wa̲)(tya̲)	*!			*	*
(li̲)(wa̲)tya̲	*!		*	*	
∅(li̲)wa̲(tya̲)			*	*	*

*Stressed Nonheads does not fare better. If we were to invoke a *Stressed Nonheads constraint, it would have to be ranked high enough to force a violation of Incorporate (so that the final mora would not be incorporated into a HD if to do so meant placing a stressed syllable in nonhead position). The following tableau shows however the same incorrect result as above.

(127)

Candidates	NoAdj Edges	*Stressed Nonheads	Incorpor	DomCor	Non-finality
l̲iw̲at̲y̲a̲			*!**	***	
(l̲iw̲at̲y̲a̲)		*!		**	*
(l̲iw̲a̲) t̲y̲a̲			*	*!*	
l̲i̲(w̲a̲) t̲y̲a̲			*!*	**	
(l̲i̲)w̲at̲y̲a̲			*!*	**	
(l̲i̲)(w̲a̲)(t̲y̲a̲)	*!*				*
(l̲i̲)(w̲a̲)t̲y̲a̲	*!		*	*	
(l̲iw̲a̲) (t̲y̲a̲)	*!			*	*
∅(l̲i̲)w̲a̲(t̲y̲a̲)			*	*	*

In the tableaux in (125) and (126), we used the high ranking of Incorporate (H-sponsor) to require all of the H-sponsors to be organized into a single domain in order to avoid a violation of No Adjacent Edges, as opposed to avoiding adjacent domains by failing to parse alternate sponsors into a domain. This strategy fails in the monosyllabic verb case because the high ranking of either Nonfinality (polysyllabic HD) or *Stressed Nonheads prevents, in any case, full satisfaction of Incorporate (H-sponsor). Thus Incorporate (H-sponsor) fails in (127) to eliminate **(l̲i̲)w̲a̲(t̲y̲a̲)** in contrast to **(l̲iw̲a̲) t̲y̲a̲**, thereby allowing DomCor (H) to prefer the former to the latter.

We suspect that the monosyllabic verb stem pattern represents another case of "output"-"output" faithfulness. Specifically, since the subject prefix and the verb stem H are located inside a single HD in the form without an OP, faithfulness to this structure requires that they continue to be in the same HD in the object-prefixed form. In other words, output-output faithfulness requires a superfluous violation of DomCor (H) -- one can avoid adjacent domains with only **one** violation of DomCor (H), but the language chooses two use **two** violations of DomCor (H) to achieve this end. This superfluous violation of DomCor (H) is parallel to the "overapplication" pattern of reduplication that

McCarthy and Prince (1995) attribute to faithfulness of the reduplicant to a base.

In this section we have seen that No Adjacent Edges and Incorporate (H-sponsor) outrank DomCor (H) and lead to violations of DomCor (H). We repeat the constraint system shown above in (104), with the emendation that DomCor (H) is outranked by Incorporate (H-sponsor).

(104') Syllable Alignment, Align L, *(H,nonhead), *Overlapping, (99a) – **undominated**
Incorporate (H-sponsor) – **dominated** by (99a)
No Adjacent Edges **--dominated** by *Overlapping

DomCor (H) – **dominated** by No Adjacent Edges, Incorporate (H-sponsor)
*Struc -- **dominated** by DomCor (H) or Incorporate (H-sponsor)
Nonfinality [=99b]-- **dominated** by DomCor (H), Incorporate (H-sponsor)
*MonoHD -- **dominated** by Nonfinality, No Adjacent Edges
Avoid Prominence -- **dominated** by Syllable Alignment, DomCor (H), Align L/ Incorporate (H-sponsor), *MonoHD
Align PW R -- **dominated** by No Adjacent Edges, Nonfinality, Avoid Prominence
Align R -- **dominated** by Align PW R
Express (H) -- **dominated** by Align PW R, *MonoHD and *(H,non-head)
Uniqueness (H-sponsor) – **dominated** by Incorporate (H-sponsor)

3.3. Short form of the present tense: some phrasal evidence.

In this section we consider the interaction of the short present form of the verb and a following nominal (including the infinitive form of the verb, which is structurally a nominal) in order to introduce a phenomenon that will be critical to our discussion of the perfective tense below. We will refer to this phenomenon as **protection**. We do not undertake here any detailed discussion of sentence phonology in Isixhosa (see Jokweni 1995 for an anlysis) and limit ourselves to matters that are directly pertinent to our analysis of the word-level tonology.

In Isixhosa, the final vowel of the verb elides in front of a vowel-initial nominal complement: $\mathbf{C_i\ V_i\ \#\#\ V_j}$ yields $\mathbf{C_i\ V_j}$. We shall refer to this phenomenon as **contraction**. We shall refer to $\mathbf{C_i\ V_j}$ as the contracted syllable. We consider here the juxtaposition of a verb and a following noun complement where the following conditions are met: (a) the verb has a penultimate High tone and (b) the nominal has an initial vowel which is underlyingly High (this condition is met by all nominals containing a preprefix, since preprefix vowels are underlyingly High; we do not motivate this point here). The contraction of such verbs and such nominals produces very interesting results. We catalogue the interaction below.

If the noun has an initial H that has not been able to shift, then there is no difference between the isolation form of the noun and the post-verbal form. In (128) we illustrate different types of nouns where the preprefix is realized with a High tone.

(128) ndipháth ícuuba ‘ I am getting tobacco’
ndifún íthaanga ‘I want a pumpkin’

ndiphá́th íguusha	‘I am getting a sheep’
ndiphá́th útywaalá́	I am getting beer’
ndiphá́th úbooyá́	‘I am getting wool’
ndiphá́th ísitóóvu	‘I am getting a stove’
ndifún úkubóóna	‘I want to see’
ndifún úkubooníísa	‘I want to show’
ndifún úkusebénzeela	‘I want to work for’

What we see from these data is that the HD in the verb consists of just the last **overt** syllable of the verb. The initial HD of the nominal consists of just the **contracted syllable**. We thus have two adjacent domains, but they have not fused. There is no fusion across words in Isixhosa. We assume that all constraints (including the OCP) must be specified for the (morphological/grammatical) domain in which they operate. The OCP in Isixhosa holds for the word domain, but not the Prosodic Phrase domain.

Given that the two HD's have not fused in (128), we expect both of the heads to be realizerd as High. They are. Next let us consider nominals where the HD of the preprefix extends onto the following vowel. Some examples (we underline the preprefix vowel in order to emphasize the point that this is the location of the High sponsor): **amáthaanga** ‘pumpkins’, **isíqhaamo** ‘a piece of fruit’, **isíbaane** ‘torch’, **isíitya** ‘plate’, **isíloonda** ‘wound’, **abáántu** ‘people’. These examples show the expected tone realization: the head of the domain is realized as High, the initial nonhead is realized without High. In (129), we see the result of locating these nouns after the verbal type under consideration:

(129)

ndiphá́th ámáthaanga	‘I am getting pumpkins’
ndiphá́th ísíqhaamo	‘I am getting a piece of fruit’
ndiphá́th ísíbaane	‘I am getting a torch’
ndiphá́th ísíiya	‘I am getting a plate’
ndiphá́th ísíloonda	‘I am wrapping up a wound’
ndifumán ábáántu	'I am getting people’
ndifumán ábántwaana	‘I am getting children’ (cf. abántwaana 'children')
ndiphá́th ámágaabá	'Iam getting hoes’ (cf. amágaabá ‘hoes’)
ndiphá́th ámáqaandá	‘I am getting eggs (cf. amáqaandá‘eggs’)

ndifún úkúúlwa ‘I want to fight’ (cf. ukúúlwa ‘to fight’)

Examination of the data in (129) reveals that the contracted syllable, which contains the nonhead in the initial domain of the noun, is realized with a High tone. Why is this? We suggest that this phenomenon is due to the ranking of the constraint Plateau (see 2.6 above) above *(H,nonhead). For full discussion of the proper formulation of Plateau in Isixhosa, see Cassimjee (1997). The data in (129) would suggest a formulation something like (130):

(130) Plateau
*…H)(0H

(130) bans adjacent domains where the second domain starts with a toneless mora. Notice that it is critical that (130) make reference to domain structure. A sequence H0H is **not** banned in Isixhosa, witness examples such as **báyabóóna** and many other examples where a toneless mora occurs between High tones; the toneless mora in **báyabóóna** is not in a domain with the following High-toned mora, thus escaping the effects of (130). The data discussed immediately below show the need for a slight revision of (130).

Finally, let us consider some nouns where the word-initial HD has two or more nonheads in it: e.g**. imihlákuulo** ‘spades’, **abantwánaana** ‘small children’, **isilóndaana** ‘small wound’, **imihlakúlwaana** ‘small spades’.

(131) ndipháth ímíhlákuulo ‘I am getting spades’
ndifumán ábántwánaana ‘I am getting small children’
ndibóph ísílóndaana ‘I am wrapping up a small wound’
ndifún ímíhlákúlwaana ‘I want small spades’
ndifún úkúcáciisa ‘I want to explain
ndifún úkúxóleela ‘I want to forgive’
ndifún úkúkhóhlákáleela ‘I want to be cruel to’
ndifún úkúqónónóndiisa ‘I want to emphasize’

In these data we see two or more nonhead syllables all being raised as a result of Plateau. These data show that Plateau must in fact ban 0H anywhere in the second of two adjacent domains.

Further data from Isixhosa suggest that the ban is in fact not against 0H, but rather against H0. However, the evidence for this interpretation is too complex to explore here. We will content ourselves with the

observation that some form of Plateau seems pertinent to the data in (129) and (131), and that domain structure is critical to understanding why plateauing is observed in (129) and (131) but does not affect examples like **báyabóóna**.

We have analyzed the short form of the present tense of High verbs as involving the "fusion" of a High subject prefix sponsor, a High object prefix sponsor, and the High sponsor of the verb stem into a single HD. We have not yet provided evidence that there is a single "fused" domain that extends from the subject prefix into the verb stem. We will next briefly present evidence for this position derived from the phrasal phonology.

When the short form of the verb begins with a vowel-initial subject prefix, then the final vowel of a preceding subject noun will be elided (e.g **úsába** will surface as **úsáb'**, where the apostrophe indicates the omitted vowel). When the penult vowel of the noun is toneless, then there is no interesting surface effect on the verb.. In other words, the short form of the verb has the shapes noted above. However, when the penult vowel of the subject noun is High-toned, we find some interesting results. Below we will contrast the case of a subject like **úsáb'** where there is contraction with the following verb (since the verb is vowel-initial) and the corresponding plural form **óosába**, where there is not (since the verb is consonant-initial after **óosába**).

We discuss toneless verbs first.

(132) úsáb' úlwa... óosába bálwa...

In the case of **úsáb' úlwa**..., the contracted syllable forms a monomoraic HD. It is of course realized with a High tone. In the case of **óosába bálwa**..., the subject prefix forms a monomoraic HD and is realized on a High tone. No discussion is necessary.

When the verb stem is bisyllabic, we find the following data:

(133) úsáb' úbámba... óosába babámba...
úsáb' úphánda... óosába bapánda...
úsáb' úcúla... óosába bacúla...
úsáb' úkhába... óosába bakhába...

The verb has, in our analysis of all these examples, a HD that is initiated by the subject prefix and extends to the first syllable of the verb stem. Notice that in an example like **úsáb' úbámba**..., the verb's HD is preceded by another HD (that naturally ends in a High-toned mora). We expect that Plateau will force the first mora of the verb's HD to be realized with a High tone. In the case of **óosába babámba**..., however, the verb's HD is not

preceded by a HD. Thus Plateau has no effect. As a consequence, *(H,nonhead) prevents the initial mora of the verb stem's HD from being realized with a High tone.

Turning to trisyllabic and longer verb stems, we see the subject prefix and other nonheads will be raised in pitch when they are preceded by a HD:

(134)	úsáb' úxólela...	óosába baxólela...
	úsáb' úlúngisa...	óosába balúngisa...
	úsáb' úkhóhlákala...	óosába bakhohlákala...
	úsáb' úncámáthela...	óosába bancamáthela...
	úsáb' úqónónóndisa...	óosába baqononóndisa...
	úsáb' úkhóhlákálela...	óosába bakhohlakálela...

From these data we see that the stretch of material in the verb from the subject prefix to the antepenultimate mora is all High-toned under the effect of Plateau. For this to be the case, that material must be in the same HD! Thus we have support for the view that there is a HD stretching from the subject prefix through the antepenult.

Let us turn our attention now to high verb stems, where there is both a High tone on the subject prefix and on the verb stem. Earlier we argued that there is a single HD stretching from the subject prefix through to the relevant point in the verb stem. The data below show the pronunciation of these forms after **úsáb'** and **óosába**.

In (135) we have the case where the verb HD consists just of the subject prefix. Naturally it will be High in both cases:

(135)	úsáb' útya...	óosába bátya...
	úsáb' úpha...	óosába bápha...
	úsáb' úkha...	óosába bákha...

In (136) we have a HD that, in our analysis, extends from the subject prefix to the first stem syllable.

(136)	úsáb' úfúnda...	óosába bafúnda...
	úsáb' úthénga...	óosába bathénga...
	úsáb' úbóna...	óosába babóna...
	úsáb' úsúla...	óosába basúla...

We see here that in the verb domain, the subject prefix is the only nonhead. It is realized as High, due to the protection afforded by the nominal, in examples like **úsáb' úthénga**... When there is no protection, as in **óosába bathénga**..., then the subject prefix does not realize a High tone.

In (137) we have examples of trisyllabic and longer High verb stems.

(137)	úsáb' úfínyéza...	óosába bafinyéza...
	úsáb' úfúmána...	óosába bafumána...
	úsáb' úbáléka...	óosába babaléka...
	úsáb' úphúláphula...	óosába baphuláphula...
	úsáb' úkhwélétela...	óosába bakhwelétela...
	úsáb' úbónákálisa...	óosába babonakálisa...

What we see from these data is that the H on the penult of the subject noun "protects" the HD initiated by the subject prefix, and that this HD extends from the subject prefix as far as the appropriate vowel in the verb stem. These pronunciations are inexplicable if there is not a HD starting at the beginning of the verb. A sequence of **toneless** syllables in Isixhosa is never subject to raising; a sequence of **nonheads** in a HD is raised, but only when protected.

Finally, let us consider the inclusion of an object prefix in the verb. Take the toneless verbs first.

(138)	úsáb' úbáqónónóndisa…	óosába babaqononóndisa…
	úsáb' úwálúngisa…	óosába bawalúngisa…

In our discussion of **uwalúngisa**… (where there is no preceding subject noun), we claimed that the subject prefix and the object prefix fuse into a single HD – **(uwalú)ngisa**… The data in (138) confirm this, since we see the nonheads of the domain surfacing as High under protection in **úsáb' úwálúngisa**… The phrasal evidence thus supports our analysis of **uwalúngisa** as a case of No Adjacent Edges forcing multiple High-sponsors into a single domain.

Turning to High verb stems, we find data such as the following:

(139)	úsáb' úwáthénga…	óosába bawathénga…
	úsáb' úbábónísa…	óosába bababonísa…
	úsáb' úbákhwélétela…	óosába babakhwelétela…

In our analysis (of forms without a preceding nominal, such as **ubakhwelétela**…) we claimed that there is a HD initiated by the subject prefix extending through the object prefix and into the verb stem. This is a "fused" domain based on three adjacent High sponsors. The data in (139) show that the whole domain is realized High when protected by an immediately preceding HD: **úsáb' úbákhwélétela**… We thus have strong evidence in favor of our analysis for the "fusion" of successive H-sponsors into a single HD.

At this juncture, let us set forth the constraint set that we have postulated for Isixhosa:

(140) Proposed Constraint System:

Syllable Alignment, Align L, Plateau, *Overlapping, Nonfinality (polysyllabic HD) [=(99a) – **undominated**
*(H,nonhead) -- **dominated** by Plateau
No Adjacent Edges -- **dominated** by *Overlapping
Incorporate (H-sponsor) – **dominated** by (99a)
Nonfinality [=99b]-- **dominated** by Incorporate (H-sponsor)
DomCor (H) – **dominated** by No Adjacent Edges, Incorporate (H-sponsor)
*Struc -- **dominated** by DomCor (H) or Incorporate (H-sponsor)
*MonoHD -- **dominated** by Nonfinality [=99b], No Adjacent Edges
Avoid Prominence -- **dominated** by Syllable Alignment, *MonoHD
Align PW R -- **dominated** by No Adjacent Edges, Nonfinality [=99b], Avoid Prominence
Align R -- **dominated** by Align PW R
Express (H) -- **dominated** by Align PW R, *MonoHD and *(H,non-head)
Uniqueness (H-sponsor) – **dominated** by Incorporate (H-sponsor)

[We have not included in this summary the proposed effects of faithfulness constraints holding across words, which we have suggested as explaining why domain structure in one word seems to be linked to domain structure occurring in related words. We also have not included the anti-expression constraint that bars High tone from being realized on a word-final monomoraic domain in phrase-medial position.]

3.4. The perfective form of the verb.

In this section we examine the tonology of the perfect stem (which involves suffixing /il/ to the verb stem and appending a final vowel **e**). While there is much that the perfect shares with the present tense in terms of its tonal pattern, there is a very critical difference that provides even more evidence for the "protection" phenomenon discussed above in 3.3.

The toneless verb stem in the perfect parallels in behavior the long present tense form. When the subject prefix is toneless, then the entire form is toneless. When the subject prefix is High-toned, that High tone reassociates rightward in accordance with the pattern established above. The following examples illustrate the extension of the HD to the antepenult vowel. (We omit examples based on monosyllabic verb stems since they reveal a special pattern; see Cassimjee (1997) for discussion.)

(141)	ndishukumisiile	vs.	bashukumísiile		(shake)
	ndinamthelisiile	vs.	banamathelísiile	(cement)	
	ndicacisiile	vs.	bacacísiile		(explain)
	ndibalisiile	vs.	babalísiile		(narrate)
	ndibaliile	vs.	babáliile	(count)	
	ndiphekiile	vs.	baphékiile		(cook)
	ndihlabiile	vs.	bahlábiile	(stab)	
	ndilimiile	vs.	balímiile	(cultivate)	

No discussion is required, since the pattern is entirely in accordance with what we expect on the basis of the present tense forms of toneless verb stems.

While toneless verb stems in the perfect present no new problems, the same is not true of High verb stems. Consider the following data.

(142)	ndibóniile	vs.	bábóniile	(see)
	ndisúliile	vs.	básúliile	(wipe)
	ndilúmiile	vs.	bálúmiile	(bite)

In these data, when there is a toneless subject prefix, the lexical H of the verb appears, as expected, on the second stem syllable (due to the fact that *MonoHD outranks Avoid Prominence). The stem-initial syllable appears toneless, due to the fact that *(H, nonhead) outranks Express (H). When there is a High subject prefix, the facts are surprising. We find that there is **a sequence of High-toned syllables starting from the subject prefix and extending through the penult**. The only other situations where we have found **sequences** of High tones is the “protection” phenomenon observed

above in connection with the phrasal tonology. After completing our survey of the data, we will provide an analysis that sees these new data as also a case of protection.

Longer verb stems are shown in (143):

(143)	ndise̲bénziile	vs.	bá̲sé̲bénziile	(work)
	ndibo̲nísiile	vs.	bábó̲nísiile	(show)
	ndibo̲nisísiile	vs.	bábó̲nísísiile	(see clearly)

Once again we see that when there is a toneless subject prefix, we simply observe that the verb stem High Domain extends to the antepenult as expected. In the cases where there is a High-toned subject prefix, we find a sequence of High tones extending from the subject prefix through the antepenult.

We propose that what is happening in (142) and (143) is that the **ba̲** subject prefix constitutes a HD and the High tone that surfaces on the vowel of the subject prefix "protects" the initial syllable(s) of the HD in the verb stem. Notice that in the underlying representation of the 3 pl. subject forms, we have a subject prefix that sponsors a High right next to the initial syllable of the verb stem, which also sponsors a High. This structure is entirely analagous to the case of the third person subject forms of High verb stems in the short form of the present tense. Thus we would expect the OCP (either No Adjacent Edges or No Adjacent Sponsors) to lead to "fusion" of the two sponsors into a single HD in the perfect just as in the short present. But this does not occur. We get **(li̲@) (be̲@ki@i@l)e**, not ***(li̲be̲ki@i@)le**.

There are different lines of attack on this problem which could be followed. One approach would be to propose that a morphological form (in this case, the perfect stem) may be specified as **an exception to the OCP**. What would it mean to be an exception to a constraint? One might suggest that if an item is an exception to a constraint, then it fails to be assigned a violation mark if it happens to violate the said constraint. In the present case, then, the perfect stem would not be assigned a violation mark if it is involved in a violation of the OCP. From this exceptionality, the correct surface forms will be predicted by the constraint system we have developed. Let us see why this is so. The following tableau shows how the optimal HD structure for **li̲@be̲@ki@i@le** is predicted.

(144)

Candidates	Nonfinal (poly)	NoAdj Edges	Incorpor	DomCor	*MonoHD
li̲be̲kiile			*!*	**	
(li̲be̲kiile)	*!			*	

(li̲be̲kii)le				*!	
(li̲be̲)kiile				*!	*
(li̲)(be̲kiile)	*!	[*]			*
∅(li̲)(be̲kii)le		[*]			*
(li̲)(be̲)kiile					**!

Because the perfect stem is an exception to the OCP (i.e. a form cannot receive a violation mark by virtue of having a perfect stem participating in a structure where there are adjacent sponsors or, alternatively, adjacent edges), the constraint DomCor (H) -- or, alternatively, Uniqueness -- will force a non-fused structure (with each sponsor in a separate domain) over a fused structure (with both sponsors in a single domain). Thus the optimal HD structure will be **(li̲) (be̲kii)le**. *(H,nonheads) does not succeed in forcing the initial vowel of the verb stem HD to be toneless since Plateau outranks *(H,nonheads).

This type of analysis falls into the category of an attempt to "translate" the notion of "rule exception" to "constraint exception"; while it achieves the correct output in the above example, it does not in its essence make use of critical concepts inherent in OT. A second line of attack would be to **relativize constraints to particular morphological forms** (the perfect stem, in this case) and to allow the relativized form of a constraint to be ranked independently of the general constraint. Thus in this example we could hypothesize a constraint Uniqueness (perfect stem-H-sponsor) and rank this constraint above No Adjacent Edges, while the general Uniqueness constraint is ranked below No Adjacent Edges. This ranking would certainly force the High of the perfect stem to be organized into a unique HD. Incorporate (H-sponsor) must, in this scenario, dominate No Adjacent Edges since we do not want to avoid an OCP violation by failing to locate the subject prefix H-sponsor into a HD. The following tableau shows how this analysis would work. (We combine DomCor (H) and Uniqueness (H-sponsor) into one column in the interest of compactness: they are unranked relative to one another and their low ranking in the system means that they do not play a decisive role in the evaluation.)

(145)

Candidates	Nonfinal (poly)	Unique (perfect)	Incorp	NAE	DomCor / Unique	*Mono HD
li̲be̲kiile			*!*		**/	
(li̲be̲kiile)	*!	*			*/*	
(li̲be̲kii)le		*!			*/*	
(li̲be̲)kiile		*!			*/*	*

(li)(bekiile)	*!			*		*
∅(li)(bekii)le				*		*
(li)(be)kiile				*		**!
li(bekii)le			*!		*/	

A third analysis would be one where morphological forms could require different constraint rankings from those that hold in general. Thus, in the case under discussion, the perfect stem could demand that Uniqueness be undominated, whereas in general Uniqueness is ranked below Incorporate (H-sponsor). There are technical issues connected to the constraint reranking analysis that we believe makes it a less attractive approach than the "relativized" constraint analysis. However, we will not attempt to examine this matter here. We will simply assume that either constraint exceptionality or morphologically relativized constraints can guarantee the appropriate domain structure in the perfect.

Perfective stems based on /C/ roots are illustrated in (146):

(146) ndityíile vs. bátyíile (eat)
ndikhíile vs. bákhíile (draw water)
ndifíile vs. báfíile (die)

These data continue to show the same thing: the heads of both the subject prefix HD and the verb stem HD are realized with a High tone, indicating the absence of "fusion" (and hence the fact that the OCP has no effect in this tense). No more discussion is required.

At this juncture we have completed our look at the perfective form of the verb in the absence of an object prefix. Now we consider the case where an object prefix is included. Toneless verb stems appear in (147).

(147) niwálwiile vs. báwálwiile
niwabáliile vs. báwábáliile
ndiyiphékiile vs. báyíphékiile
ndiyihlábiile vs. báyíhlábiile
ndikuxóleele vs. bákúxóleele
niwabalísiile vs. báwábálísiile
ndiyishukumísiile vs. báyíshúkúmísiile
siyinamathelísiile vs. báyínámáthélísiile

Examination of these data reveals that the HD initiated by the object prefix is subject to Plateau when preceded by a High-toned subject prefix. These data indicate a domain structure such as **(ba)(wabali)siile**. These data are revealing. They show that in order for either the "constraint exceptionality" or the "morphological relativization of constraints" analyses to yield the correct outputs, **the object prefix must be considered part of the perfect stem**. This is not a surprising result, given that in numerous Bantu languages one can find evidence that the object prefix coheres more closely with the verb stem proper than with the prefixes to the left of the object prefix. Given that the object prefix is part of the perfect stem, then the data in (147) will be accounted for in a fashion entirely parallel to the data in (142), (143), and (146).

We turn now to High verb stems in the perfect with an object prefix included. Recall that we have argued from the present tense form of the verb that a High object prefix and a High verb stem are "fused" into a single HD. The forms in (148) below with a toneless subject prefix show that indeed this fusion **does** occur in the perfect (since we see that the only audible High tone is at the end of the HD). Given this, we will have to guarantee that, in either the "constraint exceptionality" analysis or the "morphological relativization of constraints" analysis, the elements **internal to the perfect stem** are predicted to emerged in a fused domain while the perfect stem itself does not fuse with a HD to its left. This represents an interesting complication to the picture, but since we are not in a position here to pursue a full-scale study of 'exceptionality" and its treatment in OT, we set the problem aside for further research.

The examples in (148) show that, in the case of a High subject prefix, Plateau affects all the nonheads in the "fused" HD that starts with the object prefix and extends through the verb stem.

(148)	ndiyityíile	vs.	báyityíile	
	niwabekíile		vs.	báwábékíile
	ndiyibonííle		vs.	báyíbóníile
	niwabonísiile		vs.	báwábónísiile
	ndikusebénzeele		vs.	bákúsébénzeele
	niwabonisísiile		vs.	báwábónísísiile
	niwanyinyithekísiile		vs.	báwányínyíthékísiile

These data follow directly from the analysis that we have developed, given the domain structure **(ba)(waboni)siile**.

We have seen that all perfective forms show one essential characteristic: there is no fusion of the domain of a H-subject prefix with the domain of the perfect stem. This failure of the OCP to have any effect in

these cases means that the optimal output will have two adjacent HD's. This sets up a situation where Plateau yields a surface sequence of High tones. The perfect stem thus strongly supports the Plateau constraint motivated by the phrasal tonology discussed in connection with the present tense. This concludes our analysis of Isixhosa. In the next section, we turn our attention to Shingazidja.

4. Shingazidja.

In this section we examine the tonology of Shingazidja, a Bantu language, closely related to Kiswahili, which is spoken on the largest of the Comoros Islands, Ngazidja. Unlike Kiswahili, which lost the Proto-Bantu tonal system and replaced it with penultimate stress, Shingazidja has retained a system of tonal contrasts, and a complex surface tonal pattern; we explore this pattern in some detail below. Our discussion of Shingazidja is based upon a comprehensive elicitation of data over several years; we plan a much more extensive presentation of the Shingazidja data in the future. We will show that Shingazidja, while superficially looking quite different from Isixhosa, nevertheless reflects the same constraints, only ranked in a somewhat different fashion. We shall see that Shingazidja is like Isixhosa in having "unbounded" domains and in being a "shift" rather than a "spreading" language; we shall also see that Shingazidja is like Isixhosa in having No Adjacent Edges highly ranked. Shingazidja differs (a) in that domains align with the Right edge of the Prosodic Phrase rather than the Prosodic Word, and (b) in the area of the interaction of the Faithfulness constraints with No Adjacent Edges.

Let us begin by reviewing the basic tonal facts of Shingazidja. Some words have a rise in pitch on their final mora.

(149) nyumbá 'house', mbilí 'two', godoró 'mattress', mlevý 'drunkard'
tsilindí 'I waited', tsihulú 'I bought', tsilipví 'I paid', djuú 'on'

We see this rise in pitch as being a direct surface indication that the final vowels in these words are sponsors of High tone. It will be convenient to give the reader a constant reminder of where the sponsors of High tone are located in Shingazidja words and phrases. We shall underline all of the vowels that can be demonstrated to be sponsors. The acute mark over a vowel will indicate the location of a raised pitch in the phonetic representation.

Other words in Shingazidja have a rise in pitch on the penult mora:

(150) shonónde 'knife', kalámu 'pen', góra 'hat', báo 'board', masikíni ' poor person'

tsilála ‘I slept’, tsipíha ‘I cooked’, tsipúwa ‘I broke, cut off’, tsitsambúwa ‘I cleaned’

We consider these words to reflect a penultimate H-sponsor.

There are some other words which contrast phonetically with those in (150) in that the penultimate mora has a raised pitch, but its **shape** is different (not rising, but with some downward thrust):

(151) mhúngu ‘eel’, nkhúde ‘beans’, ndróvi ‘banana(s)’, ikómbe ‘cup’, kuvéti ‘basin’

rilípvi ‘we paid’, rihúlu ‘we bought’, rilíndi ‘we waited’

We will demonstrate below that these words must be assumed to have two High-sponsors.

Some words have an antepenult rise in pitch:

(152) púchari ‘knife’, báfuta ‘cloth’, kúdume ‘rooster’, dódoke ‘sp. vegetable’

rípiha ‘we cooked’, rílala ‘we slept’, ritsámbuwa ‘we cleaned’

We shall argue that these words also have two High-sponsors. The data in (151) and (152) differ only in terms of the **location of the two sponsors**. The evidence that establishes the location of the High-sponsors will emerge shortly.

We should note that (when pronounced in isolation) no words in Shingazidja are entirely toneless. We do not explore here the issue of whether there are simply no inputs lacking a H-sponsor (and, if this is the case, how to characterize this fact about inputs) or, if there are toneless inputs, why the output must contain a High tone. These matters are interesting, but beyond the scope of this paper.

The key to understanding these various pitch patterns comes from examining the pitch shapes that arise from the combination of words into phrases. Consider for instance the combination of words such as those illustrated in (149):

(153) mezá ‘table’, djuú ‘on’, meza djúu ‘on a table’

masohá ‘axes’, mailí ‘two’, masoha maíli ‘two axes’

tsihulú ‘I bought’, nyumbá ‘house’, tsihulu nyúmba ‘I bought a house’

A simple generalization can be made about these data: **When there are two underlined vowels in the representation, a rise in pitch occurs on the mora preceding the second underlined vowel.**

The generalization above is supported by examples where phrases consist of words of either the type shown in (149) or the type shown in (150) in any combination. The examples in (153) above involved two words of the type in (149). Below we shall other combinations:

(154) **penult + final**

magóra ‘hats’, mailí ‘two’, magora maíli ‘two hats’

sufuríya 'pan(s)', mbilí 'two', sufuriyá mbili 'two pans'

mabúku 'books', maí 'bad', mabuku mái 'bad books'

itrándra 'bed', shií 'bad', itrandra shíi 'bad bed'

madjuníya 'sacks', mané 'four', madjuniya máne 'four sacks'

penult+penult

magóra ‘hats’, maráru ‘three’, magora máraru ‘three hats’

mádji 'water', mádu 'black', madjí madu 'black water'

sungúrwa 'rabbit', kuu 'big', sungurwá kuu 'big rabbit'

nawíli 'fare', rahísi 'cheap', nawili ráhisi 'cheap fare'

gári 'car', títi 'small', garí titi 'small car'

magári 'cars', matíti 'small', magari mátiti 'small cars'

final+ penult

mezá 'table', ndraru 'three', mezá ndraru 'three tables'

maserá 'ghosts', maráru 'three', masera máraru 'three ghosts'

kalishó 'short pants', ndzídu 'black', kalishó ndzidu 'black short pants'

zitsawazí 'wooden plates', ziráru 'three', zitsawazi zíraru 'three wooden plates'

udjongá 'horn', mfupvi 'short', udjonga m@fupvi 'short horn'

When the first underlined vowel is followed immediately by an underlined vowel, then the High tone is indeed heard on the first underlined vowel; if

there are other mora between the two underlined vowels, then a High tone is not heard on either of the underlined vowels but on the last vowel in front of the second underlined vowel. In every one of these examples, then, there is a High tone on the mora in front of the second underlined vowel and there is no other High tone.

Recall that the items in (151) and (152) were transcribed with **two** underlined vowels. If one examines where we have placed underlining, then these examples also conform to the generalization formulated above Specifically, in an example such as **nkhúde**, the H is heard on the mora in front of the second underlined vowel (which happens to also be the first underlined vowel). In an example such as **púchari**, it is again the case that a raised pitch appears on the mora in front of the second underlined vowel.

Now, what is the evidence that there are two underlined vowels in these examples? The verbal examples provide one source of evidence. Let us cite some relevant data:

(155) tsilindí ‘I waited’, tsihulú ‘I bought’, tsilipví ‘I paid’
ri̱lípvi̱ ‘we paid’, ri̱húlu̱ ‘we bought’, ri̱líndi̱ ‘we waited’

tsilá̱la ‘I slept’, tsipí̱ha ‘I cooked’, tsitsambú̱wa ‘I cleaned’
rí̱pi̱ha ‘we cooked’, rí̱la̱la ‘we slept’, ri̱tsámbu̱wa ‘we cleaned’

More evidence for the double underlining in (151) and (152) comes from placing these words in phrases:

(156) kuvéti̱ 'basin', djuú̱ 'on', kuvéti̱ djuú̱ ‘on the basin’
zí̱ndji̱ ‘many’, nyumbá̱ ‘house(s)’, nyumbá̱ zi̱ndjí̱ ‘many houses’
mhógo̱ 'cassava', mtí̱ti 'small', mhógo̱ mtí̱ti 'small cassava'
zipúlu̱ 'nose rings', zirá̱ru 'three', zipúlu̱ zirá̱ru 'three nose rings'
bá̱ngi̱li 'bracelets', mbilí̱ 'two', bá̱ngi̱li mbilí̱ 'two bracelets'
masohá̱ 'axes', mafú̱ka̱re 'seven', masoha̱ máfu̱ká̱re 'seven axes'
masorodá̱ 'soldiers', mé̱ndji̱ 'many', masorodá̱ me̱ndjí̱ 'many soldiers'
makatí̱li 'killers', mé̱ndji̱ 'many', makati̱lí me̱ndjí̱ 'many killers'

Note, for example, that if **kuvéti** did not have an underlined final vowel, we would expect the pronunciation ***kuveti djúu**. Similarly, if **zíndji** did not have a final underlined vowel, we would expect *__nyumbá zindji__. And if **mafúkare** did not have an underlined penultimate vowel,. we would expect

*__masoha máfukare__. The evidence is very clear that the items in question must have two underlined vowels, not one.

Examples such as the following show that the generalization under discussion must be expanded to the following: **A rise in pitch occurs on the mora in front of every even-numbered underlined vowel.**

(157) tsihulu mágari maíndji 'I bought many cars'
bángili zíndji 'many bracelets'
minkóbe mifúkare 'seven spoons'
nkáde zíndji 'many pages'
nde zé nyora zíndji 'the many stars'

ye magari máindji yá hangú 'my many cars'
rihúlu magari máindjí 'we bought many cars'
nde zé bangilí zindjí 'the many bracelets'
ríwono masorodá mendjí 'we saw many soldiers'
rihúlu kuvéti kúu 'we bought a big basin'
tsihulú bangilí zindjí 'I bought many bracelets'

ye makúveti maíndji ya hángu 'my many basins'
rihúlu bángili zíndji 'we bought many bracelets'

How are we to interpret the generalization that a pitch rise occurs in front of even-numbered underlined vowels? If we assume that an underlined vowel represents a sponsor of a High tone, then we can rephrase the generalization as follows: (a) every odd-numbered High-sponsor, starting from the Left edge of the representation, is organized into a HD; (b) that HD extends through the mora in front of the next H-sponsor; and (c) High tone is heard only on the last mora of the HD.

This interpretation is indeed the one that we shall follow. However, notice that this interpretation does not tell us how far the HD will extend **when there is no even-numbered H-sponsor following the odd-numbered H-sponsor**. We explore this issue now. When the odd-numbered H-sponsor is at the absolue end of the phrase, it realizes the rise in pitch:

(158) **one H-sponsor**

nyumbá ‘house(s)’

masohá 'axes'

djuú 'on'

etc.

three H-sponsors

rihúlu nyumbá ‘we bought a house’

nde le kápuká 'the can'

minkhóbe miilí 'two spoons'

kuvéti tradjí 'a large basin'

etc.

five H-sponsors

rihúlu nyumbá zindjí ‘we bought many houses’

ríwono masorodá mendjí 'we saw many soldiers'

When the odd-numbered underlined vowel is not final in the phrase (below, we will see that this means: **intonational phrase**), then the rise in pitch occurs on the penult (i.e. the last vowel in the phrase is excluded.

(159) **one H-sponsor**

gári ‘car’

baháti 'chance'

mwána 'child'

soha dzíro 'heavy axe'

mapvare mále 'long road'

gari djéma 'good car'

three H-sponsors

rihúlu gári ‘we bought a car’

wo unkóbe wa háhe 'his spoon'

le kuvéti la háhe 'his basin'

nde é puchári 'the knife'

five H-sponsors

rihúlu kuvéti kúu 'we bought a big basin'

tsihulu mínkhobe mífukáre 'I bought seven spoons'

It is important to note that in Shingazidja there are no nominals that end in two toneless morae. In the case of adjectives, however, one finds items that are entirely toneless -- cf. **gari djéma** 'good car' and **mapvare mále** 'long road'. Thus in phrases it is possible to find the last odd-numbered sponsor either on the penult, as in **wo unkóbe wa háhe** 'his spoon', or on the antepenult, as in **mapvare mále** 'long road', or even the pre-antepenult,. as in **gari djéma** 'good car'. In all cases, that H-sponsor's domain extends through the penult mora of the phrase.

We have summarized now the most basic facts about Shingazidja tone. Let us now turn to the ODT analysis of these facts. On the assumption that each High tone in the output is to be identified with the head of a HD, what we have seen is that (a) every odd-numbered High-sponsor triggers the formation of a HD and (b) the head of that HD is the mora in front of an even-numbered sponsor if there is one, otherwise it is as far right as possible excluding a "final" syllable. The data we have examined suggests that in Shingazidja Align X R is an "active" constraint (i.e. it dominates the Align R member of Basic Alignment and is therefore visibly active in selecting optimal outputs). It is also clear from these data that "X" in Align X R is not the Prosodic Word, but rather some larger grouping (since the HD's stretch across adjacent words). We shall argue later that "X" is in fact a Prosodic Phrase.

We have suggested that every odd-numbered H-sponsor is organized into a domain whose head realizes High tone. What about even-numbered H-sponsors? There are two possibilities: (a) they are organized into a HD but do not express the High tone feature, or (b) they are not organized into a HD and therefore there is no surface High that results from these sponsors. Since none of the constraints proposed in this paper would explain why even-numbered domains fail to realize a High tone, we will concentrate on exploring the (b) option.

Let us begin to construct our analysis with the simplest case: inputs that have a single High-sponsor. Consider, for example, /gari djema/. The optimal output is **(gari djé)ma**> Setting aside the expression aspect of the problem, we can guarantee that this output will be optimal by having (a) Align L, Domain Correspondence, Incorporate, and Nonfinality undominated; (b) Nonfinality dominate Align PP R; and (c) Align PP R dominate Align R. The tableau in (160) illustrates.

(160) input: gari djema optimal output: gari djéma

Candidates	Nonfinal	DomCor	Incorpor	Align PP R	Align R

gari djema		*(!)	*(!)		
(gari djema)	*!				ridjema
∅(gari dje)ma				ma	ridje
ga(ri dje)ma			*!	ma	ridje

We have not yet said anything with respect to the expression of the High tone feature. Clearly, in this respect Shingazidja is entirely parallel to Isixhosa: it is a "shifting" language, which means that *(H,nonhead) dominates Express (H). Furthermore, Align PP R must dominate Express (H), since it is more important to have wide domains than to have perfect satisfaction of Express (H). We can now summarize the constraint rankings that we have motivated.

(161)

Align L, DomCor, Incorporate, Nonfinality, *(H,nonhead) -- **undominated**
Align PP R -- **dominated by** Nonfinality
Align R -- **dominated by** Align PP R
Express -- **dominated by** *(H,nonhead), Align PP R

An input such as /nyumba/ has the optimal output **nyu(mbá)**. This form shows that Nonfinality must be a dominated constraint. Specifically, DomCor and Incorporate must outrank Nonfinality in order to guarantee that a final H-sponsor be organized into a domain. Thus we revise our constraint set as in (162):

(162) Align L, DomCor, Incorporate, *(H,nonhead) -- **undominated**
Nonfinality -- **dominated by** DomCor, Incorporate
Align PP R -- **dominated by** Nonfinality
Align R -- **dominated by** Align PP R
Express -- **dominated by** *(H,nonhead), Align PP R

Consider next an input such as /meza djuu/ with two H-sponsors. The optimal output is **me(za djú)u** (on the assumption that the second H-sponsor is not organized into a HD). There must be a constraint that forces a violation of DomCor/Incorporate. Clearly, this constraint must be No Adjacent Edges. If No Adjacent Edges dominates DomCor/Incorporate, then it will preferrable to violate DomCor/Incorporate if by so doing one can satisfy No Adjacent Edges. However, there is another means for avoiding adjacent domain edges that does not involve violating **both** DomCor and Incorporate. ***me(za djú)** has no adjacent domain edges and has one violation of DomCor, but it has no violation of Incorporate. In order to guarantee that ***me(za djú)** is nonoptimal, we propose ranking

Uniqueness (the constraint that allows a single H-sponsor in a HD) above Incorporate. There is still another way of avoiding adjacent domains: one could fail to expand the HD towards the Right edge of the Prosodic Phrase: e.g. *__me(zá) dju(ú)__. How can this output be evaluated as nonoptimal? The only aspect of this structure that is bad is the failure of Align PP R to be respected. Thus it seems apparent that we must rank Align PP R above DomCor/Incorporate. Thus we have now argued that both Align PP R and No Adjacent Edges dominate DomCor/Incorporate, and that DomCor/Incorporate dominate Nonfinality, and that Nonfinality dominates Align PP R. But this is a contradiction to the transitivity of constraint ranking.

The apparent violation of transitivity can be avoided by recognizing (see the discussion of Isixhosa above) that Nonfinality is a constraint family that consists of both (163) and (164):

(163) Nonfinality
Do not align the R edge of a PW/PP/IP with the R edge of a HD.

(164) Nonfinality (polysyllabic HD)
Do not align the R edge of a PW/PP/IP with the R edge of a polysyllabic HD.

It would then be (164) that outranks Align PP R and (162) that is dominated by DomCor/ Incorporate.

We are not, however, on secure ground. If Align PP R outranks DomCor/Incorporate, then ***gari djema** should be more optimal than **(gari djé)ma** since the latter violates Align PP R but the former does not! The problem seems to be this: a H-sponsor can fail to be parsed into a HD only as a means to avoid adjacent HD's, not as a means to avoid a violation of Align PP R! Violations of Align PP R do not get repaired by eliminating domain structure.

It seems to us that one of the most problematic aspects of OT is that it predicts that **any strategy that could eliminate an offensive configuration might do so**. Our present dilemma seems to be related to this weakness in the OT architecture. As such, we are not in a position to resolve the dilemma. We will simply assume that a principled means must be evolved whereby **gari djema** will not be selected over **(gari djé)ma**, not because of constraint ranking, but because misalignment with an edge cannot induce a violation of DomCor (whereas No Adjacent Edges may induce a violation of DomCor). In othe words

The following tableau illustrates the evaluation of /meza djuu/:

(165) input: meza djuu optimal output: meza djúu

Candidates	Uniqu e	NAE	Nonfi n (poly)	Align PP R	Dom Cor	Incorp	Nonfi n
mez<u>a</u> dju<u>u</u>					**(!)	**(!)	
me(z<u>a</u> dju)(<u>u</u>)		*!		u/ 0			*
me(z<u>a</u> dju<u>u</u>)	*!		*!		*		*
me(z<u>a</u>) dju(<u>u</u>)				djuu! /0			
∅me(z<u>a</u> dju)<u>u</u>				u	*	*	

We have established the following rankings:

(166) Align L, *(H,nonhead), Uniqueness, No Adjacent Edges, Nonfinality (polysyllabic HD) -- **undominated**
Align PP R -- **dominated by** Nonfinality (polysyllabic HD)
DomCor -- **dominated by** No Adjacent Edges, Align PP R
Incorporate -- **dominated by** No Adjacent Edges, Align PP R, Uniqueness
Nonfinality -- **dominated by** DomCor, Incorporate
Align R -- **dominated by** Align PP R
Express -- **dominated by** *(H,nonhead), Align PP R

Notice that when there is an input with just two H-sponsors, e.g. /mez<u>a</u> dju<u>u</u>/ or /tsihul<u>u</u> nyumb<u>a</u>/, then No Adjacent Edges could be avoided by failing to organize either of the H-sponsors into a domain. However, Shingazidja chooses **tsihu(l<u>u</u> nyu)mb<u>a</u>** over **tsihul<u>u</u> nyu(mb<u>a</u>)**. The choice of **tsihu(l<u>u</u> nyu)mb<u>a</u>** over **tsihul<u>u</u> nyu(mb<u>a</u>)** is a matter of what in rule-based phonology is known as **directionality**. In Shingazidja we want to omit every other potential domain going from left to right rather than going from right to left. Without going into detail, we adopt the analysis that gets at directionality in this case by preferring outputs where the Left edge of a Prosodic Phrase is aligned with the Left edge of a HD -- this will prefer **tsihu(l<u>u</u> nyu)mb<u>a</u>** over **tsihul<u>u</u> nyu(mb<u>a</u>)** since the Left edge of the former is two syllables away from a HD while the Left edge of the latter is four syllables removed from a HD. (Notice that the domain may not be any closer to the Left edge of the PP since Basic Alignment L is an undominated constraint in the language.)

Consider next an input such as /r<u>i</u>hul<u>u</u> nyumb<u>a</u>/. We expect again to find adjacent domain edges to be avoided by a failure to parse one of the H-sponsors into a HD; we expect Align PP R to force the domains that do occur to extend as far as possible to the Right, without violating Uniqueness. When there are three H-sponsors in the input, it is the middle

H-sponsor that is not organized into a domain. This represents the **minimal violation** of DomCor/ Incorporate. If the initial H-sponsor of /rihulu nyumba/ were not organized into a domain, then it would still be necessary to fail to organize the **lu** into domain if adjacent domains are to be avoided.

(167) input: rihulu nyumba

Candidates	Uniqu e	NAE	Nonfi n(poly)	Align PP R	Dom Cor	Incorp	Nonfi n
rihulu nyumba					**(!)*	**(!)*	
(rihu)(lu nyu) (mba)		*!*		lunyum ba/ mba			*
(ri)hu(lu) nyu (mba)				hulunyu mba! nyumba			*
(rihulu nyumba)	*!*		*				*
(rihulu nyu)mba	*!			mba	**	*	
∅(rihu)lu nyu (mba)				lunyum ba	*	*	*

We have now provided the essentials of our ODT analysis of Shingazidja tonology. At this juncture we turn our attention to some matters having to do with the interaction of tonology and syntactic structure in Shingazidja. On the basis of this material, we will establish that the notions "Prosodic Phrase" and "Intonational Phrase" play a critical role in characterizing the Shingazidja tonal pattern.

When one examines Shingazidja sentences, it becomes immediately clear that the analysis presented above would fail dramatically if the constraint Align X Right constaint referred to the entire sentence (or Intonational Phrase). For example, consider a sentence consisting of a subject noun phrase and a main verb. (The symbol "/" is placed between what we shall refer to below as Prosodic Phrases.)

(168) ye mlevi / hanwa 'the drunkard drank'

*ye mlevi hánwa

If the subject noun phrase and the verb are located in different Prosodic Phrases, and if X in Align X R refers to the Prosodic Phrase, then in the example in (168) we predict that the domain initiated by the final mora of

the noun **mlevíi** will not extend into the verb. However, if X refers to the sentence (or Intonational Phrase), then we would expect the domain to extend into the verb (and we would also expect that in the optimal output there would be no domain corresponding to the final High tone of the verb). Thus if X=Prosodic Phrase, we predict the correct **ye mle(víi) / ha(nwáa)**; if X=Sentence or IP, then we predict the incorrect ***ye mle(vii há)nwaa**.

In many other Bantu languages (e.g. Chimwiini, Shambaa) the subject of a sentence is obligatorily in a separate Prosodic Phrase from a following verb. The example in (168) confirms that Shingazidja shares this aspect of phrasing with Chimwiini and Shambaa. We do not undertake here any detailed discussion of all the principles that underline phrasing in Shingazidja. It is sufficient to note that the active Align X R constraint in Shingazidja must be Align PP R and not Align IP R.

The following data illustrate the fact that while Align PP Right refers to the Prosodic Phrase, Nonfinality refers to the Intonational Phrase:

(169) ye mwaná/ haríi 'the child played/was afraid', normal pronunciation, as compared with:

ye mwána// haríi 'the child, he played/was afraid' ["//" =end of Intonational Phrase]

The subject noun in these examples has a penultimate High-sponsor. The subject noun is necessarily separated from the following verb by a Prosodic Phrase edge. In normal pronunciation, the subject and the verb are in the same Intonational Phrase. But it is possible to pause after the subject, thereby introducing an Intonational Phrase edge between the subject noun and the verb. Notice that the tonal pattern is different in these two cases. When there is only a PP edge between subject noun and verb, the HD of /mwana/ extends onto the final vowel; when there is an IP edge between subject noun and verb, the HD of /mwana/ fails to extend onto the final vowel. We explain this contrast by postulating that the active form of Nonfinality (specifically, Nonfinality (polysyllabic HD))in Shingazidja is the version which refers to IP (not PP, not PW).

The preceding example illustrates a point that merits emphasis. Nonfinality (polysyllabic HD) in Shingazidja must outrank Align PP R in order to prevent the domain from extending onto syllables that are **both** at the end of a Prosodic Phrase and also at the end of an Intonational Phrase. Thus we have a situation where there is a constraint (Nonfinality (polysyllabic HD)) that refers to the IP but is ranked higher than a constraint (Align PP R) that refers to the Prosodic Phrase. This is contrary to the rule-based notions of a Prosodic Hierarchy, whereby a rule operating at the Prosodic Phrase level would "precede" a rule operating at the IP level. Thus we have clear evidence that in OT, constraint rankings do not

necessarily reflect the so-called Prosodic Hierarchy. The OT literature abundantly attests to the fact that a constraint that refers to the Prosodic Word may outrank a constraint that refers, for example, to the syllable. Shingazidja provides a similar case dealing with higher prosodic levels.

The constraint No Adjacent Edges bars adjacent domains. But there is a significant issue that must be addressed. Examination of earlier data demonstrates clearly that No Adjacent Edges blocks adjacent domains **inside** a Prosodic Word. Does it block adjacent domains **across** Prosodic Words? The answer to this is positive. For example, given an input like /nyumba ndraru/, No Adjacent Edges is responsible for the fact that the second sponsor is not in a domain: **nyu(mbá) ndraru**.This demonstrates that No Adjacent Edges affects adjacent words. **But what about adjacent words in two different Prosodic Phrases**? Does No Adjacent Edges induce a failure to locate the second sponsor in a domain?

The data below show that No Adjacent Edges evaluates the entire Intonational Phrase -- in other words, a Prosodic Phrase separation does not render No Adjacent Edges irrelevant.

(170) ye magarí / tsihulú 'the cars, I bought [them]'

vs.

ye magarí / rihulú 'the cars, we bought [them]'

lewó/ mlevíi / hapíha 'today the drunkard cooked'

vs.

lewó/ Bakarí / ha píha 'today Bakari cooked' (cf. Bákari)

In (170), we provide examples involving preposed objects and clause-initial adverbials. In Shingazidja, **every** pre-verbal constituent constitutes a separate Prosodic Phrase. This includes, besides subject phrases, preposed objects and averbials. That a preposed object constitutes a separate Prosodic Phrase from the verb is shown by **ye magarí / tsihulú** 'the cars, I bought [them]'; if there were no phrasal break between the preposed object and the verb, ***ye mag(ari tsihú)lu** would be the optimal output. Similarly, **lewó/ mlevií / hapíha** 'today the drunkard cooked' shows that a time adverbial as well as a subject phrase constitutes a separate prosodic domain. If there were no separation into different prosodic phrases, we would expect the output ***(lewo mlé)vi ha(pí)ha.**

When the initial prosodic phrase of the sentence is followed by another prosodic phrase which has an initial H-sponsor -- cf. **ye magarí / rihulú** 'the cars, we bought [them]' and **lewó/ Bakarí / ha píha** 'today Bakari cooked' (cf. Bákari), we have a situation where we can test whether No

Adjacent Edges is in effect **across** prosodic phrases. Consider the input **ye magari/ rihulu**. Align PP R will guarantee that the domain initiated by the syllable **ga** will extend to the end of the prosodic phrase. Thus we will have the domain structure **ye ma(gari)**. Now, were it not for No Adjacent Edges, we would expect the verb to have the domain structure **(rihu)lu** (this is the structure that the verb has in isolation, yielding the pronunciation **rihúlu**). But the actual pronunciation requires the domain structure **ye ma(gari) rihu(lu)**. In other words, No Adjacent Edges must bar the formation of a domain at the beginning of the second prosodic phrase. Thus we have unambiguous evidence that No Adjacent Edges has an "applicational domain" that is larger than the Prosodic Phrase -- specifically, the Intonational Phrase must be its applicational domain.[8] These data show, then, that No Adjacent Edges has an applicational domain larger than Align PP R -- establishing that higher constraint ranking does not reflect smaller applicational domains.

The tableau in (171) illustrates the preceding points. We omit the Nonfinality constraints as well as Basic Alignment from consideration in order to conserve space..

[8] In the interest of thoroughness, we should note that there seems to be the possibility of allowing the “cross-prosodic phrase” context to block the effect of No Adjacent HD Edges. Thus a pronunciation such as **ye magarí / rihúlu** seems to be possible. Our research suggests that for at least some speakers the applicability of this constraint across prosodic domains is the norm, but the nature of our research -- conducted with a small number of speakers outside the Shingazidja speech community -- prevents us from making any scientific assessment of the community norms in this matter.

(171)

Candidates	Unique	NAE	Align PP R	DomCor	Incorpor
ye ma(gari)/ (rihu)(lu)		*!*	lu		
ye ma(gari)/ (rihu)lu		*!	lu	*	*
yema(ga ri) /rihu (lu)				*	*
ye ma(gari rihulu)	*!*			**	
ye ma(ga)ri/ (rihu)lu			ri! lu	*	*

5.. On how Shingazdija differs from Isixhosa.

In looking even superficially at Isixhosa, one recognizes immediately that No Adjacent Edges plays a role in the language -- specifically, that it inhibits how wide a domain may be. But even a fairly careful examination of the data in Shingazija does not necessarily lead one to recognize that No Adjacent Edges is critical in the language. The reason for the non-obviousness of the role of No Adjacent Edges is that it does not in fact control how wide a domain may be -- domains indeed are so wide that they would potentially lead to violations of No Adjacent Edges. Rather, what No Adjacent Edges in Shingazidja restricts is **the very formation of a domain**! Thus we see that the same constraint may have very different consequences on the surface.

No Adjacent Edges (or possibly the more restricted version of the OCP, No Adjacent Sponsors) also leads to a restriction on the formation of domains in Isixhosa. But whereas in Isixhosa No Adjacent Edges forces a sequence of H-sponsors into a single domain, in Shingazidja the high ranking of Uniqueness bars such output structures as optimal. In Shingazidja, the high ranking of Uniqueness means that -- in order to both have wide domains and also avoid adjacent domains -- some H-sponsors must fail to be parsed into a HD.

While there are a variety of other small differences -- e.g. Align X R refers to the Prosodic Word in Isixhosa but the Prosodic Phrase in

Shingazidja; Nonfinality in Isixhosa refers to the Prosodic Word while Nonfinality in Shingazidja refers to the Intonational Phrase; No Adjacent Edges does not have effects across words in Isixhosa (this point was not developed in the text, but can be observed in the phrasal data that we presented) but does in Shingazidja -- indeed, it has effects across prosodic phrases; there is evidence in Isixhosa for a *MonoHD constraint, but this constraint has no visible effects in Shingazidja; etc.

A quick review of the Isixhosa and the Shingazidja data should be sufficient to establish that there is limited apparent similarity in the systems. Nevertheless, we have seen that our proposed set of constraints reveals the basic sameness of the two systems -- they simply differ in (a) the ranking of the constraints, and (b) in terms of which member of constraint families like Align X R and Nonfinality X (HD) is highly ranked, and (c) in terms of the applicational domain of the constraints. We believe that the ODT framework provides a basis for understanding the unity underlying the diversity of Bantu tone systems.

References

Akinlabi, A. 1994. Featural alignment. Ms., Rutgers University.

Akinlabi, A. 1995a. Featural affixation. To appear in *Journal of Linguistics*.

Akinlabi, A. 1995b. Kalabari vowel harmony. Ms., Rutgers University.

Archangeli, D. and D. Pulleyblank. 1994. *Grounded phonology*. Cambridge, MA: MIT Press.

Benua, L. 1995. Identity effects in morphological truncation. In J. Beckman, L. Walsh Dickey, & S. Urbanczyk (eds.), *University of Massachusetts Occasional Papers in Linguistics* 18: Papers in Optimality Theory. Amherst, MA: Graduate Linguistic Student Association. Pp. 77-136.

Cassimjee, F. 1997. *Isixhosa tonology: An Optimal Domains Theory Analysis.* To be published by Lincom Europa: München.

Cassimjee, F. and C.W. Kisseberth. Forthcoming. On motivating Optimality Theory: A conspiracy argument from Emakhuwa dialectology.

Cassimjee, F. and C.W. Kisseberth. 1992. On the tonology of depressor consonants: evidence from Mijikenda and Nguni, *Proceedings of the Special Session on the Typology of Tone held at the 1992 Annual Meeting of the Berkeley Linguistics Society*. Berkeley.

Cheng, C.C. and C.W. Kisseberth . 1979. Ikorovere Malua tonology (Part 1). *Studies in the Linguistic Sciences* 9:1, 31-63.

Cheng, C.C. and C.W. Kisseberth . 1980. Ikorovere Malua tonology (Part 2). *Studies in the Linguistic Sciences* 10:1, 15-44.

Cheng, C.C. and C.W. Kisseberth . 1981. Ikorovere Malua tonology (Part 3). *Studies in the Linguistic Sciences* 11:1, 181-202.

Cole, J. and C.W. Kisseberth. 1994. An Optimal Domains theory of harmony. *Studies in the Linguistic Sciences* 24:2, 101-114.

Cole, J. and C.W. Kisseberth. 1995. Paradoxical strength conditions in harmony systems. In Jill N. Beckman (ed.), *Proceedings of the North East Linguistic Society 25, vol. 1: Papers from the main sessions*. Pp. 17-29.

Cole, J. and C.W. Kisseberth. 1995. Nasal harmony in Optimal Domains Theory.

Cole,. J. and C.W. Kisseberth. 1995. Restricting multi-level constraint evaluation: Opaque rule interaction in Yawelmani vowel harmony. Ms.

Downing, L.J. 1990. *Problems in Jita tonology*. University of Illinois doctoral disseration.

Firth, J.R. 1948. Sounds and prosodies. *Transactions of the Philological Society*, pp. 127-152.

Harris, Z. 1944. Simultaneous components in phonology. *Language* 20:181-205.

Hyman, L.M. and E. R. Byarushengo.1984. A model of Haya tonology. In Clements, G.N. and J. Goldsmith (eds.), *Autosegmental studies in Bantu tone*. Pp. 53-103. Foris: Dordrecht.

Jokweni, M.1995. Aspects of Isixhosa phrasal tonology. Doctoral disserrtation, University of Illinois.

Kirchner, R. 1993. Turkish vowel harmony and disharmony: an Optimality-Theoretic account. Ms., UCLA.

Kisseberth, C.W. 1970. On the functional unity of phonological rules, *Linguistic Inquiry* 1: 291-306.

Kisseberth, C.W. 1973a. Is rule ordering necessary in phonology?, in *Issues in linguistics: papers in honor of Henry and Renee Kahane* (eds. B. Kachru, et al). Urbana.

Kisseberth, C.W. 1973b. The vowel length alternation in Klamath: a global rule. In M. Kenstowicz and C.W. Kisseberth (eds.), *Issues in phonologiucal theory*. The Hague: Mouton

Kisseberth, C. W. 1976. The interaction of phonological rules. In A. Koutsoudas (ed.), *The application and ordering of grammatical rules and the polarity of language*.. The Hague: Mouton.

Kisseberth, C.W. 1984. Digo tonology. In G.N. Clements and J. Goldsmith (eds.), *Autosegmental studies in Bantu tone.* Pp. 105-182. Dordecht: Foris.

Kissebeth, C.W. 1992. Metrical structure in Zigula tonology, in D. Gowlett (ed.), *African Linguistic Contributions*. Pp. 227-259. Via Afrika: Pretoria.

Kisseberth, C.W. and E. Ndabarasa. 1993. Ruciga nominal tonology. Paper presented at the Annual Conference on African Linguistics, The Ohio State University.

Kraska-Szlenk, I. 1995. *The phonology of stress in Polish.* Doctoral dissertation,]University of Illinois.

Kenstowicz 1995. Base-identity and uniform exponence: Alternatives to cyclicity. Ms., MIT.

McCarthy, J. 1995. Remarks on phonological opacity in Optimality Theory. To appear in Jacqueline Lecarme, Jean Lowenstamm, and Ur Shlonsky, eds., *Studies in Afroasiatic Grammar*, Holland Academic Graphics.

McCarthy, J. and A. Prince. 1993. Generalized Alignment. In Geert Booij & Jaap van Marle (eds.), *Yearbook of Morphology 1993.* Dordrecht: Kluwer. 79-153.

McCarthy, J. and A. Prince. 1995. Faithfulness and reduplicative identity. In Jill Beckman, Laura Walsh Dickey, & Suzanne Urbanczyk, eds., *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory.* Amherst, MA: Graduate Linguistic Student Association. Pp. 249-384.

Mmusi, S. 1992. Obligatory Contour Principle effects and violations: the case of Setswana verbal tone. Doctoral disserrtation, University of Illinois.

Myers, S. 1993. OCP effects in Optimality Theory. Ms., University of Texas.

Odden, David. 1982. "Tonal phenomena in Kishambaa', *Studies in African Linguistics* 13, 177-208.

Prince, A. and P. Smolensky. 1993. *Optimality theory: constraint interaction in generative grammar.* Technical Report #2, Rutgers Center for Cognitive Science.

Pulleyblank, D. 1994a. Vowel harmony and Optimality Theory. To appear in the proceedings of the Workshop on Phonology, University of Coimbra (Septemb er 1993).

Pulleyblank, D. 1994b. Neutral vowels in Optimality Theory: A comparison of Yoruba and Wolof. Ms., University of British Columbia.

Richardson, I. 1959. *The role of tone in the structure of Sukuma.* London: School of Oriental and African Studies.

Sietsema, B. 1989. *Metrical dependencies in tone assignment.* Doctoral dissertation, MIT.