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UNGENERALIZABLE MINIMALITY IN NDEBELE*

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ZAS

A body of work in Prosodic Morphology clearly establishes the importance of prosodic constituents like the foot as templates conditioning morpheme size. A striking finding of this research is that morphological footing is independent of metrical footing in many languages, as the footing required for particular morphological processes is often not identical to that required for phonological processes like stress assignment. However, recent OT research on Prosodic Morphology has made the opposite claim. Within this theory, the Generalized Template Hypothesis (GTH) proposes that no morpheme-particular templates defining minimal and maximal size are necessary. Instead, templates are always derivable from general principles of the grammar, like independently motivated metrical footing. This paper presents evidence from Ndebele showing that the GTH is too strong. In Ndebele, several different verb forms are subject to a minimality condition. In some cases, the minimality condition can be derived through independent metrical footing, as the GTH predicts. However, in several cases it cannot, showing that morpheme-particular size constraints are still a necessary part of the grammar.

1. Introduction

The goal of this paper is to make both a descriptive and a theoretical contribution to the understanding of the phonology-morphology interface in Ndebele, a Nguni Bantu language spoken primarily in Zimbabwe. The descriptive goal is to examine the role of minimality in motivating morpho-phonological alternations in five verb forms of Ndebele: the imperative, future, reduplicative, participial and passive. I will

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An earlier version of this paper was published as Downing [2000b]. This version supercedes and, I trust, improves on that version.

show that more than one minimality condition is necessary to account for the Ndebele facts. The theoretical goal is to examine how best to formalize these distinct minimality conditions in the Optimality Theoretic (OT) framework of current phonological theory. Formalizing minimality is an issue because most recent work on prosodic morphology within Optimality Theory (see, for example, McCarthy [2000]; McCarthy & Prince [1994, 1995a,b, 1999]; Spaelti [1997]; Urbanczyk [1995, 1996]; Walker [2000]) argues that there are no morpheme-particular templates, like distinct minimality constraints for different verb constructions. Instead, a disyllabic (foot size) minimality constraint on a morpheme, for example, should universally follow from defining that morpheme as a Stem. As McCarthy [2000] argues, morphological Stems are universally parsed as PhWords. (This correlation is called the Stem → PrWord Homology [McCarthy 2000]; note that PrWord and PhWord are equivalent terms.) Further, PhWords necessarily contain a metrical foot since they dominate a foot in the Prosodic Hierarchy [McCarthy & Prince 1986]. As a result, Stem morphemes are necessarily minimally bisyllabic since they are parsed as PhWords, and PhWords must contain a minimally bisyllabic metrical foot. There is no need for a templatic minimality constraint on morphemes, like Stem=Foot (or RED=Foot, etc.).

In this paper, I will show that minimality in Ndebele cannot easily be accommodated in the proposal that all disyllabic minimality effects can be derived by the Stem → PrWord Homology. Even though the five different verbs forms of Ndebele all roughly take the verb stem as their base and are all subject to a disyllabic minimality condition, in only two cases, the imperative and future, can the minimality condition be derived by the Stem → PrWord Homology. In the other cases, it cannot, and the minimality condition must be formalized as a morpheme-particular template. The argument is structured as follows. In section 2, I provide some phonological and morphological background on Ndebele. In sections 3-6, I discuss each of the verbal forms in turn, showing why each is subject to a distinct minimality constraint. In section 7, I discuss the theoretical implications of the analysis.

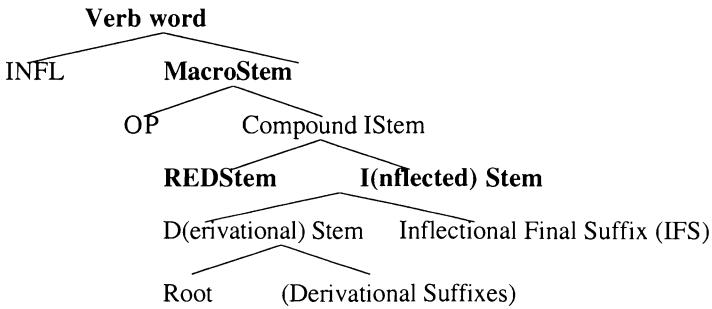
2. Background

2.1 Phonological background. All of the Ndebele data is cited in the orthography (except where clearly indicated otherwise). It is important to note that all consonant sequences in Ndebele orthography are phonetically single sounds—e.g., 'kh' = [k^h]; 'hl' = [ɬ]; 'dl' [ɮ]; mb = [^{m}b]; etc.—and syllable structure is strictly (C)V. Also, in Ndebele orthography 'y' is the palatal glide; 'j' is a palatal affricate and 'c', 'q', 'x' are the dental, retroflex, and lateral clicks, respectively. Note that acute accents indicate high tone (unaccented vowels have a low tone) in the data below, while a colon following a vowel indicates length. (As will be discussed in more detail below, penultimate syllables are always lengthened.)

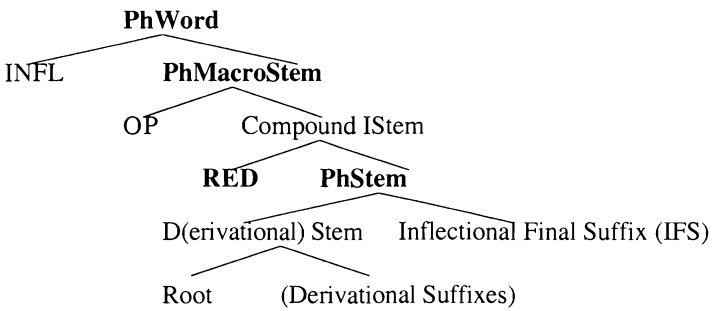
2.2. Bantu verb structure: morpho-syntactic and morpho-prosodic. As background to the analyses presented below, it is important to note that I am assuming,

as shown in (1a), that Bantu verb words consist of two distinct constituents: the inflectional prefixes (INFL) and the Stem (Inflected Stem). Work by Barrett-Keach [1986], Hyman [1993], Hyman & Mtenje [1999], Mchombo [1993], Myers [1987, 1998] and Mutaka [1994], among others, shows there is both phonological and morphological evidence for this structure in numerous Bantu languages. (This is also the traditional view of Bantu verb structure presented in work like that of Doke [1943, 1954] and Meeussen [1967].)

(1) a. The morpho-syntactic structure of verb words in Bantu (adapted from Myers [1987]; Hyman & Mtenje [1999])



b. The morpho-prosodic structure of verb words in Ndebele



The constituents of the verb word which are important for this paper are: the verb word itself, the Macro-Stem, consisting of the Object Prefixes (OP) plus the Inflected Stem [Kisseberth 1984; Odden 1996]; the reduplicant (REDStem); and the I(nflected) Stem, consisting of the D(erivational) Stem (the Root, followed by optional derivational suffixes) plus an obligatory Inflectional Final Suffix (IFS). I argue below that these four morpho-syntactic constituents are parsed into the four distinct morpho-prosodic constituents shown in (1b). This proposal assumes, following work like Inkelas [1989, 1993] and Selkirk [1986], that all phonological rules apply within morpho-prosodic domains, rather than domains defined directly on morpho-syntactic structure. As a result, every morphological constituent (M-constituent) which serves as a domain for phonological or prosodic rules must

have a corresponding morpho-prosodic constituent (Ph-constituent), and it is this Ph-constituent which interacts with the phonology. Following work like that of Czaykowska-Higgins [1996, 1998], Downing [1999b] and Inkelas [1989, 1993], I assume that sublexical morphological constituents also have corresponding Ph-constituents. In the default case, the Ph-constituent is coextensive with the corresponding M-constituent. However, the two may be misaligned, for example, by constraints requiring the Ph-constituent to be of minimal size. I shall show that PhWord, PhMacroStem, RED, and PhStem (bolded in (1b)) are all subject to distinct minimality constraints in Ndebele.

3. PhWord

3.1. Imperative. Work like that of Brandon [1975], Herman [1995], Mutaka [1994] and Myers [1987, 1995] has established the importance of PhWord as a phonological domain in many Bantu languages. The motivation for the PhWord as a constituent in much of this work comes from examining the imperative form of verb stems, since the imperative is the only context where verb stems may occur unprefixed in most Bantu languages. As shown in (2a), Ndebele follows this general pattern: the imperative form of most verbs consists of the bare verb stem. But in (2b) we see that monosyllabic stems are augmented by epenthesizing a syllable in the imperative. And in (2c) we see that vowel-initial stems are (optionally) augmented by epenthesizing an onset in the imperative.

(2) Imperative verbs in Ndebele (Downing field notes; Rycroft [1983]; source of the H tone is underlined; '=' indicates the INFL=MacroStem juncture)

	Infinitive	Imperative	
a. C-initial, Multisyllabic	*úkú=do:nsa*	*do:nsa*	'to pull'
	úkú=bhukú:tsha	*bhukú:tsha*	'to swim'
	úkú=khi:pha	*khi:pha*	'to put out'
	úkú=búthéle:la	*buthelé:la*	'to heap up'
b. C-initial, Monosyllabic	*úkú:=lwa*	*yí:-lwa*	'to fight'
	úku:=phá	*yi:-phá*	'to give'
	úku:=zwá	*yí:-zwa*	'to hear'
	úkú:=fa	*yí:-fa*	'to die'
c. V-initial	*úkw=á:la*	*(y-)á:la*	'to refuse'
	úkw=éla:pha	*(y-)elá:pha*	'to cure'
	úkw=éthu:la	*(y-)ethú:la*	'to go down'
	úkw=ábi:sa	*(y-)abí:sa*	'to help divide'

Optional epenthesis in the vowel-initial stems can be motivated by the Onset Principle [Itô 1986; Downing 1999b]. The best motivation for syllable epenthesis in the imperative form of monosyllabic stems is that, as argued by Myers [1987] for Shona, another Bantu language, PhWords are cross-linguistically required to be minimally bisyllabic. As work like McCarthy & Prince [1986, 1994, 1995b] and Selkirk [1995] has argued, this follows from the prosodic hierarchy. PhWord dominates Foot in the hierarchy, so by the Headedness Principle of the Strict Layer Hypothesis [Selkirk 1984, 1995; Nespor & Vogel 1986], PhWord must dominate a Foot. Since Feet are minimally bisyllabic, then PhWords must be, too. As we can see in the data in (2), Ndebele words are, in fact, stressed on the penultimate syllable (this is indicated by lengthening the penult vowel), as is typical in Southern Bantu languages [Doke 1954; Myers 1987]. It is plausible to propose that in Ndebele, too, the minimality requirement on PhWords falls out from a requirement that they dominate a bisyllabic foot.

The minimality and Onset conditions on PhWord can be formalized by the constraints listed in (3). These constraints and ranking optimize misaligning the MWord (in this case the bare verb stem) with PhWord by epenthesis in order to satisfy minimality and Onset. The analysis is exemplified in (4).[1] Note that in this tableau, '[' indicates a PhWord edge,'(' a foot parse. As shown in this tableau, it is not optimal to misalign MWord and PhWord by epenthesis when MWord satisfies prosodic well formedness (compare (4a) with (4b)). However, when MWord is subminimal (as in (4d)) or lacks an onset (as in (4f)), it is optimal to misalign

(3) Constraints on minimality and onset conditions on PhWord

a. **Headedness** (adapted from Selkirk [1995], fig (4ii)):
A PhWord must dominate a metrical Foot.[2]

b. **FtMin:** Feet are minimally bisyllabic.

c. **Onset:** *AlignL(σ, μ_s)

OUTRANK

d. **PhWord≈MWord**: PhWord is coextensive with MWord

e. **DEP-IO**: Output segments must have input correspondents.

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[1] To complete the analysis, one must explain why [yi] is the epenthesized syllable, rather than some other. It is actually not surprising that [yi] should be epenthesized since [i] is a common epenthetic vowel, probably due to its inherent shortness and resulting inherent lack of sonority [Steriade 1995; Pulleyblank 1998]. This generalization can be formalized, following Pulleyblank (1998), by a harmonic ranking placing DEP[+hi,-back] below other featural faithfulness constraints. To account for why only a single trochaic foot is parsed at the right edge of the word in Ndebele, I propose that **AllFtR** (a constraint requiring all feet to be aligned at the right edge of the word) outranks **Parseσ** (a constraint requiring all syllables to be parsed into feet). Since none of these constraints are ever violated, they will not be included in the tableaux.

[2] By metrical foot, I mean a foot that has a head which is more prominent than the other elements of the foot (through stress, length, pitch). See Crowhurst [1992] for detailed discussion of this distinction between the morphological and metrical foot.

(4)

	Headedness	FtMin	Onset	PhWord≈ MWord	DEP-IO
/donsa/					
☞ (a) [({do:nsa})]					
(b) [YI{(do:nsa})]				*!	**
/lwa/					
☞ (c) [(YI:{lwa})]				*	**
(d) [({lwa})]		*!			
/ala/					
☞ (e) [(Y{a:la})]				*	*
(f) [({a:la})]			*!		

MWord and PhWord by epenthesizing enough material to satisfy prosodic well-formedness constraints (as shown in (4c,e)).

To sum up this section, imperatives provide our first evidence that morpho-prosodic constituents in Ndebele are subject to a bisyllabic minimality constraint. Imperatives are PhWords. Since PhWord is the domain for stress assignment in Ndebele, the minimality requirement on imperatives falls out from the requirement that PhWord dominate a stress foot. For comparison with cases to be discussed later, it is also important to note that epenthesis of phonologically unmarked material before the morphological base is the strategy used to satisfy minimality in the imperative.

3.2. Future. The imperatives illustrate one sort of mismatch between morphological and morpho-prosodic constituency, namely, the PhWord in this case contains material not found in the morphological word to satisfy minimality. In this section, I argue for another sort of mismatch between PhWord and morphological word, namely when a single morphological word is parsed into two PhWords. The evidence for this comes from the Future construction in Ndebele, and we will see that both PhWords that make up a Future morphological word are subject to minimality.

As shown in (5a), the future prefix in Ndebele is *-za-*. The data in (5b, c) show that when monosyllabic verbs and V-initial stems occur in the future tense, they are augmented by /ku/ (which alternates with [kw] before non-round vowels and [k] before round vowels). However, /ku/ does not occur with these same verb stems if they are preceded by an object prefix (OP), as shown in (5d).[3]

(5) Future verb forms in Ndebele (Downing field notes); future prefix is *-za-*

a. C-initial, Multisyllabic

si:-za=thí:ya	'we will fish'
bá:-za=phendu:lwa	'they are being turned around'
bá:-za=tshele:la	'they will slip'
si:-za=khanzí:nga	'we will fry'

b. C-initial, Monosyllabic

si:-za=ku:-lwa	'we will fight'
bá:-za=ku:-zwa	'they will hear'
bá:-za=ku:-pha	'they will give'

c. V-initial

si:-za=kw-ehli:sa	'we will bring down'
bá:-za=kw-e:qa	'they will jump'
bá:-za=kw-a:kha	'they will build'
ngi:-za=k-o:ndla	'I will raise; rear'
bá:-za=kw-abela:na	'they will divide for each other'

d. V-initial, Monosyllabic + OP

bá:-za=m-éqi:sa	'they will make him/her jump'
si:-za=m-esabí:sa	'we will frighten him/her'
si:-za=bá:-pha	'we will give them'
ú:-za=bé:-zwa	's/he will hear them'[4]

Since /ku-/ only surfaces with monosyllabic and vowel-initial MacroStems (OP+Stem), its occurrence clearly has a prosodic motivation: it allows these MacroStems to be minimally bisyllabic and begin with onsets.

In order to formalize the minimality constraint on the MacroStem, we must first determine which morpho-prosodic constituent it is parsed into. Notice, first, that the penult vowel of both the INFL and the MacroStem are lengthened. As

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[3] An identical alternation pattern in the future tense has been identified in Kirundi, a Bantu language spoken mainly in Burundi. See Aronoff [1988], Downing [1998b], Goldsmith & Sabimana [1986], and Myers [1998] for discussion.

[4] The verb stem /-zwa/ 'to hear' has a "latent" initial 'i' which occasionally affects the vowel quality of some preceding prefixes. In most respects, however, verbs like /-zwa/ pattern with monosyllabic verbs, not vowel-initial ones.

noted in discussing the imperatives, penult length is the correlate of stress assignment to the word in Ndebele. Normally, we do not expect to find more than one long vowel per word.[5] Since we find two long vowels, /ku-/ plausibly begins a distinct PhWord from the preceding Future INFL, so that words like those in (5) have the following morpho-prosodic parse:

(6) a. [bá:za]$_{PhWd}$[ku:pha]$_{PhWd}$ 'they will give'
b. [bá:za]$_{PhWd}$[kwa:kha]$_{PhWd}$ 'they will build'
c. [bá:za]$_{PhWd}$[tshele:la]$_{PhWd}$ 'they will slip'

Further evidence that the MacroStem following the Future INFL begins a new PhWord comes from the tone patterns of these forms. In Ndebele, as in other Nguni languages (see Cassimjee [1998]; Downing [1990, 1996]; Rycroft [1980, 1983] and references cited therein), high tones shift rightwards. The rightmost high tone generally surfaces on the antepenult of the word, even if the syllable which contributes the high tone is several syllables to the left of the antepenult and must cross a MacroStem boundary to reach the antepenult. This is illustrated in (7) where we see the H tone from the H-toned subject prefixes (underlined) spreads across the stem boundary to the antepenult syllable. Note that *ya-* is the present affirmative focus prefix and *-ile* is the past tense suffix; both are underlyingly low-toned.

(7) a. *ú-yá=vódlo:za* 's/he is crushing'
b. *bá-yá=tshéle:la* 'they are slipping'
c. *bá=lím-i:le* 'they farmed'
d. *ú-yá=búthéle:la* 's/he is heaping up'
e. *bá-yá=phéfúmu:la* 'they are breathing'

These data show that the prefixal H tone crosses the morphological stem boundary (=) to reach the antepenult when the stem has no H tone. However, as shown in the data in (8), H tones do not shift long distance across word boundaries. In these data (taken from Rycroft [1983]), notice that H tones of the first word do not spread to the following word even when it is all low-toned. I conclude from this that long distance tone spread is word-bound. In terms of the theory adopted here, that means it takes PhWord as its domain. Notice that the H tone of the SP *bá-* 'they' does not spread rightwards to the MacroStem in the Future forms. This

[5] While /ku/ resembles the infinitive prefix (and historically, the Future in Ndebele, as in many Bantu languages, may well be derived from the verb 'to come' (*-za* in Ndebele) plus an infinitive complement [Nurse & Muzale 1999]), synchronically, the future tense forms cited in (5) are single verb words. That /ku/ is distinct from the infinitive prefix can be seen from comparing the data in (5) with true infinitival complements, where /úku-/ is obligatorily present no matter how long the verb is and whether or not the verb has an OP: e.g., *si:-za=za:ma úkú=ba-lwí:sa* 'we will try to fight them'. Notice the infinitival complement has an OP (bá- 'them') and the stem itself (*-lwisa* 'cause to fight') is bisyllabic, yet /úku-/ obligatorily occurs on the infinitive.

(8)	*akú:kho bantwa:na*	'there are no children'
	akú:kho zikhwa:ma	'there are no bags'
	akú:kho ndlwanya:na	'there is no small house'
	ábáfá:na be:thu	'our boys'
	ízi:nto za:khe	'his/her things'

tone pattern is expected if the INFL and MacroStem are distinct PhWords; it is totally unexpected otherwise.

The empty morph /ku/ surfaces, then, to satisfy minimality conditions on PhWord.[6] To explain why there is a correlation between the form of the base stem and the occurrence of this empty morph, I propose that the Future must be constrained to affix only to a prosodically well-formed base, PhWord. This requirement can be formalized with the constraint in (9a) which outranks the general alignment constraint (9b) defining the optimal position of INFL as adjacent to the MacroStem.

(9) (a) **AlignFut**: Align(R, Future INFL; L, PhWord)
Align the right edge of the Future INFL with the left edge of a PhWord.

OUTRANKS

(b) **AlignINFL**: Align(R, INFL; L, MacroStem)
Align the right edge of INFL with the left edge of a MacroStem.

What remains to be explained is why /ku/ does not surface when not needed to satisfy prosodic well-formedness. I propose this can be accounted for by ranking constraint AlignINFL (9b) above MAX-IO and below the prosodic constraints: Onset, Minimality>> AlignINFL>>MAX-IO. As shown in (10), this optimizes not realizing /ku/ when the morphological MacroStem is prosodically well-formed. /ku/ optimally surfaces when the MacroStem is monosyllabic or V-initial. Even though maintaining /ku/ in the output violates AlignINFL (9b), deleting it leads to violations of the higher ranked prosodic well-formedness conditions (Onset, Minimality) on PhWord. However, as shown in (10e), when the morphological MacroStem satisfies the prosodic well-formedness constraints (Minimality and Onset), it is optimal for /ku-/ not to surface.

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6 What is less clear is /ku-/'s morpho-syntactic status, since it is an empty morph with no identifiable morpho-syntactic function. As its occurrence correlates with a particular tense/aspect (Future), it is plausible to propose it is a daughter of INFL. However, since it cannot co-occur with OPs and occurs in order to satisfy prosodic well-formedness constraints on the MacroStem, it is just as plausibly a daughter of the MacroStem. To resolve this ambiguity, I propose that /ku/ is morpho-syntactically unaffiliated (and so unpositioned in the input). See Booij & Lieber [1993] and Downing [1998b] for discussion and analysis of other cases of prosodically positioned morphemes, and reference to other work on this topic. And see Downing [2000b] for an analysis of how /ku-/'s surface position and morpho-prosodic parse can be determined solely by constraint interaction.

(10)[7]

	Align Fut	Align /ku/	Onset	FtMin	DEP-IO	Align INFL	MAX-IO
/si-za=(ku)-lwa/							
☞ (a) si:za=[ku:-{lwa						*	
(b) si:za=[{lwa				*!			**
/ba-za=(ku)-eqa/							
☞ (c) ba:za=[kw-{e:qa						*	
(d) ba:za=[{e:qa			*!				**
/si-za=(ku)-thiya/							
☞ (e) si:za=[{thi:ya							**
(f) si:za=[ku-{thi:ya						*!	

To sum up this section, I have shown that the Future takes a morpho-prosodic constituent, PhWord, as its base for affixation, as well as a morphological base, the MacroStem. This best explains why the base of the Future INFL is subject to minimality: (morpho-)prosodic constituents are typically required to be prosodically well-formed. As in the imperative, the minimality condition on the base (and on the Future INFL) falls out from the requirement that a PhWord must be parsable into a metrical foot.

4. PhMacroStem

A similar pattern of alternations to those found in the Future is found in the Participial form of the verb (used, for example, in subordinate clauses introduced by the complementizer úmá 'if'). As I will show in this section, though, the Participial takes a different morpho-syntactic Base from the Future and so requires a different minimality constraint.

As shown in (11a), there is no independent tense/aspect marker in the Participial form of the verb in Ndebele (or other Nguni languages; see Cassimjee [1998] for discussion of the participial in closely-related IsiXhosa). However, some of the subject prefixes (*bé-* 'they'; *é-* 's/he') are distinct from those used in other affirmative tenses (*bá-* 'they'; *ú-* 's/he'). The data in (11b,c) show that when monosyllabic and V-initial stems occur in the participial, they are augmented by /si/ (which alternates with [s] before vowels). However, /si/ does not occur with these same verb stems if they are preceded by an object prefix (OP), as shown in (11d). Since /si/ only surfaces with monosyllabic and V-initial MacroStems, its occurrence

[7] In this tableau, '=' indicates the right edge of INFL, '[' indicates PhWord edge, '{' indicates the MacroStem edge. Even though the empty morphs are necessarily ordered in the input for typographic reasons, the parentheses around them serve as a reminder that they are actually ordered only in the output by alignment constraints.

(11) Participial verb forms in Ndebele (Downing field notes)

(a) Multisyllabic, C-initial

é=qá:nsa	'...s/he is climbing...'	*é=qá:nsa-qá:nsa* 'reduplicated'
é=ngení:sa	'...s/he is putting in...'	
bé=bó:na	'...they see...'	
bé=lí:ma	'...they are farming...'	

(b) Monosyllabic

bé=si:-dla	'...they are eating...'
ngi=si:-pha	'...I am giving...'
ngi=sí:-wa	'...I am falling...'

(c) V-initial

bé=s-éhli:sa	'...they are bringing someone down'
bé=s-éhlí-y-éhli:sa	reduplicated form of 'they are bringing s.o. down'
é=s-á:kha	'...s/he is building...'
u=s-o:ma	'...you are thirsty...'

(d) Monosyllabic and V-initial + OP

e=b-ákhé:la	'...s/he is building for them...'
ngi=kú:-pha	'...I am giving you...'

clearly has the same prosodic motivation as for the empty morph /ku-/ occurring in the Future: it allows these MacroStems to be bisyllabic and begin with onsets.

In the preceding section it was argued that the MacroStem following the Future INFL is a PhWord since stress is assigned to both the Future INFL and the MacroStem, and tone from a prefix in INFL does not spread into the MacroStem. These same tests show that /si/ does not begin a distinct PhWord from the preceding Participial INFL. Notice in (11) that only a single vowel in the participial verb word is lengthened: the penult vowel of the MacroStem. Further, the H tone of the Subject Prefix spreads to the MacroStem. This is expected if the MacroStem and INFL are part of the same PhWord, but unexpected if they are distinct PhWords. Finally, notice the participial INFL consists of a single syllable, and so is too short to constitute a distinct PhWord. I propose instead that /si/ is parsed into PhMacroStem (the morpho-prosodic constituent based on the MacroStem). Since PhMacroStem is a subconstituent of PhWord, as shown in (1b), it correctly is contained within the same tone and stress assignment domain as the Participial INFL.

PhMacroStem must further be subject to a minimality constraint particular to that constituent:

(12) **PhMacro(Stem) = Foot**: PhMacroStem is coextensive with a Foot.

PhMacroStem minimality (12) cannot fall out from Headedness (3a), since PhMacroStems, unlike PhWords, are not required to dominate a metrical foot. Further,

PhMacroStem, unlike PhWord, is only required to satisfy minimality in certain morphological contexts, like the Participial. Monosyllabic and V-initial MacroStems occur unaugmented in other morphological contexts, like the infinitive (e.g., *ukú:=pha* 'to give'; *úkw=á:kha* 'to build'; /úku-/ is the infinitive prefix) and the *-ya-* tense in the data in (13), below. (Notice that the stress falls outside the MacroStem in the monosyllabic examples, confirming PhMacroStem does not necessarily dominate a metrical foot.)

(13) No augmentation of monosyllabic and V-initial stems in other contexts

(a) Monosyllabic

si-ya:=lwa	'we are fighting'
kú-ya:=tsha	'it is burning'
bá-ya:=dla	'they are eating'
si-ya:=pha	'we are giving'

(b) V-initial

si-y=e:hla	'we are going down'
si-y=a:kha	'we are building'
bá-yá=m-éhli:sa	'they are making him/her go down'
si-y=o:tha	'we are basking'

(c) Multisyllabic, C-initial

si-ya=khwé:la	'we are climbing'
si-ya=ngeni:sa	'we are putting in'
bá-yá=do:nsa	'they are pulling'

Although the Participial takes a different morpho-prosodic constituent as its Base than the Future—the PhMacroStem rather than the PhWord—the rest of the analysis of this form is identical to that of the Future. An alignment constraint particular to the Participial (14a) outranks the usual alignment constraint (14b) requiring INFL and the MacroStem to be adjacent:

(14) (a) **AlignPart**: Align(R, Participial INFL; L, PhStem)
Align the right edge of the Participial INFL with the left edge of a PhStem.

OUTRANKS

(b) **AlignINFL**: Align(R, INFL; L, MacroStem)
Align the right edge of INFL with the left edge of a MacroStem.

Ranking AlignINFL (14b) above MAX-IO and below the prosodic constraints (Onset, Minimality>> AlignINFL>>MAX-IO) accounts for why /s(i)-/ only surfaces when required to satisfy the prosodic constraints. As shown in (15), this optimizes

(15)[8]

	Align Part	Align /si/	Onset	PhMacro, FtMin	DEP -IO	Align INFL	MAX-IO
/be=(si)-pha/							
☞ (a) be=[si-{pha						*	
(b) be=[{pha				*!			**
/be=(si)-akha/							
☞ (c) be=[s{akha						*	*
(d) be=[{akha			*!				**
/be=(si)-bona/							
☞ (e) be=[{bona							**
(f) be=[si-{bona						*!	

deleting the empty morphs when the morphological MacroStem is prosodically well-formed.

As shown in (15a,c), the /si/ optimally surfaces when the MacroStem is monosyllabic or V-initial. Even though maintaining /si-/ in the output violates AlignINFL (14b), deleting it leads to violations of the higher ranked prosodic well-formedness conditions (Onset, Minimality) on PhMacroStem. However, as shown in (15e), when the morphological MacroStem satisfies Onset and Minimality, it is optimal to delete /s(i)-/ to satisfy AlignINFL (14b).

To sum up this section, I have shown that the Participial, like the Future, takes the MacroStem as its morphological base for affixation. Like the Future, it also takes a morpho-prosodic base. This best explains why the base of the Participial INFL is subject to minimality: (morpho-)prosodic constituents are typically required to be prosodically well-formed. I have shown that the Future and Participial do not take the same morpho-prosodic constituent as their base, however. The Future takes the PhWord, while the Participial takes the PhMacroStem. As a result, the Participial minimality requirement does not fall out from the general principal of Headedness (3a) that accounts for minimality in PhWords.

5. RED

In Ndebele, as in many other Bantu languages (see Downing [2000a] and references cited therein), verb stems can be reduplicated to indicate that the action of the verb is done for a short period of time or in a careless fashion. As shown by the data in (16a), RED is maximally bisyllabic: no matter how long the Base verb stem is, RED never exceeds two syllables. The data in (16b) show that RED is also

[8] In this tableau, '=' indicates the right edge of INFL, '[' indicates PhStem edge, '{' indicates the MStem edge. Even though the empty morphs are necessarily ordered in the input for typographic reasons, the parentheses around them serve as a reminder that they are actually ordered only in the output by alignment constraints.

minimally bisyllabic. Monosyllabic stems are augmented by [yi], just as in the imperatives. The only difference is that [yi] follows the RED segments corresponding to the Base stem, while in the imperative [yi] preceded the segments corresponding to the input stem.

(16) Ndebele reduplication (Downing field notes)
(RED is bolded; source of the H tone is underlined; '=' indicates the INFL = MacroStem juncture)[9]

	Infinitive	Reduplicated	Gloss
(a) *Multisyllabic, C-initial*			
	úkú=do:nsa	*úkú=**donsá**-do:nsa*	to pull
	úkú=há:mba	*úkú=**hamba**-há:mba*	to go
	úkú=hambí:sa	*úkú=**hambi**-hambí:sa*	to cause to go
	úkú=khanzí:nga	*úkú=**khanzi**-khanzí:nga*	to fry
	úkú=límísa:na	*úkú=**límí**-límísa:na*	to help ea. other farm
(b) *Monosyllabic*			
	úkú:=lwa	*úkú=**lwayí**:-lwa*	to fight
	úku:=dlá	*úkú=**dlayí**:-dla*	to eat
	úku:=zwá	*úkú=**zwayí**:-zwa*	to hear
	úkú:=za	*úkú=**zayí**:-za*	to come
	úkú:=fa	*úkú=**fáyi**:-fa*	to die

Since REDs, like imperatives, are minimally bisyllabic and minimality is satisfied in a similar way for REDs and imperatives, one might assume that REDs are also PhWords. If this were so, then the minimality condition on REDs could also fall out from the requirement that PhWords must dominate stress feet. However, there are two important arguments why REDs are not PhWords. The first is that, if RED were a separate PhWord, we would expect its penult vowel to be lengthened under stress. However, as is clear from the data in (16), REDs are not assigned stress. Only the penult vowel of the entire reduplicated form (INFL=RED+Base stem) is lengthened, showing that both RED and the Base stem are contained within a single PhWord to which stress is assigned. The second is that, as argued above, if RED were a separate PhWord from the Stem, we would expect High tones to be blocked from shifting into the Stem. Since H tones clearly shift to RED and its Base from the preceding prefixes, as shown in (16), they must be within the same PhWord as the prefixes and cannot be separate PhWords themselves.

Since RED is not a PhWord, then the minimality restriction on REDs cannot follow from the same general constraints on metrical footing defining PhWord

[9] See Hyman, Inkelas & Sibanda (1999) for discussion of reduplication in a different dialect of Ndebele.

minimality that apply in the imperative and Future. (It is clear that RED is also a distinct morpho-prosodic constituent from the MacroStem, as it forms a subconstituent of the MacroStem.) Instead, I propose that RED minimality is accounted for by the constraints and ranking given in (17).[10]

(17) (a) **RED=Ft**
i. The RED string is coextensive with a foot.
ii. The RED string is associated with the weight-bearing elements of a foot.

(b) **FtBin**
i. FtMin: Feet are minimally bisyllabic (see (3b)).
ii. FtMax: Feet are maximally bisyllabic.

(c) **SMAX-BR**: Every segment of the Base (B) has a correspondent in the RED (R).

(d) **Ranking**: RED=Ft, FtBin >> SMAX-BR, DEP-IO

Note that the Foot defining the RED size cannot be a metrical foot, unlike the foot defining the minimal PhWord, since RED is not stressed. Instead, the feet in (18) are purely prosodic, non-headed feet, parsing the RED string into a binary constituent. The analysis is exemplified in (18).

(18)

	RED=Ft	FtMin, FtMax	Onset	SMAX-BR	DEP-IO
/RED-hambisa/					
☞ (a) (hambi)-hambi:sa				**	
(b) (hambisa)-hambi:sa		*! (Max)			
/RED-lwa/					
☞ (c) (lwaYI:)-lwa					**
(d) (lwa)-lwa		*! (Min)			

[10] See Downing [2000a] for detailed arguments in favor of this approach. Crowhurst[1992] and Mutaka & Hyman[1990] present arguments for distinguishing morphological feet (like those used to define RED size) from stress feet, showing minimality effects cannot always be derived from independently motivated footing in other languages.

The analysis given here does not explain why the epenthetic /y/ that separates the RED and the Base of V-initial stems is not copied, as predicted by work like that of McCarthy & Prince [1993a]. Downing [1998b] accounts for this by proposing that the REd in these words corresponds to the input base, not the output (by high ranking DEP-IR). This problem becomes moot in Pulleyblank's [to appear] approach which eliminates BR correspondence in favor of IR correspondence.

As shown in (18a), it is optimal to partially reduplicate longer Base stems in order to satisfy FtMax. It is also optimal to augment monosyllabic Base stems by epenthesis, as shown in (18c), to satisfy FtMin.

To sum up this section, while REDs, like PhWords and PhMacroStems, are minimally bisyllabic, this condition cannot be accounted for by parsing REDs as PhWords or PhMacroStems. The lack of stress on REDs and their ability to be a target for prefixal H tones shows that they are not themselves PhWords, but rather subconstituents of PhWord. RED is also clearly a subconstituent of PhMacroStem. As a result, RED is subject to a distinct minimality condition from the other verb constructions discussed so far.

6. PhStem

The final verb construction I will discuss is the Passive. As shown in (19a), the passive suffix is *-w-*, occurring after the final consonant of the IStem. The data in (19b,c) show that when monosyllabic (C-V) verbs and minimal vowel-initial (VC-V) stems occur in the passive, they are augmented by an epenthetic [i] before the passive glide /-w-/. Note in (19d), the epenthetic [i] does not occur with these same stems if another derivational suffix precedes the passive /-w-/.

(19) Passive verbs in Ndebele (Downing field notes)
(source of the H tone is underlined; '=' indicates the INFL=MacroStem juncture)

	Infinitive	Passive	Gloss of Infinitive
(a)	*Multisyllabic, C-initial stems*		
	úkú=hleːk-a	*úkú=hleːk-w-a*	to laugh (at)
	úkú=linganíːs-a	*úkú=linganíːs-w-a*	to measure
	úkú=cé:l-a	*úkú=cé:l-w-a*	to request
(b)	*Monosyllabic*		
	úkuː=ph-á	*úkúː=ph-íː-w-a*	to give
	úkuː=dl-á	*úkúː=dl-íː-w-a*	to eat
(c)	*V-initial* (VC-V)		
	úkw=áːkh-a	*úkw=ákh-iːw-a*	to build
	úkw=éːnz-a	*úkw=énz-iːw-a*	to do
	úkw=ó-sa	*úkw=ós-iːw-a*	to roast

(d) *Derived stems*

úkúː=lw-a	*úkúː=lwiːs-a*	*úkúː=lwiːs-w-a*
'to fight'	'to fight (tr.)'	'passive'
úkw=éːnz-a	*úkw=énziːs-a*	*úkw=énziːs-w-a*
'to do'	'to cause to do'	'passive'

Since the epenthetic [i] only surfaces with underived monosyllabic and vowel initial (VC-V) stems, its occurrence clearly has the by now familiar prosodic motivation: it allows these IStems to be minimally bisyllabic. As argued in detail in Downing [1998a, b; 1999b], VC-V stems pattern with C-V stems because the initial vowel is extraprosodic. Excluding the initial vowel from the stem improves the well-formedness of the stem by allowing it to begin with an onsetful syllable. However, once the initial vowel is excluded from these stems, they are subminimal, and so predictably pattern with CV stems in triggering [i] epenthesis.

In order to complete the analysis of [i] epenthesis in the passive, we must determine which morpho-prosodic constituent is evaluated for minimality in this morphological construction. Using our usual tests of stress and tone placement, we can see in (19) that the passive stem is not a separate PhWord. Notice that H tones from the prefixes surface within the passive stem. This would not be expected if a PhWord boundary separated the passive stem from the prefixes. The passive stem is also distinct from PhMacroStem. As shown in (19) and by the additional data in (20), not only INFL prefixes but also prefixes within the MacroStem like RED and the empty morph /ku/ co-occur with the epenthetic [i], showing they do not count to satisfy minimality.

(20) Only IStem material (following '[') counts for passive stem minimality in Ndebele

	Passive infinitive	Gloss		
(a)	úk=ó[s-i:-w-a	to be roasted	úk=**osí**-y-ó[s-i:-w-a	'reduplicated'
(b)	úku=[ph-i:-w-a	to be given	úku=**phiwá**-[ph-i:-w-a	'reduplicated'
(c)	kú-ya=[dl-í:w-a	it is being eaten		
(d)	í-y=á[kh-i:w-a	it is being built		
(e)	kú:za=[dl-í:w-a	it will be eaten	* kú:za=[ku:-dl-w-a	
(f)	kú:za=k-o[s-í:w-a	it will be roasted		

I propose that the relevant constituent for Ndebele passive minimality is the passive PhStem, the morpho-prosodic constituent corresponding to the morphological I-Stem. The minimality condition on this constituent is formalized in (21):[11]

(21) **PhStem = Foot**: PhStem (passive) is coextensive with a Foot.

The analysis is exemplified in (22), where we see that ranking the minimality constraints PhStem (21) and FtMin (3a) above DEP-IO optimizes epenthesizing [i] when the passive stem would otherwise be subminimal, as in (22c, e). However,

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[11] See Downing [1999] and Herman [1996] for a similar analysis of related facts in SiSwati, a closely related Nguni Bantu language.

the same constraint ranking penalizes epenthesizing [i] when the input passive stem is two syllables or longer.

(22)

	PhStem, FtMin	DEP-IO
/úku=hlek-w-a/		
☞ (a) uku=[hlek-w-a		
(b) uku=[hlek-iw-a		*!
/uku=ph-w-a/		
☞ (c) uku=[ph-iw-a		*
(d) uku=[ph-w-a	*!	
/uku=akh-w-a		
☞ (e) uku=a[kh-iw-a		*
(f) uku=a[kh-w-a	*!	

7. Implications for the Generalized Template Hypothesis

In the analyses in the preceding sections, I have shown that five different verbal constructions in Ndebele—the imperative, future, participial, reduplicative, and passive—are subject to minimality. Even though the same minimal size (a bisyllabic Foot) is imposed on all these constructions, it is not possible to formalize this shared minimality restriction as a single, general constraint. We instead need four constraints, one for each morpho-prosodic constituent motivated by these verb forms. As I have shown, the imperative and future provide evidence for PhWord minimality. However, the minimality constraints active in the participial, reduplicative and passive forms are imposed on subconstituents of PhWord. The participial motivates a minimality condition on its prosodic base, the PhMacroStem. The reduplicative morpheme (RED) is subject to a minimality condition on its own size (but imposes no active minimality condition on its base). The Passive PhStem must be distinct from the PhMacroStem, as MacroStem material is ignored in determining the satisfaction of Passive PhStem minimality.

The proposal that we need four distinct minimality constraints in Ndebele is at odds with recent OT work on prosodic morphology [McCarthy 2000, McCarthy & Prince 1994, 1995, 1999; Spaelti 1997; Urbanczyk 1995, 1996; and Walker 2000; among others] which argues that constraints on morpheme shape should fall out from generalized "templates" rather than morpheme-particular size restrictors like PhStem=Ft (20) or RED=Ft (8a). McCarthy [2000:169] summarizes the Generalized Template Hypothesis (GTH) especially concisely:

"According to the GTH, there are no prosodic templates or other morpheme-specific structural constraints. Instead, the descriptive effects of prosodic templates are to be obtained from the following premises, each of which is independently motivated:
"*Stem → PrWord homology*. The principal, and perhaps only, morphology-prosody interface constraint is Align-Stem [with PhWord].
"*Markedness constraints*. Universal grammar supplies phonological markedness constraints which are not sensitive to morphology.
"*Correspondence theory* [McCarthy & Prince 1993a, 1994a, 1995, 1999]. Correspondence theory extends the original OT conception of faithfulness into a general way of relating representations. This allows certain seemingly templatic effects to be obtained from general markedneess constraints [C] ranked so as to allow emergence of the unmarked[:...] MAX-IO >> C >> MAX-BR."

Morpheme-particular minimality conditions can be subsumed by the Stem → PrWord Homology as follows.[12] Any morpheme that is subject to a minimality condition is to be considered a Stem morphologically. Since Stems are aligned with PhWords by the Stem → PrWord Homology and PhWords minimally dominate one bisyllabic metrical foot by the Strict Layering Hypothesis (see section 3, above), defining a morpheme as a Stem indirectly enforces minimality by these independently needed constraints. This is what makes this theory of minimality general: only a small set of universal morpheme categories (Stem, Root, Affix) is recognized by the theory. Stress is universally assumed to take the PhWord (which in the default case must contain a stem) as its domain. As a result, universal constraints on minimal foot size can be generalized to enforce minimal bisyllabicity for any morphological constituent parsed as a PhWord.

As McCarthy & Prince [1994] make clear, defining minimality indirectly by these general constraints has the important advantage of explaining other phonological properties of morphemes besides the fixed size. For example, in Diyari, the reduplicant is a bisyllabic prefix and the second syllable always ends in a vowel, even if the corresponding base syllable is closed, as shown in (22).

(22) Diyari reduplication [McCarthy & Prince 1994: 250, fig. (29))

wíl̪a	***wíl̪a***-*wíl̪a*	'woman'
kánku	***kánku***-*kánku*	'boy'
kúɭkuɲa	***kúɭku***-*kúɭkuɲa*	'to jump'
tʲílparku	***tʲílpa***-*tʲílparku*	'bird sp.'
ɲánkan̪̈ti	***ɲánka***-*ɲánkan̪̈ti*	'catfish'

[12] The interaction of markedness and faithfulness constraints are most important for enforcing a maximality condition on morphemes. See Downing [2000a] for discussion. And see Urbanczyk [1996] for discussion of how general constraints on Root and Affix size can account for other size constraints on reduplicants.

As McCarthy & Prince [1994] argue, labelling the reduplicant a Stem (=PhWord=Foot) correctly predicts not only the bisyllabic minimal size condition on the reduplicant, but also accounts for the fact that the reduplicant is stressed. And it also accounts for why the reduplicant is vowel-final, even though syllables (and feet) can end in consonants. Consonant-final syllables can only occur word-medially in Diyari; all words must end with vowels. All of these properties—the minimal size, stress assignment, ending with a vowel—fall out from defining the reduplicants as stems, given the Stem → PrWord Homology. Accounting for the bisyllabic minimality condition with a morpheme-specific constraint like RED= Foot, in contrast, would make no predictions about stress and would wrongly predict that the reduplicant foot, like other feet, can end with a consonant.

Similarly, in Ndebele, defining the imperative and the Future's base as PhWords accounts not only for their minimally bisyllabic size, but also accounts for tone and stress assignment in these forms. Morpheme-particular minimality constraints, like "Imperative=Foot" or "Future subcategorizes for Foot," would not. However, the other Ndebele verb forms discussed here show it is too strong to claim that all bisyllabic minimality effects fall out from the Stem → PrWord Homology. RED, the PhMacroStem, and the Passive PhStem are all subject to a disyllabic minimality condition, yet they fail the independent phonological tests for PhWords. This shows that morpheme-particular size constraints are still a necessary part of universal grammar. And, in fact, this should not be a surprising result. An important contribution of the theory of Prosodic Morphology [McCarthy & Prince 1986, and others] has been to establish that morphology as well as phonology can provide evidence about the prosodic structure of a language. While this work shows that prosodic morphology and phonology draw on the same repertoire of foot types, numerous papers show that different principles can define the morphological and phonological (or metrical) footing in the same language. For example, McCarthy & Prince [1990] argue that while metrical feet in Classical Arabic are moraic trochees assigned from the right edge of the word, the fixed shape defining broken plurals and diminutives is an iambic foot whose segmentism corresponds to a moraic trochee parsed at the left edge of the related base form. Likewise Spring [1990] (see, too, McCarthy & Prince [1993a,b]; Crowhurst [1992]) argues that in Axininca Campa minimal words are quantity-insensitive bisyllabic feet: words consisting of a single bimoraic syllable are quite rare. However, metrical feet defining stress assignment are quantity sensitive iambs: stress feet consisting of a single bimoraic syllable are quite common. (See Crowhurst [1992] for detailed analysis of several examples like this.) And as Poser [1990] shows, languages like Japanese require a bimoraic foot to define minimality conditions on hypocoristic formation and other morphological processes even though Japanese is not a stress language (and, Poser argues, the footing required for these morphological processes is distinct from that proposed in metrical accounts of Japanese pitch-accent). Ndebele confirms this distinction between metrical footing and the footing required to define morphological processes like minimality, since some verb constructions are subject to minimality even though they are not parsed into metrical feet.

8. Conclusion

In sum, all bisyllabic minimality conditions on verb constructions in Ndebele cannot be accounted for by the Stem → PrWord Homology. It is most likely to be valid, in fact, for languages where Stem and morphological word are generally coextensive, and stems are not typically distinct phonological domains from words. However, in Bantu languages like Ndebele, and in other agglutinative and polysynthetic languages (see, e.g., Czaykowska-Higgins [1996, 1998]), unaffixed stems are not morphological words. Instead, stems are distinct morphological and phonological domains from words. As a result, it is not surprising that the Stem (and other major sublexical constituents) within Ndebele words turn out to be subject to size constraints distinct from those applying to words.

REFERENCES

Aronoff, Mark. 1988. "Head operations and strata in reduplication: a linear treatment." In Geert Booij & Jaap van Marle (eds.), *Yearbook of Morphology*. Dordrecht: Foris. Pp. 1-15.

Barrett-Keach, Camilla N. 1986. "Word-internal evidence from Swahili for Aux/Infl." *Linguistic Inquiry* 17: 559-564.

Booij, Geert and Rochelle Lieber. 1993. "On the simultaneity of morphological and prosodic structure." In Sharon Hargus & Ellen Kaisse (eds.), *Studies in Lexical Phonology*. San Diego: Academic Press, Inc. Pp. 23-44.

Brandon, Frank Roberts. 1975. "A constraint on deletion in Swahili." In Robert K. Herbert (ed.), *Proceedings of the Sixth Conference on African Linguistics. Ohio State University WPL* 20: 241-259.

Cassimjee, Farida. 1998. *Isixhosa Tonology: an Optimal Domains Theory Analysis*. LINCOM Studies in African Linguistics 29. Munich: LINCOM EUROPA.

Crowhurst, Megan J. 1992. *Minimality and Foot Structure in Metrical Phonology and Prosodic Morphology*. Bloomington, Indiana: IULC.

Czaykowska-Higgins, Ewa. 1996. *What's in a Word? Word structure in Moses-Columbia Salish (Nxaʔamxcín).* Winnipeg: Voices of Rupert's Land.

Czaykowska-Higgins, Ewa. 1998. "The morphological and phonological constituent structure of words in Moses-Columbia Salish (Nxaʔamxcín)." In Ewa Czaykowska-Higgins & M. Dale Kinkade (eds.), *Salish Languages and Linguistics: Theoretical and Descriptive Perspectives.* Berlin: Mouton de Gruyter. Pp. 153-195.

Doke, C.M. 1943. *Outline Grammar of Bantu.* Distributed [1983] as Communication No. 12, Dept of African Languages, Rhodes University, Grahamstown, Rep. of South Africa.

Doke, C.M. 1954. *The Southern Bantu Languages.* London: Oxford University Press.

Downing, Laura J. 1990. "Local and metrical tone shift in Nguni." *Studies in African Linguistics* 21: 261-317.

Downing, Laura J. 1996. *The Tonal Phonology of Jita.* LINCOM Studies in African Linguistics 05. Munich: LINCOM Europa.

Downing, Laura J. 1998a. "On the prosodic misalignment of onsetless syllables." *Natural Language and Linguistic Theory* 16, 1-52.

Downing, Laura J. 1998b. "Prosodic misalignment and reduplication." In Geert Booij & Jaap van Marle (eds.), *Yearbook of Morphology* 1997. Dordrecht: Kluwer. Pp. 83-120.

Downing, Laura J. 1999. "Prosodic Stem ≠ Prosodic Word in Bantu." In T. Alan Hall & Ursula Kleinhenz (eds.), *Studies on the Phonological Word.* Amsterdam: John Benjamins. Pp. 73-98.

Downing, Laura J. 2000a. "Morphological and prosodic constraints on Kinande verbal reduplication." *Phonology* 17: 1-38.

Downing, Laura J. 2000b. Satisfying minimality in Ndebele. *ZAS Working Papers in Linguistics* 19, 23-39.

Goldsmith, John and F. Sabimana. 1986. "The Kirundi Verb." Ms., Indiana University.

Herman, Rebecca. 1996. "Prosodic structure in SiSwati." *Ohio State University WPL* 48: 31-55.

Hyman, Larry M. 1993. "Conceptual issues in the comparative study of the Bantu verb stem." In S. S. Mufwene and L. Moshi (eds.), *Topics in African Linguistics*. Amsterdam: John Benjamins. Pp.. 3-34.

Hyman, Larry M. and Al Mtenje. 1999. "Prosodic morphology and tone: the case of Chichewa." In René Kager, Harry van der Hulst & Wim Zonneveld (eds.), *The Prosody-Morphology Interface*. Cambridge: Cambridge University Press. Pp. 90-133.

Hyman, Larry M., Sharon Inkelas, and Galen Sibanda. 1999. "Morpho-syntactic correspondence in Bantu reduplication." Ms., University of California-Berkeley.

Inkelas, Sharon. 1989. "Prosodic constituency in the lexicon." Ph.d. dissertation, Stanford.

Inkelas, Sharon. 1993. "Deriving cyclicity." In Sharon Hargus and Ellen Kaisse (eds.), *Studies in Lexical Phonology*. Phonetics and Phonology 4. San Diego: Academic Press. Pp. 75-110.

Itô, Junko. 1986. "Syllable theory in prosodic phonology." PhD dissertation, University of Massachusetts-Amherst.

Kisseberth, Charles W. 1984. "Digo Tonology." In G.N. Clements and J. Goldsmith, eds. *Autosegmental Studies in Bantu Tone*. Dordrecht: Foris. Pp. 105-182.

McCarthy, John. 2000. "The prosody of phase in Rotuman." *Natural Language and Linguistic Theory* 18: 147-197.

McCarthy, John and Alan Prince. 1986. "Prosodic morphology." Ms. University of Massachusetts, Amherst and Brandeis University. [published in 1996 as Rutgers Center for Cognitive Science Technical Report 32, http://ruccs.rutgers.edu/tech_rpt/pm86all.pdf.]

McCarthy, John and Alan Prince. 1990. "Foot and word in Prosodic Morphology: the Arabic broken plural." *Natural Language and Linguistic Theory* 8: 209-283.

McCarthy, John and Alan Prince. 1993a. "Prosodic morphology I: constraint interaction and satisfaction." Ms., University of Massachusetts, Amherst, and Rutgers University.

McCarthy, John and Alan Prince. 1993b. "Generalized Alignment." In Geert Booij and Jaap van Marle (eds.), *Yearbook of Morphology 1993*. Dordrecht: Kluwer. Pp. 79-153.

McCarthy, John and Alan Prince. 1994. "The emergence of the unmarked: optimality in prosodic morphology." *Proceedings of the North East Linguistic Society* 24: 333-379.

McCarthy, John and Alan Prince. 1995a. "Faithfulness and reduplicative identity." *Papers in Optimality Theory. UMOP* 18: 249-384.

McCarthy, John and Alan Prince. 1995b. "Prosodic morphology." In John A. Goldsmith (ed.), *The Handbook of Phonological Theory*. Cambridge, Mass.: Blackwell. Pp. 318-366.

McCarthy, John and Alan Prince. 1999. "Faithfulness and identity in Prosodic Morphology." In René Kager, Harry van der Hulst, and Wim Zonneveld (eds.), *The Prosody-Morphology Interface*. Cambridge: Cambridge University Press. Pp. 218-309.

Mchombo, Sam A. 1993. "Reflexive and reciprocal in Chichewa." In Sam A. Mchombo (ed.), *Theoretical Aspects of Bantu Grammar*. Stanford: CSLI. Pp. 181-207.

Meeussen, A. E. 1967. "Bantu grammatical reconstructions." *Africana Linguistica* 3. Tervuren: Musée Royal de l'Afrique Centrale. Pp. 79-121.

Mutaka, Ngessimo M. 1994. *The Lexical Tonology of Kinande*. Munich: LINCOM EUROPA.

Mutaka, Ngessimo M. and Larry Hyman. 1990. "Syllables and morpheme integrity in Kinande reduplication." *Phonology* 7: 73-119.

Myers, Scott. 1987. "Tone and the structure of words in Shona." Ph.D. dissertation, University of Massachusetts, Amherst.

Myers, Scott. 1995. "The phonological word in Shona." In Francis Katamba (ed.), *Bantu Phonology and Morphology*. LINCOM Studies in African Linguistics 06. Munich: LINCOM Europa. Pp. 69-92.

Myers, Scott. 1998. "AUX in Bantu morphology and phonology." In Larry M. Hyman and Charles W. Kisseberth (eds.), *Theoretical Aspects of Bantu Tone*. Stanford: CSLI. Pp. 231-264.

Nespor, Marina and Irene Vogel. 1986. *Prosodic Phonology*. Dordrecht: Foris.

Nurse, Derek and Henry R.T. Muzale. 1999. "Tense and aspect in Great Lakes Bantu languages." In Jean-Marie Hombert and Larry M. Hyman (eds.), *Bantu Historical Linguistics: Theoretical and Empirical Perspectives*. Stanford: CSLI. Pp. 517-544.

Odden, David. 1996. *The Phonology and Morphology of Kimatuumbi*. Oxford: Clarendon Press.

Poser, William J. 1990. "Evidence for foot structure in Japanese." *Language* 66: 78-105.

Pulleyblank, Douglas. 1998. "Markedness-based feature-based faithfulness." Paper presented at SWOT 4, University of Arizona.

Pulleyblank, Douglas. to appear. "Patterns of reduplication in Yoruba." In Kristin Hanson and Sharon Inkelas (eds.), Stanford: CSLI Press.

Rycroft, David K. 1980. "Ndebele and Zulu: Some phonetic and tonal comparisons." *Zambezia* VIII: 109-128.

Rycroft, David K. 1983. "Tone Patterns in Zimbabwean Ndebele." *Bulletin of the School of Oriental and African Studies* 46: 77-135.

Selkirk, Elisabeth O. 1984. *Phonology and Syntax: The Relation Between Sound and Structure*. Cambridge, Mass.: MIT Press.

Selkirk, Elisabeth O. 1986. "On derived domains in sentence phonology." *Phonology* 3: 371-405.

Selkirk, Elisabeth O. 1995. "The prosodic structure of function words." *Papers in Optimality Theory, UMOP* 18: 439-470.

Spaelti, Philip. 1997. "Dimensions of variation in multi-pattern reduplication." Ph.d. dissertation, University of California-Santa Clara.

Spring, Cari. 1990. "Implications of Axininca Campa for Prosodic Morphology and reduplication." PhD dissertation, University of Arizona.

Steriade, Donca. 1995. "Underspecification and markedness." In John A. Goldsmith (ed.), *The Handbook of Phonological Theory*. Cambridge, Mass.: Blackwell. Pp. 114-74.

Urbanczyk, Suzanne. 1995. "Morphological templates in reduplication." *Proceddings of the North East Linguistic Society* 26, 425-440.

Urbanczyk, Suzanne. 1996. "Patterns of reduplication in Lushootseed." PhD dissertation, University of Massachusetts, Amherst.

Walker, Rachel. 2000. "Nasal reduplication in Mbe affixation." *Phonology* 17: 65-115.

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