Chapter 6

OTHER PHENOMENA: REDUPLICATION AND COOCCURRENCE RESTRICTIONS

In this chapter I examine two cases of nasal agreement which may at first be mistaken for nasal spreading but I argue have properties identifying them as other kinds of phonological phenomena. The first is a case of nasal agreement in Mbe affixation (Bamgbose 1971), which I show to be an example of reduplication. Evidence for this conclusion is compiled both cross-linguistically and on the basis of a detailed analysis of various morpho-phonological phenomena in the language. The second is a condition of long-distance nasal agreement holding within and across morphemes in certain Bantu languages (Ao 1991; Odden 1994; Hyman 1995; Piggott 1996). I claim that this should be classified as an example of a cooccurrence restriction, paralleling a set of other languages in which cooccurrence restrictions over segments having similar but different properties are resolved by substitution of an identical feature rather than dissimilation. The direction for the cooccurrence analysis is sketched and the details are left for further research.

6.1 Reduplication in Mbe

In this case study of Mbe nasal agreement, I argue that what has been (atheoretically) termed 'nasal harmony' in Mbe (Bamgbose 1971) is in fact a case of reduplication in which material is copied as a nasal coda to a prefix with place features linked to the following onset; if place linking fails, no copy occurs. I demonstrate that this account is motivated on the basis of various other phenomena in Mbe, and it has implications illuminating the theory of reduplication. First, the place-linked nasal status of the copied segment is independently-motivated by conditions on Mbe syllable structure. Second, the size restriction on the reduplicant can be simply obtained through an atemplatic alignment constraint, AllSyllableLeft, utilized in a ranking producing The Emergence of the Unmarked (acronymically TETU; McCarthy and Prince 1994b; size-restrictor ranking after Spaelti 1997 with foundation in proposals of McCarthy and Prince 1994a; Prince 1996, 1997). This atemplatic account of size-restriction does work elsewhere in the language in limiting the size of other prefixation, both reduplicative and non-reduplicative. Further, I show that alternative templatic approaches to size restriction are both insufficient and not required. TETU rankings as an analytical mechanism are pervasive in the account, playing a role not just in the analysis of size restriction but also in the analysis of reduplication in a second clearly reduplicative prefix.

Another issue that is addressed is the possibility of prespecification in reduplicative affixes. Analyzing prefixes exhibiting nasal agreement in Mbe as reduplicative would seem to require admitting prespecified segments in reduplication; however, evidence from Mbe morphology is adduced to show that what appears to be prespecified material in fact belongs to a separate prefix. The analysis thus supports the claim that fixed segmentism in reduplication is not prespecified but is either phonologically-determined (i.e. default, derived through TETU rankings) or morphologically-determined (what McCarthy and Prince term 'melodic overwriting')[1] (McCarthy and Prince 1986, 1990; Urbanczyk 1995, 1996a, b; Alderete et al. 1996; Spaelti 1997). A more general proposal is introduced to eliminate the emergence of prespecified material in reduplicative affixes from an extension of the Root-Faith >> Affix-Faith metaconstraint (McCarthy and Prince 1994a, 1995).

The organization of this section is as follows. First, in section 6.1.1 I present the nasal agreement data in diminutive prefixation and present arguments that it is not nasal spreading and should instead be regarded as reduplication. The next section gives evidence supporting this claim, showing that syllable-size imperative reduplication exhibits a similar nasal agreement effect. An analysis of imperative reduplication is developed, and then in section 6.1.3, this analysis is extended to diminutive prefixation. Evidence is given to show that prefixation in diminutive nominals is complex, consisting of a purely reduplicative affix and a separate non-reduplicative segmental affix; an alternative single reduplicative affix with prespecified material is insufficient. It is argued that what distinguishes the syllable-size reduplication in the imperative and coda/null size reduplication in the diminutive is simply the ranking of morpheme realization constraints. In 6.1.4, the analysis of diminutives is extended to nasal agreement in the formation of inchoative verbs. Section 6.1.5 gives data from Zoque which shows that a morpheme realization constraint is violated under similar phonological conditions in another language. 6.1.6 examines the role of the atemplatic size-restrictor constraint in other affixation in Mbe, and 6.1.7 presents arguments that templatic alternatives are inadequate. Finally, section 6.1.8 addresses the general question of prespecification in reduplication and develops a proposal to eliminate prespecification effects. 6.1.9 forms an appendix, presenting a constraint hierarchy which derives the coda condition in Mbe.

[1] Building on McCarthy and Prince (1986), Alderete et al. (1996) suggest that melodic overwriting can occur when RED competes with another morpheme for the same space. Spaelti's (1997) 'syllable recycling' builds on a somewhat similar idea, while seeking to explain what enforces the anchoring violation in the output shape of RED.

6.1.1 Nasal agreement in diminutive nouns

Mbe is a Benue-Congo language spoken in the Ogoja Province of Eastern Nigeria. Mbe exhibits a remarkable nasal agreement effect, whereby a nasal occurs in the coda of certain prefixes only when the stem contains a nasal. The phenomenon and other aspects of Mbe morphology are described in a series of papers by Bamgbose (1966a, 1967a, b, 1971); additional comments on the phonology of Mbe appear in Bamgbose (1967c).[2] I begin by examining nasal agreement in the formation of diminutive nouns and return later to nasal agreement in the formation of two verbal tense/aspects.[3]

In Mbe, singular diminutive nominals are usually formed with a prefix of the form [kɛ-] (see second column in (1)). Vowel harmony produces a [ka-] variant before syllables containing [a]. In their non-diminutive form, nouns occur not as a bare root but with a prefix marking number category (singular or plural; see first column in (1)). Mbe is a 'class' language with seven primary nominal classes, four of which contain two secondary classes. The class to which a noun belongs determines which number category prefix it will take, as well as the form of syntactic agreement markers in verbs and in concord markers (thematic, qualifying, demonstrative, deictic, third person non-human object, and genitival). Comparison of the two columns in (1) reveals that tonal changes also take place in diminutive formation. The diminutive tonal patterns are complex and will not be analyzed here.[4]

(1)		Singular noun		Diminutive singular	
	a.	bù - t͡ʃí sg.- head	'head'	kɛ̌ - t͡ʃî dim. sg.- head	'little head'
	b.	lè - bɛ́l	'breast'	kɛ̌ - bɛ̂l	'little breast'
	c.	bɛ̀ - líe	'food'	kɛ̌ - lîe	'little food'
	d.	è - fúfú	'sweat'	kɛ̀ - fúfú	'little sweat'
	e.	è - kìkɛ̀l	'finger nail'	kɛ̀ - kìkɛ̀l	'little finger nail'
	f.	lè - bàrò	'liver'	kà - bàrò	'little liver'

2 Thanks to John McCarthy for first bringing the Mbe facts to my attention. I am grateful to Akin Akinlabi for help in finding the body of descriptive work on Mbe.

3 A third case of nasal agreement in the formation of perfective verbs is discussed in the appendix (6.1.9).

4 The diminutive tonal patterns are as follows (after Bamgbose 1966a: 49-50; using abbreviations and diacritics: L-low [̀], H-high [́], R-rising [̌], F-falling [̂], D-Downstep [ꜜ]). With monosyllabic nouns, the diminutive prefix is R; H-stem becomes F and L-stem becomes H. With disyllabic nouns, HH is unchanged, HL becomes FL or HL, LH becomes RF, LL is unchanged or becomes RH. With nouns over two syllables, stem tones remain unchanged and the diminutive usually takes the initial tone of the noun, although some L-initial nouns take a R-diminutive prefix.

The above data show the formation of the diminutive when the noun stem contains no nasal segmental material. If the noun contains a nasal, the diminutive is formed as above but closed with a nasal stop which is homorganic with the following onset:

(2)		Singular noun		Diminutive singular	
	a.	è - bàm	'bag'	kàm - bàm	'little bag'
	b.	bù - mù	'story'	kɛ̀m - mù	'little story'
	c.	—		kàŋ - fàŋ	'little path'
	d.	bù - tɛ̀m	'heart'	kɛ̌n - tɛ́m	'little heart'
	e.	è - rèn	'fruit'	kɛ̌n - rén	'little fruit'
	f.	lè - lɛ́m	'tongue'	kɛ̌n - lɛ̂m	'little tongue'
	g.	kɛ̀ - nén	'bird'	kɛ̌n - nên	'little bird'
	h.	lé - ʃíaní	'work'	kán - ʃíaní	'little work'[5]
	i.	—		kɛ̌ɲ - ɲíen	'little thing'
	j.	ó - kùɔm	'snake skin'	kɛ́ŋ - kùɔm	'little snake skin'
	k.	é - g͡bénó	'upper arm'	kɛ́ŋ͡m - g͡bénó	'little upper arm'

It is reasonable to question what kind of phonological mechanism produces this kind of nasal agreement effect. Is it spreading? Segment copying (i.e. reduplication)? The nasal agreement has properties which argue against this being a case of [+nasal] spreading. First, there is no alternating target segment, rather there is an alternation between the occurrence of a nasal segment and zero. Feature spreading does not induce the appearance of a new segment but affects the featural properties of a segment already present. We might speculate that the nasal agreement actually represents a featural alternation in the root onset consonant in the form of prenasalization; however the coda status of the nasal is supported by its triggering a vowel reduction known to take place in the context of closed syllables (Bamgbose 1971: 104). Also, prenasalized consonants do not occur generally in the language. Another reason to reject a spreading analysis is that the nasal agreement is non-local, that is, the dependent nasal and the stem nasal may be at any distance in the word. In the preceding chapters we have seen persuasive evidence that [+nasal] spreading (and feature spreading in general) occurs only between adjacent segments. In the cross-linguistic survey of nasal

5 Bamgbose (1971: 10) notes that nasals are realized as [n] before [ʃ, t͡ʃ, d͡ʒ] and as [ɲ] before [j, ɲ].

harmony summarized in chapter 2, spreading of [+nasal] between segments at an unlimited distance is unattested.

Given these arguments we are left with the possibility that Mbe nasal agreement is produced by reduplication. But this does not look like a typical case of reduplication. Reduplicative affixation usually copies at least a syllable (or an onset plus default vowel); yet in this case, material is copied as a coda or fails to be copied at all. There also is a fixed segmental component to the formation of diminutives ([kɛ-]), which may seem to suggest that the prefixation is not reduplicative; indeed the fixed segmentism has led a previous analyst to reject the possibility of a reduplication account (Bamgbose 1971: 102).[6] On the other hand, the nasal agreement has properties consistent with it being reduplication. The limitation of nasal agreement to the formation of specific morphemes is expected if this is a reduplicative phenomenon. Also expected is the dependency of affix segmentism on root material, i.e. the occurrence of the affix nasal is conditioned by the occurrence of a nasal in the root.

Based on the arguments against spreading and the properties consistent with segment copying, I come to the interim conclusion that the nasal agreement is an instance of *reduplication*, not nasal feature *spreading*. In the remainder of this section I will show that analyzing nasal agreement in Mbe as nasal copy is both plausible and motivated, and it has important implications for the theory of reduplication.

6.1.2 Nasal copy in imperative verbs

Independent evidence for the nasal agreement phenomenon as a case of nasal copy comes from a pattern of reduplication occurring in imperative verbs in Mbe. Verbs in Mbe are categorized as Class 1 or Class 2, corresponding to the particular form of affixation or reduplication that takes place in verbal inflection. Imperative verbs can be either simple (non-reduplicated) or reduplicated. Reduplication in imperative verbs exhibits a similar kind of nasal agreement to that seen in the diminutive. The pattern of reduplication for Class 2 imperative singular verbs is illustrated below. First, in the data in (3), the reduplicative prefix is an open syllable, copying material in the verb stem from left to right. The prefix vowel is an identical copy for a high stem vowel and [ə] for any

6 Bamgbose (1971: 105) proposes to treat the harmonizing nasal as a ‘phonetic element’ introduced by a non-phonological rule: CV-CVN(V) → CV + n-CVN(V).

non-high stem vowel.[7] Only the first vowel of a diphthong (high vowel followed by low) is copied. Tonal changes take place in the reduplicative form.[8]

(3) Class 2, Imperative non-continuous singular

	Simple verb form	Reduplicative verb form	Gloss
a.	rû	rû - rû	‘pull’
b.	t͡ʃî	t͡ʃî - t͡ʃî	‘help put on head’
c.	gê	gə̂ - gê	‘belch’
d.	lɔ̂	lə̂ - lɔ̂	‘burn’
e.	k͡pâ	k͡pə̂ - k͡pâ	‘hang’
f.	fûel	fû - fûel	‘blow’
g.	t͡ʃûe	t͡ʃû - t͡ʃûe	‘bore (hole)’
h.	ʃîe	ʃî - ʃîe	‘sell’
i.	júbô	jû - júbò	‘go out’
j.	g͡bárî	g͡bə̂ - g͡bârì	‘embrace’
k.	bɔ́rô	bə̂ - bɔ́rò	‘help’
l.	tárô	tə̂ - tárò	‘throw’
m.	sórô	sə̂ - sórò	‘descend’
n.	kúɛlô	kû - kúɛlò	‘nibble at’
o.	púabrî	pû - pûabrì	‘stray’
p.	ʃíarî	ʃî - ʃîarì	‘scatter’

The data in (4) show that if the verb contains a nasal, the reduplicative prefix is formed as above but closed with a nasal stop homorganic to the following onset.

(4) Class 2, Imperative non-continuous singular

	Simple verb form	Reduplicative verb form	Gloss
a.	bîem	bîm - bîem	‘believe’
b.	jûen	jûɲ - jûen	‘learn’
c.	d͡zûɔŋ	d͡zûn - d͡zûɔŋ	‘be higher’

7 This vowel is described as ‘a peripherally central close unrounded vowel much lower than, and advanced from, Cardinal Vowel [ɨ]’ (Bamgbose 1967c: 8). This vowel thus is essentially mid-high and central in character.

8 The tone pattern for a reduplicative form of a simple monosyllabic Class 2 verb is FF. If the simple verb is disyllabic, the reduplicative form has the tone pattern FHL for verbs ending in [o] and FFL for verbs ending in [i] (Bamgbose 1967a: 185).

d.	g͡bénô	g͡bəŋ͡m - g͡bénò	‘collide’
e.	bámô	bəm - bámò	‘hide’
f.	púɔnî	pûm - pûɔnì	‘mix’
g.	jíɔnî	jîɲ - jîɔnì	‘forget’
h.	lúonî	lûn - lûonì	‘repair’
i.	k͡pómnî	k͡pûŋ͡m - k͡pômnì	‘congeal’[9]

In imperative reduplication, the nasal agreement is unambiguously segmental copy.[10] Aspects of the analysis of this reduplication phenomenon will prove to provide explanation for the similar nasal agreement phenomenon in the diminutive nominals. Accordingly, I will present an analysis of the imperative cases and then return to the diminutives.

In the analysis of Mbe reduplication, an important role will be played by rankings producing The Emergence of the Unmarked (McCarthy and Prince 1994b, 1995). The ranking schema for TETU effects in reduplication is given in (5):

(5) Faith-IO >> Phono-Constraint >> Faith-BR

Because Faith-IO dominates the Phono-Constraint (penalizing some ‘marked’ structure or enforcing alignment), the effect of the Phono-Constraint is not apparent in general, i.e. it will not affect correspondence between an input and output. However, with the Phono-Constraint dominating Faith-BR, it will be respected in Base-to-RED copying and can induce BR correspondence violations. This produces an ‘Emergence of the Unmarked’ in reduplication.

The syllable-size reduplication in imperative verbs can be obtained through a TETU ranking. Spaelti (1997) observes that this can be achieved atemplatically using an alignment constraint: ALLσL (for other applications of this constraint see Mester and Padgett 1994; Itô and Mester 1997a; Kurisu 1998; a similar approach using all-foot-alignment to obtain to foot-size reduplicants is employed by McCarthy and Prince 1994a; Prince 1996, 1997).

(6) ALLσL: ALIGN(σ, L, Pwd, L)

9 After labial-velar consonants [k͡p, k͡p, g͡b], [u] appears as the correspondent of [o] in the reduplicant.

10 Bamgbose (1971) notes that nasal agreement in imperative verbs may be treated as reduplication. It is on the basis of cases like the diminutive, which are formed with some fixed segmentism, that he proposes a non-reduplicative account.

Following the generalized interpretation of alignment constraints, ALLσL expresses the demand that the left edge of *every* syllable be aligned with the left edge of *some* prosodic word (McCarthy and Prince 1993b). Violations are reckoned such that every misaligned syllable incurs a mark for each syllable separating it from the left edge of the Pwd. Each word containing more than one syllable will thus violate ALLσL, and violations increase with every additional syllable. As a consequence, ALLσL acts as a size-restrictor by favoring words containing only one syllable (assuming that the optimal output is fully syllabified). Spaelti’s TETU ranking interleaves ALLσL between IO and BR Faith:

(7) MAX-IO >> ALLσL >> MAX-BR

The ranking is illustrated in (8) (tones are omitted here). Since MAX-IO dominates ALLσL, the alignment constraint does not place a limit on root material (see (c)). However, ALLσL outranks MAX-BR, preventing the addition of more than one syllable in reduplicative affixation (compare (a) and (b)). I assume that high-ranking constraints on syllable structure and morpheme realization rule out alternatives copying less than a syllable, such as [j-jubo] and [jubo].

(8) Syllable-size reduplicants

	RED-jubo	MAX-IO	ALLσL	MAX-BR
☞	a. ju-jubo		***	bo
	b. jubo-jubo		****!**	
	c. ju-ju	b!o	*	

The restriction of reduplicants to one syllable is a TETU effect, that is, it is an occurrence of unmarked structure in reduplication that does not otherwise limit forms in the language. On the other hand, the restriction of reduplicant codas to a nasal with place features linked to the following onset is a distribution holding of Mbe syllable structure in general. Bamgbose (1967c: 11) notes that across the Mbe language coda nasals must be place-linked except root-finally (i.e. word-final or before a C-initial suffix). Some examples of homorganic nasals outside of reduplication are given in (9) (with syllabic nasal prefix in c-e):

(9) a. [n - ɔ́n̠tɔ̀r] ‘lizard’
b. [é - kùrán̠t͡sáŋ] ‘millet’
c. [m̠̀ - bór] ‘palm trees’
d. [ǹ̠ - sûnì] ‘soldier ant’
e. [ŋ̀ - kúel] ‘tortoise’

From Bamgbose’s data it also appears that within the domain of [prefix + root], a nasal is the only possible medial coda. Other consonants can occur in root-final position.[11] The condition on codas or ‘CodaCond’ in Mbe thus consists of three parts (i) place features of a coda consonant must be linked to a following onset, (ii) coda consonants are limited to nasals, and (iii) the coda restrictions of (i) and (ii) are exempted in root-final position. Various aspects of similar coda conditions have been analyzed elsewhere (for analyses in an optimality-theoretic framework see, e.g., Itô and Mester 1994, in press; Alderete et al. 1996; Padgett 1995b drawing on Byrd 1992, Steriade 1993c; also Jun 1995; for a previous approach, see Itô 1986). For expository convenience, I will employ a constraint, CODACOND, which simply describes the coda condition in Mbe. This descriptive constraint is given in (10), and it refers to the combination of constraints deriving this effect. In the appendix to the analysis of Mbe (in section 6.1.9), I outline the details of the constraints and rankings that constitute the content to CODACOND.

(10) CODACOND:
Codas (except root-final) must be nasals with place linked to the following onset.

Because CODACOND is respected throughout the Mbe language, it must outrank MAX-BR and Faith-IO (I assume MAX-IO).[12] This is shown for BR faith in (11) for the imperative form of [fuel]. Here candidate (b) copies the [l] coda, but even though this fares better on MAX-BR, it loses to candidate (a) because it violates CODACOND. The alternative in (c), which loses [l] in the base in order to better satisfy MAX-BR, is ruled out on the basis of a MAX-IO violation. I assume that undominated IDENT-IO/BR[±nasal] rules out alternatives changing oral consonants to nasal ones (i.e. [fun-fuel], [fun-fuen]).

11 Examples of word-final consonants are: [káb] ‘dig’, [wél] ‘drive away’, [ʃíɔr] ‘sneeze’, [túɔm] ‘send’. Examples of root-final consonants before a C-initial suffix are: [jùab - kì̂] ‘be washing’, [fùel - kì̂] ‘be blowing’, [t͡sɔ̌r - kì] ‘be carrying’, [jǐɛm - kì] ‘be singing’.
12 It is conceivable that CODACOND outranks DEP-IO rather than MAX-IO, but there are no alternating forms for which this can be tested. Thanks to Kazutaka Kurisu for raising this point.

(11) Non-nasal codas are prohibited

	RED - fuel	CODACOND	MAX-IO	MAX-BR
☞	a. fu - fuel			el
	b. ful - fuel	l!		e
	c. fu - fue		*!	e

Since a stem nasal can be copied but may end up changing its place specification in the reduplicant, MAX-BR must outrank the base-reduplicant place identity constraint to prevent segments from deleting rather than undergoing place assimilation. This is shown in (12) for the imperative of [jiɔni] (restricting attention to candidates with syllable-size reduplication as in (8). Candidate (b) loses on CODACOND because the reduplicant nasal is not place-assimilated. The alternatives are to not copy the nasal, as in (c), or copy and place-assimilate the nasal, as in (a). Even though it violates IDENT-BR[Place], candidate (a) is the winner, because it better satisfies MAX-BR.

(12) Nasal codas are place-linked

	RED - jiɔni	CODACOND	MAX-BR	IDENT-BR[Place]
☞	a. jiɲ͡-jiɔni		ɔi	*
	b. jin - jiɔni	n!	ɔi	
	c. ji - jiɔni		ɔni!	

Before going on to explore how the CodaCond and syllable-size restriction can lend explanation to nasal agreement in diminutive formation, I will briefly examine two TETU effects concerning vowels in imperative reduplication. The first of these effects is the absence of diphthongs in the reduplicative prefix. It is widely recognized that diphthongs qualify as ‘marked’ structure. Rosenthall (1997) proposes the constraint in (13) to prohibit them.

(13) NODIPH: Two tautosyllabic moras linked to distinct vowels are prohibited.

The TETU ranking which permits diphthongs in stems but not reduplicants is given in (14). Its effect is illustrated in (15).

(14) MAX-IO >> NODIPH >> MAX-BR

(15) No diphthongs in reduplication

	RED-biem	MAX-IO	NODIPH	MAX-BR
☞	a. bim͡-biem		*	e
	b. biem͡-biem		**!	
	c. bim͡-bim	*!		

It should be noted that since imperative reduplication skips the second member of the diphthong and copies the non-contiguous nasal, MAX-BR must outrank BASE-CONTIGUITY (McCarthy and Prince 1995: 371).[13]

The second TETU effect for vowels concerns the occurrence of [ə] in place of all non-high vowels in the reduplicant. This can be seen as an effect of the markedness of [-high] vowels in relation to [+high] ones (i.e. 'default' vowels are often [+high] in character). This markedness is encapsulated in the following ranking (see Beckman 1995 for another application of this ranking):

(16) *[-high] >> *[+high]
(i.e. *[e], *[o] >> *[i], *[u])

While [+high] vowels are less marked than [-high] ones, the mid-central vowel [ə] also has a default character. To explain this, I will assume that [ə] is a vowel unspecified for height features. The feature [-high] thus does not occur in reduplicants. This is obtained by the TETU ranking in (17a). On the other hand, [+high] vowels do copy faithfully, motivating the ranking in (17b). The substitution of [ə] rather than [i] or [u] for [-high] vowels in reduplicants is compelled by *[+high]. Even though this markedness constraint is low-ranked, it is violated by high vowels but not by the heightless [ə].

(17) a IDENT-IO[±high] >> *[-high] >> IDENT-BR[±high]

b. IDENT-BR[±high] >> *[+high]

[13] Note that an alternative candidate [bem - biem] ties with (15a) on contiguity (each candidate incurs one violation). Given that [bem - biem] copies the more sonorant member of the diphthong, it might actually be expected to be the winner. I suggest that copy of the first vocalic member of the diphthong can be attributed to an identity constraint for the consonantal release ($\text{IDENT}_{\text{REL}}$-IO, after Padgett 1995b, more detailed discussion of this kind of constraint follows in the appendix in section 6.1.9). Drawing on the insights of the aperture-theoretic representations proposed by Steriade (1993a, d, 1994), where a released stop is composed of a closure node (A_0) and a release node (A_{max}), the featural properties of the first vocalic element following the stop may be reasonably posited as affiliated with the release node of the stop. Padgett's constraint enforcing identity of features associated with a release position could then be used to ensure copying of the first member of the diphthong rather than the second.

The tableau in (18) illustrates the outcome for stems containing a [-high] vowel. Vowels in candidates considered here each come with their own height feature. Linkage of vowel height across syllables can be ruled out by a featural tautosyllabicity constraint (see Walker 1997a).

(18) No [-high] vowels in reduplication

	RED-lɔ	IDENT-IO[±high]	*[-high]	IDENT-BR[±high]	*[+high]
☞	a. lə-lɔ		*	*	
	b. lu-lɔ		*	*	*!
	c. lɔ-lɔ		**!		
	d. lə-lə	*!			
	e. lu-lu	*!			**

The tableau in (19) shows the faithful copying of [+high] vowels:

(19) High vowels reduplicate faithfully

	RED-ru	IDENT-IO[±high]	*[-high]	IDENT-BR[±high]	*[+high]
☞	a. ru-ru				**
	b. rə-ru			*!	*

Three TETU rankings have now been established for the imperative reduplication; one producing the limitation to a syllable in size, and two producing unmarked vocalic structures. These rankings are summarized in (20). (21) gives the rankings of faith and CODACOND.

(20) TETU rankings:

a. Reduplicant is a syllable:
MAX-IO >> ALLσL >> MAX-BR

b. No diphthongs in reduplicant:
MAX-IO >> NODIPH >> MAX-BR

c. [ə] for [-high] vowels in reduplication:
IDENT-IO[±high] >> *[-high] >> IDENT-BR[±high] >> *[+high]

(21) Faith and CODACOND:
CODACOND >> MAX-IO >> MAX-BR >> IDENT-BR[Place]

In the next section I explore how aspects of the analysis of the imperative reduplication can lend insight to the nasal agreement phenomenon seen in the formation of diminutive nominals.

6.1.3 Back to diminutives: Another pattern predicted by ALLσL

The previous section presented a clear case of reduplication in imperative verbs. Interestingly, the imperative and diminutive formations have in common that a coda is only added to the prefix when a nasal can be copied from the stem, and in both cases the copied nasal must be homorganic to the following onset. We have established that the restriction of codas to place-linked nasals is explained by a general coda condition in the language. The appendix in section 6.1.9 discusses how the nasal-specific aspect of this phenomenon emerges out of phonetically-grounded factors: it is the weak perceptibility of place in nasals that makes them susceptible to place assimilation, and thereby the only possible coda consonants (drawing on Padgett 1995b). In this section I will show that in analyzing diminutive nasal agreement as reduplication, the restriction to coda copy or zero falls out from the interaction of a differentiated morpheme realization constraint and the same size-restricting constraint as that required for the imperative reduplication, ALLσL. In fact, the diminutive will prove to be an important example of minimized copy predicted by the atemplatic TETU approach to size limiters in reduplication. I first present arguments that formation of the diminutive is complex with separate RED and fixed segment ([kɛ-]) morphemes, and then I show how constraints and rankings already required for Mbe contribute to obtaining the size restriction on RED.

Let us review the key points of formation of diminutive nominals. Singular diminutives are formed with a prefix [kɛ-] ([ka-] if [a] occurs in the following syllable). If there is a nasal in the noun stem, then the prefix is closed with a nasal coda homorganic to the following onset. Tonal changes also take place in diminutive formation. Some examples from (1-2) are repeated below.

(22)	a.	kɛ̌ - bɛ̂l	'little breast'
	b.	kɛ̀ - fúfú	'little sweat'
	c.	kàm - bàm	'little bag'
	d.	kɛ̌n - tɛ́m	'little heart'

e.	kɛ́ŋ - kùɔm	'little snake skin'
f.	kɛ́ŋ͡m - g͡bénó	'little upper arm'

Bamgbose (1966a: 48) notes that plural diminutive nouns are formed in the same way, but with [ke-] as the fixed portion of the prefixation.

Given that diminutive noun formation combines fixed segmentism, reduplication, and tonal patterns, it is worth considering what the internal structure of a diminutive noun is. I propose that the prefixation is complex, consisting of a prefix [kɛ-], with segmental material in the input, and a second purely reduplicative affix, RED, with no underlying segmental content. I will argue that it is RED that corresponds to the diminutive morpheme and [kɛ-] performs a separate function. In addition to RED, a morphologically-conditioned tonal pattern is required for diminutives. The complex structure is outlined in (23).

(23) Diminutive nominals:
kɛ + RED + *noun stem* (plus tonal information)

Importantly, I claim that diminutive prefixation does not consist of a single affix combining prespecified material ([kɛ]) and reduplication, as represented in (24).

(24) An incorrect representation:

```
RED + noun stem    (plus tonal information)
 |
 kɛ
```

A prespecification analysis like that in (24) may be rejected both on the basis of cross-linguistic evidence and an argument from Mbe morphology. The cross-linguistic argument concerns overgeneration. If prespecification were permitted in reduplicants, we would expect fixed material of all kinds; however, this is not the case: fixed segments in reduplication are usually default in character and can be derived through TETU rankings (Urbanczyk 1995, 1996a, b; Alderete et al. 1996; Spaelti 1997; McCarthy and Prince 1986, 1990 provide foundation).[14] If prespecification in reduplicative affixes were excluded, the limitation of fixed material to default segments would be explained.

[14] As noted earlier, McCarthy and Prince (1986, 1990) and Alderete et al (1996). suggest that a distinct set of cases of fixed segmentism in reduplication phenomena have a morphological basis; cf. Spaelti (1997) on 'syllable recycling'.

The next point concerns nominal classes in Mbe. Recall that Mbe has seven primary nominal classes, which determine the form of number category prefixes and syntactic agreement markers. Bamgbose (1966a: 48) notes that diminutive nominals are all members of Class 4 (regardless of the nominal class for the noun root in non-diminutive form). Subject agreement prefixes in verbs and other concord markers for diminutives thus match those for Class 4. To illustrate syntactic agreement, an example of a thematic concord marker [kukue] (sg.) for a non-diminutive Class 4 noun is given in (25).

(25)	kɛ̀ - tɔ́r	kúkˈue	ǹ	kíĺé	'It was a duiker that I saw'
	sg-duiker	Cl.4 theme	1 sg. saw		

Interestingly, the Class 4 nominal prefixes, [kɛ-] (singular) and [ke-] (plural), precisely match the fixed segmentism in the singular and plural diminutive formation; however, non-diminutive Class 4 nouns do not exhibit nasal copy (26a). As a consequence, Class 4 non-diminutive nouns are segmentally identical to their diminutive counterparts when they do not contain a nasal, although they are generally distinguished by tonal properties (26b).

(26)		Class 4 (non-diminutive)			Diminutive form	
	a.	kɛ̀-tɛ̀m	*kɛ̆n-tɛ̀m	'axe'	kɛ̆n-tɛ́m	'little axe'
	b.	kɛ̀-cì̀		'stick'	kɛ̆-cí́	'little stick'

Given that diminutives are Class 4 and have prefixal material identical to the usual Class 4 prefixes, I conclude that the [kɛ-]/[ke-] portion of diminutive formation is a Class 4 prefix, not part of the diminutive morpheme itself. I suggest that the phonological constituency of the diminutive morpheme actually consists of just a tonal component and a purely reduplicative segmental component (i.e. the coda nasal). This gives a modular view of diminutive formation, as shown in (27).[15]

15 It is conceivable that the tone and RED elements may in fact be the phonological exponents of distinct morphemes, each making their own grammatical contribution, in which case a modular view of the diminutive morpheme would not be required. This is a matter for further study in Mbe.

(27) Diminutive morpheme

```
        Diminutive
         /      \
      RED     Tonal pattern
```

The derived diminutive nominal is Class 4 and thus takes the [kɛ-]/[ke-] prefixes. This complex structure analysis explains the uniformity of Class 4 and diminutive affixes and agreement markers. If the [kɛ/ke] material were a prespecified part of a reduplicative diminutive affix, this homophony would be accidental.

With the structure of diminutive formation now established, I turn to deriving the size of the reduplicative component of the diminutive morpheme. The diminutive reduplicant is restricted to filling a syllable coda or failing to be realized at all. I suggest that the relevant generalization which underlies this pattern is that material is copied in diminutive formation only if it does not add a syllable to the word. This will be shown to be connected to the syllable-size restriction on the imperative reduplicant. In order to understand how these two size restrictions are related, we will need to call on constraints on morpheme realization. The kind of constraint which I propose to employ is given in (28) (with foundation in morpheme realization constraints from Samek-Lodovici 1992, 1993; Gnanadesikan 1996; Rose 1997; cf. also Hendricks 1998).

(28) REALIZEMORPH:

i. A morpheme must have some phonological exponent in the output. For morphemes composed of modular components in the input, each component must have phonological exponence in the output.

ii. A violation is incurred for each morpheme failing to have some phonological exponent in the output. For morphemes with a modular structure, a violation is accrued for each component failing to have some phonological exponence in the output.

Both the diminutive and imperative morphemes have two modular elements demanding phonological expression: a reduplicative segmental component and a tonal pattern component.[16] Part (i) of REALIZEMORPH demands that both of these elements have some phonological exponence in the output. Part (ii) makes explicit how violations of

16 If the modular analysis of these morphemes in Mbe could be eliminated (see n. 15), then the morpheme realization constraint could be simplified to eliminate reference to modularity.

the constraint are reckoned (after Zoll 1996). One violation will be incurred for each component for which there is no phonological exponent in the output, i.e. in diminutive or imperative formation, there will be one violation if copying fails, and one violation if a tonal pattern fails to be realized; if neither copy or the tone pattern appears in the output, two violations will be accrued.

In imperative reduplication, both the reduplicative and tonal components of the morpheme always have some phonological exponence in the output. In the case of the reduplicative component, this takes place at the cost of ALLσL, since the reduplicative material adds a syllable to the word. This motivates the ranking in (29) (I assume that morpheme realization constraints may be specific to particular morphemes).

(29) REALIZEMORPH$_{imp}$ >> ALLσL

In contrast to the imperative, realization demands for the diminutive morpheme cannot compel the addition of a syllable. Reduplication occurs in diminutive formation only when material can be copied without adding a syllable (i.e. material is copied as a coda or not at all). ALLσL must thus outrank the diminutive realization constraint:

(30) ALLσL >> REALIZEMORPH$_{dim}$

Copy of a nasal along with tonal changes in the diminutive is illustrated in (31). The constraint hierarchy in this tableau combines the morpheme realization ranking in (30) with the TETU size-restriction ranking established earlier (MAX-IO >> ALLσL >> MAX-BR). The complex constituency of the diminutive nominal is shown in the input. This consists of the Class 4 prefix [kɛ-], the diminutive morpheme composed of RED and tonal information, and the noun stem [tɛm]. Only candidates obeying the Mbe CodaCond are considered here.

(31) Nasal copy and tonal changes in a diminutive nominal

	Tone kɛ - RED - tɛm	MAX-IO	ALLσL	MAX-BR	REALIZEMORPH$_{dim}$
☞	a. kɛ̆n͡tɛ́m		*	tɛ	
	b. kɛ̆tɛ́m		*	tɛm(!)	*(!RED)
	c. kɛ̆tɛ́n͡tɛ́m		**!*		
	d. tɛ̆m	k!ɛ		tɛm	*(RED)
	e. kɛn͡tɛm		*	tɛ	*!(tone)

Candidate (d) in (31) shows that the ranking of MAX-IO over ALLσL compels retention of input segments in the output, even though this produces an output containing more than one syllable. However, as apparent from candidate (c), the ranking of ALLσL over MAX-BR in this case prevents copied material from producing more than the two syllables required to accommodate input segments. This is one of two possible TETU size restrictions that can emerge from ALLσL: here reduplication is restricted in size to not adding a syllable to the word. The remaining alternatives, (a), (b), and (e), tie on ALLσL by holding to two syllables. The winning candidate in (a) partially satisfies MAX-BR by copying a nasal, and it satisfies REALIZEMORPH both through this segmental copy and realizing the necessary tonal pattern. Candidate (e) loses because it fails to realize the tone pattern and (b) loses either on the basis of failing to copy any material (REALIZEMORPH) or an extra MAX-BR violation. It should be noted that since diminutive reduplication can copy a nasal anywhere in the stem, MAX-BR must outrank LEFT-ANCHOR-BR (McCarthy and Prince 1995: 371).

The tableau in (32) illustrates a case where reduplication fails in the diminutive. For this input, there is no nasal to copy as a coda. Since the coda condition prohibits other coda segments, this narrows the range to candidates exhibiting copy of a syllable (b) or no copy at all ((a) and (c)). The candidate copying a full syllable incurs extra violations of ALLσL, which rules it out. The remaining alternatives each violate REALIZEMORPH with respect to the RED component of the diminutive morpheme. Candidate (c) loses to (a), because (c) also fails to realize the tonal component of the morpheme.

(32) Copy fails in diminutive; tonal changes occur

	Tone kɛ - RED - bɛl	MAX-IO	ALLσL	MAX-BR	REALIZEMORPH$_{dim}$
☞	a. kɛ̆bɛ̂l		*	bel	*(RED)
	b. kɛ̆bɛ̂bɛ̂l		**!*	l	
	c. kɛbɛl		*	bel	**!(RED, tone)

The tableau in (33) shows how the different ranking of REALIZEMORPH$_{imp}$ causes the TETU size-restriction ranking to produce syllable-size copy in the imperative. The morpheme realization constraint in this case is undominated, forcing some segmental copy to take place along with the realization of tonal patterns (only candidates satisfying tone realization are shown). Candidate (c), which fails to copy any material, loses on a violation of REALIZEMORPH. Both candidates (a) and (b) copy segments, but (b) loses on the basis of ALLσL, because it adds more than one syllable. The winner (a) satisfies morpheme realization but copies just one syllable to minimally violate the alignment constraint. This gives us a second TETU size restriction from ALLσL: copy is limited to one syllable.

(33) Syllable-size copy and tonal changes in imperative

	Tone RED - jubo	MAX-IO	REALIZEMORPH$_{imp}$	ALLσL	MAX-BR
☞	a. jû-júbò			***	bo
	b. jûbô-júbò			****!**	
	c. jûbô		*!(RED)	*	jubo

To review, we have now seen that the same atemplatic size-restricting constraint in combination with differently-ranked morpheme realization constraints accounts for the coda/null size limitation in the diminutive and the syllable-size limitation in the imperative. The constraint hierarchy obtaining this result is given in (34).

(34) Size-restriction ranking summary
MAX-IO, REALIZEMORPH$_{imp}$ >> ALLσL >> MAX-BR, REALIZEMORPH$_{dim}$

The motivation from the analysis of reduplicative imperatives for the reduplication account of the diminutive is now two-fold. First, we have seen that the limitation to nasal copy falls out from the independent demand of CODACOND. Second, the TETU

approach to the size-restriction on imperative reduplication can also explain the size-restriction seen in the diminutive. Differences in the size-restriction outcomes come from different rankings of morpheme realization constraints. The diminutive account thus strengthens the atemplatic TETU approach to size restriction in reduplication (Spaelti 1997 building on McCarthy and Prince 1994a; Prince 1996, 1997) by providing evidence of a phenomenon predicted under the hypothesis of factorial constraint ranking.

An important aspect of the atemplatic analysis of the size restriction on diminutive copy is that it explains the coda/null size of the reduplicant. Various analysts have examined cases of reduplication where copy is limited to a single consonant. Some recent analyses in Optimality Theory of single consonant copy (in some circumstances) include Spaelti (1997) on West Tarangan and Kola; Alderete et al. (1996) on Yoruba (with a following default vowel); Gafos (1996) on Temiar, Rose (1997) on Ethio-Semitic; Takeda (1997) on Kammu; and Hendricks (1998) on Shuswap. Spaelti's (1997) analysis of 'syllable recycling' is closest to the account of Mbe developed here. I will briefly review the key points of Spaelti's account and its relation to the analysis of Mbe.

The syllable recycling phenomenon that Spaelti examines is exemplified by Rebi West Tarangan (Austronesian; spoken in the Aru Archipelago in Maluku, Indonesia). This language exhibits a reduplication pattern in which an infixing reduplicant (appearing to the left of main stress) copies a single consonant as the coda to a preceding open syllable, as in (35a). In these forms, an existing syllable is 'recycled' rather than creating a new syllable with reduplicated material. When the preceding syllable is closed, a full CVC is copied (35b).[17] (Data from Spaelti 1997: 179 citing Nivens 1992, 1993.)

(35) Rebi West Tarangan

a.	biˈtɛm-na	bi<u>m</u>ˈtɛmna	'small' (3 sg.)
	taˈpuran	ta<u>r</u>ˈpuran	'middle'
b.	pajˈlawa-na	paj<u>law</u>ˈlawana	'friendly' (3 sg.)

Spaelti observes that the copy of a single segment as a coda, as in the forms in (35a), can be driven by ALLσL[18], i.e. minimization of the number of syllables in the

17 Spaelti notes that other examples of 'syllable recycling' are listed in Broselow and McCarthy (1983).
18 Spaelti uses ALLσR rather than ALLσL, but this is not crucial for the analytical point at issue here.

word. He obtains this single consonant copy pattern by ranking ALLσL over a constraint requiring that the left edge of the reduplicant be aligned to the left edge of some syllable, ALIGN(RED, L, σ, L). The tableau in (36) illustrates the analysis (from Spaelti 1997: 165). (For a full analysis of the details of reduplication in Rebi, see Spaelti 1997.)

(36) Syllable recycling in Rebi West Tarangan

	RED - tapuran	ALLσL	ALIGN-L (RED, σ)
☞	a. tar̲ˈpuran	***	**
	b. tapur̲ˈpuran	****!**	

The analysis of nasal copy in Mbe diminutive formation draws on Spaelti's idea of using minimization of the number of syllables in the word to achieve reduplication that does not add a syllable. Importantly, Mbe and Rebi West Tarangan differ in their outcomes in words for which copy of a single consonant would be ill-formed. In Mbe diminutives this occurs when there is no nasal to copy (required by CODACOND), in which case reduplication fails altogether. In Rebi, single consonant copy is prevented when the preceding syllable is closed. In this circumstance, copy of a full syllable takes place (conditions on syllable structure prevent formation of a complex coda). Mbe diminutive reduplication thus violates morpheme realization rather than add a syllable to the word (ALLσL >> $\text{REALIZEMORPH}_{dim}$), but Rebi will add a syllable when necessary to achieve some segmental exponent for RED (REALIZEMORPH >> ALLσL). The case of CVC copy in Rebi is illustrated in (37).

(37) CVC copy driven by morpheme realization

	RED - pajlawa - na	REALIZEMORPH	ALLσL
☞	a. pajlaw̲ˈlawana		**********
	b. pajˈlawana	*!	******

In addition to always realizing a reduplicant, Rebi West Tarangan is distinct from Mbe in always choosing the segment following the stressed vowel to copy rather than the leftmost base segment (demanded by LEFT-ANCHOR-BR; McCarthy and Prince 1995). Drawing on a proposal of Moore (1996), Spaelti (1997) notes that this can be

explained by the ban on geminates in West Tarangan.[19] The tableau in (38) illustrates the approach (from Spaelti 1997: 201).

(38) Copy of second consonant after site of reduplicant

	RED - tapuran	NOGEMINATE	ANCHOR-L
☞	a. tar̲ˈpuran		**
	b. tap̲ˈpuran	*!	

Unlike Rebi, Mbe diminutive reduplication copies the first eligible segment (a nasal) in the base, even if this produces adjacent identical nasal segments (e.g. [kɛ̀m-mù] 'little story', [kɛ̀m-mɛ̀l] 'little neck', [kɛ̆n-nên] 'little bird', [kɛ̆ɲ - ɲíen] 'little thing'; Bamgbose 1971: 48). Since Bamgbose notes that coda nasals are always homorganic with a following onset consonant, these nasals could reasonably be treated as geminates, in which case ANCHOR-L dominates NOGEMINATE.[20] However, as noted earlier (in relation to tableau (31)), left anchoring is violable when the only nasal occurs elsewhere in the base. ANCHOR-L must thus be dominated by either MAX-BR or $\text{REALIZEMORPH}_{dim}$.

To review, the 'syllable recycling' phenomenon in Rebi West Tarangan reduplication has in common with Mbe diminutive reduplication the copy of a single consonant to form a syllable coda, and in both languages this can be handled with the atemplatic size-restrictor constraint, ALLσL. Mbe differs from Rebi in two interesting ways. First, Mbe diminutive formation offers a new kind of resolution when single consonant copy fails: no reduplication occurs at all, violating REALIZEMORPH, in contrast to the initiation of a new syllable in Rebi. Also, Mbe copies the first eligible consonant (nasal) in the base, while Rebi always reaches rightward into the base to copy the segment following the stressed vowel. Rebi single consonant copy thus consistently violates ANCHOR-L, but Mbe violates ANCHOR-L only when the base-initial segment is not a nasal.

19 See Spaelti (1997) for discussion of some remaining issues in the restriction of copy to the post-stress segment.

20 It is not clear whether nasal coda-onset syllable contact occurs freely within the [prefix + root] domain in Mbe. Outside of reduplication, no examples of a [.CVN.NV.] structure could be found in Bamgbose's data, although there is an example of a syllabic nasal prefix before a nasal onset: [ǹtùo ɛ́è .ǹ.ɲˈuam.] 'a good calabash' (Bamgbose 1966a: 47). Note that geminate consonants of other kinds are ruled out by the coda condition. If non-syllabic syllable-final nasals are generally restricted before onset nasals (outside of root-final position), then this occurrence in reduplication would be an 'emergence of the marked', a phenomenon discussed in n. 31.

6.1.4 Nasal agreement in inchoative verbs

An important claim underlying the account of the diminutive is its complex formation, consisting of a componential diminutive morpheme and a separate nominal class morpheme. Nasal agreement in the formation of inchoative verbs provides further support for a complex constituency in coda/null nasal copy. The formation of inchoative verbs exhibits a nasal coda agreement in combination with fixed prefixal material, paralleling the nasal agreement of diminutive nouns. First, (39) shows that inchoative verbs are usually formed with a prefix [re-]:

(39)

Simple verb form	Gloss	Inchoative form	Gloss
tà	'touch'	rê-tà	'has started to touch'
kɛ́l	'look'	rê-kɛ́l	'has started to look'
káb	'dig'	rê-káb	'has started to dig'

In (40) we see that if the verb contains a nasal, it is copied as a coda to the [re-] prefix (note that [e] reduces to [ə] in a closed syllable).

(40)

Simple verb form	Gloss	Inchoative form	Gloss
túɔm	'send'	rə̂n-túɔm	'has started to send'
kɛ̀n	'walk'	rə̂ŋ-kɛ́n	'has started to walk'
jɪ́ɔnî	'forget'	rə̂ɲ-jɪ́ɔnì	'has started to forget'

Given the arguments against prespecification in reduplicative affixes and the complex structure proposed for diminutive formation, it is reasonable to posit a complex structure for inchoative verb formation as well:

(41) Inchoative verbs:
re + RED + *verb stem* (plus tonal information)

As in the case of diminutives, there is evidence from the morphology of Mbe, supporting the analysis of the fixed segmentism in inchoative formation as a separate prefix. The evidence comes from the fact that [re-] occurs in the formation of four other verbal tense/aspect forms, either as the sole prefixal material or in combination with [ke] (it is conceivable that [reke-] may have a complex structure [re + ke]). This is shown in (42). Note that different tonal patterns also accompany different tense/aspect forms.

(42)

a.	Remote Past (sg.)	Gloss
	rè-tá	'had touched'
	rè-jɪ́ɛm	'had sung'
b.	Past Continuous (sg.)	Gloss
	rèké-ta	'was touching'[21]
	rèké-jɪ̀ɛmó	'was singing'
c.	Future (sg.)	Gloss
	rèké-tà	'will touch'
	rèké-jɪ́ɛm	'will sing'
d.	Future Continuous (sg.)	Gloss
	rèké-tá	'will be touching'
	rèké-jɪ́ɛmó	'will be singing'

Since the [re] segmentism occurs in the formation of a variety of verbal tense/aspect forms, I hypothesize that it is not segmental material specific to the inchoative morpheme, but rather it has some more general function across these verbal forms (although the precise nature of the function and meaning of [re-] requires further research). This leaves an inchoative morpheme consisting of just RED and tonal information, matching the structure proposed in (41) above.[22]

Reduplication in inchoative formation takes place only when material can be copied without adding a syllable. As established in the analysis of diminutives, this pattern is obtained when the size-restricting constraint, ALLσL, outranks morpheme-realization. This motivates the following ranking:

(43) ALLσL >> $\text{REALIZEMORPH}_{\text{Inc}}$

The inchoative data thus strengthens the reduplication analysis of nasal agreement by presenting independent support for a separate prefix with fixed material to which a nasal reduplicative affix may form a coda. Further, it provides an additional case of affixation in Mbe which falls under the ranking structure proposed for the diminutive.

21 For this form, the tone on [ta] is not marked in the source (Bamgbose 1967b).

22 Again, further investigation of the morphology of the language may show that RED and the tonal information may be better analyzed as exponents of distinct morphemes.

6.1.5 Independent evidence for REALIZEMORPH: Zoque

Violable morpheme realization constraints play an important role in achieving coda/null copy in diminutive and inchoative nasal agreement. In this section I show that prefixation in Zoque (Zoquean; Southern Mexico) provides cross-linguistic support for a violable REALIZEMORPH constraint.

In Zoque, morpheme realization fails when a nasal pronominal prefix fails to undergo place assimilation to a following consonant. Data and description are from Wonderly (1951), and for previous analyses see Dell (1973), Lombardi (1990), Steriade (1993a), and Padgett (1994, 1995c). The data are given in (44-45). The data in (44) show that a nasal pronominal prefix assimilates in place to a following oral stop or affricate. It may be noted that post-nasal voicing in these data is an independent phenomenon taking place in non-homorganic sequences as well.

(44)	a.	N - pama	→	mbama	'my clothing'
	b.	N - plato	→	mblato	'my plate'
	c.	N - tatah	→	ndatah	'my father'
	d.	N - trampa	→	ndrampa	'my trap'
	e.	N - t͡sima	→	nd͡zima	'my calabash'
	f.	N - t͡ʃoʔngoja	→	ɲd͡ʒoʔngoja	'my rabbit'
	g.	N - kaju	→	ŋgaju	'my horse'
	h.	N - gaju	→	ŋgaju	'my rooster'
	i.	N - kwarto	→	ŋgwarto	'my room'

The data in (45) show that the nasal prefix fails to surface before a continuant consonant ([l] is assumed here to be [+continuant] after Padgett 1994: 485, 1995c: 41).[23]

(45)	a.	N - faha	→	faha	'my belt'
	b.	N - sɨk	→	sɨk	'my beans'
	c.	N - ʃapun	→	ʃapun	'my soap'
	d.	N - rant͡ʃo	→	rant͡ʃo	'my ranch'
	e.	N - lawus	→	lawus	'my nail'

[23] The nasal prefix also deletes before [ʔ, m, n, ɲ]. It is retained before [w, j, h] (Wonderly 1951: 121). See Padgett (1995c: 64-5) for analysis of the latter cases as place assimilation with gliding.

It is reasonable to posit that the nasal prefix deletes before a continuant consonant because place assimilation has failed to take place (see, for example, Padgett 1994, 1995c). Note, however, that while non-homorganic nasals are forbidden before a consonant word-initially, they can occur in word-medial position:

(46)	a.	t͡sam̲t͡sam̲naju	'he chatted'
	b.	nɨm̲geʔtu	'he also said'
	c.	min̲ba	'he comes'
	d.	ken̲geʔtu	'he also looked'
	e.	ʃuhpuɲbuɲ	'soapberry'
	f.	maŋ̲ba	'he goes'
	g.	t͡siŋ̲damɨ	'bathe!'

Padgett (1994, 1995c) develops an insightful generative account of the nasal pronominal prefixation, which I will essentially follow here translated into an OT framework. My concern will be with where a morpheme realization constraint figures in the ranking. Padgett observes that nasals only undergo place assimilation to segments of like stricture. To obtain this, he proposes that place-assimilated nasals in Zoque must also share stricture features with the following consonant. The details of how this structure is to be enforced need not concern us here, for further details the reader may consult Padgett's analysis. For the present purposes, I will simply use the descriptively-expressed constraint in (47), which refers to the combination of constraints deriving this effect. Note that Mbe does not exhibit this restriction on place-linked nasals.

(47) *N͡Z: No place-linking between nasals and continuants.

Padgett observes that the difference in acceptability of word-initial versus word-medial non-homorganic nasals can be attributed to a distinction in the syllabification of NC clusters in these environments. In initial NC clusters he proposes that the nasal is syllabified along with the following consonant into an onset, while in medial NC clusters, the nasal belongs to a coda. Drawing on this distinction, he suggests that the prohibition on non-homorganic nasals in word-initial position is the result of a more general syllable structure restriction in Zoque whereby onsets license only one consonantal place feature. This restriction I will refer to with the descriptively-expressed constraint in (48):

(48) 1-C-PLACE: Onsets license only one C-Place feature.

Both the constraints *N͡Z and 1-C-PLACE are undominated in Zoque. When they cannot be satisfied in a nasal + continuant consonant cluster, they compel a violation of REALIZEMORPH, that is, the nasal pronominal prefix fails to have a phonological exponent in the output. This is illustrated in (49). A hypothetical coronal nasal prefix input is shown here. [.] marks syllable boundaries.

(49) Nasal prefix loss before a continuant

	n - faha	*N͡Z	1-C-PLACE	REALIZEMORPH
☞	a. .fa.ha.			*
	b. .nfa.ha.		*!	
	c. .ɱ͡fa.ha.	*!		

In the case of nasal + noncontinuant-obstruent initial clusters, the nasal prefix will undergo place assimilation at the cost of any input place specification in order to satisfy REALIZEMORPH. REALIZEMORPH must thus outrank IDENT-IO[Place]. Given richness of the base (Prince and Smolensky 1993: 191), this ranking is needed to derive the correct outcome no matter what the input place of the pronominal prefix.

(50) Nasal prefix place assimilation to following stop

	n - gaju	*N͡Z	1-C-PLACE	REALIZEMORPH	IDENT-IO[Place]
☞	a. .ŋ͡ga.ju.				*
	b. .nga.ju.		*!		
	c. .ga.ju.			*!	

Finally, because medial NC clusters syllabify the nasal into a coda, 1-C-PLACE will not come into play in these structures, and nasal place identity will be respected:

(51) No nasal place assimilation word-medially

	maŋba	*N͡Z	1-C-PLACE	REALIZEMORPH	IDENT-IO[Place]
☞	a. .maŋ.ba.				
	b. .mam͡.ba.				*!

The constraint hierarchy established for Zoque nasal place assimilation and prefixation is summarized in (52):

(52) *N͡Z, 1-C-PLACE >> REALIZEMORPH >> IDENT-IO[Place]

The significance of this hierarchy for the analysis of Mbe nasal agreement is that it offers independent evidence from another language for a violable REALIZEMORPH constraint. In addition, the Zoque pronominal prefix parallels the diminutive and inchoative formation in permitting the occurrence of a prefixal nasal segment only when place-linked to a following consonant. In Mbe, this is resolved by nasal place assimilation to any following consonant; in Zoque, nasal place assimilation occurs only when the following consonant is similar in stricture; i.e. a noncontinuant.

6.1.6 Extending explanation to other affixation

In the analysis of nasal copy across the imperative and inchoative verbs and diminutive nouns, an important role is played by the atemplatic size-restricting constraint, ALLσL. Another affixation phenomenon in Mbe also exhibits a restriction which may be attributed to the force of this constraint. In this section, I will briefly outline how ALLσL applies to a size-restriction on class prefixation in nominal morphology.

We have already seen that nouns take nominal class prefixes marking number category (e.g. (1-2)). The examples given so far show a prefix applied to a noun root in non-diminutive nominals or a prefix ([kɛ-/ke-]) applied to a derived diminutive nominal. However, in some cases class prefix affixation is more complex. To understand this, we must first consider the three forms of nominal prefixes. These are (i) CV or V, which occur before consonant-initial stems, (ii) C, which occurs before a vowel-initial stem, and (iii) N, which occurs before vowel-initial or consonant-initial stems. Bamgbose (1966a: 36) notes that plural prefixation exhibits what I will call a 'cumulative affixation' property such that when the singular form of a noun is formed with one of the latter two types of prefix (C or N), then the plural nominal class prefix is added to the whole of the singular noun form. Yet if the singular is formed with a CV or V prefix, the plural prefix replaces the singular prefix in the plural noun. This is illustrated in (53); examples (a-d) show cumulative affixation and (e-h) show replacement.

(53)

	Singular	Plural	Gloss
a.	l - én	bɛ̀ - lén	'name'
b.	l - úob	bɛ̀ - lúob	'navel'
c.	m - òm	bɛ̀ - mɔ̀m	'wine'
d.	m̀ - pîe	bɛ̀ - mpîe	'dog'
e.	kɛ̀ - tɔ́r	kè - tɔ́r	'duiker'
f.	ò - sùe	ɛ̀ - sùe	'house'
g.	lè - lɛ́m	bɛ̀ - lɛ́m	'tongue'
h.	lè - kwór	ŋ̀ - kwór	'heap'

A similar cumulative affixation effect appears in diminutive formation. Nouns which take C or N prefixes in their non-diminutive form construct their diminutive counterpart by prefixing [kɛ-] and [ke-] to singular and plural non-diminutive noun forms respectively (54a-b). Nouns with a V or CV prefix in their non-diminutive form replace this with [kɛ-/ke-] in their diminutive counterpart (54c-d).

(54)

	Non-diminutive	Diminutive	Gloss
a.	l - í	kɛ̌ - lí	'eye'
b.	ŋ̀ - kúel	kɛ̌ŋ - kûel	'tortoise'
c.	bù - t͡sí	kɛ̌ - t͡sî	'chair'
d.	ò - bé	kɛ̌ - bê	'hand'

Why are purely consonantal prefixes retained but V or CV ones replaced? A phonological generalization underlies this phenomenon: cumulative prefixation takes place only when the combined prefixal material amounts to no more than a syllable. This is particularly clear when we consider the variable syllabification of nasal prefixes. In word-initial position before a consonant, nasal prefixes are syllabic and tone-bearing; however, when an additional V or CV prefix appears before them, nasal prefixes are syllabified into a syllable coda and do not bear a tone. The restriction of nominal prefix material to no more than a syllable can be explained by a familiar constraint in our analysis of Mbe: ALLσL. Here the size-restrictor constraint limits the total size of combined prefixes (whether reduplicative or non-reduplicative). The analysis involves calling on a separation between faith for root material and faith for affix material. This segregation has basis in a wide range of cross-linguistic phenomena showing asymmetries in root versus affix faith (see, for example, McCarthy and Prince 1994a,

1995; Beckman 1995, 1997, 1998; Selkirk 1995; Urbanczyk 1996b; Alderete 1996, 1997a, Walker 1997b). McCarthy and Prince (1994a, 1995) propose a universally fixed ranking for root and affix faith, given in (55):

(55) Root-Affix faithfulness metaconstraint:
Root-Faith >> Affix-Faith

In the case of nominal prefixation, ALLσL limits the total size of combined prefixation to one syllable. Root material is not limited, however. This is achieved by an affixal TETU ranking, as in (56):

(56) Root-Faith >> ALLσL >> Nominal-Affix-Faith

The ranking in (56) refers to nominal affixation in particular, because verbal affixation proves to be capable of adding more than one syllable (as we will see in section 6.1.9).[24] The way in which the ranking in (56) realizes the size-restriction on cumulative nominal prefixation is shown in (57-58). Here I posit inputs containing multiple nominal prefixes in forms with potentially complex prefixation. I assume that a high-ranking constraint enforcing the presence of some nominal class prefix rules out candidates with no prefixation at all.

(57) Cumulative prefixation when combined material does not exceed a syllable

	bɛ - N - pie	Root-Faith	ALLσL	Nom-Affix-Faith
☞	a. .bɛm.pie.		*	
	b. .bɛ.m.pie.		**!*	
	c. .bɛ.pie.		*	m!
	d. .m.pie.		*	b!e
	e. .bɛm.	p!ie		

24 In another kind of lexical category faith distinction, Smith (1997) argues for the existence of faithfulness constraints that are specific to nouns (to explain Japanese accent patterns). In Mbe, affixes on verbs must have a higher-ranked faith demand than those for nominal affixes (or perhaps just affixes in the general case).

(58) No cumulative prefixation when combined material would exceed a syllable

	N - le - kwor	Root-Faith	ALLσL	Nom-Affix-Faith
☞	a. .ŋ.kwor.		*	le
	b. .n.le.kwor.		**!*	

LINEARITY-IO, which enforces the same ordering relations between material in the input and material in the output, rules out the alternative [leŋkwor] (McCarthy and Prince 1995: 371); alternatively, this could be ruled out by morphological demands on the ordering of morphemes. The preservation of the leftmost prefix over others may be attributed to a high-ranking demand to express the plural morpheme in plural nominals. This will rule out [lekwor] as the optimal output for the form in (58) (this form also violates a left-anchoring constraint).

This analysis focuses only on the implications of complex prefixation for the role of the size-restricting constraint in Mbe grammar. A separate and interesting issue that will not be examined here is why cumulative prefixation takes place. It is conceivable that this phenomenon is a paradigm uniformity effect (see, e.g., Benua 1995, 1997; McCarthy 1995; Kenstowicz 1995; Burzio 1997), or it is possible that it is motivated by some function of nominal class prefixes beyond simply marking number category. These are morphological issues that definitely deserve further investigation.

6.1.7 Atemplatic versus templatic approaches to size restriction

In the analysis of prefixation in Mbe presented above, the size-restrictor constraint ALLσL explains a number of effects, including the syllable-size copy of the imperative, the coda/null copy of the diminutive and inchoative, and the limit of a syllable on combined nominal prefixation. Previous approaches to size-restrictions in reduplication have called on templates to limit copied material. In this section, I will compare this alternative to the atemplatic TETU account. Interestingly, templates prove to be insufficient for handling the range of size restrictions in Mbe.

One version of the template-based approach to size-restriction makes use of fixed reduplication-specific templatic constraints. Under the Prosodic Morphology Hypothesis, these templates are prosodically-defined (e.g. RED=σ; McCarthy and Prince 1986, 1990, 1993a). This approach signalled a breakthrough in the understanding of reduplication, and it accounts for the majority of reduplication phenomena, for example,

in Mbe, RED=σ, can handle the imperative syllable-size copy.[25] However, the more unusual size restriction exhibited by the diminutive and inchoative reduplicants in Mbe poses a problem for prosodically-defined templates. One problem is that the coda/null size of the reduplicant does not correspond to a unit of prosody; another drawback is that a fixed templatic form does not predict the variability of the reduplicant realization as coda segment or zero. In addition, since nominal prefixation does not restrict the size of a particular prefix but rather limits the combined size of overall prefixation, even apart from reduplication, the fixed templatic approach does not serve to explain the cumulative prefixal size restriction.

A second templatic alternative building on the insights of the Prosodic Morphology Hypothesis is known as 'Generalized Template Theory' (McCarthy and Prince 1994a, b; Urbanczyk 1995, 1996a, b). This approach achieves size restrictions through TETU rankings with templatic constraints on the phonological structure of a general morphological category, such as 'Affix'. An example of a generalized templatic constraint is Afx≤σ: 'the phonological exponent of an affix is no larger than a syllable'. Afx≤σ easily handles the case of imperative syllable-size copy. Ranking this constraint between MAX-IO and MAX-BR will limit reduplicant size to one syllable. MAX-BR will drive copy of the largest possible syllable, and the independently-required CODACOND will restrict coda material to that allowed in the language. This is shown in (59).

(59) Afx≤σ in syllable-size copy

	RED - jubo	CODACOND	MAX-IO	Afx≤σ	MAX-BR
☞	a. ju - jubo				bo
	b. jubo - jubo			*!	
	c. jub - jubo	*!			o
	d. ju - ju		b!o		

Although generalized templates account for the majority of reduplication phenomena, they are insufficient for the more unusual cases of diminutive/inchoative coda/null reduplication. The problem is that the templatic size restrictor is specific to the size of the affix and does not make reference to the overall syllabic structure of the word. Ranked between IO and BR faith, Afx≤σ predicts that copied material will form a full syllable, driven by the maximizing function of MAX-BR, as shown in (60). This

[25] For arguments against an earlier templatic theory calling on fixed CV skeleton structure (e.g. McCarthy 1981; Marantz 1982), see McCarthy and Prince (1986, 1990).

incorrect outcome is signalled by the reverse-pointing hand beside candidate (c). Candidate (a), which is the actual outcome, is not selected by this tableau.

(60) Afx≤σ gives wrong outcome for diminutive

	kɛ - RED - tɛm	CODACOND	MAX-IO	Afx≤σ	MAX-BR
☞	a. kɛn͡-tɛm				t!ɛ
	b. kɛ - tɛm				t!ɛm
☜	c. kɛtɛn͡-tɛm				

The fact that reduplication for the diminutive and inchoative morphemes takes place only when it will not add a syllable to the word requires independent explanation. ALLσL is what achieves this explanation; yet it is also capable of capturing the size-restriction on its own. It thus obviates the need for a generalized templatic constraint. A similar problem arises with the syllable-size limit on cumulative nominal prefixation. Here it is not the case that individual prefixes must be less than a syllable in size, rather they must together add no more than a syllable to the word. This requires invoking ALLσL to limit size over the word, and this constraint on its own can perform the work of a generalized templatic constraint. The atemplatic approach to syllable-size restriction (Spaelti 1997) can be understood as a progression of the Prosodic Morphology Hypothesis and Generalized Template Theory. It retains the insights that size restrictions in reduplication are correlated to prosodic structure and may be derived with TETU rankings. Where it advances is in eliminating the need for templates. The morphology of Mbe provides empirical evidence that this is a necessary step to take.

Finally, there is an argument concerning theoretical overgeneration against the use of templatic constraints. This argument, discussed by Prince (1996, 1997) and Spaelti (1997), is known as the Philip Hamilton/René Kager Conundrum. The analysts for whom the conundrum is named observed that the use of templatic constraints in Optimality Theory predicts the occurrence of back-copying of templatic conditions, e.g., a requirement of a syllable-size reduplicant may induce truncation of the base to a syllable in size in order to perfectly satisfy BR faith; however, back-copying of templatic conditions is unattested. Prince and Spaelti point out that using atemplatic alignment constraints to produce size restrictions is not faced with this problem.

We have seen that templatic alternatives to size restriction are insufficient to obtain reduplicant size limits and are also not required. In addition, they are not capable of providing explanation for the range of size-restriction phenomena that ALLσL

covers. I conclude that TETU rankings with atemplatic alignment constraints, which minimize structure over the entire word, are not only successful size-restrictors, but they are necessary. The argument of overgeneration provides a theoretical motivation. Mbe adds to the set of languages providing an empirical justification; it exhibits size restrictions (with some novel characteristics) which necessitate an atemplatic approach.

6.1.8 Ruling out prespecification in reduplication

I conclude the discussion of Mbe by returning to the issue of prespecification in reduplication. The formation of diminutives and inchoatives, in which a reduplicated nasal forms the coda to fixed segmental prefix material, may at first seem to suggest a need for prespecified segments in reduplicative affixes. However, I have presented evidence from other aspects of Mbe morphology showing that the fixed segmentism is best analyzed as material belonging to a separate morpheme from RED. It was also noted that previous analysts have argued that prespecified material in reduplicants should be generally disallowed, since the theory would otherwise predict a wider range of fixed segmentism than is actually attested (McCarthy and Prince 1986; Urbanczyk 1996a, b; Alderete et al. 1996).

On the basis of these arguments, it seems desirable to rule out the occurrence of prespecified segments in reduplicants. I propose to obtain this result on the basis of constraint rankings holding over the set of output candidates. The alternative would be to try to rule out prespecification in reduplicants in the input. Note that this could not be achieved with optimality-theoretic constraints, since these apply to outputs not inputs. Given the assumption of Richness of the Base, which posits that all inputs are possible (Prince and Smolensky 1993: 191), the null hypothesis would be that prespecification in reduplicants could occur in inputs. Ignoring this possibility amounts to simply stipulating that reduplicative affixes cannot come with segmental material in the input, something that runs counter to the basis of Optimality Theory. Allowing for the possibility of prespecified reduplicative affixes in the input, I suggest that the absence of presecification as the source of fixed segmentism in reduplicants in the output can be derived from an extension of the Root-Faith >> Affix-Faith metaconstraint (McCarthy and Prince 1994a, 1995).

I begin by reviewing the correspondence relations that hold in reduplication. The ‘Basic Model’ of McCarthy and Prince (1995: 273) is given in (61) (the ‘Full Model’ includes Stem-to-RED identity or IR-Faith, but this will not concern us here).

(61) The Basic Model of reduplicative identity:

Input: /Af$_{RED}$ + Stem/
↑↓ *I-B Faithfulness*
Output: R ↔ B
B-R Identity

The model in (61) posits a correspondence relation between (i) the input and output forms of the stem, and (ii) between the output form of the stem (the base) and the output form of the reduplicative affix. In this model, the reduplicative affix is in correspondence only with the base. If it were assumed that the reduplicative affix came with no prespecified material, there would be nothing in the input form of the affix to which the output could correspond. However, let us suppose that the reduplicative affix can have prespecified segmentism. This necessitates an elaborated version of the 'Basic Model' with correspondence between the input and output forms of the affix, as shown in (62).

(62) Elaborated Basic Model of reduplicative identity:

Input: /Af$_{RED}$ + Stem/
Affix-IO Faithfulness ↑↓ ↑↓ *Stem-IO Faithfulness*
Output: R ↔ B
B-R Identity

In the case of reduplicative affixes, Affix-IO faithfulness has the potential to conflict with BR Identity. Constraint ranking gives the two possible outcomes in (63). Faith is subscripted here to indicate that these rankings generalize over any combination of faith constraints (i.e. any combination of MAX, DEP, etc.).

(63) a. Faith$_i$-BR >> Affix-Faith$_j$-IO

b. Affix-Faith$_i$-IO >> Faith$_j$-BR

The ranking in (63a), which places BR-Faith over Affix-Faith, yields a pattern in which maximal reduplication takes place (within the limits of any size-restriction) and wins over prespecified material. This outcome corresponds to the one in which there is no apparent prespecification, a result which is clearly well-attested. The second ranking, in (63b), places Affix-Faith at the top. With this hierarchy for MAX, any prespecified material will appear in the output at the cost of maximizing copied material from the base. This is illustrated in (64) for a hypothetical language with a RED containing

prespecified segmentism [so]. Here the prespecified material is preserved and reduplication takes place to fill up the remainder of the size restriction. This outcome is the one which may yield prespecified material as the source of fixed segmentism in reduplication, a pattern we have seen reason to believe is unattested.

(64) A ranking yielding combination of prespecified material with reduplication

	RED - bam | so	AFFIX-MAX-IO	ALLσL	MAX-BR
☞	a. sob - bam		*	am
	b. bam - bam	*!	*	

Another problematic kind of fixed segmentism arises under a combination of DEP and MAX constraints. The tableau in (65) shows how this can produce full copy of the base in combination with fixed material. What is unexpected about this kind of outcome is that the fixed [so] occurs only with reduplicative forms, not otherwise.

(65) Prespecified material plus full copy

	RED - bam | so	AFFIX-MAX-IO	DEP-BR
☞	a. sobam - bam		so
	b. bam - bam	*!	

Note that Faith-BR and Affix-Faith-IO only have the potential to conflict when correspondence holds for a given affix to both input material and base material, i.e. when a reduplicative affix comes with prespecified content. If the ranking in (63b) could be eliminated, we would prevent prespecified material from ever appearing in the output of a reduplicative affix at the cost of reduplicative faith. I suggest that this result can be achieved by extending McCarthy and Prince's Root-Affix Faith metaconstraint, a ranking-restrictor with significant independent motivation in the theory. Let us consider the correspondence relations in (63) in terms of root and affix faith. Affix-Faith-IO is an affix-to-affix correspondence relation, and Faith-BR is a correspondence relation between a root or root-containing stem and an affix. The undesirable ranking in (63b) thus ranks a faith relation between affixes over a faith relation between a root-based form and an affix. I propose to revise the metaconstraint: Root-Faith >> Affix-Faith such that any correspondence relation in which the first argument is a *root* or root-containing stem universally outranks a correspondence relation where the first argument is an *affix*.

The first argument is the one that is relevant, since the root-based constituent always forms the first argument in any root-to-affix correspondence relation (i.e. Faith-BR, following McCarthy and Prince 1995). The revised metaconstraint is given in (66):

(66) Revised Root-Affix Faith metaconstraint:
Faith_i-Root-*X* >> Faith_j-Affix-*Y*

The metaconstraint in (66) admits the rankings Root-Faith_i-IO >> Affix-Faith_j-IO and Faith_i-BR >> Affix-Faith_j-IO and rules out their reverse counterparts *Affix-Faith_i-IO >> Root-Faith_j-IO and *Affix-Faith_i-IO >> Faith_j-BR. We may thus eliminate the ranking in (63b), and consequently the emergence of prespecified material in a reduplicative affix, on the basis of the more general principle of Root over Affix Faith.[26]

6.1.9 Appendix: Deriving CodaCond in Mbe

In section 6.1.2 I made use of a descriptive constraint, CODACOND, noting that the effect of this constraint could be derived through the interaction of other more basic constraints. In this appendix, I examine the details of these rankings, drawing on the work of previous analysts of cond condition effects. The descriptive properties of the coda condition in Mbe are repeated in (67):

(67) Coda condition in Mbe
- (i) Place features of a coda consonant must be linked to a following onset.
- (ii) Coda consonants are limited to nasals.
- (iii) The coda restrictions of (i) and (ii) are exempted in root-final position.

First, place features of a coda consonant must be linked to a following onset. Alderete et al. (1996) suggest that this may be driven by the interaction of markedness and faith constraints.[27] The constraints driving multiple linking are place feature markedness constraints, which I refer to here as *C-PLACE/X (collapsing the hierarchy *PL/DORS, *PL/LAB >> *PL/COR; after Prince and Smolensky 1993; Smolensky 1993; for applications see Padgett 1995a; Alderete et al. 1996; among others). Importantly,

26 Under an alternative view of reduplication in the Reduplicate! model of Spaelti (1997), the problem of prespecification could be obviated by the model itself, since there is no empty affix posited at all. This may provide an argument for re-examining the standard assumptions about the nature of RED.

27 Cf. Padgett (1995b), who uses spreading constraints rather than markedness; cf. also Itô and Mester (1994, in press) on an approach to coda place-linking using alignment.

violations of *C-PL/X are reckoned on an autosegmental basis rather than a segmental one, so that one occurrence of a place feature linked to two segments incurs one violation for the single place feature, rather than two violations for the two segments to which it is linked (McCarthy and Prince 1994a; Itô and Mester 1994; Beckman 1995, 1997, 1998; Alderete et al. 1996; Walker 1998). This is illustrated in (68).

(68) a. One *C-PL/X violation   b. Two *C-PL/X violations

```
     C   C                    C   C
      \ /                     |   |
  [+coronal]            [+cor] [+cor]
```

If *C-PL/X outranks consonantal place feature identity constraints (both IO and BR), then place-linked structures for consonant clusters in roots and reduplicants will be selected over structures with two separate places. MAX constraints must also outrank place-identity constraints to prevent segments from deleting rather than undergoing place assimilation. This is shown in (69), restricting attention to candidates preserving onset place features. High-ranked ONSET is shown to prevent deletion of onset consonants. This tableau also includes an undominated contraint, HAVEPLACE, which requires that every consonant have some place feature specification (Itô and Mester 1993; Lombardi 1995b; Padgett 1995b). [T] represents a placeless consonant.

(69) Copied codas are place-linked

	RED-jiɔni	HAVEPLACE	ONSET	*C-PL/X	MAX-IO MAX-BR	IDENT-IO[Place] IDENT-BR[Place]
☞	a. jiɲ͡-jiɔni			j, ɲ͡j, n		*(BR)
	b. jin-jiɔni			j, n, j, n!		
	c. ji-jiɔni			j, j, n	n!(BR)	
	d. ji-jiɔi		*!	j, j	n(IO)	
	e. jiT-jiɔni	*!		j, j, n		*(BR)
	d. TiT-TiɔTi	*!***				**(IO)

A second property of the place assimilation must yet be explained: coda place features take on the place features of a neighboring onset but not the reverse. In his discussion of nasal place assimilation, Padgett (1995b) handles this by calling on faith constraints that are position sensitive, where the availability of such positions is defined by greater perceptual facilitation or prosodic privilege (Beckman 1995, 1997, 1998;

McCarthy 1995; Lombardi 1995b; Alderete 1995, 1996; Selkirk 1994 cited by Beckman 1998; Katayama 1998; Walker 1998). Padgett observes that the positional asymmetry for place assimilation has a phonetic grounding: consonants are more likely to resist loss of input place features in positions where they are released, that is, in positions where they occur before a tautosyllabic liquid or vocoid (1995b: 17-18, drawing on Byrd 1992; Steriade 1993c; see also Jun 1995).[28] Faith constraints specific to the perceptually-salient position of release are capable of preventing *C-PL/X from threatening the preservation of place features in onset position. The positional faith constraint that will be required is given in (70) (after Padgett 1995b: 19):

(70) IDENT$_{REL}$-IO[Place]:
Let S be a [+release] segment in the output. Then every place feature in the input correspondent of S has an output correspondent in S.

The ranking needed for Mbe places release-sensitive IO-faith for place features over *C-PL/X, which in turn outranks general faith for place features:

(71) IDENT$_{REL}$-IO[Place] >> *C-PL/X >> IDENT-IO/BR[Place]

This ranking will produce spreading of place features from onsets to codas in consonant clusters, as illustrated in (72). Only candidates respecting HAVEPLACE and ONSET are considered here and in subsequent tableau.

(72) Place features spread from onset to coda

	RED-puɔni	IDENT$_{REL}$-IO[Place]	*C-PL/X	IDENT-IO[Place] IDENT-BR[Place]
☞	a. pum͡-puɔni		p, m͡p, n	*(BR)
	b. pun͡-tuɔni	*!	p, n͡t, n	*(IO)
	c. pun-puɔni		p, n, p, n!	

IDENT$_{REL}$-BR[Place] must also outrank *C-PL/X to ensure identity of place feature copy. Recall that *C-PL/X collapses a hierarchy of place feature markedness constraints. It is the dominating status of BR and IO IDENT$_{REL}$-[Place] that prevents

28 Padgett observes that positions of release may be expanded in some languages to include word-final consonants; also in some languages positions of release may include consonants in all positions (1995b: 18).

place features in released positions from reverting to the least marked consonantal place (e.g. coronal, or in some languages laryngeal). The definition of IDENT$_{REL}$-BR[Place] is given in (73) and the tableau showing its application is in (74) (considering only candidates respecting the non-high vowel reduction in the reduplicant).

(73) IDENT$_{REL}$-BR[Place]:
Let S be a [+release] segment in the reduplicant. Then every place feature in the base correspondent of S has a reduplicant correspondent in S.

(74) Onset place identity is preserved

	RED-ge	ID$_{REL}$-IO[Place] ID$_{REL}$-BR[Place]	*PL/DOR *PL/LAB	*PL/COR	ID-IO[Place] ID-BR[Place]
☞	a. gə - ge		**		
	b. də - ge	*!(BR)	*	*	*(BR)
	c. də - de	*!(IO)		**	*(IO)

Next we must explain why coda consonants are limited to nasals (except in root-final position, which I will return to presently). In dealing with the failure of coda obstruents to assimilate in place, Padgett (1995b: 23) suggests a breakdown for place-faithfulness by segment type in which faith for place features in obstruents outranks faith for place features in nasals, a ranking grounded in the observation that nasal place is more difficult to perceive than obstruent place (see Ohala and Ohala 1993: 241-2 and references therein). To this I propose to add that identity for place in approximants also outranks nasal place identity:

(75) IDENT-IO/BR[OBS-Place], IDENT-IO/BR[APR-Place] >> IDENT-IO/BR[NAS-Place]

If faith for place features occurring in obstruents and approximants are high-ranked in Mbe, then obstruents and approximants will always retain their place specifications. These leaves two possible outcomes for these classes of segments in codas ([-release] positions), they will either occur in codas with distinct place features (violating *C-PL/X) or they will be disallowed in codas (I assume violating MAX rather than DEP, see n. 12). The latter is what takes place in Mbe (except root-finally), meaning that C-PL/X must outrank MAX-IO/BR, as shown in (76). As noted in section 6.1.2, I assume that undominated IDENT-IO/BR[nasal] rules out alternatives changing oral consonants to nasal (i.e. [fun-fuel, [fun-fuen]), and for the moment I consider only candidates preserving onset place identity (as in (72), (74)) and maintaining root-final consonants. [ʋ] represents a labio-dental approximant.

(76) Non-nasal codas are prohibited

	RED-fuel	IDENT-IO/BR[OBS-Pl] IDENT-IO/BR[APR-Pl]	*C-PL/X	MAX-IO MAX-BR
☞	a. fu- fuel		f, f, l	el(BR)
	b. ful- fuel		f, l, f, l!	e(BR)
	c. fuʋ͡-fuel	*!(BR-APR-Pl)	f, ʋ͡f, l	e(BR)

In contrast to oral consonants, nasals are retained in codas, although they must be place-linked. To achieve this outcome, IDENT[NAS-Place] must be outranked by MAX, as shown in (77). The difference between nasal versus oral consonants is thus that nasals in codas will share place features with a following onset at the cost of place feature identity, while oral consonants in codas will be lost rather than violate place-identity through assimilation.

(77) Nasal codas occur (place-linked)

	RED-puɔni	IDENT[OBS-Pl] IDENT[APR-Pl]	*C-PL/X	MAX-IO MAX-BR	IDENT-IO/BR[NAS-Pl]
☞	a. pum͡-puɔni		p, m͡p, n	ɔi(BR)	*(BR)
	b. pun-puɔni		p, n, p, n!	ɔi(BR)	
	c. pu-puɔni		p, p, n	ɔni!(BR)	

The final aspect of the Mbe CodaCond to be explained is the failure of coda restrictions to apply in root-final position. Recall that coda restrictions are lifted not only when root-final consonants are word-final, but also when a root-final consonant occurs before a suffix consonant (see n. 11). If it is the case that root-final position is a position of release, then this exemption could simply be a consequence of faith sensitive to surface release positions. However, the release status of root-final consonants is not discussed in the descriptions of Mbe. If it were that case that root-final consonants are not released, then with the rankings as they stand, situating *C-PL/X over MAX-IO, root-final consonants before a consonant-initial suffix would be expected to delete (or

place-assimilate in the case of nasals).[29] In this eventuality, I suggest that the exceptionality of root-final consonants is another consequence of positional faith constraints, in this case specific to the root-final segment. The need for edge-sensitive faith constraints is noted by McCarthy and Prince (1995: 371), who propose anchoring constraints enforcing faith for edge material. In Mbe, it is the segment at the right edge of the root that receives privileged faith status, both in segmental correspondence and featural identity. I express the needed position-sensitive faith constraints as anchoring constraints in (78). The anchoring constraint formulation proposed by McCarthy and Prince demands a correspondent for peripheral segments, as in (78a). This kind of correspondence relation is of the MAX family, as I have noted in the name of the constraint. I add to this (78b), which enforces identity of featural properties for peripheral segments.

(78) a. RIGHT-ANCHOR-MAX$_{ROOT}$:
Any segment at the right edge of the root in the input has a correspondent at the right edge of the root in the output.

b. RIGHT-ANCHOR-IDENT$_{ROOT}$[Place]:
Let α be a segment at the right edge of the root in the input and β be a correspondent of α at the right edge of the root in the output. If α is [Place γ], then β is [Place γ].
(Correspondent segments at the right edge of the root are identical in Place features.)

Since MAX and IDENT right-anchoring constraints save consonants and their place features in root-final position, they must outrank *C-PL/X. This is illustrated in (79-80) for suffixed forms [jùab-kî] 'be washing' and [jǐɛm-kì] 'be singing'.

29 Note that even if root-final consonants are not *phonetically*-released in Mbe (which is an empirical question), it is conceivable that root-final position is phonologized as a location in which consonants are released. This could be derived through an opaque constraint interaction where the sympathy candidate is one in which the root-final position is also Pwd-final (and is thus released). Whether there is any independent evidence for this approach is an interesting question to pursue in further research of the Mbe language.

(79) Codas without linked place can occur in root-final position

juab - ki	R-ANCHOR-MAX$_{RT}$	R-ANCHOR-IDENT$_{RT}$[Pl]	*C-PL/X
☞ a. juab-ki			j, b, k
b. jua-ki	*!		j, k
c. juag͡-ki		*!	j, g͡k

(80) Root-final nasals without linked place

jiem - ki	R-ANCHOR-MAX$_{RT}$	R-ANCHOR-IDENT$_{RT}$[Pl]	*C-PL/X
☞ a. jiem-ki			j, m, k
b. jie-ki	*!		j, k
c. jieŋ͡-ki		*!	j, ŋ͡k

We now have completed the rankings which obtain the Mbe CodaCond, which holds within roots and prefixes, including the reduplicative prefix in imperative verbs. The analysis draws on the insights of earlier accounts calling on markedness and (positional) faith constraints (Padgett 1995b, Alderete et al. 1996), and they serve to explain why codas are restricted to place-linked nasals except in root-final position. It has emerged that the special status of nasals with respect to codas is a consequence of the relatively weak salience of place in nasals, reflected analytically by a low-ranked place feature identity constraint for nasals (after Padgett 1995b). The rankings for the coda restrictions are summarized in (81).

(81) Summary of rankings for CodaCond:

IDENT$_{REL}$-IO/BR[Place], IDENT-IO/BR[OBS-Place], IDENT-IO/BR[APR-Place]
ONSET, HAVEPLACE, R-ANCHOR-MAX$_{ROOT}$, R-ANCHOR-IDENT$_{ROOT}$[Place]
|
*C-PLACE/X
|
MAX-IO, MAX-BR
|
IDENT-IO/BR[NAS-Place]

Before concluding this appendix, I briefly examine nasal copy in the formation of perfective verbs. This discussion is included for completeness, but the analysis should

be considered as only tentative. The goal of this last segment to outline how place markedness constraints already employed in the analysis of Mbe could be extended to offer explanation for an independent restriction in perfective nasal copy. Perfective verbs are formed with a prefix [me-] (82). Perfective verbs also exhibit the third and last instance in Mbe of a prefixal place-linked nasal segment alternating with zero (examples (c-e)):

(82)

	Perfective verb form	Gloss
a.	mê - tá	‘has touched’
b.	mê - júbò	‘has gone out’
c.	mém̀ - bámò	‘has hidden’
d.	méǹ - lám	‘has cooked’
e.	méɲ̀ - jíɛm	‘has sung’

Nasal copy in the perfective differs from the previous cases we have seen in an important way: the copied nasal in perfective formation is syllabic and transcribed as tone bearing, while in diminutive, inchoative, and imperative formation it is syllabified as a coda and is not tone-bearing. In commenting on this, Bamgbose (1971: 104-105) notes that a CVN syllable does not generally contrast with an open syllable followed by a syllabic nasal in Mbe; however, in support of positing a syllabic nasal in the case of perfective affixation (aside from its transcribed tone-bearing character), he observes that the nasal does not produce reduction of /e/ to [ə] in the [me-] prefix. If the nasal formed a syllable coda, this absence of reduction would be unexpected, since /e/ allophonically reduces to [ə] in closed syllables throughout the language.[30] It is particularly interesting to contrast the consistently full vowel of [me-] with the reduced quality of the vowel in the [re-] inchoative prefix when followed by a nasal.[31]

[30] Transcription of [e] in roots in the Mbe data given earlier follows Bamgbose’s phonemic transcription and does not reflect this reduction.

[31] In discussing the coda status of copied nasals, Bamgbose (1971: 104-5) also raises the interesting and rather unexpected point that in imperative reduplicants closed by a nasal, the high vowels [i] and [u] occur freely; but in general in Mbe [i] and [u] occur only rarely in closed syllables. This is an example of what Spaelti (1997) calls ‘The Emergence of the Marked’ in reduplication, a case where identity between base and reduplicant correspondents yields a structure in reduplicants that does not otherwise normally occur in the language. Spaelti documents several examples of this kind. The problem that arises in obtaining this sort of outcome is in preventing the deletion of the base segment in order to avoid producing the marked structure. The deletion outcome is what would be expected under a ranking where MAX-IO was simply dominated by the constraint forbidding high vowels in closed syllables (which I will refer to as *i/uC]σ. Spaelti (1997: 85) observes that the kind of ranking configuration needed is something like the following: X >> *i/uC]σ >> MAX-IO >> MAX-BR, where the constraint ‘X’ achieves the effect of ‘do not delete the high vowel’. I will not pursue the details

The copied nasal that occurs in perfective formation is also exceptional in a second respect: it can copy a nasal in the verb stem in the usual way or it can copy a syllabic nasal pronoun to its left. Correspondence to a nasal pronoun is not possible in the other cases of nasal agreement (compare inchoative forms below).

(83)

		Perfective verb form	Gloss
a.	ǹ	méǹ - tá	'I have touched'
	ò	mê - tá	'you have touched'
b.	ǹ	mém̀ - bɔ́rò	'I have helped'
	ɛ̀	mê - bɔ́rò	'he has helped'
c.	ǹ	méǹ - lál	'I have slept'
	é	mê - lál	'it has slept'
		Inchoative verb form	Gloss
d.	ǹ	rê - lɔ̂ èt͡sí *rèń - lɔ̂	'I have started to burn the tree'
e.	ǹ	rê - bɔ́rò bùt͡sì *rèḿ - bɔ́rò	'I have started to help the friend'

Although fascinating, the availability of copy of material in a preceding pronoun will not be analyzed here. I will simply note that it is possible that the syllabic status of the copied nasal in perfective forms may contribute to the availability of this alternative.

On the strength of the evidence from diminutive and inchoative prefixations for a separate RED affix in nasal segment/null copy, I assume that affixation in perfective verbs is also complex, consisting of a prefix [me-] and a separate purely reduplicative prefix. I hypothesize that the syllabic status of the copied nasal in perfective prefixation is driven by a requirement that reduplicated perfective prefix material coincide with a tone. I will refer to this requirement as PERF/TONE, noting that this could perhaps be captured with an affix-to-tone alignment constraint. Because perfective reduplication adds a syllable in order to satisfy this constraint, PERF/TONE and REALIZEMORPH$_{perf}$ must outrank the size-restrictor ALLσL:

(84) PERF/TONE, REALIZEMORPH$_{perf}$ >> ALLσL

of this case further here and leave a deeper investigation of the emergence of the marked for future research.

The question is, if the perfective reduplicant can constitute a syllable, why is it not realized as V(N), which would better satisfy syllable peak markedness and MAX-BR? I suggest that the answer may be found in place markedness constraints. These prohibit the occurrence of place features, and in the case of the coda condition, they drive the place-linked status of coda nasals. The reduplicative syllabic nasal prefix is distinguished by its satisfaction of this constraint: it does not add a place feature to the word. We have already established that *C-PL/X outranks MAX-BR. If it also outranked the demand of the morpheme realization for the perfective, copy would take place only when it did not add a place feature. Up until now, I have made use only of *C-PL/X, which prohibits consonantal place features. Perfective reduplication can also not add vowel place features (recall from 6.1.2 that linking of vowel features across syllables is disallowed). The ban on C-Place and V-Place features being introduced by the perfective morpheme is expressed by the ranking in (85).[32]

(85) *C-PL/X, *V-PL/X >> REALIZEMORPH$_{perf}$

The following tableaux illustrate the effect of these rankings. First, (86) shows a case where a nasal is copied from the verb stem. Here morpheme realization and the requirement that the perfective prefix coincide with a tone compel the addition of a syllable.

(86) Copied nasal is syllabic

	me - RED - bamo	*C-PL/X *V-PL/X	PERF/TONE	REALIZEMORPH$_{perf}$	ALLσL
☞	a. .mé.m͡.bá.mò.	******			******
	b. .mêm͡.bá.mò.	******	*!		***
	c. .mê.bá.mò.	******		*!	***
	d. .mé.bàm͡.bá.mò.	*******!*			******

32 It should be noted that this treatment of syllabic nasals as syllables containing a nasal consonant in the nucleus is only tentative. Some analysts have argued that so-called syllabic nasals must correspond to a VN representation, in which the vowel is reduced (i.e. schwa) (see, e.g., Ní Chiosáin and Padgett 1997 for review of this issue). If the VN represention were required, then this could provide further evidence for schwa as a placeless vowel in Mbe.

The tableau in (87) shows an example where morpheme realization fails because there is no available nasal to copy and copying other material would necessitate adding a place feature:

(87) Copy fails when no nasal in stem

	me - RED - ta	*C-PL/X *V-PL/X	PERF/TONE	REALIZEMORPH$_{perf}$	ALLσL
☞	a. .mê.tá.	****		*	*
	b. .mé.tà.tá.	*****!*			***

The above rankings have shown that place markedness constraints outrank ALLσL. Earlier it was established that ALLσL dominated realization constraints for the diminutive and inchoative morphemes. This ranking is consistent with the position of *C-PL/X, since realization of the diminutive and inchoative morphemes does not compel violations of place markedness constraints. It also has been determined that the realization constraint for the imperative dominates ALLσL. Since imperative reduplication does introduce additional place features, the imperative realization constraint must also outrank *C-PL/X and *V-PL/X. The domination of MAX-BR by ALLσL will keep reduplicant size down to a syllable.[33] Similarly, in nominal affixation, whatever constraint forces some nominal class affix to appear will have to outrank place markedness constraints.

6.2 Cooccurrence effects in Bantu

In this section I examine a nasal agreement phenomenon occurring in certain Bantu languages (Johnson 1972; Howard 1973; Ao 1991; Odden 1994; Hyman 1995; Piggott 1996). I suggest that this nasal agreement is not a case of [+nasal] feature spreading, but rather the result of a cooccurrence restriction, paralleling a set of other languages having cooccurrence restrictions over segments with similar but different properties. The motivation for a cooccurrence analysis is sketched here and the details are left for further research.

33 Something further will be required to explain why the imperative reduplicant does not simply consist of a syllabic nasal when there is a nasal in the base to copy (which is predicted by C-PL/X >> MAX-BR if no more is said). This could be attributed to a prosodic constraint on the imperative reduplicant requiring that it match the canonical form of a verb root (minimally CV; Bamgbose 1967a).

I exemplify the nasal agreement pattern with data from Kikongo, spoken in southwestern Zaire. In Kikongo suffixes, a voiced oral segment realized as either [l] or [d],[34] becomes a nasal [n] when a nasal stop occurs anywhere in the root. This is shown in (88) for three different suffixes. The data in (88a-b) are from Ao (1991). The first form in (88c) is from Piggott (1996 drawing on Bentley 1887, Laman 1936) and the second form is from Odden (1994). Root-suffix combinations compose the morphological domain of the stem. In the following data, roots are underlined; note that prefix nasals do not trigger suffixal nasal agreement, since they occur outside of the stem domain. I will not be not concerned with the [l] ~ [d] variation here.

(88) Kikongo

a. Perfective passive: [-ulu]/[-unu]

m-bul-ulu	'I was hit'
n-suk-ulu	'I was washed'
masangu ma-kin-unu	'the maize was planted'
masangu ma-nik-unu	'the maize was ground'

b. Perfective active: [-il]([-id])/[-in]

m-bud-idi	'I hit'
n-suk-idi	'I washed'
tu-kun-ini	'we planted'
tu-nik-ini	'we ground'

c. Applicative: [-il]/[-in]

sakid-ila	'to congratulate for'
kudumuk-is-ina	'to make jump for'

Interestingly, there is no limitation on the distance between the alternating suffix segment and the nasal in the root. Also intervening vowels and voiceless obstruents are unaffected, remaining oral. This kind of suffix alternation between [l/(d)] and [n] occurs in several other Bantu languages, including Luba (Johnson 1972; Howard 1973), Lamba (Doke 1938), Bemba, Tonga, Suku, and Yaka (the last four listed in Hyman 1995; in some cases, e.g. Lamba, there is a requirement that no consonants intervene between the root nasal and suffix consonant).

34 This segment is realized as [d] before [i] (Bentley 1887: 624).

Ao (1991) gives the following examples from Kikongo to show that a nasal-obstruent sequence does not cause the suffix segment to become nasalized, nor does it prevent a preceding nasal from bringing about the nasalization. These nasal-obstruent sequences are analyzed as prenasalized stops by Piggott (1996) (Hyman 1995 makes a similar assumption for Yaka).

(89) a. tu-bing-idi 'we hunted'
tu-bing-ulu 'we were hunted'
tu-kong-idi 'we tied'
tu-kong-olo 'we were tied'[35]

b. tu-meng-ini 'we hated'
tu-meng-ono 'we were hated'
tu-mant-ini 'we climbed'
wu-mant-unu 'it was climbed'

The data in (88-89) show the nasal agreement in suffix consonants. Nasal agreement does not induce oral/nasal alternations in root segments; however, as noted by Ao (1991: 195-96, n. 3) and confirmed by Piggott (1996 drawing on dictionary listings of Bentley 1887 and Laman 1936), a voiced oral consonant never occurs to the right of a nasal stop anywhere in a stem; a root such as [mab] is thus ill-formed. The distributional facts for Kikongo may this be stated as in (90) (following Piggott 1996):

(90) Kikongo consonant distribution:
Within a stem, a voiced consonant to the right of a nasal consonant is a nasal.

The first question for an analysis of this distribution is what phonological mechanism brings about the nasal distribution in (90)? In previous work, this nasal agreement phenomenon has been analyzed as the result of spreading of [+nasal] (e.g. Ao 1991, Odden 1994, Hyman 1995, Piggott 1996). However, there are two significant respects in which this nasal agreement differs from all of the cases of nasal spreading documented in the nasal harmony database (summarized in chapter 2). First, the nasal agreement is non-local, that is, the root nasal and the alternating suffix consonant are non-adjacent, and in some cases, are separated by multiple syllables. This contrasts with

35 Kikongo exhibits a height harmony in suffix vowels such that the high vowels [i, u] lower to [e, o] when the root vowel is [e, o].

the important generalization established by the study of nasal harmony in chapter 2 that [+nasal] spreading occurs only between strictly adjacent segments. Second, the set of target segments does not obey the nasal compatibility hierarchy. If the nasal agreement in Kikongo were nasal spreading, it would have to be posited as targetting all voiced consonants and not vocoids. This differs from the systematic finding of the nasal harmony database that nasal spreading targetting consonants also targets vowels (as predicted by vowels being higher-ranked on the nasal compatibility scale). Given these considerable differences from the core generalizations established for nasal spreading, I reject the possibility that the Bantu nasal agreement is a feature spreading phenomenon. Since the nasal agreement can occur anywhere within a stem and involves featural change rather than the presence or absence of a segment, I also reject the possibility of a reduplication phenomenon (i.e. segment copy).

With spreading and reduplication ruled out, I turn to another kind of phonological mechanism which has not yet been considered, namely, cooccurrence restrictions. Cooccurrence restrictions refer to conditions excluding similar sound elements in a word or some other domain. I suggest that analyzing the Bantu nasal agreement effects along these lines explains both its non-locality and the kinds of segments targetted.

In the history of analysis of cooccurrence conditions, an analytical breakthrough came with advent of autosegmental representations and the proposed Obligatory Contour Principle (OCP), which bans adjacent identical elements (e.g. segments, features, tones) at some level of phonological structure (Leben 1973; McCarthy 1979, 1981, 1986; Mester 1986). Although the OCP served to explain many cooccurrence effects, several analysts have noted that its locality requirement (i.e. adjacency on a tier) is too restrictive for some cooccurrence phenomena which appear to occur at any distance within some domain, such as the word (Jones 1997; Walker 1997c; Flemming 1998; see also Itô and Mester 1996, Alderete 1997b, who formulate an OCP constraint without a locality requirement, and Pierrehumbert 1993a, Frisch, Broe, and Pierrehumbert 1997, who propose a gradient and quantitative approach). This application of cooccurrence restrictions to any similar (or identical) segments within some domain matches the non-local character of the Bantu nasal agreement.

Another way in which the Bantu nasalization resembles cooccurrence restrictions of certain other languages concerns the set of segments targetted by the restriction. An important observation that has received little attention in the study of cooccurrence effects is that the restrictions do not always simply exclude *identical* elements; in some cases they exclude *similar but different* elements within some domain (Odden 1994;

Mester 1986; Sagey 1986; Walker 1997c, Flemming 1998). An example of the latter kind comes from Ngbaka, a Niger-Congo language, reported by Thomas (1963) and discussed by Mester (1986) and Sagey (1986). Ngbaka arrays its consonants according to a hierarchy, as in (91) (following Mester 1986: 41). It exhibits a cooccurrence restriction in words such that for each place of articulation, adjacent elements on the scale are forbidden. Non-adjacent or identical elements are compatible. Thus, nasal and prenasal are excluded together, also prenasal and voiced (oral), and voiceless with voiced (oral).

(91) voiceless obstruent - voiced obstruent - prenasalized voiced obstruent - nasal
e.g. [p] [b] [^{m}b] [m]

Kera (Chadic) exhibits a similar restriction banning a mix of voiced and voiceless stops/affricates within the word (Ebert 1979; Odden 1994). This restriction induces voicing in affix stops when the stem contains a voiced obstruent (e.g. /ki-d͡ʒir-ki/ → [gi-d͡ʒir-gi] 'colorful' (masc.); cf. [ki-sar-ki] 'black' (masc.)). The cooccurrence restrictions in Ngbaka and Kera are strikingly similar to the nasal agreement phenomenon in Kikongo: two similar but different segments in a nasality and/or voicing continuum are excluded within the word/stem (with place of articulation adding to similarity in Ngbaka). Segments that are sufficiently similar or sufficiently different are allowed to cooccur. In Kikongo, voiced consonants qualify as insufficiently similar and insufficiently different from nasals. This may be understood as inducing the nasalization of voiced consonants in Kikongo suffixes when the root contains a nasal. Kikongo differs from Ngbaka in permitting prenasal segments to cooccur with nasal and voiced consonants. Prenasal stops thus appear to meet the required similarity threshold with segments matching in nasality or voicing in Kikongo; the similarity threshold in Ngbaka is somewhat less permissive.

To review, although the Kikongo pattern of nasal agreement may at first appear to be a completely different type of nasal harmony (with [+nasal] feature spreading), the consonant distribution patterns of languages like Ngbaka and Kera indicate that it shares much in common with cooccurrence restrictions holding over similar but different elements. Accordingly, I propose that an analysis of Bantu nasal agreement should fall under a cooccurrence account. Cooccurrence effects applying to similar but different elements have been little studied, because they are not immediately well-accounted for by the OCP (but see, e.g., Mester 1986 for a proposal concerning Ngbaka). I will not develop an account of such restrictions here, but note that there are five focal issues to

be examined in future research; these are (i) the object of the cooccurrence restriction: this can hold over identical sound properties or similar but different ones, (ii) locality: different apparent requirements occur, e.g. segmental adjacency, syllable adjacency, or membership in the same word (but see Flemming 1998, who reanalyzes some of these apparent requirements), (iii) blocking and directionality: a specific type of intervening segment in some cases blocks the cooccurrence effect (e.g. Gurundji; Jones 1997); in some instances the cooccurrence effect seems to be directional (e.g. Kikongo), (iv) resolution: the conflicting sounds either dissimilate (become less alike) or they assimilate (become more alike), (v) motivation: what drives the coocccurence effect? Flemming (1998) suggests that contrast demands can play a role; Walker (1997c) notes that speech planning may contribute to the effect. This is clearly a rich domain for further research.