'DISCONTINUOUS' REDUPLICATION IN ULU MUAR*

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0 Introduction

The theory of Prosodic Morphology (McCarthy and Prince 1986, 1990) treats reduplication as the affixation of a prosodic template to a base. The affixation of a CV skeleton (cf Marantz 1982) is rejected on the grounds that 'no language process ... is known to depend on the raw number of segments in a form' (1986:3). On the other hand, in the realm of nonphonological allomorphy as well as phonology proper, it is the case that rules may count moras, syllable or feet (1986:2). In other words, rules count prosodic units, never segments. For a detailed discussion of the reasons for rejecting segments, see McCarthy and Prince 1986. Instead, I present below the conditions on the association of segments to a template in order to show how Prosodic Morphology is able to provide a highly constrained account of reduplication phenomena.

0.1 Prosodic Morphology

In reduplication, a prosodic template is affixed to a base. This affixation triggers off a complete copy of the melodic elements of the base, which then go on to link up with the template. There is a tendency called Maximization of Association (MA) where as many elements are associated as possible (McCarthy and Prince 1986).

However, this association process is constrained by the No Skipping Condition (NSC) and the Satisfaction Condition (SC). The NSC states that association of melodic elements to the template must be continuous. If a particular melodic element, for some reason, fails to associate, then the association stops. It is not possible for the association process to 'skip' over the recalcitrant melodic element in order to continue the association process, even if there happens to be a melodic element 'further down' that can satisfy the template. And the SC requires that all the elements in a template be satisfied. In other words, there must enough (appropriate) melodic elements to satisfy the template. Otherwise, the entire reduplication process fails and nothing is licensed. We see, then, that the NSC and the SC jointly serve to constrain the kinds of reduplication possible.

If so far as our goal is to seek a constrained account of reduplication phenomena, it is therefore desirable that both the

NSC and the SC be maintained. Thus, any claim that the NSC and the SC need to be drastically relaxed or abandoned even, needs to be examined carefully. Such a claim can be found in Kroeger's discussion of reduplication in the Malay dialect Ulu Muar.

1 Ulu Muar And Kroeger's Solution

1.1 The Data

Kroeger's discussion of Ulu Muar is based on data taken from Hendon's (1966) monograph. The following are examples of a reduplication process that, according to Kroeger, pose major problems for the NSC and the SC.

(1)	a.	sie?	si?-sie?	'is torn repeatedly'
	b.	tari?	ta?-tari?	'accordion'
	c.	bele?	be?bele?	'is repeatedly turned over'
	d.	cakap	ca?-cakap	'talks'
	e.	sikit	si?-sikit	'various small quantities'
	f.	galap	ga?-galap	'repeatedly dark'
	g.	kawan	ka°-kawan	'friend'
	h.	dayaŋ	dan-dayaŋ	'hand-maidens'
	i.	diam	din-diam	'remains silent'
	j.	tanam	bo-tan-tanam	'gardens regularly'
	k.	paraŋ	pam-paraŋ	'sword-like decoration'
	l.	suko	su-suko	'to be enjoying (oneself)'
	m.	bilo	bi-bilo[1]	'whenever'
	n.	pukɷ	pu-pukɷ	'is repeatedly hit'
	o.	ula	*	'snake'
	p.	ameh	*	'gold'
	q.	adi?	*	'younger sibling'

Examples a-k show that the first CV of base are copied, as well as the final C. If the final C is a stop, it is neutralized to a laryngeal. If it is a nasal, it becomes homorganic to the first C of the base. This appears to be a violation of the NSC because it implies that the process is only sensitive to both edges of the base: the initial CV and the final C. Any intervening material is ignored.

Examples l-n show that where the base has no final consonant, the copy, too, has no final consonant. This is

problematic for the SC because although the presence of a consonant in initial-position is obligatory (as o-p show, vowel-initial stems cannot reduplicate), the presence of a consonant in final position is not (since vowel-final bases can reduplicate). The implication is that the part of the reduplication template that associates with the final C must remain unfilled for vowel-final bases.

1.2 Kroeger's Solution

To deal with the data just presented, Kroeger first assumes that both the initial CV and the final Cs which survive the reduplication process are licensed by the reduplication template itself. This is what leads him to characterise the reduplication as 'discontinuous'. He proposes to weaken the NSC by limiting cases of 'discontinuity' to just where the association is between edge elements. He recognizes that the Ulu Muar phenomenon 'does not involve ARBITRARY gaps or leaps in the copying process. Copying in these examples is strikingly and crucially edge-governed' (1989:198). One possibility, as Kroeger himself notes, is to apply the rule of Edge-In Association (Yip 1988) which will associate the initial and final melodic elements with the initial and final free slots, anchoring the two ends. Association then continues inwards until all slots are filled.

While such a move would allow us to maintain the NSC, albeit in a much weaker form, it is still problematic because of the requirements of the SC since the presence of the final consonant seems to be optional. And as Kroeger rightly points out, this violates a fundamental assumption of a templatic approach such as Prosodic Morphology: the persistence of templatic slots. That is, these templatic slots MUST always be filled if an appropriate melodic element is available. Thus, an edge-in approach would predict incorrect results for vowel-final stems so that a form like *suko* might be expected to produce either **so-suko* or **suk-suko*, depending on whether the association is melody-driven or template-driven (Kroeger 1989:199). As we saw, the correct form is actually *su-suko*. He then concludes 'that a template-and-association model of reduplication cannot provide an adequate analysis of these facts. We must look for a non-templatic solution' (1989:199).

Kroeger then proposes to use a parse (McCarthy and Prince 1990), which is a mechanism for prosodic circumscription. He invokes not just one, but two parses to deal with Ulu Muar. His solution is as follows. First, there is a full copy of the base. Then two separate parses apply

simultaneously to the copy. One of the parses will parse a light syllable (CV) on the left edge, while the other will parse a single consonant on the right edge. The intervening residue is deleted. In the case of a vowel-final stem, the second parse will simply fail to parse anything, and nothing would be licensed on the right edge of the copy. The following (p197) is one of his examples:

(2)	a. Base	diam
	b. Full Reduplication	diam-diam
	c. Parse (Left Edge: CV, Right Edge: C)	[di]a[m]-diam
	d. Delete Residue	[di][m]-diam
	e. Syllabify, Neutralize, Assimilate	din-diam

What is of interest to us is the way Kroeger's solution deals with the NSC and SC violations. Since Kroeger has weakened the NSC to allow it to be violated in edge-governed situations, the fact that the two parses ignore the intervening material is not a problem for him. Also, since he is using parses rather than templates, violation of the SC is no longer a problem either.

1.3 Problems With Kroeger's Solution

There are a number of problems with Kroeger's solution. I will mention the more specific problems before going on to the more general ones.

First of all, Kroeger is not clear on whether his left edge parse is to be defined prosodically (in terms of a light syllable) or segmentally (CV). In his discussion of Ulu Muar, both ways of referring to the parse are used. Note, however, that the right edge parse must be defined segmentally (C) in order for it to not license a vowel. Apparently, then Kroeger's solution either forces us to mix prosodic and segmental criteria, or it must be segmentally defined only. If the former is the case, this mixing of 'apples and oranges' has the undesirable consequence of unconstraining the nature of the parse. If the latter is the case, then it is open to all the criticisms of segmentally defined processes that have been mentioned in McCarthy and Prince (1986).

Secondly, Kroger's solution is unworkable because his right edge parse will license the copying of any final consonant, including fricatives and open approximants. However, as the data in 3a-b show, certain consonants such as *s* and *l* are not preserved under reduplication. And as 3c shows, it appears to be the case that sometimes even a nasal may not get preserved.

(3) a. timbus ti-timbus
b. jual ju-jual
c. layaŋ la-layaŋ

It is not obvious to me how Kroeger can modify his right edge parse so as deal with the data in 3. Even if this could be done, it would considerably complicate the right edge parse. As it stands, the following (unacceptable) outputs would be predicted by his solution:

(4) a. *tis-timbus
b. *jul-jual
c. *lan-layaŋ

Thirdly, we have already seen that vowel-initial stems are unable to undergo this form of reduplication (1o-q above). However, in cases where a base is both vowel-initial and consonant final, it seems that Kroeger's solution would predict that it should reduplicate. I illustrate this with the word *anak* 'child'. The sample derivation given below throws up a host of other problems with Kroeger's solution as well.

(5) a. Base anak

b. Full Reduplication anak-anak

c. Parse (Left Edge: CV, Right Edge: C) [ ]ana[k]-anak

d. Delete Residue [k]-anak

e. Syllabify, Neutralize, Assimilate k-anak /?-anak

Since Kroeger allows one of his parses (on the right edge) to fail so as to derive *su-suko* from *suko*, there is no reason why the opposite shouldn't happen - his left edge parse fails while the right edge parse licenses the final C.

Another problem with his solution is that the processes of neutralization and assimilation are merely 'added on' after the parses have already decided which segments are to be preserved. Thus, it is not clear if neutralization should apply or not since Ulu Muar allows *k* to appear in the onset (see 1g). That is, should the output of reduplication should be *k-anak* or *?-anak* ?

I suggest that Kroeger's problems stem from his assumption that BOTH EDGES OF THE COPY must be licensed as part of the reduplication process itself. It will be much more fruitful, and much simpler, if we assume that ONLY THE LEFT EDGE is licensed by the reduplication . Whether or not any material from the right edge remains undeleted, I propose, should depend on the possibility of SYLLABIFYING WITH THE BASE itself. As mentioned earlier, the MA will try to associate as many elements as possible without violating any general conditions such as the SC and the NSC, or any language-specific ones such as those present in Ulu Muar (see below in section 2).

I will claim that the nasal or laryngeal features of the final C are licensed (Ito 1986, 1989; Goldsmith 1990) to be preserved as PART OF THE ONSET of the base, forming a single segment with the onset of the base and giving us either a prenasalized or laryngealized onset. In this solution, the processes of nasal assimilation and neutralization are no longer merely 'added on' after the reduplication has already taken place. Instead, these processes play an integral part in deciding what segments get erased and what segments don't. Features of a segment (such as its nasal or laryngeal features) that can be combined with the initial consonant of the base get preserved. To show that this claim is motivated, I give below a brief discussion of the phonology of Ulu Muar before presenting my own analysis of the reduplication process.

2. Ulu Muar Phonology

2.1. Ulu Muar Has Prenaslized And Laryngealized Segments

Hendon (p110) describes a truncation process which preserves only the final syllable of a word. The following are some examples:

(6) a. beso? 'tomorrow' = so?
b. ikan 'fish' = kan
c. rumah 'house' = mah

What is of interest to us is the result when the word contains a sequence of homorganic nasal followed by a stop:

(7) a. ampe? 'four' = mpe?
b. antah 'uncertainty' = ntah
c. minta? 'request' = nta?

The truncation data suggest that Ulu Muar treats the homorganic nasal plus stop sequence as a single segment. Also, Hendon (p6) observes that final-position oral stops sometimes have an allophonic variant which is a laryngealized nasal. Thus, we get situations where final *p* alternates with *?m* and final *t* alternates with *?n* (final *k* alternates with *?*). This suggests that Ulu Muar has laryngealized segments as well.

(8) a. adat 'payment' = ada?n
b. cakap 'speak' = caka?m
c. mahap 'pardon' = maha?m
d. atap 'thatch' = ata?m

2.2 Ulu Muar Avoids Closed Syllables, Except Word-finally

Hendon (p23) notes that in word-final position, either no consonant or just a single consonant is present.[2] In initial position, Hendon (p31) gives a great variety of consonant clusters such as *pt, kp, pd*, and *gm*, among others. However, he observes (p32, footnote) that each of these clusters are in free alternation with an otherwise identical cluster where the consonants are separated by a vowel. This suggests that the consonant clusters in initial positions are essentially a phonetic phenomenon due to fast speech, rather than being phonologically licensed. (It is worth noting here that a homorganic nasal plus stop sequence is never in alternation with a sequence where the consonants are separated by a vowel (p109), thus supporting the claim that nasal plus stop sequences should be treated as single segments.)

Finally, in medial position, the examples all involve a consonant sequence where the first member is either a nasal or a laryngeal, as shown below:[3]

(9) a. simpan 'keep'
b. lintah 'water leech'
c. ci?gu 'honorific for a teacher'
d. ke?jo 'a kind of citrus fruit'

Other kinds of clusters in this position are much 'rarer' (p25) and are clearly loan-words:

(10) a. dokto 'doctor'
b. caklat 'chocolate'

2.4 Summary

The crucial points that emerge from our brief survey of Ulu Muar phonology are:

i) The language avoids consonant clusters; closed syllables appear only in word-final position.

ii) We now have reason to treat a glottal stop followed by a segment as a single laryngealized segment. Likewise, a nasal which is homorganic to a following segment can be treated as a single prenasalized segment.

3 An Alternative Account

3.1 Dealing With The Left Edge

I claim that only the preservation of the left edge of the copy (the first CV) is part of the reduplication process itself. Preservation of material on the right edge (the final C) will depend on syllabification possibilities; specifically, on the possibility that it can form a single segment with the initial consonant of the base. My aim will be to show that, contrary to Kroeger's claims, a templatic approach is not only possible, but accounts better for the reduplication phenomenon. Since I will be working within the framework of Prosodic Morphology, the template I use will have to be defined prosodically. To avoid reduplicating vowel-initial bases, I posit a prefixing template that is defined in terms of a branching mora.[4]

(11) [μ]
/\

Basically, this is all we need. This allows us to rule out vowel-initial bases; it also allows us to reduplicate a base that is consonant-initial and vowel-final since the template says nothing at all about what happens on the right edge.

3.2 Dealing With The Right Edge

As we saw in our discussion of Ulu Muar phonology, there is reason to believe that the syllable in Ulu Muar licenses prenasalized and laryngealized segments. On the other hand, we also saw that consonant clusters are disfavoured, except in the case of loan-words. These two observations, taken together,

account for the fact that for the final C of the copy to survive the reduplication process, it must be either a nasal or a stop. In the first situation, the nasal loses its place specification and survives as a nasalization of the initial consonant of the base. In the second situation, it survives as a laryngeal feature.

3.3 Reduplication In Ulu Muar

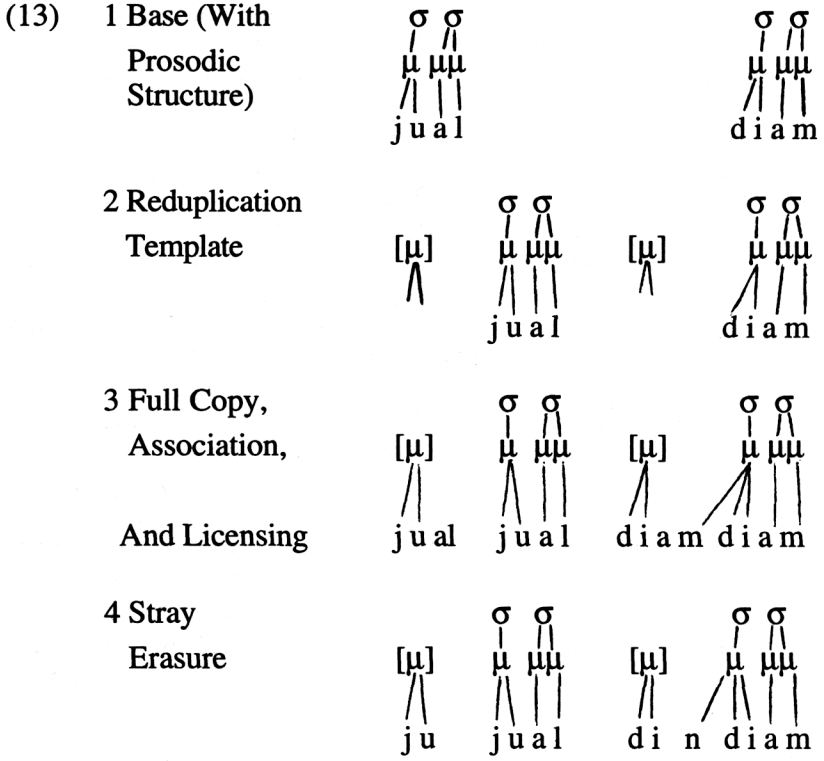
The crucial difference between our analysis and Kroeger's is that we have dealt with the preservation of material on the right edge of the copy as not being licensed by the reduplication template, but rather as being licensed by its ability to form a single onset with the initial consonant of the base. This licensing is INDEPENDENT of the reduplication template. Thus, the 'discontinuity' claimed by Kroeger is only apparent. An important consequence follows from this difference. If Kroeger is right and the final C of the copy is part of the reduplication process itself and licensed by a parse, then it should ALWAYS BE PRESERVED. On the other hand, if the survival of the final C depends on an interaction between it and the initial consonant of the base, then when such an interaction is unable to produce a single onset, it should NOT BE PRESERVED. This allows us to deal with the examples that were a problem for Kroeger. I reproduce below examples 3a-c:

(12)	a. jual	ju-jual	*jul-jual
	b. timbus	ti-timbus	*tis-timbus *tih-timbus
	c. layaŋ	la-layaŋ	*lan-layaŋ

As we saw earlier, in Kroeger's solution the final consonant is licensed by a right edge parse. This would predict the preservation of the final *l* and *s* in the copy. There would also be no explanation as to why the final nasal fails to be preserved. Under our analysis, the fact that the *l* fails to be preserved is due to the impossibility of *lj* forming a single segment. The *s* fails to be preserved because Ulu Muar doesn't allow consonant clusters. And since we have seen no reason to assume that Ulu Muar licenses preaspirated segments, the *s* is unable to be preserved even as a glottal fricative.[5] Finally, *nl* fails to form a single segment because of the articulatory and perceptual difficulties raised by having a nasalized liquid (Ohala 1975).

In 13 below, I give a sample derivation of how the reduplication in Ulu Muar works.

(13)



The crucial part of the derivation is in step 3 where the final consonant *l* of *jual* is unable to form an onset with the *j* of the base, which accounts for its erasure. The final nasal of *diam*, on the other hand, is licensed to form a prenasalized *d*, giving us *nd*. To conclude this part of the discussion, we can see that, contrary to Kroeger's claims, it is not only possible to use a templatic approach to deal with Ulu Muar reduplication, it is also possible to preserve both the NSC and the SC, thus allowing us to maintain a more constrained account of reduplication.

4 A Related Phenomenon In Kashaya

The proposed analysis for Ulu Muar treats the reduplication process as involving two independent parts: the filling of a reduplication template, and the syllabification of the final nasal or glottal stop with the initial consonant of the base to form a single onset. We will now look at a reduplication process in Kashaya which provides support for this analysis.

Buckley (1991), discusses laryngeally incremented consonants in Kashaya. These are consonants that involve a laryngeal, *h* or

ʔ, and a consonant. Buckley notes that Kashaya has no (surface) onset clusters, 'yet there is good evidence that the laryngeal increment and the following consonant link together as an onset during the first part of the derivation' (p1).

Buckley's claim is based on two observations. First, he notes that incremented consonants are commonly found word-initially (*ʰcoma* 'feast') where true clusters are not allowed. Second, Kashaya has a suffixing reduplication process where the final monomoraic syllable of the base is copied. The following is taken from Buckley (1991:2):

(14)	a. ko.lo'	ko.lo'.lo	'hollow'
	b. ho.pom	ho.pom.po	'smokehole'
	c. hi.ʰla	hi.ʰla.ʰla-	'gossip'
	d. ha.ʔdi	ha.ʔdi.ʔdi	'various'
	e. mi?.dis.ti	mi?.dis.ti.ti	'wrentit'
	f. qʰa.?ay.lo	qʰa.?ay.lo.lo	'ogre'

In a and b, we see that the final monomoraic syllable of the base is preserved under reduplication. And as c and d show, consonants which have a laryngeal increment reduplicate along with their increments. But as e and f show, a consonant that precedes the final mora does not get copied since it cannot combine with the following consonant to form a single onset. This is clearly similar to the analysis that has been proposed for Ulu Muar. In both Kashaya and Ulu Muar, the preservation of certain consonants under reduplication is not due solely to the reduplication template, but is subject to the ability of those consonants to form a single segment with the following consonant.

5 Conclusion

This paper has made the claim that, in reduplication, it is important to distinguish between parts of the copy that are licensed by the reduplication template from parts that are licensed by more general aspects of a language's phonology. In both cases, the association is motivated by the Maximization of Association. Failure to make this distinction leads us, in the case of Ulu Muar, to treat the reduplication as discontinuous. However, once this distinction has been made, we can see that the requirements of the reduplication template are fully met, as

dictated by the Satisfaction Constraint, and that the mapping is continuous, as demanded by the No Skipping Condition.

Notes

* My thanks go to Sharon Inkelas and Larry Hyman for their comments on this paper.

1 Hendon presents the reduplication as:

bilo	bbilo	'whenever'
pukɷ	ppukɷ	'is repeatedly hit'

There is good reason, however, to believe that the above forms belong to the same class as *su-suko*, and that the outputs cited by Hendon, without the first vowel, are the result of fast speech. For example, he notes (p59) that a reduplicated form may sometimes optionally leave out its vowel, so that *kawan* 'friend' sometimes appears as *ka°kawan* or *k°kawan*. Also, he gives the following forms:

bali?	bli?	'returns'
calah	clah	'interstice'

He points out that 'for the most part, the simplified forms are found in more rapid speech... ' (p108, footnote).

2 The only example of what might be a consonant cluster in final position comes from the word *wakawh* which Hendon glosses as 'cooperative cemetary'. This is an Arabic loan, and is used to refer to anything that is used for religious purposes. In the Kelantan dialect of Malay, it appears as *wakaf*.

3 There is little support for the possibility that the homorganic nasal and the laryngeal feature are actually codas. This would amount to the claim that, in Ulu Muar, codas are tolerated so long as they lack a distinctive place specification. One problem is we would not be able to explain the example in 3c where the final nasal failed to be preserved. Another problem is that word-final codas clearly have a distinctive place of articulation so that the condition on codas would have to be formulated so as to apply only word-internally. Finally, as the data from 7 and 8 show, there is positive evidence for treating the nasal and laryngeal features as part of the onset rather than the coda.

4 Other alternatives exist. One possibility, if one's conception of syllable structure required that the onset be directly linked to the syllable node, would be to have a light syllable template with an onset node (Prince and Smolensky 1993). Another possibility (Larry Hyman, p.c.) would be to define the reduplication template simply as a single light syllble. Vowel-initial stems are prevented from reduplicating by making the added assumption that at this particular stage in the derivation, a V is not a licit syllable.

5 There is an isolated example where a glottal fricative survives the reduplication process: *pueh* reduplicates as *puh-pueh*. It is not clear how general this is.

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