on patterns and incorporating these advancements into the present analysis will improve our ability to capture the characteristics of TR Malay specifically and of human language in general.

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Discontiguous reduplication in a local variety of Malay*

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Discontiguous partial reduplication patterns, in which a string of segments in the reduplicant corresponds with a discontiguous string of segments in the base, have been observed in various languages in the Austronesian and Austro-Asiatic families. Several such patterns show a preference for the anchoring of the segments at both edges of the base. I propose that edge-anchoring reduplication, though typologically rare, is the result of natural interaction between fundamental phonological constraints, specifically when CONTIG-BR is ranked below constraints on reduplicant size. Support for my proposal is offered from Ulu Muar Malay, whose edge-anchoring reduplication pattern is, I argue, the result of prosodic correspondence requirements, and not the result of segmental prominence at both edges (contra Nelson 2003).

1. Introduction

Discontiguous reduplication patterns have been attested in a variety of languages, most notably from the Austronesian and Austro-Asiatic families. Patterns of discontiguous reduplication arise when the string of segments that form a reduplicant morpheme stands in correspondence with a discontiguous string of segments from the reduplicative base. These patterns are relatively uncommon in the languages of the world, but when they are attested, the resulting reduplicants have a tendency to stand in correspondence with segmental material clustering around the edges of the reduplicative base. In recent work in Optimality Theory (Prince and Smolensky 2004), Hendricks

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(2001) and Nelson (2003) have analyzed these "edge-anchoring" discontiguous reduplication patterns using constraints that stipulate anchoring of both edge segments.

Here, I consider a pattern of apparent "edge-anchoring" discontiguous reduplication in the Ulu Muar dialect of Malay. An example of this pattern is shown below in (1).

(1) Ulu Muar Malay Discontiguous Reduplication (Hendon 1966)[1]
tarɪʔ ⇒ **taʔ**-tarɪʔ "accordion"

The [**ta**] in the reduplicant prefix corresponds with the initial consonant and vowel in the stem, while the [**ʔ**] corresponds with the rightmost segment in the stem. The medial segments [rɪ] in the stem have no corresponding segments in the reduplicant. Foreshadowing the analysis to come, I argue that base-reduplicant discontiguity of the type exemplified in (1) does not result from faithfulness to both the left and right edges. Instead, anchoring is limited to the edge with which the reduplicant morpheme is aligned (or, on a different view, the edge to which it attaches).[2] In Ulu Muar Malay, the reduplicant morpheme is a prefix, so anchoring is established only at the left edge. The preservation of the rightmost segment is not due to anchoring but is instead a necessary side-effect of reduplicant maximality and prosodic correspondence. Evidence against right-edge anchoring is presented, providing further empirical support for this analysis.

2. Ulu Muar Malay reduplication

Ulu Muar Malay is a dialect of vernacular Malay, which is in the Malayo-Polynesian subgroup of Austronesian languages and is spoken on the Malay Peninsula in the Negeri Sembilan region. It is unknown how many remaining speakers are left today: as of 1966, when the major fieldwork on this language was conducted, it was already a low-prestige dialect faced with extinction (Rufus Hendon, p.c.).

The discontiguous pattern of reduplication in Ulu Muar Malay, an example of which has been given in (1), yields a CVC syllable prefix. Further examples of this pattern are given in (2), illustrating the effects of reduplication of stems ending with segments of different types.

(2) Ulu Muar Malay Type III Reduplication (Hendon 1966: 58–59)
  a. Stop-final stems:
    i. tarɪʔ ⇒ **taʔ**-tarɪʔ "accordion"
    ii. budaʔ ⇒ **bʊʔ**-budaʔ "children"
    iii. sikɪt ⇒ **sɪʔ**-sikɪt "various small quantities"
    iv. gɑlap ⇒ **gɑʔ**-gɑlap "is repeatedly dark"
  b. Nasal-final stems:
    i. siaŋ ⇒ **sɪɲ**-siaŋ "during the daytime on various days"[3]
    ii. dajaŋ ⇒ **dan**-dajaŋ "handmaidens"
    iii. diam ⇒ **dɪn**-diam "remains silent"
  c. [h]-final stems:
    i. pueh ⇒ so-**pʊh**-pueh "to their complete satisfaction"

1. Where it aids expositional clarity, reduplicated segments have been printed in **boldface**. Numerical indices indicate what I analyze as corresponding segments.

2. See Lunden 2004 for an Optimality-Theoretic treatment of Marantz's Generalization (Marantz 1982) and motivation for the connection between ANCHOR and ALIGN constraints.

The Type III pattern shown above is one of several patterns of reduplication in Ulu Muar Malay. Each pattern is conditioned by the phonological shape of the stem. According to Hendon (1966), the discontiguous pattern of reduplication is found only with stems which either: (i) begin with [s] and end in a stop or nasal, or (ii) begin with a consonant (other than [s]) and end in a stop, nasal, or [h]. Because the shape of the reduplicant depends purely on the phonological shape of the stem, the various reduplication patterns do not bear a one-to-one correspondence with a semantic function. That is to say, the same pattern of reduplication may be used to form plural nominals from singular nominals, to intensify adjectives, to form iterative predicates from semelfactive predicates, etc.

A few descriptive generalizations can be drawn from the data in (2). First, it has already been observed that reduplicant morphemes are monosyllabic and of the form CVC: the derivation of reduplicant size is discussed in § 2.1. Second, the onset consonant in the reduplicant syllable corresponds with the initial consonant in the base, while the coda consonant in the reduplicant syllable corresponds with the final consonant in the base: this apparent edge anchoring is discussed in § 2.2. Third, the nucleus vowel in the reduplicant corresponds with the leftmost vowel in the base: vowel selection is discussed in § 2.3. Finally, there are some feature mismatches between BR-corresponding coda segments, as well as between BR-corresponding high vowels, neither of which bear directly on the present analysis of the BR-correspondence relation itself (but are nevertheless discussed briefly in the Appendix).

The discontiguous reduplication analysis I advance here is laid out in parts. Since discontiguous reduplication is necessarily partial reduplication (total reduplication is naturally contiguous) the reduction of the reduplicative base can be analyzed in Optimality Theory by isolating a set of constraints that dominate MAX-BR. Once the size of the reduplicant is established, it must be populated with segments corresponding to segments in the base. In most languages, the prototypical situation involves contiguous reduplication, where CONTIG-BR is ranked relatively highly. By contrast, languages containing patterns of discontiguous reduplication must rank CONTIG-BR lower. The task, then, is to identify the crucial set of constraints that must dominate CONTIG-BR to yield the attested pattern. Ultimately, a ranking of both sets of

3. [s] is treated here as post-alveolar.

constraints – those that dominate MAX-BR and those that dominate CONTIG-BR – must be (and are) established.

2.1 Maximal syllable reduplicants

The reduplicant morpheme has the shape of a CVC syllable. In Ulu Muar Malay, complex onsets are attested, but long vowels, diphthongs, and complex codas are not attested. Setting aside the issue of complex onsets for the time being, I tentatively treat CVC syllables as maximal.

One long-standing technique used to derive maximal syllable reduplicants in Optimality Theory has been to invoke Generalized Alignment constraints such as ALL-σ-LEFT (McCarthy and Prince 1993a, Mester and Padgett 1994) defined below in (3).

(3) ALIGN(σ, L, PWd, L) (henceforth ALL-σ-LEFT): Align the left edge of each syllable to the left edge of the prosodic word in which it is contained.
(gradiently assessed; each intervening syllable incurs one violation)

By appealing to the TETU[4] ranking of ALL-σ-LEFT below MAX-IO but above MAX-BR, stems are permitted to contain as many syllables in the output as can be formed from the segments remaining from the input, while reduplicants are optimally monosyllabic.[5] Any reduplicant containing more than a single syllable incurs unnecessary extra violations of ALL-σ-LEFT. Segments must then be deleted until just one syllable remains, while obeying the phonotactics of the language; the fewest possible segments are deleted to minimize violations of the lower ranked MAX-BR. Tableau 1 illustrates the way in which Ulu Muar Malay discontiguous reduplicants fill the maximal syllable "template."

In Tableau 1 and throughout this paper, I use both the symbols ☞ and 👌 to indicate the winners calculated in the tableau, but only ☞ indicates the candidate that is the attested output in Ulu Muar Malay.

Candidate 1:a is ruled out because it is too large and incurs unnecessary violations of ALL-σ-LEFT. While candidate 1:b is monosyllabic, more segments have been deleted than is necessary. The remaining candidates contain CVC reduplicant syllables: this is the optimal syllable size for reduplicants.[6] The fact that there are, at present, three winners simply means that more constraints are necessary to select the actual output. The identification of these constraints is the primary objective of the immediately following sections.

4. TETU refers to the OT phenomenon known as "The Emergence of The Unmarked;" see McCarthy and Prince 1994.

5. This is not strictly true. I must crucially assume a high ranking constraint guaranteeing realization of the reduplicant; this could be formalized as some version of REALIZEMORPHEME (Kurisu 2001). Obviously the null reduplicant would best satisfy ALL-σ-LEFT, but REALIZEMORPHEME would militate against this result by requiring that a reduplicant be realized overtly.

6. I have mentioned that Ulu Muar Malay phonotactics occasionally permit complex onsets. It might therefore be predicted that a candidate like **glaʔ**-galap may emerge. That this prediction is not borne out may be attributed to violations of LINEARITY-BR, an issue that I leave aside.

Tableau 1. Reduplicant size restricted by ALL-σ-LEFT

		RED-/galap/	MAX-IO	ALL-σ-L	MAX-BR
a.		$\mathbf{g_1a_2.l_3a_4p_5}$-$g_1a_2.l_3a_4p_5$		****!**	
b.		$\mathbf{g_1a_2}$-g_1a_2.lap		***	***!
c.	👌	$\mathbf{g_1a_2l_3}$-$g_1a_2.l_3$ap		***	**
d.	👌	$\mathbf{g_1a_2p_5}$-$g_1a_2.lap_5$		***	**
e.	☞	$\mathbf{g_1a_2ʔ_5}$-$g_1a_2.lap_5$		***	**

2.2 "Anchoring" the edges

The most striking question arising from the Ulu Muar Malay discontiguous reduplication pattern in (2) is why the reduplicant syllable corresponds with both edges of the base, at the expense of contiguity violations. Such a scenario is typologically rare but nonetheless predicted given the flexibility of constraint ranking in Optimality Theory.

Beginning with the left edge, I assert that Positional Faithfulness (Beckman 1999) plays a decisive role in this phenomenon in the form of an anchoring constraint that targets the edge of the stem to which the reduplicant affix attaches, which is the left edge in the Ulu Muar Malay pattern. With respect to the preservation of the right-edge segment, I do not assume that there is any such edge anchoring. Instead, I argue that this phenomenon is the result of Prosodic Correspondence (McCarthy and Prince 1993b, Benua 1995, Ito et al. 1996).

2.2.1 *Anchoring the left edge*

Marantz (1982) observes that there is a general tendency for reduplicative prefixes to correspond with the left edge of the reduplicative base. Though he does not discuss patterns of discontiguous reduplication, I temporarily assume (and later argue) that this correlation holds in the pattern examined here, expressed formally via the Positional Faithfulness constraint L-ANCHOR-BR (Beckman 1999). This constraint is violated whenever the leftmost segment of the reduplicative base does not have a correspondent in the reduplicant. Consider Tableau 2, for instance.

The relevant candidate is 2:a, which exhibits an instance of "wrong-edge reduplication." That this output is not attested provides evidence for some constraint on left-edge faithfulness: if no such constraint were present in the grammar of Ulu Muar Malay, it might be expected that CONTIG-BR would create a preference for a contiguous reduplicant like that in 2:a or 2:c (2:b contains a contiguous reduplicant as

Tableau 2. Left-edge segment preserved from the stem

RED-/gɑlap/		L-ANCH-BR	ALL-σ-L	MAX-BR
a.	$l_3a_4p_5$-gɑ.$l_3a_4p_5$	*!	***	**
b.	$g_1ɑ_2$-$g_1ɑ_2$.lap		***	***!
c. ✌	$g_1ɑ_2l_3$-$g_1ɑ_2$.$l_3$ap		***	**
d. ✌	$g_1ɑ_2p_5$-$g_1ɑ_2$.lap$_5$		***	**
e. ☞	$g_1ɑ_2ʔ_5$-$g_1ɑ_2$.lap$_5$		***	**

well, but it is too small). Candidates 2:a and 2:c are immediately given further consideration below.

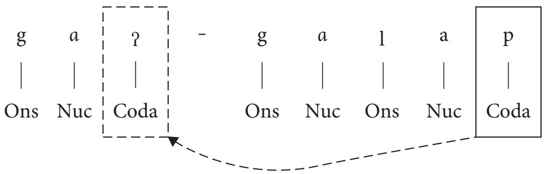
2.2.2 *Finding a coda, or, "not anchoring the right edge"*

Prosodic correspondence refers to the idea that corresponding segments should share the same syllabic role.[7] With respect to reduplication, prosodic correspondence tries to ensure that the onset of a reduplicant syllable corresponds with an onset in the base, and likewise for nuclei and codas. The concept of prosodic correspondence has been motivated by constraints on several different output-output correspondence relations, such as base-reduplicant correspondence (McCarthy & Prince 1993b), base-truncatum correspondence (Benua 1995), and base-argot correspondence (Ito et al. 1996).

Contra previous accounts of Ulu Muar Malay discontiguous reduplication (e.g. Kroeger 1989, Nelson 2003), I argue that prosodic correspondence is responsible for picking out the segment at the right edge of the base for preservation in the reduplicant as a coda, due to its status as the only coda in the syllabified stem. Put another way, the leftmost CVC sequence of segments in the base is unable to fill the CVC reduplicant template because it does not contain a coda. It is exactly this problem that rules out candidate 2:c above.

The attested correspondence relation is illustrated schematically in (4).

(4) Reduplicant coda corresponds with nearest stem coda:



The Optimality-Theoretic constraint responsible for the prosodic correspondence relation in (4) is formalized below as CORR-Σ-ROLE-BR (Aguero-Bautista 1998, Kenstowicz 2005; cf. McCarthy & Prince 1993b), which can be thought of as a quasi generalized anchoring constraint. Rather than anchoring PWd or MWd positions (i.e., left edge/right edge), for example, this constraint induces an anchoring of syllabic positions.

7. I thank Armin Mester for originally suggesting that I pursue a prosodic correspondence analysis.

(5) CORR-Σ-ROLE-BR: Let ℜ be a base-reduplicant correspondence relation. ∀x and ∀y such that x and y are segments and xℜy, assess a violation if x and y do not have the same syllabic role (onset, nucleus, or coda).
(Informal definition: BR-Corresponding segments should match in syllabic role.)

CORR-Σ-ROLE-BR must outrank CONTIG-BR to allow skipping of medial onset consonants in favor of codas in the base. If CONTIG-BR » CORR-Σ-ROLE-BR, an onset consonant nearer to the other reduplicated segments in the stem would be resyllabified as a coda in the reduplicant so as to minimize CONTIG-BR violations, contrary to what is attested. In effect, candidate 2:c would be predicted to win, given this incorrect ranking. Instead, the stem-final coda is selected to serve as the reduplicant syllable's coda (and thereby incurring CONTIG-BR violations), indicating that CORR-Σ-ROLE-BR crucially outranks CONTIG-BR.

In Tableau 3, candidate 3:a (= candidate 2:c) is ruled out by CORR-Σ-ROLE-BR. Even though the reduplicant in 3:a is a maximal syllable, its [l] is syllabified as a coda while the correspondent [l] in the base is syllabified as an onset. The candidate with a core syllable reduplicant (candidate 3:b) loses because its reduplicant syllable is not maximal. This result has been established previously via ALL-σ-LEFT » MAX-BR, but 3:b in this tableau now provides evidence for the ranking of MAX-BR » CONTIG-BR.

Tableau 3. CORR-Σ-ROLE-BR preserves the only available coda[8]

RED-/gɑlap/		CORR-Σ-ROLE-BR	ALL-σ-LEFT	MAX-BR	CONTIG-BR
a.	$g_1ɑ_2l_3$-$g_1ɑ_2$.$l_3$ap	*!	***	**	
b.	$g_1ɑ_2$-$g_1ɑ_2$.lap		***	***!	
c. ✌	$g_1a_4ʔ_5$-g_1ɑ.la$_4$p$_5$		***	**	**
d. ☞	$g_1ɑ_2ʔ_5$-$g_1ɑ_2$.lap$_5$		***	**	**

8. Syllable boundaries are indicated with periods. For the purposes of assessing violations of CORR-Σ-ROLE-BR in each tableau, an onset is any consonant that is either (i) word-initial, or (ii) immediately following a morpheme boundary (-) or syllable boundary (.). All other consonants are codas. Contrary to appearance, we have not yet seen evidence for a crucial ranking between CORR-Σ-ROLE-BR and MAX-BR. For present purposes, the placement of CORR-Σ-ROLE-BR is arbitrary as long as it dominates CONTIG-BR. But see Tableau 6 in § 3.3 for evidence that CORR-Σ-ROLE-BR » MAX-BR.

As the only coda consonant in the base is [p], it is this consonant that is selected by CORR-Σ-ROLE-BR to correspond with the coda in the reduplicant, which is neutralized to [ʔ] – see candidates 3:c and 3:d. The key difference between the winning candidates 3:c and 3:d lies in the selection of the preserved vowel, which is explored further in the following section.

The prosodic correspondence analysis of what looks like "right-edge anchoring" makes a clear prediction: if there were any medial coda in the stem, this coda would be selected to stand in correspondence with the reduplicant's coda rather than any stem-final coda. I have not found an attested Ulu Muar Malay stem containing a medial cluster that has successfully undergone the discontiguous reduplication pattern described by Hendon (1966); indeed, the phonotactics of Ulu Muar Malay generally prohibit medial consonant clusters in native words. However, a few borrowings with medial clusters exist in the language. These borrowings, examples of which are given below in (6), could provide the relevant testing ground for this prediction. At this point in time, I have no idea whether it is borne out.

(6) Ulu Muar Malay words containing medial clusters (Hendon 1966: 25)
  a lintah "water leech"
  b. caklat "chocolate"
  c. paspʊt "passport"
  d. kastam "customs service"

2.2.3 *Initial syllable prominence*

Now, the edge consonants in the reduplicant have correspondents in the base, established via positional faithfulness and prosodic correspondence. A new question arises, however. If both consonantal edges of a polysyllabic base are anchored in a monosyllabic reduplicant, which vowel in the base should correspond with the vowel in the reduplicant? Put differently, which edge should be considered "dominant" when segments from the middle of the base must be selected to stand in correspondence with the reduplicant? CONTIG-BR is already maximally violated, so it can serve no function in singling out a vowel among the remaining medial segments for preservation in the reduplicant.[9]

In patterns of contiguous reduplication, Marantz's Generalization states that BR-correspondence strings should have a left-to-right directionality or a right-to-left directionality. The paradox in the present case that is both directionalities manifest themselves simultaneously, resulting in partial reduplicants that correspond with both the leftmost and the rightmost consonant in the base. Nevertheless, Ulu Muar Malay discontiguous reduplicants show preservation of the vowel nucleus in the stem-initial syllable, which lends further support for the idea that Positional Faithfulness is functioning to preserve material from the left edge when all else is equal. Nelson (2003)

9. Even so, it may be the case that CONTIG-BR violations are in some sense "postponed" as long as possible. Thanks are due to Kie Zuraw for this idea.

accounts for this fact with the constraint FAITH-V_1, which requires faithfulness to the leftmost vowel, citing evidence from both Parisian and Québec French (Charette 1991: 203).[10] Beckman (1999: Ch. 2) also provides phonological evidence for faithfulness to the root-initial vowel in patterns of Shona vowel neutralization showing that initial vowels remain unneutralized, as well as phonological evidence for a constraint on faithfulness to the initial syllable in general.

Given that MAX is a Correspondence-Theoretic faithfulness constraint on deletion, I propose the constraint MAX-INITIAL-σ-BR as the relevant Positional Faithfulness constraint preventing deletion of segments in the initial syllable. This constraint subsumes the utility of the aforementioned left-edge-targeting constraints L-ANCHOR-BR and FAITH-V_1, but it makes a different theoretical claim and a different empirical prediction. MAX-INITIAL-σ-BR assures that the initial vowel is preserved whenever the initial consonant is preserved by virtue of the fact that they occur in the same initial syllable, which Beckman (1999) argues to be a prominent position. In contrast, there is no such intrinsic connection between L-ANCHOR-BR and FAITH-V_1. Furthermore, MAX-INITIAL-σ-BR predicts that any and all additional segmental material in the initial syllable would be preserved as well, whether this be a coda or another consonant in a complex onset; the combination of L-ANCHOR-BR and FAITH-V_1 makes no such prediction.

I adopt the MAX-INITIAL-σ-BR analysis and argue for its superiority in § 3.3. The diagram in (7) illustrates schematically the way in which MAX-INITIAL-σ-BR works.

(7) All segments in the initial syllable of the base are preserved:

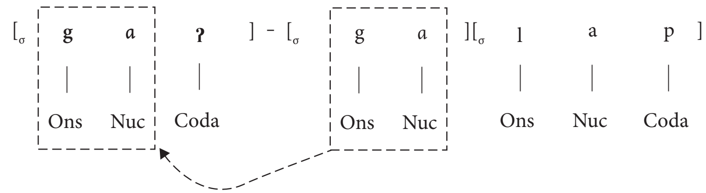


Tableau 4 shows how it interacts with the other constraints under discussion. The crucial distinction in Tableau 4 is between candidates 4:d and 4:e.

The reduplicant's vowel in candidate 4:d corresponds with the vowel in the final syllable rather than the vowel in the initial syllable. Candidate 4:e, on the other hand, contains a reduplicant whose vowel corresponds with the vowel in the stem-initial syllable, as required by MAX-INITIAL-σ-BR, and is thus selected as the winner. Of

10. Deletion of [ə] is allowed in medial syllables in both Parisian and Québec French, *e.g.*, *matelas* "mattress." Compare this to the *pas de rôle* "no role" example, where [pa.də.ʁol] ⇒ [pa.dʁol] (Rialland 1986, Raffelsiefen 2005). However, [ə] is not deleted in initial syllable position in a disyllabic word in Parisian French (*cheval*, vs. Québec French *cheval* "horse"). Deletion is not allowed in polysyllabic words like *cependant* "however" in either dialect of French.

Tableau 4. MAX-INITIAL-σ-BR ensures that initial vowel is preserved

		RED-/gɑlap/	MAX-INIT-σ-BR	CORR-Σ-ROLE-BR	MAX-BR	CONTIG-BR
a.		$\mathbf{l_3a_4p_5}$-$gɑ.l_3a_4p_5$	*!*		**	
b.		$\mathbf{g_1ɑ_2l_3}$-$g_1ɑ_2.l_3ap$		*!	**	
c.		$\mathbf{g_1ɑ_2}$-$g_1ɑ_2.lap$			***!	
d.		$\mathbf{g_1a_4ʔ_5}$-$g_1ɑ.la_4p_5$	*!		**	**
e.	☞	$\mathbf{g_1ɑ_2ʔ_5}$-$g_1ɑ_2.lap_5$			**	**

course, CONTIG-BR must be lowly ranked so as to prevent contiguous reduplicants, as in 4:a, 4:b, and 4:c, from emerging in the output.

I now summarize the ranking arguments necessary to yield the discontiguous reduplication pattern seen in (2). In order to derive the size of Ulu Muar Malay discontiguous reduplicants – i.e., a CVC maximal syllable – the TETU ranking of MAX-IO » ALL-σ-LEFT » MAX-BR restricts reduplicants to a single syllable. Furthermore, ranking {MAX-INITIAL-σ-BR, CORR-Σ-ROLE-BR, MAX-BR} » CONTIG-BR yields the discontiguous shape of the reduplicant, given the type of stems that Hendon (1966) claims trigger this pattern of reduplication. MAX-INITIAL-σ-BR ensures that the initial CV from the stem is preserved in the reduplicant, and the combination of CORR-Σ-ROLE-BR and MAX-BR ensure that a coda consonant from elsewhere in the word is preserved as well, if one is available.

3. Previous analyses and theoretical implications

3.1 Kroeger 1989: Pre-OT

Many aspects of the OT analysis I propose in § 2 are directly inspired by those of the analysis advanced by Kroeger (1989). To foster a greater understanding for the motivation behind the OT analysis in § 2, it is worthwhile to review Kroeger's analysis briefly.

For Kroeger, the discontiguous partial reduplication process in Ulu Muar Malay is full reduplication followed by a truncation process, which proceeds via a three-step operation.

(8) Kroeger's Three-Step Operation
1. Parse a light (CV) syllable from the left edge (one mora).
2. Parse a single consonant on the right edge.[11]
3. Apply a deletion operation to the residue.

11. This targeting of a single consonant is permitted because Kroeger views the rightmost consonant as an extraprosodic appendix.

The operation imposes licensing conditions on particular syllables and segments and then deletes any syllables or segments that are not licensed. An example derivation of **gɑʔ**-gɑlap from gɑlap is illustrated below, in (9).

(9) Example derivation of **gɑʔ**-gɑlap (Kroeger 1989: 201)
1. gɑlap (base)
2. **gɑlap**-gɑlap (full reduplication)
3. [**gɑ**]**la**[**p**]-gɑlap (parsing: one left-edge mora, one right-edge consonant)
4. [**gɑ**][**p**]-gɑlap (deletion of residue in copy)
5. **gɑʔ**-gɑlap (syllabification, neutralization, assimilation)

Kroger's analysis argues that the initial vowel is preserved because of its position in the initial CV syllable: its preservation necessarily entails preservation of the initial consonant as well. This observation is similarly encoded in the OT analysis in § 2 via the constraint MAX-INITIAL-σ-BR, which militates against deletion of any segment in the initial syllable.

While Kroeger analyzes the right-edge segment as an appendix, I treat it as a lone coda – i.e., as syllabified along with the rest of the word. My analysis therefore permits its preservation because there is a coda position available in the reduplicant for it, and its preservation satisfies CORR-Σ-ROLE-BR since it bears the same prosodic role in the reduplicant. Both the analysis in § 2 and the analysis advocated by Kroeger (1989) argue that right-edge copying is the result of some special property of the rightmost consonant arising from language-specific phonotactics, independent from any theory-driven particularities of consonants occurring at an edge.

Furthermore, both analyses predict that no right-edge copying occurs with stems that are vowel-final. This prediction is examined in detail in § 3.3.

3.2 Recent work in OT

There are a few recent analyses of discontiguous reduplication in OT, including Nelson's (2003) Asymmetric Anchoring Theory, which specifically considers the Ulu Muar Malay reduplication phenomenon under discussion here.[12]

Nelson accounts for edge-anchoring reduplication patterns by deriving minimal reduplicants with both edges anchored. Rather than treating the minimality of the reduplicant as an effect of ALL-σ-LEFT, Nelson derives reduplicant minimality via place markedness. Her meta-constraint PLACEMARKEDNESS favors small reduplicants since they ban any segment linked to place features.[13] To allow the edges to be

12. Cf. Hendricks' (2001) Compression Model, which treats a similar phenomenon in Semai, an Austro-Asiatic language spoken in Papua New Guinea.

13. None of the candidates in Tableau 5 contain reduplicants with only placeless segments. I assume that in adopting an analysis where PLACEMARKEDNESS acts as a size restrictor, higher ranked IDENT-F constraints would be necessary to preserve place features.

Tableau 5. Nelson's Asymmetric Anchoring analysis[14]

		RED-/budaʔ/	E-ANCH-BR	FAITH-V$_1$	*PLACE
a.		**b$_1$u$_2$.d$_3$a$_4$ʔ$_5$**-b$_1$u$_2$.d$_3$a$_4$ʔ$_5$			********!
b.		**b$_1$u$_2$**-b$_1$u$_2$.daʔ	*!		******
c.		**b$_1$**ʊ$_2$**d$_3$**-b$_1$u$_2$.d$_3$aʔ	*!		*******
d.		**d$_3$a$_4$ʔ$_5$**-bu.d$_3$a$_4$ʔ$_5$	*!	*!	******
e.		**b$_1$a$_4$ʔ$_5$**-b$_1$u.da$_4$ʔ$_5$		*!	******
f.	☞	**b$_1$**ʊ$_2$**ʔ$_5$**-b$_1$u$_2$.daʔ$_5$			******

preserved, Nelson ranks EDGE-ANCHOR-BR[15] above PLACEMARKEDNESS. The initial vowel is preserved by FAITH-V$_1$, as discussed in § 2.3.

In Tableau 5, MAX-BR and CONTIG-BR comitted (or space) have to be ranked below PLACEMARKEDNESS (*PLACE), and they function in the same way as in my analysis, presented in § 2. Candidate 5:a is ruled out by virtue of its size: containing a full reduplicant, it incurs more violations of PLACEMARKEDNESS than is necessary. Candidates 5:b–c are ruled out because the rightmost segment in the base is not preserved in the reduplicant, violating EDGE-ANCHOR-BR. The candidate with a "wrong-edge" reduplicant, candidate 5:d, violates EDGE-ANCHOR-BR as well, since the leftmost segment in the base is not preserved in the reduplicant. Furthermore, it violates FAITH-V$_1$ because the initial vowel is not preserved. Candidate 5:e violates FAITH-V$_1$, as the wrong vowel is preserved, even though both edge consonants are anchored. Candidate 5:f remains as the winner.

The analysis presented in Tableau 5 works elegantly, and it is very interesting. The PLACEMARKEDNESS component ensures that reduplicants be as small as possible, without referring to the fact that reduplicants are optimally monosyllabic. The segments that remain are all treated as prominent: the edges and the initial vowel need to be preserved, so EDGE-ANCHOR-BR and FAITH-V$_1$ guarantee this preservation.

Despite their possible superficial similarity, there are several theoretical differences between Nelson's analysis and the one advanced here. First, if the right edge is preserved because of a constraint that guarantees preservation of both edges – EDGE-ANCHOR-BR – the correlation between right-edge anchoring and the fact that codas occur only at the right edge is treated as accidental. Furthermore, the anchoring of the onset and the anchoring of the nucleus from the initial syllable are guaranteed by two different constraints on Nelson's analysis, but only one constraint on the present analysis.

14. The high vowels in the reduplicants in Tableau 5 are represented as tense in open syllables and lax in closed syllables. See the Appendix for details and rationale.

15. Nelson (2003) argues against right-anchoring, but if one recognizes right-anchoring as valid, then Nelson's EDGE-ANCHOR-BR is theoretically equivalent to a PWd-level constraint disjunction of LEFT-ANCHOR-BR and RIGHT-ANCHOR-BR, as discussed below in § 4.

Let us imagine for a moment that the basic insight behind Marantz's Generalization can be expressed in OT as a correlation (as Lunden 2004 suggests). If the ranking of alignment constraints parallels the ranking of prominence constraints, Marantz's Generalization holds. In other words, if the left edge is treated as more prominent than the right edge (FAITH-LEFT » FAITH-RIGHT), then the reduplicant should align to the most prominent edge (ALIGN-LEFT » ALIGN-RIGHT). The analysis presented in Tableau 5 is incompatible with such a characterization, leaving reduplicant placement unexplained. In other words, it is unclear why the reduplicant is prefixed under Nelson's analysis since she treats both edges as simultaneously prominent.

The brief study of vowel-final stems below sheds more light on the key differences between the two analyses.

3.3 Treatment of vowel-final stems: Evidence for prosodic correspondence

As in other Austronesian languages, Ulu Muar Malay unsurprisingly contains plenty of vowel-final words that are permitted to undergo reduplication as well. In fact, there are two different reduplication processes that Ulu Muar Malay vowel-final stems may undergo. They may be fully reduplicated, or alternatively, they may undergo partial reduplication, which yields a CV reduplicant prefix corresponding with the initial CV syllable of the base.[16] Hendon (1966) refers to the total reduplication pattern as Type I and the CV partial reduplication pattern as Type IV. (Recall that Hendon calls the discontiguous pattern under discussion Type III.) In this section, I show that the "Type IV" CV pattern can actually be reduced to a special subtype of the "Type III" CVC pattern, compatible with vowel-final stems.

(10) Type I Reduplication of vowel-final stem
rajo ⇒ **rajo**-rajo "persons of royal descent"

(11) Type IV Reduplication of vowel-final stem (Kroeger 1989: 59)
suko ⇒ bo-**su**-suko ati- e "are enjoying themselves"

Setting the total reduplication pattern in (10) aside, consider example (11). The reduplicant prefix in (11) is **su**-, which corresponds to the initial syllable in the base [suko]. This phenomenon is compatible with the analysis that I have proposed for discontiguous reduplicants in § 2 because of the conditional nature of prosodic correspondence. The coda in the reduplicant is licensed by virtue of the presence of a coda in the base.

Vowel-final stems provide evidence for the biconditionality of prosodic correspondence in Ulu Muar Malay. That is, a coda surfaces in the reduplicant if and only if there is a coda in the base. If there are no medial codas in native Ulu Muar Malay words, then vowel-final words in Ulu Muar Malay cannot contain any codas at all. As

16. The issue of why and how a particular stem may undergo multiple patterns of reduplication is beyond the scope of this chapter, but see Spaelti 1997 for a treatment of multipattern reduplication in Nakanai.

such, my analysis predicts that there cannot be a coda in the reduplicant (even a placeless one), since resyllabifying an onset in the stem as a coda in the reduplicant is prohibited by CORR-Σ-ROLE-BR.

Thus, the same analysis proposed for the discontiguous cases also predicts the contiguity and the size of CV reduplicants resulting from vowel-final stems, as shown in Tableau 6.

Candidate 6:a contains another "wrong-edge" reduplicant. It incurs two violations of MAX-INITIAL-σ-BR since neither the initial consonant nor the initial vowel from the stem is preserved in the reduplicant. Candidate 6:b contains a CVC reduplicant but is ruled out by CORR-Σ-ROLE-BR because [k] is an onset in the base but a coda in the reduplicant. The candidate with the wrong vowel preserved, candidate 6:c, is likewise ruled out by MAX-INITIAL-σ-BR. The initial vowel must be preserved, not the final vowel. And the preservation of both vowels in candidate 6:e comes at the expense of additional ALL-σ-LEFT violations because Ulu Muar Malay does not permit tautosyllabic vowel clusters (Hendon 1966), which is possibly guaranteed by a highly ranked constraint like *[$_\sigma$...VV...].

Tableau 6 shows that the presence of a coda in the base is necessary to license a coda in the reduplicant. Thus the CV pattern of reduplication reduces to a variant of the discontiguous CVC pattern. On the other hand, Nelson's (2003) analysis of discontiguous reduplication in Ulu Muar Malay is only formulated to explain the Type III pattern and does not extend to cover the vowel-final cases, even with a crucial unranking of constraints. Tableau 7 illustrates the problem.

Now, if Ulu Muar Malay did permit syllable-internal vowel clusters, such as *[suo], then the predicted output on Nelson's analysis would be ***suo**-suko, contrary to fact. As it stands, treating the initial vowel as well as the edge segments as prominent makes the wrong prediction for vowel-final stems. One is forced to copy an additional consonant to break up the resulting vowel cluster to satisfy both EDGE-ANCHOR-BR and FAITH-V$_1$ at the expense of a PLACEMARKEDNESS violation, resulting in what resembles full reduplication for sufficiently short stems, like [suko].

Tableau 6. Type IV Reduplication gets the same analysis as Type III

		RED-/suko/	MAX-INIT-σ-BR	CORR-Σ-ROLE-BR	ALL-σ-L	MAX-BR	CONT-BR
a.		**k**$_3$**o**$_4$-su.k$_3$o$_4$	*!*		***	**	
b.		**s**$_1$**u**$_2$**k**$_3$-s$_1$u$_2$.k$_3$o		*!	***	*	
c.		**s**$_1$**o**$_4$-s$_1$u.ko$_4$	*!		***	***	**
d.	☞	**s**$_1$**u**$_2$-s$_1$u$_2$.ko			***	**	
e.		**s**$_1$**u**$_2$**k**$_3$**o**$_4$-s$_1$u$_2$.k$_3$o$_4$			****!**		

Tableau 7. Type IV Reduplication cannot get the same analysis as Type III (Nelson 2003)

		RED-/suko/	E-ANCH-BR	FAITH-V$_1$	*PLACE	CONTIG-BR
a.		**k**$_3$**o**$_4$-su.k$_3$o$_4$	*!	*	******	
b.		**s**$_1$**u**$_2$**k**$_3$-s$_1$u$_2$.k$_3$o	*!		*******	
c.		**s**$_1$**o**$_4$-s$_1$u.ko$_4$		*!	******	**
d.	☹	**s**$_1$**u**$_2$-s$_1$u$_2$.ko	*!		******	
e.	👌	**s**$_1$**u**$_2$**k**$_3$**o**$_4$-s$_1$u$_2$.k$_3$o$_4$			********	

All of the remaining candidates in Tableau 7 with monosyllabic reduplicants incur at least one violation of either EDGE-ANCHOR-BR or FAITH-V$_1$. Candidate 7:a violates both of these constraints: there is one violation of EDGE-ANCHOR-BR since the left-edge consonant is not anchored, and one violation of FAITH-V$_1$ since the initial vowel is not preserved in the reduplicant. Candidate 7:b incurs a violation of EDGE-ANCHOR-BR since the rightmost vowel [o] is not preserved. Note that, in contrast to the analysis presented in Tableau 6, the preservation of [k] in candidate 7:b does not violate any constraint except for PLACEMARKEDNESS (*PLACE), the size restrictor. The [k] in the analogous candidate 6:c from Tableau 6 has incurred a violation of CORR-Σ-ROLE-BR since the copy in the reduplicant is syllabified as a coda, whereas its correspondent in the base is an onset.

At this point, candidates 7:c and 7:d each violate either EDGE-ANCHOR-BR or FAITH-V$_1$, leaving candidate 7:e as the unlikely winner. The fact that candidate 7:e resembles the Type I total reduplication pattern (Hendon 1966) is furthermore entirely accidental and due to the shape of the particular base [suko]. If the base were to contain an extra syllable (like the hypothetical *[sukola]), even total reduplication would be impossible on Nelson's analysis due to her PLACEMARKEDNESS constraint.

The core issue in the extension of Nelson's analysis to vowel-final stems amounts to a competition among the vowels [u] (the vowel in the initial syllable) and [o] (the vowel at the right edge). This competition is only brought about because of the constraint EDGE-ANCHOR-BR, which prefers discontiguity in any partial reduplicant. In contrast, the extension of my analysis to vowel-final stems is straightforward: no prominence is placed on the right edge whatsoever, and the choice of vowel proceeds without a problem. The initial CV syllable is preserved exactly as it is in the discontiguous cases above, and prosodic correspondence is satisfied since there is no viable coda in the base – at the right edge, or otherwise – to serve as a correspondent for a coda in the reduplicant.

4. In conclusion

I have shown that explanation of the apparent "both-edge anchoring" phenomenon in (2) does not necessitate constraints like EDGE-ANCHOR-BR. The alternative analysis proposed in § 2 is based on conditional licensing of codas: if there is a coda at the right edge of a stem, then a coda is licensed at the right edge of the reduplicant. The prosodic correspondence constraint CORR-Σ-ROLE-BR prohibits any non-coda in the base from standing in correspondence with a coda in the reduplicant. The imposition of conditions on the licensing of reduplicant codas allows for simple extension of the same analysis to stems that do not contain codas.

The problem with relying on EDGE-ANCHOR-BR to preserve right-edge codas, as Nelson (2003) does, is that this constraint attempts to preserve segments at the right edge, regardless of whether or not they are codas, contrary to the attested facts. Since it has been shown that such reliance on EDGE-ANCHOR-BR to preserve right-edge coda consonants is not necessary, questions arise regarding the status of constraints like EDGE-ANCHOR in Universal Grammar.

Consider Beckman's (1999) Positional Faithfulness Theory, which designates the left edge as a prominent position, but not the right edge.[17] Positional Faithfulness Theory is founded on the idea that faithfulness constraints can be formulated either as general or positional. General constraints apply to all positions within a domain, while positional constraints only apply to prominent positions. Nelson (2003) argues that EDGE-ANCHOR should be treated as a general constraint on anchoring, while LEFT-ANCHOR should be treated as a positional constraint on the leftmost segment. The ultimate goal of Nelson's formulation of the anchoring constraints in this way is to do away with RIGHT-ANCHOR (which is in line with Beckman's proposal).

While I support the goal, I take issue with the means of achieving it. In my view, ANCHOR constraints are already positional versions of MAX constraints. If one adopts this view, the formulation of a constraint EDGE-ANCHOR, then, treats both edges as prominent positions. EDGE-ANCHOR itself is functionally equivalent to a local constraint disjunction of LEFT-ANCHOR$\vee_{Dom}$RIGHT-ANCHOR.

(12) Comparison of EDGE-ANCHOR with LEFT-ANCHOR ∨ RIGHT-ANCHOR

RED-CVC	E-ANCH-BR		RED-CVC	L-ANCH-BR $\vee_{PWd}$R-ANCH-BR
$C_1V_2C_3$- $C_1V_2C_3$			$C_1V_2C_3$- $C_1V_2C_3$	
C_1V_2- C_1V_2C	*	*vs.*	C_1V_2- C_1V_2C	*
V_2C_3- CV_2C_3	*		V_2C_3- CV_2C_3	*
V_2-CV_2C	**		V_2-CV_2C	**

17. Beckman cites phonetic and psycholinguistic evidence, *e.g.*, Hawkins and Cutler 1988, as the basis for this claim.

It thus makes sense to consider EDGE-ANCHOR a notational variant of LEFT-ANCHOR $\vee_{Dom}$ RIGHT-ANCHOR. EDGE-ANCHOR-BR then, by definition, refers to the right edge as a target for preservation in the reduplicant.[18] Although it has been shown that the right edge may be targeted as prominent in some instances (e.g. tone distribution; see Zhang 2004), there is no prima facie evidence for right-edge prominence in the Ulu Muar Malay discontiguous reduplication pattern presented in (2), as the reduplication of vowel-final stems indicates.

In contrast, the analysis I advance in § 2 does not refer to the right edge in any constraint definition, but instead derives right-edge preservation via constraint interaction – as a language-specific accident, basically. The main theoretical difference between the analysis described here and the EDGE-ANCHOR analysis in Nelson 2003 is that only the former is directly compatible with Positional Faithfulness Theory, as formulated by Beckman.

Nevertheless, my analysis may not be correct. Both Nelson's and my analyses make very clear and very strong empirical predictions. If there is a medial coda in the base, my analysis predicts that this coda would be selected to correspond with a coda consonant in the reduplicant, whether or not a stem-final coda is present as well. In contrast, Nelson's analysis predicts that the stem-final coda would be selected to correspond with a coda in the reduplicant even if there were a medial coda present in the base. While societal and geographical circumstances make it difficult to test these predictions in Ulu Muar Malay, the analyses might be tested on other languages with edge-anchoring reduplication patterns: either on other dialects of Malay or on Austro-Asiatic languages that show the same kind of patterns. A crosslinguistic study of this magnitude is unfortunately beyond the scope of the present work. However, I have shown in this chapter that it is possible for patterns of discontiguous reduplication to be analyzed without constraints that stipulate discontiguity, like EDGE-ANCHOR. The type of crosslinguistic study described above would be extremely valuable in determining the validity of such an analysis, as well as the practicality of positing constraints like EDGE-ANCHOR in Universal Grammar.

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18. This claim obviously extends to Hendricks' (2001) use of RIGHT-ANCHOR-BR in his Compression Model treatment of Semai discontiguous reduplicants.

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Appendix: Featural mismatches

As mentioned in § 2, there are at least two other phonological processes that apply to Type III reduplicants, namely high vowel laxing and coda placelessness. Specifically, high vowel laxing refers to the fact that the correspondents of [u] and [i] surface as [ʊ] and [ɪ] in a CVC reduplicant. Additionally, stops serving as reduplicant codas must appear as [ʔ], while a nasal coda in a reduplicant prefix must assimilate to the place of the following onset in the base. The only other consonant licensed in the coda position in reduplicants is [h]. This restriction is what I am referring to as coda placelessness.

While these processes do not bear directly on the previous discussion of reduplicant discontiguity (or the Correspondence-Theoretic representation thereof), they are explored briefly here. Local constraint conjunction can be applied to account for both of these patterns straightforwardly.[19] I begin by examining the descriptive generalizations that require explanation.

First, high vowel laxing occurs only in closed syllables (i.e., syllables with a coda). In Optimality-Theoretic terminology, this generalization can be captured by the constraint NO-CODA$\wedge_{\sigma}$*[+HIGH, +ATR].[20] Second, coda placelessness can be analyzed as place feature deletion occurring only on codas. Another conjoined constraint can capture this generalization in OT: NO-CODA$\wedge_{seg}$*PLACE, where *PLACE can be thought of as a *STRUC constraint against association of segments to place features (like Nelson's PLACEMARKEDNESS).

These two phenomena have different scopes of application, as well. High vowel laxing occurs across the board in all closed syllables (i.e. in both the base and the reduplicant), but conditioned coda placelessness is a phenomenon observed in reduplicants only. The TETU ranking schema applied earlier to account for reduplicant size can also cover the distribution of these two featural mismatches as well, illustrating the utility of an OT analysis to explain these facts.

Recall that the TETU ranking of MAX-IO » ALL-σ-LEFT » MAX-BR is invoked to reduce reduplicant size to a single syllable without affecting the shape or size of the base. Similarly, ranking IDENT-IO » NO-CODA$\wedge_{seg}$*PLACE » IDENT-BR permits

19. There are some technical issues surrounding the minimal domain in which these constraints apply; further explication lies beyond the scope of this chapter. See Ito and Mester 2003 for a recent discussion of local constraint conjunction.

20. I am treating [ATR] as the relevant feature that distinguishes [i] from [ɪ] and [u] from [ʊ]; cf. discussions of Québec French high vowel laxing in closed syllables in Dumas 1978, Légaré 1978, and McLaughlin 1986.

placeless codas in reduplicants but not in stems. Tableau A clearly illustrates how coda placelessness is restricted to reduplicant codas.

What about high vowel laxing? Since high vowel laxing occurs in closed syllables in both reduplicants and stems, the constraint against tense high vowels in closed syllables can simply be ranked over both IDENT-IO and IDENT-BR.

Tableaus A and B show how an OT analysis can simultaneously account for the distribution of placeless codas and high, lax vowels via constraint interaction. This account could easily be integrated into the analysis presented in § 2 for greater precision.

Tableau A. Coda placelessness in reduplicants only

RED-/galap/	IDENT-IO	NO-CODA∧$_{seg}$*PLACE	IDENT-BR
a. **g$_1$a$_2$p$_5$**-g$_1$a$_2$.laʔ$_5$	*! (ʔ)	* (**p**)	* (**p**)
b. **g$_1$a$_2$ʔ$_5$**-g$_1$a$_2$.laʔ$_5$	*! (ʔ)		
c. **g$_1$a$_2$p$_5$**-g$_1$a$_2$.lap$_5$		**! (**p**, p)	
d. ☞ **g$_1$a$_2$ʔ$_5$**-g$_1$a$_2$.lap$_5$		* (p)	* (**ʔ**)

Tableau B. High vowel laxing in all closed syllables

RED-/sikit/	NO-CODA∧$_{σ}$ *[+HIGH, +ATR]	IDENT-IO	IDENT-BR
a. **s$_1$i$_2$ʔ$_5$**-s$_1$i$_2$.kit$_5$	*!* (**iʔ**, it)		* (**ʔ**)
b. **s$_1$i$_2$ʔ$_5$**-s$_1$i$_2$.kɪt$_5$	*! (**iʔ**)	* (ɪ)	* (**ʔ**)
c. **s$_1$ɪ$_2$ʔ$_5$**-s$_1$i$_2$.kit$_5$	*! (it)		** (**ɪ**, **ʔ**)
d. **s$_1$ɪ$_2$ʔ$_5$**-s$_1$ɪ$_2$.kɪt$_5$		**! (ɪ, ɪ)	* (**ʔ**)
e. ☞ **s$_1$ɪ$_2$ʔ$_5$**-s$_1$i$_2$.kɪt$_5$		* (ɪ)	** (**ɪ**, **ʔ**)

Phonological evidence for the structure of Javanese compounds

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This paper presents field data from Javanese showing that Noun-Noun and Noun-Adjective compounds in Javanese are phonologically distinct from both non-compound words and phrases. I explore the idea that this behavior can be explained by a syntactic approach in which this difference arises from a distinction between early and late spell-out (Chomsky 1999). I further argue that various phonological approaches to the same data are unable to produce the desired surface forms.

1. Javanese compounds[1]

Javanese compound phonology shows unique behavior within the language, in that it is distinct from both the phonology of non-compound words and the phonology of phrases. Specifically, both parts of a compound behave as if they are at the end of a prosodic word, even when a clitic follows the compound. However, a non-compound word followed by a clitic does not show this behavior.

In this paper, I will explore the proposal that this phenomenon arises as an effect of the interface between syntax and phonology; the phonological pattern provides evidence for the syntactic derivation. I compare a syntactic account of these data to several purely phonological or morphophonological approaches and argue that these data result from a difference in syntactic derivation between compound words and phrases. Specifically, a distinction between early and late spell-out (Chomsky 1999) can account for the fact that the behavior of a compound word is distinct from that of a phrase. The analysis presented here is also in keeping with Marantz's (to appear) distinction between inner and outer word formation in Distributed Morphology.

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