Stem disyllabicity in Guugu Yimidhirr

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Summary

The phonology and morphology of Guugu Yimidhirr, an Australian language spoken in Queensland (Haviland 1979), make repeated reference to a constituent that has the size of *precisely two syllables*, irrespective of the quantity of the syllables involved. For various reasons, this disyllabic constituent cannot be morphological in nature, e.g. root or stem, and it must therefore be prosodic. On the one hand, it is larger than the foot, as it may consist of two monosyllabic feet [(H)(H)]. But on the other hand, it must also be smaller than PrWd, in which it may be properly contained. In this paper I argue that PrWd structure in Guugu Yimidhirr is *recursive* (McCarthy & Prince 1993a). The embedded PrWd is precisely disyllabic because of two constraints. First it is *minimally* disyllabic because of DISYLL: both edges of PrWd must align with edges of different syllables (McCarthy & Prince 1993a). Second, it is *maximally* disyllabic because of ALIGN-σ: every syllable must stand at the right edge of some PrWd. This is also the constraint that produces recursivity of PrWd. Arguments for recursive PrWd structure are based on various prosodic patterns of Guugu Yimidhirr (in particular stress, alternations of vowel length as induced by suffix, and verbal reduplication).

1. Introduction

Prosodic size restrictions on specific morphological domains occur in many languages. The best-known size limitation (which is often imposed on stems or reduplicants) is the bimoraic minimum, i.e. a single heavy syllable [H] or two light syllables [LL]. In terms of prosodic categories, this limitation equals a (bimoraic) *foot*. Recently attention has been drawn to another size limitation, i.e. two syllables regardless of their weight. Just as bimoraicity, disyllabicity may function as a *minimality* requirement, as in Japanese word clippings (Itô 1992), Axininca Campa reduplication (McCarthy & Prince 1993a), or Turkish stems (Inkelas & Orgun 1994). It may also form the *maximum* size of certain categories, as in Arabic canonical noun roots (McCarthy & Prince 1990), and finally, it may be a *strict* delimiter, as in Guugu Yimidhirr verb stems (see Section 3.3 below). In contrast, no languages seem to occur that require specific morphological domains to be (minimally, maximally or precisely) trisyllabic or quadrisyllabic, etc. The question that naturally arises is whether disyllabicity is reducible to a single prosodic category, just as bimoraicity can be reduced to the quantity-sensitive foot.

From a broad cross-linguistic perspective, there is every reason to assume that disyllabicity is a basic size requirement of morpho-prosodic theory. The first question that one might reasonably ask is whether the property of disyllabicity is reducible to the *syllabic binarity* of the prosodic category *foot*[1] (Prince 1980, McCarthy & Prince 1986, Kager 1989, 1993ab, Hayes 1995):

(1) **FTBIN**
Feet are binary under syllabic or moraic analysis.

If we would simply restrict ourselves to quantity-insensitive languages, the answer to this question would no doubt be positive. Foot binarity implies disyllabicity in quantity-insensitive languages, since (by definition) these languages do not distinguish light and

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[1] This option was proposed during the presentation of this paper at the HILP conference.

heavy syllables, and therefore cannot satisfy FtBin by bi-*moraic* analysis, i.e. by a [H] foot. Therefore any evidence for disyllabicity as a property that is independent of FtBin can in principle only be found in quantity-*sensitive* languages, i.e. those languages that are potentially capable of satisfying FtBin by bi-moraic analysis. More precisely, any language that allows for monosyllabic bi-moraic [H] feet, but otherwise requires certain domains to be disyllabic, motivates a disyllabicity principle independent from FtBin.

As I will show below, Guugu Yimidhirr is precisely such a language. First, it is quantity-sensitive in various respects, and accordingly it uses the bimoraic [H] foot. Its minimal word is bimoraic (e.g. *míil* ‘eye’). Stress falls on every heavy syllable, even when two are adjacent, e.g. *búuɽáay* ‘water’. On the other hand, its prosody repeatedly refers to a disyllabic domain at the beginning of the prosodic word. For example, the vowel length contrast is restricted to the first two syllables of a word. This restriction is respected by pre-lengthening suffixes, which never lengthen the vowel of a syllable outside the first two, e.g. *ŋalga*[:]*l-ŋu* ‘smoke-PURP’, vs. *bad̪ibay-ŋu* (**bad̪iba*[:]*y-ŋu*) ‘bone-PURP’. Secondary stress feet copy relative prominence of the first two syllables of the word, e.g. iambic [(*ma.gíil*)].(*ŋay.gù*) ‘just branches’, vs. trochaic [(*dúɾ.gin*)].(*bì.gu*) (place name), [(*búu*).*ɾa*].(*yày.gu*) ‘still in the water’. Finally, certain morphological categories (verb stems, adjectival redupliacants) are strictly disyllabic.

The question which arises next is: what is the nature of this disyllabic domain? Clearly it cannot be identified as morphological, since roots and stems may exceed two syllables, but still require the disyllabic domain at their beginning, because of the above mentioned distribution of vowel length and stress. Hence the disyllabic domain must be prosodic in nature. It cannot be Ft, since [H] feet are well-formed. It must therefore be PrWd. However, this poses the next problem of how to account for PrWd that exceed the disyllabic format.

In this paper, I will argue that PrWd structure may be self-embedding (Inkelas 1989, McCarthy & Prince 1993a). I will argue that, in contrast to the cases of recursive PrWd structure known from the literature, recursivity of PrWd in Guugu Yimidhirr may arise without corresponding morphological nested structure, e.g. [[*ba.d̪i*].*bay*.-*ŋu*]. Left PrWd edges coincide with the left stem edge because of Align-Wd. Recursivity of PrWd bracketing is due to Align-σ, a constraint which requires each syllable to stand at the right edge of some PrWd. Finally, PrWds are minimally disyllabic because of Disyll (McCarthy & Prince 1993), a constraint requiring that both edges of each PrWd align with edges of different syllables.

The structure of this paper is as follows. Section 2 summarizes the evidence for disyllabicity as a morphology-prosody alignment property on the basis of reduplication in Axininca (McCarthy & Prince 1993). It extends this theory to strict disyllabicity (by Align-σ), and also generalises it to PrWd-syllable. Section 3 presents the evidence for disyllabicity in Guugu Yimidhirr. This includes stem size, distribution of vowel length, word stress, stem size requirements imposed by affixes, and adjectical reduplication. Section 4 goes into the complicated phenomena of vowel lengthening and shortening in second stem syllables, and its conditioning by specific suffixes. Section 5 addresses verbal reduplication, showing that reduplicant functions as a regular suffix w.r.t. lengthening and shortening. Finally, Section 6 gives conclusions.

2. Disyllabicity as an interface property

In the literature, a number of quantity-sensitive languages have been identified in which certain morphemes must be minimally disyllabic, e.g. Japanese (loan abbreviations, Itô 1992, Itô & Mester 1992), Axininca Campa (reduplication, McCarthy & Prince 1993a), and Turkish (stems, Inkelas & Orgun 1994). Since each of these languages is quantity-sensitive, morpheme templates cannot be identified as quantity-insensitive *feet* [σσ].

An argument of this type has been made by McCarthy & Prince (1993a) for the interaction of epenthesis and reduplication in Axininca. Relevance of the bimoraic foot is evident from word stress, as well as from vowel epenthesis in subminimal stems (e.g. /*p*/ [pAA], *[pA], ‘feed’). Bi-moraic epenthesis follows from FTBIN dominating FILL:

(2) **FILL**
Syllable positions must be filled by underlying segments.

The requirement of reduplicant disyllabicity is independent of FTBIN, as the data in (3) show. Polysyllabic roots undergo total reduplication, but prefixes are not reduplicated along (3a.ii). With monosyllabic roots, a prefix is reduplicated together with the root if one is available (3b.ii), a form of augmentation that points to minimal disyllabicity of the reduplicant. Finally, a monosyllabic stem without a prefix undergoes no epenthesis (3b.i), which shows that the disyllabicity requirement ranks lower than FILL:

(3) a.i kawosi-kawosi-waiTaki ‘bathe’
a.ii noŋ-kawosi-kawosi-waiTaki ‘bathe-I-FUT’ (*noŋ-kawosi-noŋkawosi-..)

b.i naa-naa-waiTaki ‘chew’ (*naaTA-naaTA-...)
b.ii no-naa-nonaa-waiTaki ‘chew-I-FUT’ (*no-naa-naa-...)

The fact that prefixes are not reduplicated along with polysyllabic stems (3a.ii) shows that R ≤ ROOT (4a) must dominate MAX (4b):

(4) a. **R ≤ ROOT**
The Reduplicant contains only the root.

b. **MAX**
R = B

On the other hand, R ≤ ROOT must be dominated by a constraint DISYLL (6), which requires the reduplicant to be minimally disyllabic. Crucial evidence for this is the fact that prefixes are reduplicated along with monosyllabic roots (in violation of R ≤ ROOT). In its turn DISYLL is dominated by FILL because no reduplicant undergoes vowel epenthesis to satisfy DISYLL. The individual constraint rankings in (5) can be inferred:

(5) a. FTBIN » FILL pAA > pA
b. FILL » DISYLL naa-naa > naaTA-naaTA
c. DISYLL » R ≤ ROOT no-naa-nonaa > no-naa-naa
d. R ≤ ROOT » MAX noŋ-kawosi-kawosi > noŋ-kawosi-noŋkawosi

A simple ranking argument shows that DISYLL cannot be reduced to FTBIN, since then it would have to be ranked both above and below FILL.

Then what is this requirement of minimal disyllabicity, if it cannot be reduced to foot size? McCarthy & Prince propose that it is a property of the prosody-morphology interface, specifically an alignment of a morphological category, here *Reduplicant*, with the prosodic category *syllable*.

(6) **DISYLL** (Align Version)[2]
The left and right edges of the Reduplicant must coincide, respectively, with the left and right edges of *different* syllables.

We may think of DISYLL as making three independent assertions simultaneously:

(7) a. *Left-alignment* $[_{\text{MCat}} = [_{\sigma_1}$
b. *Right-alignment* $]_{\text{MCat}} =]_{\sigma_2}$
c. *Non-identity* $\sigma_1 \neq \sigma_2$

McCarthy & Prince (1993a:138) observe that “DISYLL cannot be identified with a standard template. Disyllabicity is not an absolute requirement of shape-invariance, like familiar templates, but only a lower bound, since trisyllabic reduplicants are impeccable. Thus it cannot be identified with the category *Foot*, which imposes both upper and lower bounds. Furthermore, a disyllabic quantity-*insensitive* foot would be required, yet this is incompatible with the thorough-going quantity-sensitivity of prosody in Axininca Campa.” This argument is compelling, but its conclusion, i.e. that disyllabicity is a morphology-prosody interface property, cannot be accepted until both of the following problems have been solved[3].

First, DISYLL accounts for *minimal* disyllabicity only. It fails to extend to *strict* nor *maximal* disyllabicity (strict disyllabicity in Guugu Yimidhirr will be discussed in §3.3). Upper bounds require a reverse type of prosody-morphology interface constraint, which align edges of some PCat (e.g. σ, Ft, PrWd) with edges of MCat. For example, if every foot must stand at the edge of MCat, then the maximal size of MCat equals a foot (McCarthy & Prince 1994, Kager to appear). The property of a MCat of being strictly disyllabic can be derived by ranking DISYLL above ALIGN-σ, a constraint requiring that *each syllable stands final in* MCat.

(8) **ALIGN-σ**[4]
The right edge of every syllable must coincide with the right edge of MCat.

Any polysyllabic MCat actually violates ALIGN-σ. But when ALIGN-σ is dominated by DISYLL, a strictly disyllabic MCat constitutes a minimal violation of ALIGN-σ. As I will show below, a close relative of ALIGN-σ is the source of recursive PrWd structure.

The second challenge to the McCarthy & Prince’s view that disyllabicity is just a special type of morphology-prosody alignment resides in *nonmorphological* disyllabic domains. As I will argue at length below, Guugu Yimidhirr prosody makes repeated reference to a disyllabic prosodic domain that cannot be equated with the root, nor with the stem. This evidence suggests that DISYLL and ALIGN-σ may refer to *only* PCats (e.g. PrWd and syllable). With this background, let us now turn to Guugu Yimidhirr.

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[2] Ultimately, DISYLL is restated as a ‘segregation’ constraint (McCarthy & Prince 1993a:169):

RT-SFX-SEGREGATION: A root and a suffix cannot be wholly integrated in a single syllable.

Although this formulation may be adequate for Axininca Campa reduplication, it no longer even captures minimal disyllabicity of single morphological domains (including Japanese and most of the cases to be discussed in Section 6).

[3] These remarks carry over to the eventual successor of DISYLL in McCarthy & Prince (1993a), RT-SFX-SEGREGATION (cf. footnote 1).

[4] Compare the double-edge alignment constraint ALIGN (FT,RT) from Kager (to appear), which has the effect of maximizing MCat to two *feet*.

3. Recursive PrWd structure in Guugu Yimidhirr

The consonant inventory of Guugu Yimidhirr (Haviland 1979:36) is given below:

(9)

	Bilabial	Apico-alveolar	Apico-postalveolar (retroflex)	Lamino-dental	Lamino-palatal	Dorso-velar
Plosives	b	d	ɖ	d̪	ɟ	g
Nasals	m	n	ɳ	n̪	ɲ	ŋ
Lateral		l				
Rhotics		ɾ	ɽ			
Semi-vowels	w				y	

As is usual in Australian languages, the consonant inventory is is very complex as compared to the vowel inventory /i, ii; a, aa; u, uu/, i.e. three vowels plus length. The syllable has an obligatory and non-complex onset. Codas must be non-branching too, and coda consonants do no contribute to syllable weight (as will become clear in Section 3.2 on word stress). The minimal stem is *bimoraic*, but monosyllabic bimoraic stems are in fact rare (8/731, or 1%):

(10) 4 nouns: *dii* ‘tea’ (loan), *miil* ‘eye’, *d̪uul* ‘guts’, *buuɾ* ‘bird's nest’

4 particles: *n̪aa* ‘that, there’ (root /*n̪a*/), *yii* ‘this, there’ (root /*yi*/), *yuu* ‘yes’, *aa* (agreement)

This is actually a first diagnostic of quantity-sensitivity, and of the bimoraic foot [H], in Guugu Yimidhirr. More evidence for bimoraic [H] feet will be presented in Section 3.2 on stress. Let us now look at the evidence for disyllabicity from vowel length.

3.1 The distribution of vowel length

One of the most striking manifestations of disyllabicity in Guugu Yimidhirr is its role in constraining the distribution of vowel length. Without exceptions, long vowels must stand in either *the first and/or second syllable* of the stem, e.g.:

(11) σ_1: miil ‘eye’, waad̪a ‘crow’, waaɽigan ‘moon’, guuɽumugu ‘meat hawk’
σ_2: dawaaɽ ‘star’, gambuugu ‘head’, d̪amaaɽbina ‘magpie goose’
σ_{1+2}: buuɾaay ‘water’, daaɾaalŋan ‘kangaroo’, ɟiiɽaayŋguɽ ‘old man’

Statistics about the quantitative composition of polysyllabic roots are given in (12):

(12)

Total	731	#LL	432	#LH	139	#HL	105	#HH	55
2σ	628	LL	363	LH	119	HL	97	HH	49
3σ	83	LLL	53	LHL	18	HLL	7	HHL	5
4σ	21	LLLL	16	LHLL	2	HLLL	1	HHLL	1

Interestingly compounds may have vowel length in the first two syllables of both words involved, e.g. *gami=biiba* ‘many’ (literally ‘grandfather-father’), or even those of three words, e.g. *wuuɾuyu=ŋaad̪aaɾ=manaad̪i* ‘curer=CAUS=REF+PAST, became a curer’. This also shows that noun reduplication involves PrWd compounding, e.g. *gad̪ii-gad̪ii* ‘very far away’ (/*gad̪ii*/, lit. ‘far-far’), *dinda=dindaal-gu* ‘quickly’ (/*dindal*/ ‘quick-quick’).

The restriction of vowel length to the first to syllables of the stem is enforced in a number of ways. Significantly, it is respected under affixation, since suffixes never induce vowel length in any other syllable but the second of the stem (see Section 4):

(13)	a.	/maŋal-nda/	ma.ŋaal.nda	‘clay-ERG’
	b.	/wuluŋguɾ-nda/	wu.luŋ.guɾ.nda (* wu.luŋ.guuɾ.nda)	‘lightning, flame-ERG’

Let us now identify the domain of vowel length (in fact, that of syllable *weight*). It cannot be *morphological*. If the root or stem were the domain of weight, this would not explain the fact that weight is restricted to the first two syllables of longer roots or stems. It would be most ad hoc to stipulate internal morphological structure inside long stems or roots. This reveals an important point. Disyllabicity, as it is relevant to the distribution of syllable weight in Guugu Yimidhirr, cannot be construed as a property of the prosody-morphology interface (as McCarthy & Prince 1993a propose) since there is no corresponding disyllabic *morphological* category with which syllable weight aligns.

It then follows that the domain with which heavy syllables align (the first two syllables of every PrWd) must be *prosodic*. What can this domain be? Obviously, mora or syllable are too small. Assuming a prosodic hierarchy μ–σ-Ft-PrWd, this leaves us two choices[5], a quantity-insensitive *Foot* (14a), or a recursive *PrWd* (14b). Consider the two corresponding prosodic structures of a [HH] word, e.g. *búu.ɾáay* ‘water’:

(14) a. *Quantity-insensitive Foot* b. *Recursive PrWd*

Suppose that the disyllabic foot were the domain of syllable weight. Then this foot must be *quantity-insensitive* since all combinations of light and heavy syllables may occur at the beginning of a PrWd: [LL], [LH], [HL], and [HH]. This completely contradicts the general quantity-sensitivity of the prosody of Guugu Yimidhirr. In particular a quantity-insensitive foot contradicts the fact that every heavy syllable is stressed (cf. *búu.ɾáay*), as I will show in Section 3.2. It also contradicts the bimoraic word minimum (cf. *míil*). This leaves as the single option available the recursive PrWd, i.e. structure (14b). Now we must face two problems. First, what *forces* recursive PrWd structure in long words that have no corresponding internal morphological bracketing? Second, how can heavy syllables be restricted to the innermost PrWd?

The solution to the first problem involves alignment. PrWd parsing structures of long words are all of the following kind:

(15) $[_{\text{PrWd}}\ [_{\text{PrWd}}\ \sigma\ \sigma\ ]\ \sigma\ ...]$

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[5] I disregard a third alternative, i.e. to set up a new prosodic category (e.g. Prosodic Stem, Itô 1992) between PrWd and Ft, and to impose strict disyllabicity on it. In my opinion, there is not enough cross-linguistic evidence for extending the prosodic hierarchy.

This recursive PrWd parsing may be analysed as follows. First, left PrWd edges stack up at the left edge of the stem (or: each left bracket of PrWd must be in absolute stem-initial position). This is achieved by undominated ALIGN-WD:

(16) **ALIGN-WD**
Align (PrWd, Left, Stem, Left)

Second, every PrWd (in a recursive structure) is minimally disyllabic because of DISYLL, a slight variation on the constraint proposed by McCarthy & Prince (1993a):

(17) **DISYLL**
The left and right edges of the PrWd must coincide, respectively, with the left and right edges of *different* syllables.

The third constraint required has two effects. It guarantees that the innermost PrWd is maximally disyllabic, and that additional syllables are organized into recursive PrWd structure. ALIGN-σ requiring every syllable to stand at the end of some PrWd:

(18) **ALIGN-σ**
The right edge of every syllable must coincide with the right edge of PrWd.

These constraints are ranked as in (19):

(19) ALIGN-WD, DISYLL » ALIGN-σ

The recursive PrWd structure of a trisyllabic word arises as shown in tableau (20):

(20) /waaɽigan/	ALIGN-WD	DISYLL	ALIGN-σ		
			σ_1	σ_2	σ_3
a. ☞ [[waa.ɽi].gan]			*		
b. [waa.ɽi.gan]			*	*!	
c. [[[waa].ɽi].gan]		*!			
d. [[waa].ɽi.gan]		*!		*	
e. [[waa].[ɽi.gan]]	*!	*		*	

ALIGN-WD and DISYLL rule out non-initial PrWds (20e) and monosyllabic PrWds (20c-e), respectively. Among the remaining candidates, the one is selected that has the fewest violations of ALIGN-σ. This is the 'recursive' candidate (20a), which is minimally more optimal than the 'nonrecursive' candidate (20b). Now consider a quadrisyllabic word:

(21) /guuɽumugu/	ALIGN-WD	DISYLL	ALIGN-σ			
			σ_1	σ_2	σ_3	σ_4
a. ☞[[[guu.ɽu].mu].gu]			*			
b. [[guu.ɽu].mu.gu]			*		*!	
c. [[guu.ɽu.mu].gu]			**!	*		
d. [guu.ɽu.mu.gu]			**!*	**	*	
e. [[[[guu].ɽu].mu].gu]		*!				
f. [[guu.ɽu].[mu.gu]]	*!		*		*	

Candidate (21a) is selected, one which has double-recursive PrWd structure. Generally, the ranking ALIGN-WD, DISYLL » ALIGN-σ produces a disyllabic PrWd at the beginning of the stem, followed by right PrWd edges after *each* following syllable. In Section 3.2, I will refine this result in favor of the *single*-recursive candidate (21b), which better fits the rhythmic stress pattern. (The analysis of stress involves undominated PARSE-σ.)

Why is syllable weight restricted to the initial disyllabic PrWd? As I will show in Section 3.2, every heavy syllable must be main-stressed (due to a strong form of the familiar *Weight-to-Stress Principle*). Moreover, only feet within the deepest embedded PrWd may be main-stressed (due to a constraint named *HDWD*). From here on I will refer to this deepest embedded PrWd as the *Head-PrWd*[6]. The observation that heavy syllables stand in first or second position in the stem then becomes a direct consequence of these combined requirements.

3.2 Word stress

The stress pattern of Guugu Yimidhirr presents another argument for a recursive PrWd structure. Haviland (1979:41-43) describes it as follows. First, in words that begin with two light syllables or a heavy-light sequence, the initial syllable has primary stress, while remaining odd-numbered syllables have secondary stress (cf. 22a-b). Second, in words that begin with a light-heavy sequence, the second syllable has primary stress and remaining even-numbered syllables have secondary stress (cf. 22c). Third, in words that begin with a heavy-heavy sequence, both the first and second syllable have primary stress, while remaining odd-numbered syllables have secondary stress (cf. 22d).

(22)	#**LL**	a.i	ná.mbal	‘stone-ABS’
		a.ii	máɾ.bu.gàn	‘cave-ABS’
		a.iii	dúɾ.gin.bì.gu	‘Indian Head (place name)’
		a.iv	máɾ.bu.gàn.bi.gù	‘cave-LOC-EMPH’ (‘still in the cave’)
	#**HL**	b.i	gúu.gu	‘language-ABS’
		b.ii	búu.ɾa.yày	‘water-LOC’ (‘in the water’)
		b.iii	búu.ɾa.yày.gu	‘water-LOC-EMPH’ (‘still in the water’)
		b.iv	d̪áa.ba.ŋàl.ŋa.là	‘ask-RED-IMP’ (‘keep asking!’)
	#**LH**	c.i	ma.gíil	‘branch-ABS’
		c.ii	na.mbáal.ŋan̪	‘stone-ABL’ (‘from the stone’)
		c.iii	ma.gíil.ŋay.gù	‘branch-PL-EMPH’ (‘just branches’)
	#**HH**	d.i	búu.ɾáay	‘water-ABS’
		d.ii	búu.ɾáay.bì.gu	‘water-LOC-EMPH’ (‘still in the water’)

The quantity-sensitivity of the patttern is evident: heavy syllables attract primary stress by an undominated constraint. Accordingly, I propose a variant of the familiar WSP (Prince 1992) in (23a). Now it becomes clear why the disyllabic domain is not a foot. First, a disyllabic foot is by nature *quantity-insensitive*, in sharp contrast to the observed primary stress attraction by heavy syllables. Second, a disyllabic foot does not explain the fact that the sequence [HH] (22d) is double-stressed. This would require a *double-headed* foot, an otherwise unmotivated weakening of foot theory. Instead I assume that such sequences are parsed as two monosyllabic heavy feet, viz. [(H)(H)]. Both primary stressed feet must stand in the Head-PrWd because of undominated HDWD (23b):

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[6] Perhaps the term ‘Prosodic Stem’ (Itô 1992) is more accurate, but Itô’s use is rather different.

(23) a. **WSP**
Heavy syllables are heads of most prominent feet.

b. **HdWd**
Most prominent feet occur only inside the Head-PrWd.

The next challenge is how to account for the puzzling secondary stress pattern. Resumption of secondary stress after a heavy syllable in the context ...HLL... follows one of two modes. One mode is the alternating stress pattern ...**H**L**L**..., which occurs in words beginning with #HL and #LH (cf. 24b-c). The other mode is a 'clashing' pattern ...**HL**L..., which occurs in words beginning with #HH (24d). Hence, in order to predict the resumption mode, one needs information on what *precedes* the heavy syllable. This is highly problematic for a localistic theory of iterative stress assignment, because the preceding context is not strictly adjacent to the locus of foot assignment.

Nevertheless, it is possible to predict the resumption mode on the basis of the disyllabic Head-PrWd. Intuitively, the relative prominence of the first two syllables of the word is echoed in the rhythmic pattern (iambic or trochaic) of the rest of the word. The relative prominence of the first two syllables is clearly quantity-based: strong-weak (trochaic) in words beginning with #[**L**L] or #[**H**L], and weak-strong (iambic) in words beginning with #[L**H**]. Note that a double-stressed #[**HH**] sequence counts as trochaic, an observation to which I will return immediately below.

(24)	Trochaic	a.	[(**L**L)]	[[(dúɾ.gin)].(bì.gu)]
		b.	[(**H**L)]	[[(búu.ɾa)].(yày.gu)]
		c.	[(**H**)(**H**)]	[[(búu).(ɾáay)].(bì.gu)]
	Iambic	d.	[(L**H**)]	[[(ma.gíil)].(ŋay.gù)]

In a slightly more formal way, the generalization may be stated as follows: Prominence of secondary stress feet (trochaic or iambic) *harmonizes* with that of the Head-PrWd[7]. The constraint that predicts type of secondary stress foot is stated as Harmony (26a).

For [HL] and [LH], internal prominence follows directly from the WSP, which selects strong-weak and weak-strong internal prominence, respectively. In the case of [LL], the choice of a trochee reflects the default status of the trochee for a quantitatively balanced sequence (Prince 1992, Hayes 1995). Finally, [HH], double-stressed by WSP, is counted as trochaic as well. Again this is as expected, since it forms a quantitatively balanced sequence. The constraint that favors trochaic default feet is RhType=T (26d).

A second aspect of the rhythmic pattern deserves special attention. This is the fact that final secondary stresses are possible that seem not to correspond to binary feet, cf. (*máɾ.bu*).(*gàn.bi*).(*gù*) 'still in the cave'. Kiparsky (1991) and Kager (1995) propose that such unary feet reflect the presence of a silent syllable at the end of the word, with which a binary foot can be formed. This proposal is known as *catalexis*. I assume that catalexis is due to an interaction of undominated FtBin and Parse-σ (26b) with Align-R (26c), which requires lexical word to be absolutely final in PrWd[8]. That is, priority is given to exhaustive parsing over avoiding silent syllables. Accordingly, words with odd

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[7] Kager (1993a) analyses this pattern by strictly disyllabic feet whose internal prominence is due to WSP (which may result in a double-stressed [HH] foot). Default prominence is trochaic. As mentioned earlier, the major disadvantage of this analysis is its use of double-headed feet.

[8] Notice that syllable catalexis, as a PrWd rather than a PrSt property, does not annihilate the analysis of disyllabic verb stems given above.

numbers of syllables require catalexis in order to be fully parsable into binary feet. The structures in (25) present output metrical parsings of the words of (24). Square brackets indicate PrWd edges, while feet are indicated in the bracketed grid notation:

```
(25)  a.     (*          .    )         b.      (*         .        .   )
             (*    .)  (*   .)                  (*    .)  (*    .) (*   .)
            [[dúɾ.gin].bì.gu]                [[[d̪áa.ba].ŋàl.ŋa].là σ]

      c.     (     *          . )       d.    (*     *      .    )
             ( .   *)  (.     *)              (*)   (*)    (*   .)
            [[ma.gíil].ŋay.gù]               [[búu.ɾáay].bì.gu]
```

The combined forces of undominated Disyll and Parse-σ predict that an initial #HL sequence is parsed as an unbalanced trochee (25b), thereby violating RhHrm (26e)[9]. An overview of constraints that are relevant to Guugu Yimidhirr stress is given below:

(26)			
	a.	**Harmony**[10]	Feet have identical prominence within PrWd.
	b.	**Parse-σ**	Every syllable belongs to a foot.
	c.	**Align-R**	Align (LexWd, R, PrWd, R)
	d.	**RhType=T**	Feet are trochaic.
	e.	**RhHrm**	*(HL)

The ranking of these constraints w.r.t. those given earlier (FtBin, Align-Wd, Disyll, Align- σ) is as follows:

(27) FtBin, Align-Wd, Disyll, WSP, HdWd, Harmony, Parse-σ » Align-σ » Align-R » RhType=T, RhHrm

In (28) I summarize evidence for some crucial individual rankings of these constraints:

(28) *Ranking:*	*Because:*	
FtBin » Align-σ	[[(dúɾ.gin)].(bì.gu)]	> [[[(dúɾ.gin)].(bì)].(gù)]
Harmony » RhType=T	[[(ma.gíil)].(ŋay.gù)]	> [[(ma.gíil)].(ŋày.gu)]
Disyll » Align-σ, Align-R	[[(búu.ɾa)].(yày.σ)]	> [[(búu)].(ɾà.yay)]
Parse-σ » Align-σ	[[(dúɾ.gin)].(bì.gu)]	> [[[(dúɾ.gin)].bi].gu]
Parse-σ » Align-R	[[(máɾ.bu)].(gàn.σ)]	> [[(máɾ.bu)].gan]
Parse-σ » RhType=T	[[(ma.gíil)].(ŋay.gù)]	> [[ma.(gíil)].(ŋày.gu)]
Align-R » RhHrm	[(gúu.gu)]	> [(gúu).(gù.σ)]
Align-σ » RhHrm	[(gúu.gu)]	> [(gúu).(gù.σ)]
Align-σ » Align-R	[[(búu.ɾa)].(yày.σ)]	> [(búu).(ɾà.yay)]

First consider tableaux of #LL cases, which do not involve WSP. To save space in the tableaux, undominated Align-Wd has been omitted:

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[9] Arguments for the unbalanced trochee on the basis of root structure in Kambera were given by (Van der Hulst & Klamer, this volume).

[10] McCarthy & Prince (1986) propose a similar foot harmony principle to account for Yidiɲ stress.

(29) /maɾbugan/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [[(máɾ.bu)].(gàn.σ)]							**	*	
b. [[(maɾ.bú)].(gan.`σ)]							**	*	*!*
c. [[(máɾ.bu)].gan]						*!	*		
d. [(máɾ.bu).gan]						*!	***		
e. [[(maɾ.bú)].(gàn.σ)]				*!					*
f. [[(máɾ.bu)].(gàn)]	*!						*		

(30) Input: /duɾginbigu/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [[(dúɾ.gin)].(bì.gu)]							**		
b. [[(duɾ.gín)].(bi.gù)]							**		*!*
c. [[[(dúɾ.gin)].bi].gu]						*!*	*		
d. [[(dúɾ.gin)].(bi.gù)]				*!					
e. [[(dùɾ.gin)].(bí.gu)]			*!						
f. [[[(dúɾ.gin)].(bì)].(gù.σ)]	*!							*	
g. [[[(dúɾ.gin)].(bì)].(gù)]	*!*								

Next consider the tableaux of #HL cases. The initial heavy syllable is not parsed as a [H] foot because of undominated DISYLL (31d-32d-33d) or PARSE-σ (31c-32c-33c), or because of ALIGN-σ (31b-32b-33b).

(31) /guugu/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [(gúu.gu)]							*		
b. [(gúu).(gù.σ)]							**!*	*	
c. [(gúu).gu]						*!	*		
d. [[(gúu)].(gù.σ)]					*!		*	*	
e. [(gúu).(gù)]	*!						*		

(32) /buuɾayay/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [(búu.ɾa)].(yày.σ)]							**	*	
b. [(búu).(ɾà.yay)]							***!		
c. [(búu).ɾa].yay]						*!*	*		
d. [[(búu)].(ɾà.yay)]					*!		*		
e. [[(búu).(ɾà)].(yày)]	*!*						*		

(33) /buuɾayaygu/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [(búu.ɾa)].(yày.gu)]							**		
b. [[(búu).(ɾà.yay)].(gù.σ)]							***!*	*	
c. [(búu).ɾa].(yày.gu)]						*!	**		
d. [[[(búu)].(ɾà.yay)].(gù.σ)]					*!				
e. [(búu).(ɾà)].(yày.gu)]	*!								

Next consider the tableaux of #LH cases. Here an initial iamb arises due to WSP while iambic rhythm is due to HARMONY. The final syllable in output (34a) forms an iamb together with the catalectic syllable, but remains unstressed because it is in the weak position of the foot.

(34) /nambaalŋan̪/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [[(na.mbáal)].(ŋan̪.`σ)]							**	*	**
b. [[(na.mbáal)].ŋan̪]						*!	*		*
c. [[(na.mbáal)].(ŋàn̪.σ)]				*!			**	*	*
d. [[(ná.mbaal)].(ŋàn̪.σ)]		*!					**	*	
e. [[(na.mbáal)].(ŋàn̪)]	*!						*		*

(35) /magiilŋaygu/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a. ☞ [[(ma.gíil)].(ŋay.gù)]							**		**
b. [[[(ma.gíil)].ŋay].gu]						*!*			*
c. [[(ma.gíil)].(ŋày.gu)]				*!			**		*
d. [[(má.giil)].(ŋày.gu)]		*!					**		
e. [[(mà).(gíil)].(ŋày.gu)]	*!						**		

Finally consider the tableau of a #HH case[11]. Both heavy syllables are primary stressed because of WSP, while rhythm is trochaic due to RHTYPE=T:

(36) /buuɾaaybigu/	FT-BIN	WSP	HD-WD	HAR-MONY	DI-SYLL	PARSE-σ	ALIGN-σ	ALIGN-R	RHTYPE =T
a.☞ [[[(búu).(ɾáay)].(bì.gu)]							**		
b. [[[(búu).(ɾáay)].(bi.gù)]							**		*!
c.[[[(búu).(ɾáay)].bi].(gù.σ)]						*!	**	*	
d. [[(búu.ɾaay)].(bì.gu)]		*!							
e. [[(búu).(ɾàay)].(bì.gu)]		*!							

Finally, let us return to the restriction that long vowels do not occur outside the first two syllables of PrWd. I assume that vowel length in positions outside Head-PrWd is subject to deletion, in the sense of *mora loss*. More formally, PARSE-μ[12] ranks below the constraints governing the distribution of weight, i.e. WSP and HDWD. We are able to rank PARSE-μ more precisely w.r.t. the other constraints. Below I use *H*$^-$ to indicate a heavy syllable of which one input mora is left unparsed (cf. Prince & Smolensky 1993):

(37)	*Ranking:*	*Because:*		
	ALIGN-σ » PARSE-μ	[[(**LL**)] (**L**H$^-$)]	>	[(**LL**) (L**H**)]
	PARSE-μ » RHTYPE=T	[[(L**H**)] (LL)]	>	[[(**L**H$^-$)] (**LL**)]
	PARSE-μ » RHHRM	[[(**H**L)]	>	[(**H**$^-$L)]

---

[11] Unfortunately, Haviland (1979) does not exemplify the stress pattern of words of the type HHL. My analysis predicts [[(H)(H)](Lσ)], with a secondary stress on the third syllable.

[12] Unfortunately, no alternations illustrate the neutralization of vowel length outside the Head-PrWd. This is due to the fact that Guugu Yimidhirr is an exclusively suffixing language. Loss of length could occur only in case a long stem vowel were 'pushed' outside the initial disyllabic window by a prefix, and consequently were shortened .

3.3 Morpheme-specific disyllabicity

In three contexts, Guugu Yimidhirr morphemes are strictly disyllabic, i.e. *non-recursive* PrWds. These contexts are: *verb stems* (monosyllabic roots being always augmented), *adjectival reduplicants*, *bases of certain inflectional suffixes* (longer and shorter bases take allomorphs of these suffixes). Of course, the lower bound is due to DISYLL. The question arises what causes the upper bound (i.e. 'two and no more than two') in these contexts[13]. I will argue below that the upper bound reflects the right-edge alignment of PrWd with MCat, which may be enforced by various factors.

I first consider verb stems. Most (203/215 or 94.4%) are disyllabic by virtue of a disyllabic root, while all nine monosyllabic roots are obligatorily augmented up to the size of a disyllabic stem[14]. Disyllabic verb roots are distributed over three conjugations, named after their (typical though not uniform) final segment in the Nonpast tense stem form. These are the *L*-conjugation (marked by *-l*), *R*-conjugation (marked by -ɾ), and *V*-conjugation (marked by a stem-final long vowel). Examples of Nonpast stems are:

(38)		*L-conjugation*	*R-conjugation*	*V-conjugation*
	LL	gunda-l 'hit'	ŋalbu-ɾ 'shut, close'	---
	HL	baada-l 'try, taste'	gaama-ɾ 'vomit'	---
	LH	---	gayii-l 'hook, snare'	d̪ada-a 'go'
	HH	---	miidaa-ɾ 'lift'	baaɾŋa-a 'yell'

The more interesting cases are nine monosyllabic verb roots, which are distributed over three irregular conjugations, i.e. 3 in the MA conjugation, 3 in the NA conjugation (one of which is a verbalizing formative), and 3 in the 'monosyllabic' L conjugation (all of which are actually verbalizing formatives). All monosyllabic verb roots are *augmented to meet disyllabicity*, and maintain the augment under further suffixation, as well as reduplication. For example, the Purposive of disyllabic roots is based on the root, while that of monosyllabic roots is based on the augmented (disyllabic) Past or Nonpast stem.

(39)	*Conj*	*Root*	*Nonpast stem*	*Past stem*	*Purposive*	*Gloss*
	L	/gunda-/	gunda-l	gunda-y	gunda-n̪u	'hit'
	MA	/n̪aa-/	n̪aa-maa	n̪aa-d̪i	n̪aa-d̪i-n̪u	'see'
	NA	/wu-/	wu-naa	wu-nay	wu-na-n̪u	'lie, exist'
	L	/=ma-/	=ma-l	=ma-d̪i	=ma-d̪i-n̪u	(Inchoative)

Stem disyllabicity is respected by the derivational morphology, which never produces derived stems that are longer than two syllables (except under reduplication, which will be addressed in Section 5). Specific derivational suffixes are added by compounding to a so-called *derived stem form*, which is formed by adding *-:l*, *-:y*, or *-:ɾ*. The second

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[13] Similar observations are made by McCarthy & Prince (1994:18) w.r.t. stem reduplication in Diyari and other languages. They argue that the *prosodically unmarked* structures assert themselves whenever faithfulness constraints need not be respected (as is the case in reduplicants, which unlike stems, need not respect PARSE and FILL). Such an account might explain strict disyllabicity of the adjectival reduplicant, and perhaps disyllabic base selection by suffix allomorphs as well. However, it fails to generalize to verb stem disyllabicity, since verbs stems are subject to faithfulness.

[14] Only three (1.5%) verb roots are longer than disyllabic. Haviland (1979:82) argues that both of the quadrisyllabic roots are best viewed as (semantically opaque) compounds.

type of derived stem, the *reflexive stem form*, is formed by stem vowel lengthening, and it functions as the basis of inflectional suffixes. Examples are given below:

(40)		*L*	*R*	*NA*
	Root	/gunda-/	/ŋalbu-/	/n̪aa-/
	Derived stem form	gunda-:y	ŋalbu-:ɾ	---
	Adjective	gunda-:y=baga	ŋalbu-:ɾ=baga	---
	Causative	gunda-:y=ma-naa	ŋalbu-:ɾ=ma-naa	---
	Reflexive stem form	gunda-:	ŋalbu-:ɾ	n̪aa-d̪a-:
	Past	gunda-:d̪i	ŋalbu-:ɾ=ŋaɾa-:d̪i	n̪aa-d̪a-:d̪i
	Nonpast	gunda-:ya	ŋalbu-:ɾ=ŋaɾa-:ya	n̪aa-d̪a-:ya
	Imperative	gunda-:yi	ŋalbu-:ɾ=ŋaɾa-:yi	n̪aa-d̪a-:yi

How to analyse strict disyllabicity of verb stems in terms of constraints? As I noted earlier, a verb stem equals a nonrecursive PrWd (a ‘Head-PrWd’). Every PrWd is minimally disyllabic because of DISYLL, while maximally two syllables may occur in a Head-PrWd because of ALIGN-σ. The anti-recursivity effect is due to ALIGN-VERB:

(41) **ALIGN-VERB**
Align (PrWd, Right, Verb Stem, Right)

This constraint makes the strong assertion that *every PrWd must stand final in a verb stem*. Consequently no PrWd edges may occur inside the verb stem. The only structure satisfying this requirement is a nonrecursive PrWd that is right-aligned with verb stem, i.e. disyllabic verb stem. (Later I will explain why nonverbs may violate ALIGN-VERB.)

Although there is no direct evidence from alternations, I assume that trisyllabic or longer verb roots are actually truncated into a disyllabic PrWd format. This can be modelled as the domination of faithfulness (crucially PARSE) by ALIGN-VERB:

(42) DISYLL, ALIGN-VERB » ALIGN-σ » PARSE

Note that trisyllabic (or longer) verb roots could never surface in their underlying form. As a result of *lexicon optimization*, such roots will not occur as underlying forms either.

Verb stem disyllabicity may in principle also be violated by monosyllabic roots. In Guugu Yimidhirr, minimal stem disyllabicity is *never* enforced by vowel epenthesis. (In this respect the situation resembles that of Axininca.) In terms of constraint ranking, FILL-NUC » DISYLL. But in verb roots, it is enforced by obligatory *augmentation*, with a suffix as an augment (cf. 39). Note that augmentation is no violation of FILL-NUC, since ‘genuine’ morphemes are used[15].

Next consider nonverbal stems. If undominated, ALIGN-VERB would incorrectly deny any MCats other than verb stems (e.g. nouns) the option of having PrWd structure at all. Since this is not the case, there must be an undominated constraint which sees to it that all lexical categories acquire PrWd prosody:

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[15] To rule out augmentation of longer roots I assume, a ‘minimal effort’ constraint STEM ≤ ROOT, requiring that a Stem equals a Root (and nothing more). This must be dominated by DISYLL, and also by PARSE-M-FEAT: “Overtly expres morphosyntactic features by affix”, since feature-bearing (non-augmentation) suffixes are freely allowed on stems of any length.

(43) **LX ≈ PR**
A member of the morphological category MCat corresponds to a PrWd.

Let us now turn to disyllabicity in adjectival reduplication. This process, which indicates intensity or repetition, copies the first two syllables of the base (i.e. $C_1v_1C_2v_2$), regardless of their quantity (cf. 44c):

(44)	a.	yimid̪iɾ	‘this way’	yimi=yimid̪iɾ	‘this same way again
	b.	gal(a)bay	‘long’	gala=galbay	‘very far away’
	c.	gad̪ii	‘far away’	gad̪ii=gad̪ii	‘very far away’
	d.	dindal	‘quick’	dinda=dindaal-gu	‘quickly’

As Haviland (1979:62) points out, the pattern of lengthening of *dinda=dindaal-gu*, with vowel length on the *fourth* syllable, indicates that adjectival reduplication produces a double PrWd structure, i.e. a *compound*. (Pre-suffixal lengthening itself is a completely regular process, to be discussed in §4.) Since both the reduplicant and the base form PrWds on their own, strict disyllabicity of the reduplicant cannot be explained in terms of antirecursivity. Instead compound PrWd status of the construction follows from:

(45) **ADJ$_{RED}$= STEM**
The Adjectival Reduplicant is a stem.

In the analysis of Diyari reduplication by McCarthy & Prince (1994), disyllabic PrWd size of the reduplicant is construed as an ‘emergence of the unmarked’. The reduplicant is not subject to faithfulness (in particular to PARSE); therefore its size approximates the prosodically ideal PrWd, a single foot (this is perfectly aligned, and satisfies exhaustive parsing). In Guugu Yimidhirr an adjectival reduplicant of three or more syllables would violate independently motivated high-ranking constraints, e.g. PARSE-σ and/or ALIGN-R[16]. (These are ranked above MAX.)

(46) /yimi-d̪iɾ, RED/	ADJ$_{RED}$=STEM	FTBIN	PARSE-σ	ALIGN-R	MAX
a. ☞ [(yí.mi)]=[[(yí.mi)]-(d̪ìɾ.σ)]				*	d̪iɾ
b. yi=[[(yí.mi)]-(d̪ìɾ.σ)]	*!		*	*	mid̪iɾ
c. [(yí)]=[[(yí.mi)]-(d̪ìɾ.σ)]		*!		*	mid̪iɾ
d. [[(yí.mi)]-d̪iɾ]=[[(yí.mi)]-(d̪ìɾ.σ)]			*!	*	σ
e. [[(yí.mi)]-(d̪ìɾ.σ)]=[[(yí.mi)]-(d̪ìɾ.σ)]				**!	

The third case of morpheme-governed disyllabicity is that of certain inflectional suffixes that select disyllabic stems as their base. An example is the (pre-lengthening) ergative allomorph *-n̪*. (Longer stems stems take other allomorphs, e.g. *-ndu* and *-ŋun*.)

(47)	a.	/yugu/	yugu(:)-n̪		‘wood-ERG’
	b.	/muuni/	muuni(:)-n̪		‘stickiness-ERG’
	c.	/balinga/	balinga-ŋun	*balinga(:)-n̪	‘porcupine-ERG’
	d.	/waarigan/	waarigan-ndu	*waari(:)-n̪-gan	‘moon-ERG’

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[16] Note that NOCODA » MAX because *dinda=dindaal-gu* > *dindaal=dindaal-gu*. Lengthening of the second stem syllable is induced by suffix *-gu*, and will be discussed in Section 4. The fact that *dinda=dindaal-gu* has no vowel length in the reduplicant (**dindaa=dindaal-gu*) follows from another constraint discussed below.

This may be analyzed by the constraints of (48a-c), ranked as in (48d)[17]:

(48) a. **Afx-to-PrWd**
Base of ERG -:*n̪* is PrWd.

b. **Rightmost**
Suffix is located at the right edge of word.

c. **M-Parse**
Morphemes are parsed into morphological constituents.

d. Afx-to-PrWd, Rightmost, Align-σ » M-Parse

The ranking (48d) expresses that it is better for an ergative form to remain ‘unrealized’ (the ‘null-parse’ 49c-49b, a violation of M-Parse) than to adjoin ergative -*n̪* to a base that is not disyllabic (and thus violate Afx-to-PrWd):

(49) /balinga, -n̪/	Afx-to-PrWd	Align-σ	M-Parse
a. [[ba.lin].ga-n̪]	*!		
b. [ba.lin.ga-n̪]		*!	
c. ☞ /balinga, -n̪/			*

The relevance of Rightmost » M-Parse becomes clear when we consider the fact that Afx-to-PrWd cannot be satisfied by infixation into a longer stem (cf. 47d):

(50) /waarigan, -n̪/	Afx-to-PrWd	Rightmost	M-Parse
a. [[waa.ri-n̪]].gan]		*!	
b. ☞ /waarigan, -n̪/			*

In sum, I have demonstrated that strict disyllabicity is due to two types of factor, viz. morpheme-specific alignment (Align-Verb, Afx-to-PrWd), and size requirement (Adj_{RED}= Stem). What these factors share in common is that they produce structures in which a specific morpheme is right-aligned with the Head-PrWd. In all cases, minimal disyllabicity follows from Disyll.

4. Suffixal lengthening and shortening

Guugu Yimidhirr has three kinds of suffix, *regular*, *lengthening*, and *shortening*, which are distinguished by their effect on the length of the vowel in the second syllable of the stem to which they attach. As observed earlier, no suffix affects the length of a vowel other than those in the *second* syllable. This was explained in Section 3.1 as a combined effect of two undominated constraints, viz. WSP (“heavy syllables are main-stressed”), and HdWd (“main-stressed syllables stand in the Head-PrWd”).

A *regular* suffix such as -*ŋun* (51a) lengthens a stem vowel if it is followed by a liquid or a glide (i.e., any possible coda consonant except a nasal). A *lengthening* suffix such as -*:ŋu* (51b) behaves in every respect as a R-suffix, but in addition it lengthens a stem-final vowel (51b.ii). Finally, a *shortening* suffix such as -*in̪* (51c) shortens a vowel that is followed by a consonant in its stem.

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[17] Compare the analysis of Dyirbal allomorphy in McCarthy & Prince (1993a:110-113).

(51)	*R*-suffix /-ŋun/	a.i	/buɲɟul/	buɲɟuul-ŋun	‘frill lizard-ERG’
		a.ii	/mayi/	mayi-ŋun	‘food-ERG’
		a.iii	/ŋalan/	ŋalan-ŋun	‘sun-ERG’
	L-suffix /-:ŋu/	b.i	/ŋalgal/	ŋalgaal-ŋu	‘smoke-PURP’
		b.ii	/min̪a/	min̪aa-ŋu	‘meat-PURP’
		b.iii	/bayan/	bayan-ŋu	‘house-PURP’
	S-suffix /-$in̪/	c.	/gabiiɾ/	gabiɾ-in̪	‘girl-ERG’

Membership of suffix category (*R*, *L*, *S*) is partly predictable. First, all and only vowel-initial suffixes are shortening. Second, all -CCv suffixes of which the first consonant is an oral consonant (a liquid or a glide), are lengthening, e.g. *-:ygu*, /*bama*/, *bamaa-ygu* ‘Aboriginal person-EMPH’. All remaining suffixes are regular or lengthening, but this is unpredictable. I will argue below that L-suffixes are lexically represented with a free mora that associates to an immediately preceding stem vowel.

The fact that Cv skeletons are relevant points to a familiar type of sensitivity to syllable structure. Preliminary analysis shows that vowel-initial suffixes produce open stem syllables, and *shorten* their vowels that stand at the end of the Head-PrWd (52b). This nicely matches the fact that ‘regular’ suffixes *fail to lengthen* stem-final vowels in open syllables in the same context (52c). As a counterpart of ‘open syllable shortening’, puzzling ‘closed syllable lengthening’ applies to every second stem syllable that is not closed by a nasal (52a):

(52)	a.i	/buɲɟul-ŋun/	[[bu.^{ɲ}ɟuul].-ŋun]	>	[[bu.^{ɲ}ɟul].-ŋun]
	a.ii	/bama-ygu/	[[ba.maa-y].gu]	>	[[ba.ma-y].gu]
	b.	/gabiiɾ-in̪/	[[ga.bi].ɾ-in̪]	>	[[ga.bii].ɾ-in̪]
	c.	/mayi-ŋun/	[[ma.yi].-ŋun]	>	[[ma.yii].-ŋun]

In the next sections I will argue that pre-suffixal lengthening and shortening are due to a pair of constraints that both refer to Head-PrWd. The first of these, ALIGN-H, aligns the right edge of PrWd with a heavy syllable.

(53) **ALIGN-H**
Align (PrWd, Right, $\sigma_{\mu\mu}$, Right)

Weight of the PrWd-final syllable always attracts stress because of undominated WSP. Since the optimal [(L**H**)] output of /LL/ violates both RHTYPE=T and FILL-μ, we find:

(54) WSP, ALIGN-H » RHTYPE=T, FILL-μ

Dominating ALIGN-H must be some constraint which induces shortening as well as non-lengthening of open syllables in PrWd-final position (52b-c). This is identified as FREE-V (Prince & Smolensky 1993:101)[18]:

(55) **FREE-V**
PrWd-final vowels must not be parsed.

---

[18] Prince & Smolensky add “in the nominative”, a specific requirement relevant to Lardil only.

I deviate from Prince & Smolensky (1993) in interpreting FREE-V not as an anti-parsing constraint that refers to inputs vowels, but rather as one that minimizes the quantitative material to which a PrWd-final vocalic segment is spread out. This is motivated by two types of evidence. First, it may be gradually satisfied by long vowel *shortening* (rather than full deletion) in contexts where deletion is ruled out by top-ranking syllabification constraints. Shortening due to FREE-V is alluded to by Prince & Smolensky (1993:101), who remark that "It appears to be the morphologized reflex of the prosodic weakness of final open syllables, which are liable to de-stressing, de-voicing, shortening, truncation, and so on, under purely phonological conditions". Even though FREE-V is best satisfied by leaving unparsed both input moras of a long input vowel (i.e. full V-deletion 56c), it is satisfied *gradually* by leaving unparsed only one input mora (i.e. V-shortening 56b):

```
(56)  a.     σ           b.    σ                 c.
            / \                |
            μ μ                μ <μ>                     <μ μ>
            \ /                 \ /                       \ /
             a     (input)       a    (V-shortening)       a    (V-deletion)
```

In Guugu Yimidhirr, vowels in open second syllables of longer words are shortened, but no vowel, be it long or short, is ever deleted. Shortening, but not deletion, respects an undominated constraint PARSE-VOWEL 'vocalic segments must be parsed'.

Second, to the shortening effects of FREE-V that were just mentioned we would like to add PrWd-final *non-lengthening*. PrWd-final vowels are frequently exempt from lengthening rules that affect metrically strong open syllables (e.g. in iambic languages discussed by Hayes 1995). A mora association view of FREE-V not only covers deletion and shortening, but also the non-lengthening of PrWd-final vowels (cf. 52c).

This preliminary analysis still does not answer for the following questions. First, why do nasal codas inhibit vowel lengthening? Second, why may lengthening suffixes create long open syllables, contra FREE-V? Third, why are long stem vowels shortened only if a consonant follows within the stem, e.g. */gabiiɾ-in̪/ gabiɾ-in̪* vs. *gudaa-ŋun* 'dog-PURP'? Answers require a more detailed discussion of the three types of suffix.

4.1 Regular suffixes

Regular suffixes lengthen a vowel if it is followed in the stem by an oral consonant, i.e. liquid or glide /l, ɽ, ɾ, y/. Examples are ERG *-ŋun*, DAT *-bi*/*-wi*, and ERG *-nda*.

(57) *R-suffixes: Lengthening effects*

a.	/buɲɟul/	buɲɟu[:]l-ŋun	(= buɲɟuul-ŋun)	'frill lizard-ERG'
b.	/d̪amal/	d̪ama[:]l-bi	(= d̪amaal-bi)	'foot-DAT'
c.	/maɲal/	maɲa[:]l-nda	(= maɲaal-nda)	'hand-ERG'

Observe that -CCv suffixes beginning with an oral consonant lengthen a stem vowel in precisely the same context, i.e. when it stands in a syllable that is closed by a liquid or glide. The only difference is that now the closing consonant is provided by the suffix, rather than the stem. Examples of -CCv suffixes that behave like this are EMPH -*:ygu*, LOC -*:lŋguɽ*, PAST+NEG -*:lmugu*, and PERF -*:yga*:

(58)	a.	/bama/	bama[:]-ygu	‘Aboriginal person-EMPH’
	b.	/guŋga/	guŋga[:]-lŋguɽ	‘North-LOC’
	c.	/wud̪i/	wud̪i[:]-lmugu	‘ask-PAST+NEG’
	d.	/baawa/	baawa[:]-yga	‘cook-PERF’

For these suffixes, the distinction between ‘regular’ and ‘lengthening’ is irrelevant. For reasons of generality I treat them among the *regular* suffixes.

No regular suffix lengthens a vowel that (i) is not in the second syllable in the word (cf. 59a), or (ii) stands in a final syllable (cf. 59b), or (iii) stands in absolute stem-final position (cf. 59c), or (iv) is followed by a nasal (cf. 59d):

(59) *R-suffixes: Non-lengthening effects*

a.i	/wuluŋguɾ/	wuluŋguɾ-ŋun	*wuluŋgu[:]ɾ-ŋun	‘light-ERG’
a.ii	/wuluŋguɾ/	wuluŋguɾ-nda	*wuluŋgu[:]ɾ-nda	‘light-ERG’
b.i	/baga/	baga-y	*baga[:]-y	‘dig-PAST’
b.ii	/d̪amba/	d̪amba-ɽ	*d̪amba[:]-ɽ	‘throw-NONPAST’
c.i	/mayi/	mayi-ŋun	*mayi[:]-ŋun	‘food-ERG’
c.ii	/biiba/	biiba-wi	*biiba[:]-wi	‘father-DAT’
c.iii	/guŋga/	guŋga-ngaɽ	*guŋga[:]-ngaɽ	‘North-LOC’
d.i	/ŋalan/	ŋalan-ŋun	*ŋala[:]n-ŋun	‘sun-ERG’
d.ii	/bayan/	bayan-bi	*baya[:]n-bi	‘house-DAT’

No regular suffix shortens an underlying long vowel in the second syllable, regardless of whether it is stem-final (cf. 60a), or before a nasal (cf. 60b):

(60) *R-suffixes: Non-shortening effects*

a.	/gudaa/	gudaa-ŋun	*guda‹a›-ŋun	‘dog-ERG’
b.i	/diwaan/	diwaan-ŋun	*diwa‹a›n-ŋun	‘turkey-ERG
b.ii	/ŋulbaan/	ŋulbaan-bi	*ŋulba‹a›n-bi	‘cloud-DAT’

Summarizing, regular suffixes have no effects but to lengthen a stem vowel in a closed syllable with an oral coda. The analysis of this pattern can be split into two issues. First, what causes lengthening of the second syllable? This relates to the interaction between ALIGN-H and other constraints. Second, what is the nature of the restriction that this syllable be closed by a liquid or glide? This relates to the nasal coda effect and FREE-V.

With respect to the issue of position, it is relevant to note that underived roots have obligatory vowel length *in the same context*, without exception. That is, a general pattern exists such that if the second syllable of a root is non-final, and if it is closed by an oral consonant, then it must have a long vowel:

(61) *Length of non-final second syllables in bare stems*:

a.	L**H**L(L)		b.	H**H**L(L)	
	bul.buuɽ.mbul	‘pheasant’		daa.ɽaal.ŋan	‘kangaroo’
	d̪a.maaɽ.bi.na	‘magpie goose’		ɟii.ɽaay.ŋguɽ	‘old man’

No obligatory lengthening of a closed second syllable occurs if it happens to be final. Hence we observe a free contrast between (62a,c) vs. (62b,d):

(62) *Non-lengthening of final second syllables in bare stems*:

a.	L**L**		c.	H**L**	
	ba.wuɽ	‘rock wallaby’		ŋaa.d̪aɽ	‘dog, dingo’
	bu.gul	‘antbed’		wuu.gul	‘louse, flea’
b.	L**H**		d.	H**H**	
	ga.n̪aaɽ	‘crocodile’		d̪iil.buuɽ	‘jabaroo’
	d̪u.maal	‘thorn, splinter’		gaa.ɽaay	‘raffia palm’

Concentrating first on the issue of position, how to single out the *second syllable* only if it is *non-final*? Second syllable length is obviously the effect of ALIGN-H. But what about the *non-finality* requirement on lengthening? In Section 3, I established that Guugu Yimidhirr stress is *quantity-sensitive*. Hence, if the final syllable of a PrWd were lengthened, it would automatically become stressed, by undominated WSP. This would violate NONFINALITY (McCarthy & Prince 1993a:151), which must dominate ALIGN-H.

(63) **NONFINALITY**
The PrWd-final syllable is unstressed.

Also, since NONFINALITY is enforced by non-lengthening, but not by *shortening* of vowels in final syllables, it must be dominated by PARSE-µ. Adding this up, we find:

(64) WSP, HDWD » PARSE-µ » NONFINALITY » ALIGN-H » FILL-µ

Important individual sub-rankings implied by (64) are motivated in (65):

(65) a. PARSE-µ » NONFINALITY ga.n̪áaɽ > gán̪a‹a›ɽ
b. WSP, HDWD » ALIGN-H wúluŋgùɾ-nda > wùluŋgú[:]ɾ-nda
c. NONFINALITY » ALIGN-H báwuɽ > bawú[:]ɽ
d. ALIGN-H » FILL-µ buɲɟu[:]l-ŋun > buɲɟul-ŋun

Turning to the second issue, the puzzling fact that the syllable to be lengthened must be *closed*, but may not be closed by a *nasal*. The fact that vowels in open syllables fail to lengthen before regular suffixes has been attributed above to FREE-V (55), which in effect prohibits long vowels in absolute final position in PrWd. For regular suffixes, it is enforced by non-lengthening (cf. *mayi-ŋun*), but not by shortening (cf. **guda-ŋun*). This points to a ranking of FREE-V above ALIGN-H, but below PARSE-µ.

(66) a. PARSE-µ » FREE-V gudaa-ŋun > guda‹a›-ŋun
b. FREE-V » ALIGN-H mayi-ŋun > mayi[:]-ŋun

(The discussion of shortening affixes in Section 4.2 will lead to a small but significant revision of this ranking.)

4.1.1 Nasal codas

In order to see what is special about nasal codas after long vowels, we must first look into some phonotactics. Guugu Yimidhirr disallows word-initial complex onsets as well as word-final complex codas. This suggests that *COMPLEX (Prince & Smolensky 1993) is undominated. The prediction is that intervocalic clusters may contain maximally two consonants (a single coda plus a single onset). However, three-consonant clusters occur in intervocalic position. Such clusters always consists of a *possible word-final coda* /l, ɽ, ɾ, y/ (as the first consonant) plus a *homorganic nasal plus stop* (as the second and third consonants). Ternary clusters occur both after short and long vowels:

(67) a. gaɽ.ᵐbi ‘blood’ wal.ᵑga ‘heart, breath, insides’
b. yiiɽ.ᵐbaaɽ ‘rib’ gaal.ᵑgaan ‘blue-tailed mullet’

This strongly suggest that homorganic NC clusters are actually *pre-nasalised stops*, and therefore mono-segmental. This assumption completely eliminates complex onsets. The fact that prenasalised stops do not occur word-initially must be due to some independent constraint that I will not state here.

Let us now turn to the distribution of nasals after long vowels. Nasals after *long vowels* must be homorganic with following consonant, always an *oral stop*[19].

(68) ᵐb gaa.ᵐbi ‘flying fox’ ⁿd mil.gaa.ⁿduɽ ‘seagull’
ᶮɟ ɲuu.ᶮɟu ‘neck, throat’ ᵑg gaa.ᵑga ‘yam’

In contrast, nasals may, but need not, be homorganic with following consonant after *short* vowels. If the cluster is not homorganic, then the nasal is invariably *coronal*, the unmarked place of articulation[20]:

(69) n.b bun.ba ‘large dilly-bag’, gan.bi ‘blood’
n.g ŋan.ga ‘flower, feather’, ba.lin.ga ‘porcupine’
n.m wan.ma ‘dance, song’, bun.muul ‘sore, swelling’

When homorganic NC clusters are actually pre-nasalized stops, this observation can be restated as a constraint *VVN:

(70) ***VVN**
Long vowels must not be followed by nasal codas.

I will assume this constraint throughout the remainder of this paper, although I suspect that it can be decomposed[21].

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[19] Only three exceptions occur, cf. *ɟiin.bal* ‘to tease’, *buduunbina* ‘thunder’, *daangaay* ‘wind’.

[20] These phenomena point to the conclusion that codas cannot license place features, i.e. the familiar *Coda Condition* (Itô 1986). Accordingly codas must either share place features with a following consonant, or not have any place features at all (be coronal).

[21] Assuming a theory of syllable structure that has constituents *Onset*, *Nucleus* and *Coda* (Prince & Smolensky 1993), *VVN can be reduced to two primitive constraints, i.e. *CODA^{Nas} “No nasal codas” (Zec 1988) and *COMPLEX^{Nuc} “No ternary (or *vvC*) nucleus”. Either of these two constraints is necessarily violated in syllabifying a pre-consonantal nasal after a long vowel:

```
(i)   a.    Nuc    *COMPLEX^Nuc          b.    Nuc Coda      *CODA^Nas
            / | \                               / \    |
           vv Nas                              v v   Nas
```

Returning to regular suffixes, we may characterize their behavior w.r.t. the nasal coda constraint *VVN as both non-lengthening and non-shortening. That is, while *VVN blocks lengthening (71a), it is not strong enough to produce shortening (71b):

(71)	a.	*VVN » ALIGN-H	ŋalan-ŋun	>	ŋala[:]n-ŋun
	b.	PARSE-μ » *VVN	diwaan-ŋun	>	diwa‹a›n-ŋun
			diwaan	>	diwa‹a›n

Or in terms of ranking, PARSE-μ » *VVN » ALIGN-HD. The total ranking of constraints that are relevant to lengthening and shortening found so far are is given in (72):

(72) WSP, HDWD » PARSE-μ » NONFINALITY, FREE-V, *VVN » ALIGN-H » FILL-μ

From here on I will first discuss shortening suffixes in Section 4.2, and then turn to lengthening suffixes in Section 4.3.

4.2 Shortening suffixes

Shortening suffixes shorten a long vowel in the second stem syllable if it is open. Some examples are ERG -$*iɲ* and -$*il*, DAT -$*ay*, and PURP -$*a*:

(73)	a.	/gabiiɾ/	ga.bi‹i›.ɾ-in̪	(= ga.bi.ɾ-in̪)	‘girl-ERG’
	b.	/nubuun/	nu.bu‹u›.n-il	(= nu.bu.n-il)	‘one-ERG’
	c.	/gaan̪aal/	gaa.n̪a‹a›.l-ay	(= gaa.n̪a.l-ay)	‘older sister-DAT’
	d.	/buuɽaay/	buu.ɽa‹a›.y-a	(= buu.ɽa.y-a)	‘water-PURP’

As mentioned before, *all and only* vowel-initial suffixes are shortening[22]. Shortening is due to FREE-V, the constraint minimizing quantity of vowels in absolute final position in PrWd. As observed earlier, PrWd-final vowel shortening maximally satisfies FREE-V without violating undominated PARSE-VOWEL.

Ideally, we would like to express that shortening is nothing but the counterpart of the ‘non-lengthening’ effect found before regular suffixes, e.g. *mayi-ŋun*. However, the constraint ranking given in Section 4.1. does *not* predict vowel shortening. In order to explain the non-shortening of long vowels before regular suffixes (e.g. *gudaa-ŋun*), as well as the non-shortening in absolute word-final position, it was necessary to rank PARSE-μ above FREE-V. But shortening suffixes apparently require the reverse ranking:

(74)	a.	Non-shortening:	PARSE-μ » FREE-V	gu.daa.-ŋun	>	gu.da‹a›.-ŋun
				gu.daa-∅	>	gu.da‹a›-∅
	b.	Shortening:	FREE-V » PARSE-μ	ga.bi‹i›.ɾ-in̪	>	ga.bii.ɾ-in̪

Let us assume that the ranking (74b) is correct. Then what causes non-shortening before regular suffixes and at word-end? No affix-specific property can be involved here, since *all and only* vowel-initial suffixes are shortening. Looking closer at both cases, we find that vowel shortening applies if and only if *a consonant follows* the long vowel within

---

[22] As vowel-initial suffixes, these cannot take vowel-final stems, since that would create hiatus, and onset epenthesis is ruled out. Moreover, a more optimal C-initial allomorph can always be found (cf. ERG -$*iɲ*/-:*ɲ*, ERG -$*il*/-:*l*).

the stem (cf. 74b). In contrast, a long vowel standing at the end of both the stem and the Head-PrWd, will not be shortened (cf. 74a).

The contrast looks much like the ‘derived context effect’ of Lexical Phonology. Vowel shortening only applies if its context (absolute PrWd-final position) is created by a ‘re-syllabification’ of the stem’s coda as an onset of the suffix syllable. Shortening is blocked in a PrWd-final vowel that is in that context already within the smaller domain of the stem. In Optimality Theory, however, the notion of ‘derived context’ has little or no meaning. But an alternative analysis for non-shortening of a stem-final long vowel is possible, one which is based on *stem alignment*. More specifically, if shortening were to apply in (74a), then the right edge of the morphological stem would not align with the right edge of a syllable. This violates ALIGN (McCarthy & Prince 1993a:46):

(75) **ALIGN**

$$]_{\text{Stem}} =]_{\sigma}$$

Non-alignment of the shortened candidate is shown in the structure (76a). I assume with Prince & Smolensky (1993a:60) that vowel shortening amounts to the *non-parsing of a mora by a syllable*. Consequently the right edge of the syllable, which depends on the right edge of its rightmost mora, fails to coincide with the right edge of the stem, which itself depends on its rightmost element, i.e. the syllabically unparsed mora[23].

(76) a. *Mis-alignment avoidable*: b. *Mis-alignment unavoidable*:

In the contrasting shortening case (76b) mis-alignment cannot be avoided, even by non-shortening. This is because the stem-final consonant must be syllabified as the onset of the suffix vowel. There is no way to avoid this because both ONS and FILL$^{\text{ONS}}$ (Prince & Smolensky 1993) are undominated in Guugu Yimidhirr (*ga.biiɾ.in̪, *ga.biiɾ. in̪). Since alignment cannot be satisfied anyway, the optimal candidate is the one that minimally violates the next-lower constraint, i.e. the one with a shortened vowel. I conclude that ALIGN ranks above FREE-V . The revised ranking is given in (77):

(77) FILL$^{\text{ONS}}$, ONS, WSP, HDWD, ALIGN » FREE-V » PARSE-μ » NONFINALITY, *VVN » ALIGN-H » FILL-μ

This ranking predicts that roots contain no long vowels in their second syllable if this is open and non-final. Indeed, the small number of roots that have a long vowel in this position all have special status, e.g. *muu.luu.mul* ‘dove’ (onomatopoeia)[24].

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[23] Relevance of prosodically unparsed elements to morphological edge alignment is assumed by Prince & Smolensky (1993:111).

[24] Also *gilaad̪a* ‘glass’ (a loan, English *glass*), *ɲuɽuumu* ‘mouth’ (only in respectful language).

4.3 Lengthening suffixes

Lengthening suffixes, as compared to regular suffixes, have the additional property of lengthening an immediately preceding stem vowel:

(78)	a.	/mayi/	mayi[:]-ŋu	‘food-PURP’
	b.	/ŋamu/	ŋamu[:]-gal	‘mother-ADES’
	c.	/dani/	dani[:]-^{ŋ}gu	‘slow-EMPH’
	d	/bama/	bama[:]-l	‘Aboriginal person-ERG’
	e.	/yugu/	yugu[:]-n̪	‘wood-ERG’

Actually this is the only special property of lengthening suffixes, which in all other respects are like regular suffixes. First, they trigger lengthening a vowel that is followed by an oral consonant, following the exceptionless pattern discussed in Section 4.1.

(79)	a.	/ŋalgal/	ŋalga[:]l-ŋu	‘smoke-PURP’
	b.	/ɟiiɾal/	ɟiiɾa[:]l-gal	‘wife-ADES’

Second, lengthening suffixes have skeletal shapes that regular suffixes may also have, e.g. they may begin with a single nasal (PURP *-:ŋu*), or a single oral stop (ADES *-:gal*), or a pre-nasalised stop (EMPH *-:^{ŋ}gu*), or they consist of a single oral or nasal consonant (ERG *-:l*, ERG *-:n*). Lengthening suffixes, again like regular suffixes, may also be phonetically empty, e.g. ERG *-:∅*[25]:

(80)	a.	/babi/	ba.bi[:]-∅	‘grandmother-ERG’
	b.	/ŋaad̪aɽ/	ŋaa.d̪a[:]ɽ-∅	‘dog, dingo-ERG’

Third, as is the case with regular suffixes, lengthening is blocked if the preceding stem vowel is not in the second syllable (cf. 81a), or if the second syllable is closed by a nasal (cf. 81b).

(81) *L-suffixes: Non-lengthening effects*

a.i	/bad̪ibay/	bad̪ibay-ŋu	*bad̪iba[:]y-ŋu	‘bone-PURP’
a.ii	/bid̪a-guɽ/	bid̪a-guɽ-gal	*bid̪a-gu[:]ɽ-gal	‘children-ADES’
a.iii	/d̪aɽamali/	d̪aɽamali-gal	*d̪aɽamali[:]-gal	‘thunder-ADES’
b.i	/bayan/	bayan-ŋu	*baya[:]n-ŋu	‘house-PURP’
b.ii	/bayan/	bayan-ŋgu	*baya[:]n-ŋgu	‘house-EMPH’

Finally, again like regular suffixes, lengthening suffixes never shorten stem vowels:

(82) *L-suffixes: Non-shortening effects*

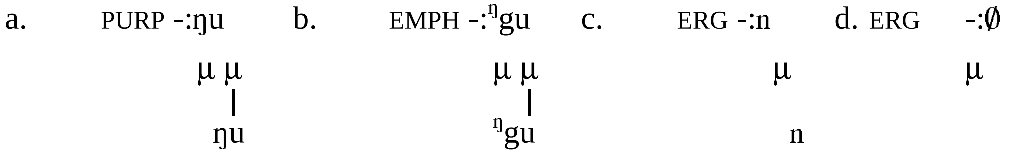
a.	/bulaan/	bulaan-gal	*bula‹a›n-gal	‘3dual-ADES’
b.	/d̪awuun̪/	d̪awuuyn̪-ŋu	*d̪awu‹u›yn̪-ŋu	‘friend-PURP’

---

[25] Lengthening zero-suffixes may be contrasted with ‘regular’ zero-suffixes, such as ABS -∅, e.g. *babi-∅* ‘grandmother-ABS’, *ŋaad̪aɽ-∅* ‘dog, dingo-ABS’.

We must now identify the property that distinguishes lengthening suffixes from regular suffixes. I propose that lengthening suffixes are lexically encoded by an empty mora preceding the suffix:

(83)



Furthermore, the segmentally free suffixal mora demands realisation by some constraint that is ranked above FREE-V, cf. *mayii-ŋu*. PARSE-μ is ranked below FREE-V, and for that reason cannot be the constraint at stake. Instead, the dominating constraint is:

(84) **LINK-μ**
A mora must be associated to a melodic element.

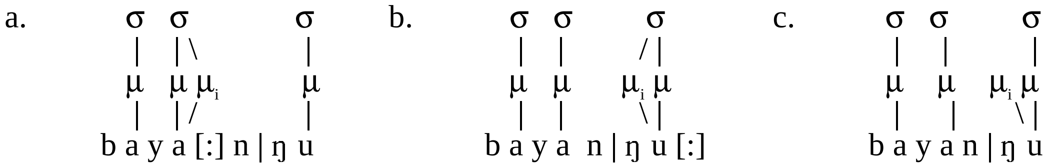
This constraint is dominated by two constraints, one to prohibit the realisation of affixal length on vowels that are outside the Head-PrWd, another to limit it to lengthening immediately adjacent vowels only. The first of these has been identified already as the pair WSP and HDWD. The second is required for the contrast between *yuguu-:n̪* 'wood-ERG', in which lengthening freely applies, and *bayan-:ŋu* 'house-PURP', in which it is blocked. Here the observation is that the lengthened vowel must *immediately precede* the lengthening suffix, since not even a stem consonant may stand in between[26].

With this in mind, we can identify the source of the ill-formedness of *bayaan-ŋu* as RIGHTMOST (McCarthy & Prince 1993a):

(85) **RIGHTMOST**
Suffix is located at right edge of word.

All of a suffix's input elements must stand at the right edge, *including* its free mora (if any). Now consider the representation that would arise by linking the free mora of *-:ŋu* (indexed as μ_i in 86) to the second stem vowel, as in *baya*[:]*n-ŋu* (86a). This violates RIGHTMOST, since a root element (i.e. /n/) stands closer to the right edge than a suffix element (the indexed mora). Nor can the suffix mora be parsed by the suffix syllable, as in (86b), since that would violate WSP or HDWD. Finally, the single remaining option is non-lengthening, i.e. to leave the suffix mora unparsed by a syllable, as in (86c):

(86)



(violates RIGHTMOST) (violates WSP or HDWD) (violates LINK-μ)

Finally we need to establish the ranking of ALIGN w.r.t LINK-μ. Assuming that a suffixal mora that is parsed by a stem syllable violates ALIGN, e.g. *ma.yi-i.ŋu*, it is clear

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[26] Observe that *VVN does not predict this contrast: as we have seen before, *VVN must actually be dominated by LINK-μ, as *yuguu-:n̪* confirms.

that LINK-μ is the higher-ranked of the two. This is shown in (87), which also gives the remaining rankings of ALIGN w.r.t ONS, FILL^{ONS}, and FREE-V:

(87)	a.	ONS » ALIGN	ga.bi‹i›.ɾ-in̪	>	ga.biiɾ.-in̪
	b.	FILL^{ONS} » ALIGN	ga.bi‹i›.ɾ-in̪	>	ga.biiɾ.□-in̪
	c.	ALIGN » FREE-V	gu.daa-ŋun	>	gu.da‹a›-ŋun
	d.	LINK-μ » ALIGN	ma.yi-[:].ŋu	>	ma.yi.-ŋu

The ranking of these constraints w.r.t. the ones given earlier is established in (88):

(88)	a.	LINK-μ » FREE-V	ma.yi-[:].ŋu	>	ma.yi.-ŋu
	b.	LINK-μ » *vvN	yu.gu-[:]n̪	>	yu.gu-n̪
	c.	LINK-μ » NONFINALITY	yu.gu-[:]n̪	>	yu.gu-n̪
	d.	HDWD » LINK-μ	ba.d̪i.bay.-ŋu	>	ba.d̪i.ba[:]y.-ŋu
	e.	HDWD » PARSE-μ	ba.d̪i.bay.-ŋu	>	ba.d̪i.ba[:]y.-ŋu
	f.	RIGHTMOST » LINK-μ	ba.yan.-ŋu	>	ba.ya[:]n.-ŋu
	g.	RIGHTMOST » PARSE-μ	ba.yan.-ŋu	>	ba.ya[:]n.-ŋu

These sub-rankings are integrated into the total ranking in (89):

(89) FILL^{ONS}, ONS, WSP, HDWD, RIGHTMOST » LINK-μ » ALIGN » FREE-V » PARSE-μ » *vvN » NONFINALITY » ALIGN-H » FILL-μ

This is illustrated by the tableaux (90-93):

(90) /mayi, -ŋun/	FILL^{Ons}	ONS	LINK-μ	ALIGN	FREE-V	PARSE-μ	*VVN	ALIGN-H
a. ☞ [[ma.yi].-ŋun]								*
b. [[ma.yi-[:]].ŋun]				*!	*			

(91) /gudaa, -ŋun/	FILL^{Ons}	ONS	LINK-μ	ALIGN	FREE-V	PARSE-μ	*VVN	ALIGN-H
a.☞ [[gu.da‹a›]-ŋun]				*!		*		*
b. [[gu.daa]-ŋun]					*			

(92) /mayi, -:ŋu/	FILL^{Ons}	ONS	LINK-μ	ALIGN	FREE-V	PARSE-μ	*VVN	ALIGN-H
a. [[ma.yi].-ŋu]			*!					*
b. ☞ [[ma.yi-[:]].ŋu]				*	*			

(93) /gabiiɾ, -in̪/	FILL^{Ons}	ONS	LINK-μ	ALIGN	FREE-V	PARSE-μ	*VVN	ALIGN-H
a. ☞ [[ga.bi‹i›].ɾ-in̪]				*		*		*
b. [[ga.bii].ɾ-in̪]				*	*!			
c. [[ga.biiɾ].-in̪]		*!						
d. [[ga.biiɾ].-□in̪]	*!							

5. Verb reduplication

Verb reduplication indicates either repeated action, action in progress, or action done to excess. It copies the second stem syllable including a conjugation-marker /-l, -ɾ, [:]/, if any. Interestingly, lengthening of stem vowels occurs under conditions that are highly similar to suffixal lengthening. E.g., an orally closed stem syllable is lengthened (94a), while a long vowel at the end of a stem is not shortened (94b):

(94)	a.i	/balga-l/	bal.ga[:]l-gal	‘making’
	a.ii	/daga-ɾ/	da.ga[:]ɾ-gaɾ	‘growing’
	b.i	/biini-i/	bii.nii.-ni	‘dying’
	b.ii	/maa^{n}di-i/	maa.^{n}dii.-^{n}di	‘taking’

My hypothesis is that the reduplicant suffix has all properties of *regular suffixes* w.r.t. lengthening. As we proceed, it will become clear that this is the case without exception. Interestingly, due to high-ranked phonotactic constraints the verb reduplicant may take a vowel-initial shape -vC. In this case we find shortening of the stem vowel, precisely as is the case in vowel-initial suffixes (e.g. -$*il*).

A preliminary analysis of verbal reduplication requires the following constraints (McCarthy & Prince 1993a, 1994):

(95)	a.	**RED = AFFIX**	The verbal reduplicant is an affix.
	b.	**RED = σ**	The verbal reduplicant is a syllable.
	c.	**RIGHTMOST**	Suffix is located at right edge of word.
	d.	**SFX-TO-PRWD**	Suffix RED to PrWd.
	e.	**MAX**	Reduplicant = Base.
	f.	**ANCHORING**	In B+R, the final element in R is identical to the final element in B.
	g.	**CONTIGUITY**	R corresponds to a contiguous substring of B.

The following evidence shows that MAX must be dominated by RED=σ, ALIGN-H, WSP, HDWD, and PARSE-μ.

(96)	WSP, HD-WD » MAX	[[da.ga[:]ɾ].-gaɾ]	>	[[da.ga[:]ɾ].-gaaɾ]
	RED = σ » MAX	[[da.ga[:]ɾ].-gaɾ]	>	[[da.ga[:]ɾ].-dagaɾ]
	PARSE-μ » MAX	[[bii.nii].-ni]	>	[[bii.ni‹i›].-ni]
	ALIGN-H » MAX	[[da.ga[:]ɾ].-gaɾ]	>	[[da.gaɾ].-gaɾ]

The reduplication-specific constraints are integrated into the total ranking as in (97):

(97) FILL^{ONS}, ONS, WSP, HDWD, RIGHTMOST, **RED=AFFIX, RED=σ**, **ANCHORING, CONTIGUITY** » LINK-μ » ALIGN » FREE-V » PARSE-μ » *vvN » NONFINALITY » ALIGN-H » FILL-μ, **MAX**

This is illustrated by the tableaux in (98) and (99):

(98) /daga-ɾ RED/	WSP HDWD	RED = σ	ALIGN	FREE-V	PARSE -μ	ALIGN -H	MAX
a. ☞ [[da.ga[:]ɾ].-gaɾ]							da, [:]
b. [[da.gaɾ].-gaɾ]						*!	da
c. [[da.ga[:]ɾ].-dagaɾ]		*!					[:]
d. [[da.ga[:]ɾ].-gaaɾ]	*!						da

The independently motivated ranking ALIGN » FREE-V (Section 4.2) accounts for the fact that reduplicated forms of V-Conjugation stems maintain their stem vowel length (cf. 99b). Also, since WSP and HDWD are undominated (and in particular since they dominate MAX), base vowel length is never copied to the reduplicant (cf. 99d), as it would fall in the third syllable (hence outside the disyllabic Head-PrWd).

(99) /biini-[:] RED/	WSP HDWD	RED = σ	ALIGN	FREE-V	PARSE -μ	ALIGN -H	MAX
a. ☞ [[bii.nii].-ni]				*			bii, [:]
b. [[bii.ni‹i›].-ni]			*!		*	*	bii
c. [[bii.nii].-bi.ni]		*!		*			[:], [:]
d. [[bii.nii].-nii]	*!			*			bii

This basic analysis will now be extended to cases that involve interaction with some other syllabification constraints. Finally, consider the forms in (100), which show non-lengthening and shortening of the stem vowel under reduplication:

(100)	*Non-lengthening*				
	a.	/baawa-l/	baa.wa.l-al	(*baa.wa[:]l.-wal)	‘cooking’
	b.	/d̪ulu-ɾ/	d̪u.lu.ɾ-uɾ	(*d̪u.lu[:]ɾ.-luɾ)	‘scrubbing’
	Shortening				
	c.	/miiɾii-l/	mii.ɾi‹i›.l-il	(*mii.ɾiil.-ɾil)	‘telling, showing’
	d.	/gayii-l/	ga.yi‹i›.l-il	(*ga.yiil.-yil)	‘hooking’

The reduplicant has the shape -vC (e.g. *-al*, *-il*) whenever the second stem consonant is a liquid or glide, while the conjugation marker is a liquid /-l, -ɾ/. The output shows the effect of an undominated constraint on syllabification. More precisely Guugu Yimidhirr disallows approximant clusters, e.g. /lw, ly, lɾ, ɾl/. An undominated constraint rules out transitions between a coda of lesser or equal sonority than the onset of the syllable that follows it (the *Syllable Contact Law*, Vennemann 1988):

(101) **σ-CONTACT**
A coda’s sonority must exceed that of the following onset.

This undominated constraint interacts with the ones given earlier as shown in tableaux (102-103):

(102) /baawa-l RED/	σ-Contact	Onset	Align	Free-V	Parse-μ	Align-H	Max
a. ☞ [[baa.wa].l-al]			*			*	baaw
b. [[baa.wa[:]].l-al]			*	*!			baaw, [:]
c. [[baa.wa[:]l].-al]		*!					baaw, [:]
d. [[baa.wa[:]l].-wal]	*!						baa, [:]

(103) /miiɾii-l RED/	σ-Contact	Onset	Align	Free-V	Parse-μ	Align-H	Max
a. ☞ [[mii.ɾi‹i›].l-il]			*		*	*	miiɾ
b. [[mii.ɾii].l-il]			*	*!			miiɾ, [:]
c. [[mii.ɾiil].-il]		*!					miiɾ, [:]
d. [[mii.ɾiil].-ɾil]	*!						mii, [:]

In sum, verb reduplication behaves precisely as regular suffixation w.r.t. vowel lengthening and shortening. This conclusion supports the proposal made by McCarthy & Prince (1994) to identify reduplicants as stems or affixes (RED=STEM, RED=AFFIX).

6. Conclusions

Guugu Yimidhirr is *prosodically coherent* in its reference to the disyllabic Head-PrWd. In particular, it is referred to by constraints on verb stem size, distribution of length, stress, affix subcategorization, adjectival reduplication, suffixal lengthening and suffixal shortening. I have presented provides evidence in favor of a recursive PrWd structure, and against an attempt to reduce disyllabicity to FTBIN.

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