To appear in the proceedings of the West Coast Conference on Formal Linguistics 13 (1994).

Prosodic Alignment and Misalignment in Diyari, Dyirbal, & Gooniyandi: An Optimizing Approach[*]

Megan J. Crowhurst
Yale University

1. Introduction

Diyari (Austin 1981, Poser 1989), Dyirbal (Dixon 1972), and Gooniyandi (McGregor 1990), languages of Australia, are metrically similar in assigning stress initially in all morphemes containing at least two syllables.[1] In Diyari and Gooniyandi, the third syllable of a quadrisyllabic morpheme is also stressed. Examples are shown in (1).[2]

(1)a. *Diyari* (Austin 1981:31)

pínadu	'old man'	káṇa-wàṛa	'man-pl.'

---

[*] This paper has benefitted from useful comments by Stanley Insler and Donca Steriade, and from extensive discussion of the analysis with Scott Myers. I am grateful in addition to R.M.W. Dixon for providing additional information and forms by electronic communication (these forms are followed by "p.c." below). Any flaws are, as always, the sole responsibility of the author.

[1] Diyari and Dyirbal are Pama-Nyungan languages while Gooniyandi is a member of the distantly related Bunaban family (Ruhlen 1987). I have followed the transcriptions of Austin (1981) and Dixon (1972) for Diyari and Dyirbal. McGregor's orthography for Gooniyandi has been modified to include IPA symbols, where this would result in greater clarity. For example, the vowel given by McGregor as *oo* is really a short /u/ (see McGregor 1990:58), and the orthographic sequences *dd* and *ng* have the phonemic values /‘,N/.

[2] Stress in Gooniyandi is complicated by vowel length in trisyllabic and quinquesyllabic morphemes. However, within morphemes containing an even number of syllables, regardless of vowel length, and in most trisyllabic morphemes, the facts are as described here.

Nándawàlka	'to close'	pínadu-wàṛa	'old man-pl.'

b. *Dyirbal* (Dixon 1972:275,230 and Dixon, personal communication)

ëúgumbil	'woman'	búnëul-múNa	'spank-part.'
múlumíyan	'whale' (p.c.)	búrbula-gára	'Burbula-1 of a pr'

c. *Gooniyandi* (McGregor 1990:120-125)

wá'amba	'flood'	bírla-bíJi	'yams-per.'
Ní'iwárndi	'across'	Ná'agi-n̲íNi	'my-abl.'

The pattern illustrated in (1) suggests that in these languages, (i) left edges of morphemes and stress feet ideally coincide, and (ii) morpheme-internal footing is iterative to the limits of enforced binarity. A ban on monosyllabic feet is indicated by the absence of stress on monosyllabic sequences in word-final and pre-stress positions. The feet required, quantity-insensitive disyllabic trochees, are exemplified in (2) with forms from Dyirbal and Gooniyandi.

(2)	*Dyirbal*	*Gooniyandi*
	(ëúgum)bil	(Ní'i)(wárndi)
	*(ëúgum)(bíl)	*(Ní'i)warndi
	(búrbu)la-(gára)	(wá'am)ba
	*(búrbu)(lá)-(gára)	*(wá'am)(bá)
	*(búrbu)(lá-ga)ra	

Language-specific differences begin to emerge in the treatment of strings containing monosyllabic suffixes, which by themselves cannot accommodate a disyllabic foot. In Diyari, no monosyllabic morpheme is assigned stress, even when two or more occur adjacently, (3) (forms followed by a reference with *P* are from Poser 1989).

(3) *Diyari*

a. yát̲a-yi	(yát̲a)-yi	'speak-pres.' A42
b. púdi-ya-ni-wu	(púdi)-ya-ni-wu	'aux.-imp.-number marker-distort.' A86
c. máḍa-l̲a-n̲i	(máḍa)-l̲a-n̲i	'hill-char-locative' A40
d. wáḍaṛu-Jt7a	(wáḍa)ṛu-Jt7a	'how-number' A43
e. t̲úraṛa-yi-l̲a	(t̲úra)ṛa-yi-l̲a	'lie-pres-NI' A83
f. ṇánda-na-màt̲a	(ṇánda)-na-(màt̲a)	'hit-part-ident.' P119
g. púöudu-n̲i-màt̲a	(púöu)du-n̲i-(màt̲a)	'mud-loc.-ident.' P119
h. páḍaka-yìrpa-ṇa	(páḍa)ka-(yìrpa)-ṇa	'carry-be.-rel.' A78

Like Diyari, Dyirbal (i) avoids stress on a sole monosyllabic suffix after a disyllabic or trisyllabic root, (4a,b). In a sequence of monosyllabic suffixes, however, Dyirbal assigns stress to the first of each pair, proceeding from left to right, (4c,d,e,f). More striking is the fact that when a monosyllabic suffix is flanked by a root and a following disyllabic suffix, as in (4g,h), the monosyllable is stressed and the initial syllable of the following suffix is not.[3] (*P/p* in (4) is the present/past inflection.)

(4) *Dyirbal* (Dixon 1972:274,275,280,284; Dixon, personal communication)

a.	wáyJëi-Nu	(wáyJëi)-Nu	'motion uphill-rel.cl.'
b.	búrgu®um-bu	(búrgu)®um-bu	'jumping ant-erg.'
c.	búyba-rí-Ju	(búyba)-(rí-Ju)	'hide-refl.-pres/past'
d.	wáyJëi-Nú-gu	(wáyJëi)-(Nú-gu)	'motion uphill-rel.cl.-dat.'
e.	núdil-mál-ëa-Ju	(núdil)-(mál-ëa)-Ju	'cut-com.-loc.-p/p'
f.	bánagay-mbá-ri-Ju	(bána)gay-(mbá-ri)-Ju	'return-refl.-comit.-p/p'
g.	ëáNga-ná-mbila	(ëáNga)-(ná-mbi)la	'eat-pron.-with'
h.	mándalay-mbál-bila	(mánda)lay-(mbál-bi)la	'play-comit.-lest' p.c.

In Gooniyandi, quite simply, sequences of a root followed by a string of monosyllabic suffixes (a prosodic word; see §5) display a straightforwardly iterative stress pattern. Prominence is assigned to odd-numbered syllables counted from the left, (5b-e), but never to a final syllable, (5a,e). The significant difference from Dyirbal is that when a monosyllabic suffix follows a trisyllabic root, the root-final syllable is stressed, whether or not a second monosyllabic suffix follows, (5d,e) (cf. DY *(búrgu)® um-bu, (bána)gay-(mbá-ri)-J u*).

(5) *Gooniyandi*

a.	níyi-ya	[(níyi)-ya]$_{PW}$	'that-loc.' M124
b.	Nábu-wá-Nga	[(Nábu)-(wá-Nga)]$_{PW}$	'father-his-erg.' M125
c.	míla-jí‘-iJ-bí‘-a	[(míla)-(jí‘-iJ)-(bí‘-a)]$_{PW}$	'we'll see you' M127
d.	márlamí-ya	[(márla)(mí-ya)]$_{PW}$	'nothing-loc.' M124
e.	Ná‘aJú-wa-Nga	[(Ná‘a)(Jú-wa)-Nga]$_{PW}$	'mother-his-erg. M125

Intuitively, the differences illustrated in (3)-(5) can be summed up as follows. In Diyari, syllables may not be grouped into feet across a morpheme boundary. Here, the licensing of syllables by feet is sacrificed to a requirement of morphological integrity imposed on foot structures. The existence of forms like *(búyba)-(rí-J u)* in Dyirbal demonstrates the opposite case: In this language, it is apparently better to assign foot structure than for feet to respect morphological integrity. Grouping *forwards* across a

---

[3] I have been unable to find forms which are marked for stress and which contain a sequence of four monosyllabic suffixes. However, Dixon's (1972:274-5) description clearly indicates that an alternating stress pattern would be expected. The form in (4h) was provided by Dixon (personal communication).

morpheme boundary in forms like *(bána)gay-(mbá-ri)-J u* suggests that in Dyirbal, hetermorphemic footing is possible only when the left boundary of the resulting foot is aligned with that of a morpheme. The opposite pattern, footing *backwards* across a morpheme boundary, does not occur in Dyirbal: The final syllable of a trisyllabic root is never parsed into a foot with a following, heteromorphemic syllable (e.g. DY *(búrgu)®um-bu*, **(búrgu)(® úm-bu)*). However, this pattern does occur in Gooniyandi when a trisyllabic root is followed by a monosyllabic suffix (e.g. GO *[(márla)(mí-ya)]*$_{PW}$, **[(márla)mí-ya]*$_{PW}$), suggesting that the left-alignment requirement is relaxed in Gooniyandi if by so doing, the monosyllable could be licensed by a foot. That the attested form in (5e) is *[(N á‘ a)(J ú-wa)-N ga]*$_{PW}$ and not *[(N á‘ a)J u-(wá-N ga)]*$_{PW}$ shows that syllable licensing is not the only important factor: The second foot also occurs as close as possible to the left edge of the prosodic word.

This paper proposes an optimizing analysis of the similarities and differences between Diyari, Dyirbal, and Gooniyandi discussed above. Before proceeding to the analysis, I provide a working introduction to the principles and assumptions of Optimality Theory (Prince & Smolensky 1991, 1993; McCarthy & Prince 1993a,b) most important for this study.

2. Optimality Theory

The central claim of OPTIMALITY THEORY (OT) is that cross-linguistic variation along specific phonological dimensions follows from interactions among a set of universally available constraints whose relative priorities are language-specifically determined. In shifting the burden of explanation from derivation to constraint systems, OT abolishes phonological rules and other derivational notions, replacing them with the functions in (6a) and (6b) (Prince & Smolensky 1993:4, McCarthy & Prince 1993a:4). GEN is a generative function which takes an input representation and returns an infinitely large set of possible output forms, or CANDIDATES. The candidate set returned by GEN for some input *i* expresses the complete set of inter-elemental relationships that would result from applying phonological rules in a general and unconstrained manner (or alternatively, which would occur under a system of free coindexation).

(6)a. GEN: $\text{Gen}(\text{ in}_i\ ) \rightarrow \{\ \text{cand}_1, \text{cand}_2, ...\ \}$

b. EVAL: $\text{Eval}(\ \{\ \text{cand}_1, \text{cand}_2, ...\ \}\ ) = \text{out}_{\text{real}}$

The task of EVAL is to evaluate the harmony of candidates as measured in terms of a hierarchy of constraints whose relative priorities are determined by the language. The OPTIMAL, most harmonic candidate (by hypothesis, the true output) is that which best satisfies the constraint hierarchy. OT eschews the notion of grammaticality in favour of harmony or optimality because *grammatical* implies that all relevant constraints have been satisfied, whereas the central goal of OT is to account for the observation that constraints are in fact often violated. In this context, *best satisfaction* entails minimal constraint violation. In other words, the optimal candidate is the one that does the least damage, given relevant constraint rankings and the limitations of the input representation.

Constraint violation is inevitable when the properties of an input form are such that it can satisfy either, but not both of two competing constraints. To illustrate, consider the widely attested observation that feet ideally consist of exactly two elements, morae or syllables (Prince 1980; McCarthy & Prince 1986, 1993a,b; Kager 1989; Hayes 1994), expressed in (7) as the constraint FOOT BINARITY (FtBin; Prince & Smolensky 1993:47).

(7) *Foot Binarity:* Feet are binary under some level of analysis (μ, σ).

Under FtBin, feet with the structure (σ σ) count as optimal (for the languages in question), while (σ) is disfavoured. A second well-accepted generalisation is that syllables are ideally dominated by foot structure. McCarthy & Prince (1993b:11) state this requirement as PARSE-σ in (8).[4]

(8) *Parse-σ:* All syllables must be parsed by feet.

Under (8), every syllable not dominated by foot structure in a candidate will incur a violation of Parse-σ.

In a hypothetical grammar consisting of only these constraints, candidates based on a trisyllabic input must violate either FtBin or Parse-σ. Crucial ranking among constraints is determined by examining exactly such cases of conflict. Tableau 1 shows that when Parse-σ has higher priority than FtBin, FtBin may be violated by the optimal candidate to gain success on Parse-σ.[5] By contrast, if FtBin outranks Parse-σ (Tableau 2), then the candidate incurring no FtBin violations wins, at the expense of Parse-σ:

Tableau 1: Parse-σ » FtBin

Tableau 2: FtBin » Parse-σ

---

[4] When syllables cannot be parsed by F due to conflict with higher ranking constraints, I assume they are dominated by PrWd in output representations. This relaxation of the Strict Layer Requirement (Selkirk 1984:26), which imposes strict dominance relations on prosodic representations, has been discussed insightfully by Hewitt (1992) and Itô & Mester (1992).

[5] The following conventions are used in this paper: A constraint to the left of the symbol "»" receives higher priority than the symbol to its right (e.g. FtBin » Strict Layer). A colon (e.g. Ft Bin : Strict Layer) indicates equal priority. In tableaux, crucially ranked constraints are separated by a solid vertical line, with the highest ranking constraint in the left. Unranked constraints are separated by a dotted line. A fatal constraint violation is followed by "!", optimal candidates are checked "✓", and shading obscures cells whose contents play no crucial role in determining the relative harmony of a candidate.

Candidate	Parse-σ	FtBin
(σ́ σ) σ	*!	
✓ (σ́ σ)(σ́)		*

Candidate	FtBin	Parse-σ
✓ (σ́ σ) σ		*
(σ́ σ)(σ́)	*!	

When all candidates pass the highest ranking constraint, illustrated in Tableau 3 with a quadrisyllabic input, then the decision is passed to the constraint next in priority.

Tableau 3: Ft Bin » Parse-σ

Candidate	FtBin	Parse-σ
✓ (σ́ σ)(σ́ σ)		
(σ́ σ) σ σ		*! *

Similarly, if all candidates fail the highest ranking constraint, the deciding role is still performed by the next constraint in the hierarchy. A final possibility is that if FtBin and Parse-σ are unranked with respect to one another, then a violation of either counts equally, predicting the existence of alternative optimal candidates, other factors being equal. In general, I adopt the OT assumption that interacting constraints are in fact ranked, except in the case of undominated constraints, and when the absence of ranking is crucial for the analysis (see §4).

3. Diyari

Recall from the first section that Diyari stresses the first syllable of all morphemes of at least two syllables, but never monosyllabic morphemes or the third syllable of a trisyllabic morpheme (e.g. *(páḍa)ka-(yìrpa)-ṇa*, *(púdi)-ya-ni-wu*). The analysis proposed here requires the constraints FtBin and Parse-σ introduced in (7) and (8). In addition, it must be explained why the single foot assigned to a trisyllabic morpheme abuts the left and not the right edge, as indicated by initial, trochaic stress.

The stress-attracting property of morpheme-initial syllables in general can be expressed in terms of the constraint MORPHEME-FOOT-LEFT (MFL) in (9).

(9) *Morpheme-Foot-Left:* Align(Morpheme, L, Foot, L)

MFL states that the left boundary of every morpheme must coincide with the left boundary of a foot. A single violation is assessed for every morpheme which does not meet this requirement.

Tableau 4 illustrates the interaction of FtBin, Parse-σ, and MFL in selecting optimal candidates based on monomorphemic trisyllabic and quadrisyllabic inputs /pinadu/ and /Nandawalka/, respectively. FtBin is unviolated in Diyari, and hence, we may assume, undominated in the constraint hierarchy. Candidates violating FtBin in 4-1a,b are excluded immediately, since non-violating candidates exist. Next to FtBin in priority is MFL. Only one candidate, 4-1e, passes MFL and is selected as optimal, even though it contains a single parse violation.

Tableau 4: Trisyllabic inputs /pinadu/ and /Nandawalka/.

Candidates		FtBin	MFL	Parse-σ
1a.	(pína)(dù)	*!		
b.	(pí)(nàdu)	*!		
c.	pinadu		*!	***
d.	pi(nádu)		*!	*
e. ✓	(pína)du			*
2a. ✓	(Nánda)(wàlka)			
b.	(Nánda)walka			*! *
c.	Nan(dáwal)ka		*!	**
d.	Nanda(wálka)		*!	**

As discussed earlier, failure to parse a single syllable to foot structure is a consequence of the dominant status of FtBin. When the input is a quadrisyllabic morpheme, as with /Nandawalka/ in 4-2, FtBin and Parse-σ are not in conflict. Thus, of the two candidates which pass MFL (4-2a,b), the optimal candidate, 4-2a, is the one which contains two disyllabic feet and no unparsed syllables. Thus, the optimal *(Nánda)(wàlka)* violates none of the constraints in the hierarchy established so far. (Note that there is no evidence for crucial ranking between Parse-σ and MFL. The attested forms *pínadu* and *Nándawàlka* will also be correctly selected as optimal if the two constraints are unranked, or under an alternative in which Parse-σ dominates MFL.)

Sequences of a disyllabic root plus a monosyllabic or disyllabic suffix display the same stress patterns respectively as the monomorphemic *pínadu* and *Nándawàlka*. Tableau 5, based on the inputs /yata-yi/, /kaṇa-waṛa/, shows that these results, too, are predicted by our constraints. The absence of stress on the monosyllabic suffix in 5-1 shows that MFL, like Parse-σ, is crucially dominated by FtBin.

Tableau 5: Inputs /yata-yi/, /kaṇa-waṛa/

Candidates		FtBin	MFL	Parse-σ
1a.	(yáṯa)-(yì)	*!		
c.	ya(ṯá-yi)		**!	*
b. ✓	(yáṯa)-yi		*	*
2a. ✓	(káṇa)-(wàṛa)			
b.	(káṇa)-waṛa		*!	**

c.	kaṇa-(wáṛa)		*!	**

The striking property of Diyari is that even though footing is iterative in morphemes longer than three syllables, stress is never assigned to any of a sequence of adjacent monosyllabic suffixes. The constraints FtBin, MFL, and Parse-σ alone cannot determine the attested outcome in the latter cases. As before, FtBin rules out candidates in which monosyllabic suffixes are analysed as degenerate feet. However, relying on Parse-σ and MFL for adjudication when the input is a disyllabic or trisyllabic root followed by a string of monosyllabic suffixes (e.g. /pudi-ya-ni-wu/, /ṯuraṛa-yi-ḻa/) incorrectly predicts that as many syllables as possible will be parsed as long as the resulting feet are left-aligned with morphemes, as in **(púdi)-(yà-ni)-wu*, **(ṯúra)ṛa-(yì-ḻa)*. The true victors, *(púdi)-ya-ni-wu* and *(ṯúra)ṛa-yi-ḻa*, differ from their rivals in failing to parse syllables into feet across morpheme boundaries. This generalisation is captured by assigning high priority to the constraint TAUTOMORPHEMIC-FOOT (or Tauto-F), which requires that foot parsing be faithful to morphological structure.

(10) *Tautomorphemic-Foot:* $*_F[\sigma\ _M[\![\ \sigma]$

Under Tauto-F, any foot whose syllables straddle a morpheme boundary incurs a violation. When Tauto-F is dominant, it is better to leave syllables unparsed than to endure a heteromorphemic foot. Like FtBin, Tauto-F is unviolated in Diyari and therefore, we assume, undominated. The correct outcome is ensured if Tauto-F dominates Parse-σ. Using as illustrations the polymorphemic inputs /pudi-ya-ni-wu/, Tableau 6 shows that a single violation of Tauto-F triumphs over two or three violations each of MFL and Parse-σ.

Tableau 6: Input /pudi-ya-ni-wu/.

Candidates		FtBin	Tauto-F	MFL	Parse-σ
1a. ✓	(púdi)-ya-ni-wu			***	***
b.	(púdi)-(yà-ni)-wu		*!	**	*
c.	(púdi)-ya-(nì-wu)		*!	**	*
d.	(púdi)-(yà)-(nì)-(wù)	*! **			

Tableau 7 shows that the high ranking assigned to Tauto-F also precludes the assignment of stress to the third syllable of a suffixed trisyllabic root.

Tableau 7: Inputs /waḍaṛu-Jä u/, /ṯuraṛa-yi-ḻa/, /puö udu-ni-mata/.

Candidates		FtBin	Tauto-F	MFL	Parse-σ
1a. ✓	(wáḍa)ṛu-Jäa			*	**

c.	(wáḍa)(ṛù-Jäa)		*!	*	
b.	(wáḍa)ṛu-(Jäà)	*!			*

Tableau 7, continued

Candidates		FtBin	Tauto-F	MFL	Parse-σ
2a. ✓	(ṯúra)ṛa-yi-ḻa			**	***
b.	(ṯúra)ṛa-(yì-ḻa)		*!	*	*
c.	(ṯúra)(ṛà-yi)-ḻa		*!	**	*
d.	(ṯúra)ṛa-(yì)-(ḻà)	*! *			*
3a. ✓	(púöu)du-ṉi-(màta)			*	**
b.	(púöu)(dù-ṉi)-(màta)		*!	*	
c.	(púöu)du-(ṉì)-(màta)	*!			*

To summarise, stress in Diyari is assigned (i) initially in morphemes of at least two syllables, but never to monosyllables, and (ii) to the third syllable of a quadrisyllabic, but never a trisyllabic morpheme. This array of facts submits to an analysis in which four interacting constraints, Foot Binarity in (7), Parse-σ in (8), Morpheme-Foot-Left in (9) and Tautomorphemic-Foot are assigned the language-specific priorities in the constraint subhierarchy in (11). (The relationship of dominance between MFL and Parse-σ is not crucial. What is important is that these constraints are outranked by FtBin and Tauto-F.)

(11) *Diyari:* FtBin : Tauto-F » MFL » Parse-σ

The treatment of Diyari presented here has emphasised the roles of the constraints MFL and Tauto-F. MFL ensures the presence of a foot at the left edge of every morpheme large enough to support it under FtBin dominance, while Tauto-F insists that syllable-to-foot parsing be faithful to morphological structure.

4. Dyirbal

Dyirbal differs most significantly from Diyari in permitting the construction of feet across morpheme boundaries as long as the left edge of every foot occurs at the left edge of a morpheme. In Dyirbal, then, it is often better to parse syllables even if feet unfaithful to morphological structure result, leading to Tauto-F violations. In terms of the hierarchy, this difference is expressed by demoting Tauto-F from undominated status (in Diyari) to a position below Parse-σ in Dyirbal.

Tableau 8 presents analyses of the input /buyba-ri-Ju/, a disyllabic root followed by two monosyllabic suffixes, with the constraints employed in §3. Like Diyari, Dyirbal imposes an absolute ban on monosyllabic feet (cf. *ë úgumbil, *ë úgumbìl*), and is therefore again assigned undominated status. Due to its revised status, Tauto-F is routinely violated in surface forms like *búyba-rí-Ju* , its effect suppressed by the dominant constraints MFL and Parse-σ. In Tableau 8 the candidate with FtBin violations is ruled out, leaving three contenders, all containing MFL violations. The optimal candidate is *(búyba)-(rí-Ju)*, the minimal violator of MFL.

Tableau 8: Input /buyba-ri-J u/.

Candidates		FtBin	MFL	Parse-σ	Tauto-F
a.	(búyba)-(rí)-(Jú)	*! *			
b.	buy(bá-ri)-Ju		**! *	**	*
c.	(búyba)-ri-Ju		**!	**	
d. ✓	(búyba)-(rí-Ju)		*		*

(So far we have seen no evidence for ranking MFL and Parse-σ; any of the rankings MFL » Parse-σ, Parse-σ » MFL, or Parse-σ : MFL will yield the attested output. Evidence for the ranking MFL » Parse-σ, another difference between Diyari and Dyirbal, is provided below.)

Unmodified, the constraint hierarchy established so far does not select an optimal candidate when the input is a disyllabic or trisyllabic root followed by two monosyllabic suffixes, such as /nudil-mal-ëa-Ju/ or /banagay-mba-ri-Ju/; the constraints in Tableau 8 fail to decide between *(núdil)-(mál-ë a)-J u* and its rival **(núdil)-(mál-ë a)-J u* which violate Parse-σ and MFL equally. The generalisation so far eluded is that in the attested output *(núdil)-(mál-ë a)-J u*, the second foot lies as close to the left edge of the stem as possible without violating MFL (cf. *(bána)gay-(mbá-ri)-J u*, **(bána)gay-mba-(rí-J u)*). Assuming the stem to be coextensive with the category prosodic word (PrWd), this generalisation can be captured by introducing the constraint ALIGN FOOT-PRWD (or F-PrWd) in (12).

(12) *Align Foot-PrWd:* Align(F, L, PrWd, L)

F-PrWd states that for every left foot boundary, there exists a corresponding left PrWd boundary. Violation is evaluated gradiently, one infrigement assessed for every syllable separating a foot from the left edge of the PrWd.

Tableau 9 analyses the polysyllabic input /nudil-mal-ëa-Ju/ under the new constraint hierarchy. We see that when the root contains an even number of syllables and candidates are tied with equal numbers of MFL (and parse) violations (e.g. 9-a,b), the decision falls to F-PrWd.

Tableau 9: Input /nudil-mal-ë a-J u/.

Candidates		FtBin	MFL	Par-σ	F-PrWd	Taut-F
a.✓	[(núdil)-(mál-ëa)-Ju]		**	*	**	*
b.	[(núdil)-mal-(ëá-Ju)]		**	*	***!	*
c.	[(núdil)-mal-ëa-Ju]		***!	***		
d.	[(núdil)-(mál-ëa)-(Jú)]	*!			** ****	*

Tableau 9 shows, at least, that F-PrWd must not be ranked more highly than MFL and Parse-σ since in that case, **núdil-mal-ë a-J u* should be optimal. (Some prioritisation among the three constraints will be crucial, as 9-a and the unattested 9-c are tied with six violations across MFL, Parse-σ, and F-PrWd.)

Evidence for finer ranking distinctions emerges in Tableau 10. Here, the optimal form 10-e is correctly selected if MFL dominates F-PrWd and Parse-σ, and if F-PrWd and Parse-σ are not ranked with each other. Excluding candidates with FtBin and excessive MFL violations, we are left with 10-d,e,f, tied with two MFL violations. In this case, 10-e, with fewest violations across F-PrWd and Parse-σ as a block triumphs. (Parse-σ must not dominate F-PrWd since in that case, 10-d should be optimal.) It is interesting to note that while the rightmost foot in *núdil-mál-ë a-Ju* , Tableau 9, lies as close as possible to the left edge of the PrWd, this is not true in *bánagay-mbá-ri-Ju*. The generalisation is that when competitors violate MFL equally, the candidate in which the second foot is shifted one syllable to the right wins, as this forestalls F-PrWd violations that would be incurred by a third foot (compare 10-e with 10-d).[6]

Tableau 10: Input /banagay-mba-ri-Ju /.

---

[6] A similar rightward shift with an input consisting of a disyllabic root plus four monosyllabic suffixes (e.g. σ σ-σ-σ-σ-σ) would yield an extra MFL violation, and thus should not occur. The predicted optimal output, (σ σ)-(σ-σ)-(σ-σ), is consistent with Dixon's (1972) description of Dyirbal stress. However, a search of Dixon (1972) yielded no forms which might be used to test this prediction.

Candidates		FtBin	MFL	Par-σ	F-PrWd	Taut-F
a.	[(σ σ)-σ-(σ-σ)-(σ)]	*!	**	*	*** *****	*
b.✓	[(σ σ)-(σ-σ)-(σ-σ)]		**		** ****	**
c.	[(σ σ)-σ-σ-(σ-σ)]		***!	**	****	
d.	[(σ σ)-σ-(σ-σ)-σ]		***!	**	***	*
e.	(σ σ)-σ-σ-σ-σ		***!*	****		

Candidates		FtBin	MFL	Par-σ	F-PrWd	Taut-F
a.	[(bána)gay-(mbá-ri)-(Jú)]	*!	*	*	*** *****	*
b.	[ba(nágay)-(mbá-ri)-Ju]		***!	**	* ***	*
c.	[(bána)gay-mba-ri-Ju]		***!	****		
d.	[(bána)(gáy-mba)-(rí-Ju)]		**		** ****!	**
e.✓	[(bána)gay-(mbá-ri)-Ju]		**	**	***	*
f.	[(bána)gay-mba-(rí-Ju)]		**	**	****!	*

Tableau 10 also shows that MFL domination over Parse-σ and F-PrWd is crucial. If these constraints were unranked, then 10-c should be optimal: Since candidates 10-c and 10-e are tied with an equal number of violations across the three constraints, the deciding role should fall to Tauto-F.

So far, it has been assumed that F-PrWd and Parse-σ are unranked. In fact, the absence of ranking between these constraints is crucial to correctly determine optimal candidates based on quadrisyllabic inputs such as /burgu®um-bu/ and /mulumiyan/. Tableau 11 is based on the input /burgu®um-bu/, a trisyllabic root plus a single monosyllabic suffix. Doubly and singly-footed candidates, 11-b and 11-a, contain equal numbers of MFL violations. Furthermore, 11-a contains two parse violations, 11-b two F-PrWd violations. The tie between these otherwise equally harmonic candidates is broken by Tauto-F, which rules out 11-b.

Tableau 11: Input /burgu® um-bu/.

Candidates		FtBin	MFL	Par-σ	F-PrWd	Taut-F
a.✓	[(búrgu)®um-bu]		*	**		
b.	[(búrgu)(®úm-bu)]		*		**	*!
c.	[(búrgu)(®úm)-(bú)]	*! *			** ***	

Note that *(búrgu)® um-bu* in 11-a would still be selected as optimal under the ranking F-PrWd » Parse-σ. Evidence that this ranking cannot be correct is provided by an analysis of the monomorphemic /mulumiyan/. In this case, the doubly-footed candidate *(múlu)(míyan)*, with two F-PrWd violations, and not the singly-footed *(múlu)miyan* with two parse violations, is optimal--the scenario opposite to that in Tableau 11. Tauto-F is irrelevant for monomorphemic inputs, however, and cannot break the tie between the two main contenders. The correct result is obtained if we invoke MORPHEME-FOOT-RIGHT (MFR; the right-edge counterpart of MFL), stated in (13), and rank this final constraint at the bottom of the hierarchy below Tauto-F.

(13) *Morpheme-Foot-Right:* Align(M, R, F, R)

Analyses of quadrisyllabic /mulumiyan/ and the trisyllabic /ëugumbil/ are presented in Tableau 12.

Tableau 12: Input /mulumiyan/.

Candidates		FtBin	MFL	Par-σ	F-PW	Taut-F	MFR
1a.✓	[(múlu)(míyan)]				**		
b.	[(múlu)miyan]			**			*!
c.	[mulu(míyan)]		*!	**	**		
d.	mulumiyan		*!	****			*

Tableau 12, continued.

Candidates		FtBin	MFL	Par-σ	F-PW	Taut-F	MFR
2a.✓	[(ëúgum)bil]			*			*
b.	[ëu(gúmbil)]		*!	*	*		
c.	ëugumbil		*!	***			*
d.	[(ëúgum)(bíl)]	*!			**		

Evidence for the ranking Tauto-F » MFR is provided by the analysis of the input form /burgu®um-bu/ in Tableau 11. As discussed above, the tie between 11-a,b is settled by excluding the candidate with a Tauto-F violation, even though this leads to two MFR violations in the optimal candidate *(búrgu)® um-bu.*

Another distinctive property of Dyirbal is that a monosyllabic suffix may be footed with the initial syllable of a disyllabic suffic across a morpheme boundary, showing that even though MFR is active in the hierarchy, it does not assert itself when F-PrWd is at stake.

Tableau 13: Input /ëaNga-na-mbila/.

Candidates		FtBin	MFL	Par-σ	F-PW	Taut-F	MFR
a.✓	[(ëáNga)-(ná-mbi)la]		*	*	**	*	**
b.	[(ëáNga)-na-(mbíla)]		*	*	***!		*
c.	[(ëáNga)-(ná)-(mbíla)]	*!			** ***		

In this section, I have argued that the facts of stress assignment in Dyirbal can be accommodated under constraint hierarchy in (14).

(14) *Dyirbal:* FtBin » MFL » Parse-σ : F-PrWd » Tauto-F » MFR

Comparing the metrical systems of Diyari and Dyirbal in OT terms, we see that FtBin is unviolated in both languages. Important differences between the two languages are the low ranking assigned to Tauto-F, and the crucial roles played by F-PrWd and MFR in Dyirbal. Finally, MFL must outrank Parse-σ in Dyirbal, but not in Diyari. In §5 we turn to an examination of stress in Gooniyandi.

5. Gooniyandi

Gooniyandi demonstrates the cross-linguistically unmarked pattern of iterative footing from left to right within a PrWd. McGregor (1990:125) states that "[a]ll but a couple of disyllabic and polysyllabic morphemes bear initial stress, and constitute separate phonological words from the words to which they are attached."[7] That is, the PrWd consists of a minimally disyllabic morpheme and any following monosyllabic suffixes. To maximise the contrast with Diyari and Dyirbal, the analysis presented in this section is limited to the PrWd, the domain of stress in the three languages of this paper.[8]

The absence of stress on final odd-numbered syllables in forms like *wá‘ amba* and *N á‘aJ ú-wa-N ga* shows that FtBin is once again undominated in Gooniyandi. That as many syllables as possible are parsed and that the resulting feet occur as close as possible to the left edge of the PrWd shows that Parse-σ and F-PrWd are active, with the former dominating the latter constraint to account for iterative footing. Tableau 14 presents analyses for the monomorphemic inputs /wa‘amba/ and /Ni‘iwarndi/ under the rankings FtBin » Parse-σ » F-PrWd » MFL.

Tableau 14: Unaffixed roots, inputs /wa‘ amba/, /N i‘ iwarndi/.

Candidates		FtBin	Parse-σ	MFL	F-PrWd
1a. ✓	[(wá‘am)ba]		*		
b.	[wa(‘ámba)]		*	*!	*
c.	wa‘amba		**!*	*	
d.	[(wá‘am)(bá)]	*!			**
2a. ✓	[(Ní‘i)(wárndi)]				**
b.	[(Ní‘i)warndi]		*! *		
c.	[Ni‘i(wárndi)]		*! *	*	**
d.	[Ni(‘íwarn)di]		*! *	*	*

---

7 Another Australian with this property is Yidin^{y} (Dixon 1977a,b).

8 The emergence of multiple PrWds could be accounted for with a constraint Align(Morpheme, L, PrWd, L) (MORPH-PRWD), which requires that the left edge of every morpheme be aligned with the left edge of a PrWd. Under the ranking FtBin » Morph-PrWd, only suffixes of at least two syllables will be properly aligned with respect to Morph-PrWd.

The significant different between Gooniyandi and Dyirbal is that the final syllable of a trisyllabic root is footed with a following suffixed syllable in Gooniyandi, but not in Dyirbal (cf. GO *márlamí-ya*, DY *búrgu® um-bu*). The Dyirbal pattern was accounted for by positing crucial nonranking between Parse-σ and F-PrWd. The change in the constraint hierarchy of Gooniyandi which accounts for the metrical contrast is that Parse-σ dominates F-PrWd. As in Dyirbal, Tauto-F is routinely violated (cf. *N á‘ aJ ú-wa-N ga*), suggesting that Tauto-F is again subordinated to Parse-σ and MFL. Tableau 15 shows that for the polymorphemic inputs /marlami-ya/, /Na‘aJu-wa-Nga/, /mila-ji‘-iJ-bi‘-a/, iterative footing across morpheme boundaries is driven by Parse-σ and F-PrWd, with MFL and Tauto-F having no effect.

Tableau 15: Inputs /marlami-ya/, /N a‘ aJ u-wa-N ga/, /mila-ji‘ -iJ -bi‘ -a/.

Candidates		FtBin	Pars-σ	F-PrWd	MFL	Taut-F
1a.	[(márla)mi-(yá)]	*!	*	***		
b.	[mar(lamí)-ya]		*! *	*	**	
c.	[(márla)mi-ya]		*! *		*	
d.✓	[(márla)(mí-ya)]			**	*	*
2a.	[(Ná‘a)(Jú-wa)-(Ngá)]	*!		** ****	*	*
b.✓	[(Ná‘a)(Jú-wa)-Nga]		*	**	**	*
c.	[(Ná‘a)Ju-(wá-Nga)]		*	***!	*	*
3a.✓	[(míla)-(jí‘-iJ)-(bí‘-a)]			** ****	**	**
b.	[(míla)-ji‘-iJ-(bí‘-a)]		*! *	****	***	*
c.	[(míla)-jí(‘-iJ-bí‘)-a]		*! *	***	****	*
d.	[(míla)-ji‘-iJ-bi‘-a]		*! ***		****	

Dominance of Parse-σ is crucial for each of the inputs /marlami-ya/ and /mila-ji‘-iJ-bi‘-a/ in Tableau 15. Under the alternative, F-PrWd » Parse-σ, 15-1c should be optimal instead of 15-1d for /marlami-ya/, and 15-3d should be optimal instead of 15-3a for /mila-ji‘-iJ-bi‘-a/. (Equal ranking, Parse-σ : F-PrWd, would be equally unsuccessful.) Evidence that F-PrWd must outrank MFL is that under the opposite or equal ranking, 15-2c and not 15-2b should be optimal. There is no evidence that MFL and Tauto-F are crucially ranked with respect to one another.

To sum up, the left-to-right iterative stress pattern of Gooniyandi is captured in an OT analysis under the constraint hierarchy in (15).

(15) *Gooniyandi:* FtBin » Parse-σ » F-PrWd » MFL » Tauto-F

Only the undominated position of FtBin and the rankings Parse-σ » F-PrWd and F-PrWd » MFL are crucial. Relevant differences between Gooniyandi and Diyari, Dyirbal are that in Gooniyandi, Parse-σ dominates all constraints but FtBin, followed in the hierarchy by F-PrWd.

6. Conclusion

This paper has shown that variations in the assignment of stress in Diyari, Dyirbal, and Gooniyandi can be analysed in optimality-theoretic terms by differently prioritising six constraints, Foot Binarity, (7); Parse-σ, (8); Tautomorphemic-Foot, (10); Morpheme-Foot-Left, (9); Foot-PrWd, (12); and Morpheme-Foot-Right, (13). The constraint subhierarchies in (16) were posited to account for metrical differences across the three languages.

(16)

Diyari:	FtBin : Tauto-F » MFL » Parse-σ
Dyirbal:	FtBin » MFL » Parse-σ : F-PrWd » Tauto-F » MFR
Gooniyandi:	FtBin » Parse-σ » F-PrWd » MFL » Tauto-F

Of the constraints in (16), only Foot Binarity is surface-true of the three languages discussed. Beyond this, the following significant differences between Diyari, Dyirbal, and Gooniyandi are observed. Diyari places an absolute ban on foot structures incorporating syllables from different morphemes. The constraint which plays a crucial role in enforcing this is Tauto-F. Dyirbal permits heteromorphemic footing, but insists that the left edge of every foot be aligned with the left edge of a morpheme. Surprisingly, this result emerged as an effect of crucial nonranking between Parse-σ and F-PrWd, not as a product of MFL. In Gooniyandi, morphological faithfulness in foot parsing and left-edge foot/morpheme alignment are sacrificed to parsing requirements and the requirement that feet must occur as close as possible to the left edge of the prosodic word.

References

Austin, P. 1981. *A grammar of Diyari, South Australia*. NY and London: Cambridge University Press.

Dixon, R.M.W. 1972. *The Dyirbal Language of North Queensland*. NY & London: Cambridge University Press.

Hayes, B. 1994. *Metrical Stress Theory: Principles & Case Studies*. Chicago: The University of Chicago Press.

Hewitt, M. 1992. *Vertical Maximization & Metrical Theory*. PhD dissertation, Brandeis University.

Itô & Mester. 1992. Weak Layering & Word Binarity. UCSC unpublished ms.

Kager, R. 1989. *A Metrical Theory of Stress & Destressing in English & Dutch*. Dordrecht: Foris.

McGregor, D. 1990. *A functional grammar of Gooniyandi*. Amsterdam: John Benjamins.

McCarthy, J. & A. Prince 1986. Prosodic Morphology. UMass/Rutgers unpublished ms.

McCarthy, J. & A. Prince 1993a. *Prosodic Morphology I*. UMass/Rutgers

unpublished ms. (forthcoming, MIT Press).
McCarthy, J. & A. Prince 1993b. Generalized Alignment. UMass/Rutgers unpublished ms.
Poser, W. 1989. The metrical foot in Diyari. *Phonology* 6.117-148.
Prince, A. 1980. A Metrical Theory of Estonian Quanity. *LI* 11.511-562.
Prince, A. & P. Smolensky. 1991. Optimality. Paper given at the *Arizona Phonology Conference* (Tucson).
Prince, A. & P. Smolensky. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar*. Rutgers/Univ. of Colorado unpublished ms. (forthcoming, MIT Press).
Ruhlen, M. 1987. *A Guide to the World's Languages. Volume 1: Classification*. Stanford, CA: Stanford University Press.
Selkirk, E.O. 1984. *Phonology & Syntax: The Relation Between Sound & Structure*. Cambridge, MA & London, Eng.: The MIT Press.