

Edge-Crispness Effects in Moraic Structure

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Edge-Crispness effects in moraic structure*

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1. Introduction. In this paper I examine the stress facts of Ngalakan, a Non-Pama-Nyungan Australian language of the Gunwinjguan family (see, e.g. Alpher, Evans and Harvey to appear). The definition of syllable weight in Ngalakan appears to be unique to the stress literature. Weight for stress is assigned only to syllables which have a heterorganic coda to a following onset, and not to any other syllables. Although other analyses (e.g. Bach 1975, Zec 1995) have shown that the sonority of the syllable coda can be distinguished for weight, differences in association of autosegmental structure to syllable structure have not previously been shown to play a role. The evidence of Ngalakan is therefore crucial for determining what it is about syllables that contributes to weight, and hence to stress.

I propose an analysis in OT-theoretic terms (e.g. Prince and Smolensky 1993) using a constraint CrispEdge[μ]. Although this particular constraint has not been proposed previously (to my knowledge) it is a relatively straightforward instantiation of a constraint family CrispEdge[ProsodicCategory] (PCat) proposed by Ito and Mester (1994). The constraint CrispEdge[μ] can distinguish mora associations to segments according to their sub-melodic structure. In particular, segments which are non-discrete for place association to syllable structure cannot be associated to a mora. CrispEdge[μ] in effect prevents full syllabification of homorganic codas.

In what follows I first examine the bulk of the relevant examples in §2 and §3. In §3 I examine the evidence for a weight distinction in Ngalakan based on segment-to-syllable association. In §4 I propose the constraints that account for the patterns in an OT framework. Finally, I argue in §5 that the same constraints can help us account for otherwise mysterious asymmetries in stem gemination allomorphy. The conclusion is in §6.

2. Stress types. Open disyllabic roots show initial stress:

- | | | | |
|-----|----|------|-------------------------------|
| (1) | a. | táta | 'wild honey' |
| | b. | kíti | 'young girl' |
| | c. | mátu | 'paperbark sp.; baby-carrier' |
| | d. | cíwi | 'liver' |
| | e. | mála | 'centipede' |

Open trisyllabics show initial stress. There is no secondary stress on the final syllable when open; I assume it is unfooted.

- | | | | |
|-----|----|--------|---------------------|
| (2) | a. | pícuṭu | 'big wind' |
| | b. | wáṭiya | 'multiparous woman' |
| | c. | céraṭa | 'women's ceremony' |
| | d. | ṅúliri | 'black duck sp.' |
| | e. | kómoḷo | 'white crane' |

Open quadrisyllabics show initial stress. There is secondary stress on the third syllable.

- | | | | |
|-----|----|----------|----------------------------------|
| (3) | a. | círifiti | 'bird sp.' |
| | b. | páramùnu | 'sand goanna' (large lizard sp.) |
| | c. | káṇamùru | 'wild-honeybee sp.' |
| | d. | wáriṭila | 'hooked boomerang' |
| | e. | kúṇṇàra | 'tree sp.' |
| | f. | tárapiya | 'black cockatoo' |
| | g. | púrukùlu | 'snake sp.' |

There are no examples of open-syllabled roots with more than four syllables. One example is open except for a nasal stop cluster. Here again, the primary stress is initial; secondaries are placed on every following odd-numbered syllable:

- (3) h. káran̄k̄an̄jaṇini 'macropod sp.'

For words with only open syllables in Ngalakan, the generalization is initial stress with secondary stresses on every following odd syllable. In OT-terms this kind of metrical pattern is to be accounted for with constraints FootForm, FootBinarity (demanding left-headed, bimoraic trochees) ranked above Parse[σ], demanding every syllable to be parsed into a foot. AlignLeft(Peak, ProsodicWord) will require the primary stress to be initial in the word.

3. Weight in Ngalakan. In Ngalakan, syllables which contain a coda which is heterorganic to a following onset are assigned root stress over both initial syllables and syllables with codas homorganic to a following onset. Trisyllabics with medial heterorganic coda syllables are the most consistent:

- (4) a. puṭólko? 'brolga' (bird sp.)
 b. kuṭálpun 'together'
 c. miṭárppu? 'crab'
 d. purúṭci 'water python'
 e. waṭúrkku 'fighting club'
 f. luṭúrwa 'vine sp.'
 g. kaṭáykka 'paperbark (*Melaleuca*) sp.'

In all of the above examples (4a-g), primary word stress is aligned with a non-initial syllable, in contrast to the examples with all open syllables in §2. What the above examples have in common is a medial syllable in which the coda is heterorganic to the onset of the final syllable.

Quadrisyllabics and higher have the same characteristics, with the added complication that heavy initial or third syllables participate in the typical trochaic pattern. In general, where the heavy syllable is non-final it attracts primary word stress, other syllables receiving secondary stress according to the footing algorithm.

- (5) a. paṭawárkka [place name]
 b. maṭapúrka? plant sp.
 c. caṭawárcca 'full'

The few examples with heavies in non-metrically prominent syllables are:

- (5) d. kaṭálpuru 'female plains kangaroo'
 e. kipiṭkuluc 'tawny frogmouth'
 f. kùricáṭponjko 'olive python'

Note that exx. (5e, f) show that codas are often, but need not be, sonorants to count as heavy for stress. And see section §3.4 for discussion.

3.1 Homorganic codas do not count for weight. Contrast the examples in §3 above, with examples (6) below with homorganic codas to following onsets in medial syllables:

- (6) a. móloppoḷ 'shovelhead catfish'
 b. kámakkun 'properly'
 c. cáruṭtu? 'macropod sp.' (female agile wallaby)
 d. mánappuṅ 'echidna' (spiny anteater)
 e. móroṭṭin? 'wild cassava'
 f. cápatta 'freshwater tortoise sp.'
 g. cámpakku 'tobacco' (old loan)
 h. wáracçàra 'flood water'

i.	ŋámuccùlo	'subsection term'
j.	ŋóloŋko?	'eucalyptus sp.'
k.	cákanta	'macropod sp.' (female plains kangaroo)
l.	ŋúrunʦuc	'emu'
m.	páŋaŋka	'bird sp.'

Stress is by no means avoided in syllables closed by homorganic codas, but is realized initially, as per the usual rule:

(6)	n.	ŋáppunun?	'subsection term'
	o.	káppaŋta?	'white mud'
	p.	wáccuŋtu	'mature goanna sp.' (large reptile)
	q.	ŋápcuła	'eye; seed'
	r.	wómboroʦ	'macropod sp.' (large rock wallaby)
	s.	cúŋtupol?	'macropod sp.' (small rock wallaby)

These examples demonstrate the dichotomy of the weight distinction in Ngalakan. While syllables with a heterorganic coda can attract stress away from its normal initial position, homorganic codas can not. Rather, syllables ending in geminates and homorganic nasal-stop clusters behave the same as open syllables in terms of stress assignment. I now examine the characteristics of final syllables which mark them as special for stress purposes.

3.2 Final segment extrametricality. In word-final position, the picture is more complicated. Firstly, simple final closed syllables do not attract stress in Ngalakan:

(7)	a.	cítaŋ	'coolamon' (container)
	b.	cépaŋ	'line, row'
	c.	cícuk	'macropod sp.' (large nail-tailed wallaby)
	d.	kúpuy	'sweat' (n.)
	e.	yáwok	'yam sp.'
	f.	kácet	'knife'
	g.	cáric	'charcoal'
	h.	cáuk	'short'
	i.	ŋápak	' <i>Eucalyptus</i> sp.'
	j.	ŋótokoc	'ankle'
	k.	káyapam	'wild orange' (<i>Capparis</i> sp.)
	l.	cálapir	'red ant sp.'
	m.	cáŋaran	'jabiru' (large wading bird sp.)
	n.	cáʦukal	'macropod sp.' (male plains kangaroo)
	o.	cáliwiŋ	' <i>Capparis</i> sp.'
	p.	márawul	'hungry'
	q.	céntewèrec	'willy wagtail' (bird sp.)

From the data it appears that final simple coda segments do not count for weight, since stress is never attracted to final syllables when closed with a simple coda. In addition, the glottal stop does not count when computing weight anywhere:¹

(8)	a.	kúʦel?	'(really) cold'
	b.	cánay?	'goanna sp.'
	c.	cótoʦw?	'morning star'
	d.	mátaʦw?	'tree sp.'
	e.	múŋaŋ?	[subsection term]
	f.	yána?	'what; something'
	g.	yére?	'downriver'
	h.	kámaci?	'swag (bedroll; belongings)'
	i.	páʦikùlu?	'Eucalyptus sp.'

Nor do medial glottal stop codas (in historically complex forms):

j. ɲánaʔpay 'and moreover'

There are two things to be explained here: the lack of weight of simple final codas, and the apparent invisibility of the glottal stop. To account for the apparent discrepancy between the weight of codas medially and the lack of weight of simple codas finally, we must assume that word-final consonants are extrametrical.

Weight in Ngalakan depends on discrete place association between a mora and a coda (as I discuss below in §4). The behavior of glottal stop is then expected, since glottal stops are assumed not to be specified for place (Padgett 1991[1995]).² As such it does not play a role in the computation of stress. In addition, to make sure that a sonorant plus glottal stop sequence behaves the same for extrametricality as a simple consonant, I must make a further assumption. It has been noted (e.g. Ladefoged 1971) that the glottis plays a dual role in phonetics: both as a feature [glottal stricture] in voice contrasts, and as a possible articulatory place. My assumption for Ngalakan is that glottal stops should be analyzed as a feature [glottalization] on preceding sonorants, rather than as a segment with its own root node.³ In this case, glottalized sonorants (as they will henceforth be referred to) are contour segments along the lines of Steriade (1992), and behave exactly as non-glottalized sonorants for the purposes of computing weight-for-stress.

3.3 Final heavy syllables. When the final syllable is closed by a cluster, it is usually heavy.⁴ Examples with consistent second stress are:

- (9) a. kiɲálk 'white ibis'
 b. kaʃúrk 'deep'
 c. camólk 'for nothing, in vain'
 d. piccúrk 'edible tuber sp.'
 e. kappúrk 'dry'

3.4 Multiple heavies and heavies in polysyllabic roots. When there is more than one heavy syllable in a root, the leftmost is assigned word stress. The other heavy syllables in the word optionally receive a secondary stress when non-adjacent:

- (10) a. mélwem 'sandfly'
 b. cálpurkic 'jewfish'
 c. lárkurca 'vine sp.'

The few examples of trisyllabics with final heterorganic clusters do not show final primary stress. They receive a final secondary stress on the heavy syllable:

- (11) a. péremèlk 'shoulder blade'
 b. cácapàŋʔ 'yesterday'
 c. cíliwùk 'guts'
 d. kúnunùrk 'tree sp.'
 e. páramàlk 'wild cucumber'

In almost all examples of heavy syllables the coda is a continuant and the following onset a stop, though (5e-f) show that this need not be the case for attraction of stress. Therefore the Ngalakan stress pattern is not dependent on the sonority of the coda in order to count as heavy for stress (as shown for Kwakiutl by Bach 1975, other languages Zec 1995). There are examples where a low-sonority heterorganic stop coda attracts (primary) stress (12a, c), while a corresponding high-sonority but homorganic nasal coda does not (12b, d). Ex. (12e) shows that the stress pattern of the root in (12c) contrasts with the typical five syllable pattern.

- (12) a. purúŋci 'water python'
 b. ɲóloŋkoʔ 'eucalyptus sp.'

- c. kùricáptonko 'olive python'
- d. kálarãnta? 'edible tuber sp.'
- e. ñárakkaràni [place name]

4. Analysis: preliminaries. In this section I outline an analysis of Ngalakan weight in an Optimality Theoretic (OT) framework (see for example Prince and Smolensky 1993). What OT allows us to do is to set up a relatively small number of general conditions on outputs in Ngalakan, like well-formedness conditions. But it is in the interaction of these often competing demands that OT differs from other theories. OT hypothesizes that some demands ('constraints') outrank others in deriving a well-formed output. Moreover, the effects of constraints are general throughout the language. OT specifically predicts that constraints on outputs will be the same whether in the realm of stress rules or allomorphy or compounding. This is a strong claim, but if true, it makes the theory more constrained and all the stronger for its consistency of application throughout the grammar.

4.1 CrispEdge. My analysis of the weight-for-stress distinction in Ngalakan makes crucial reference to a constraint family proposed by Ito and Mester (1994; see also Merchant 1994): 'CrispEdge[Prosodic Category]'. Ito and Mester propose CrispEdge as a constraint family to resolve certain contradictions in the use of the constraint family Align. They propose that the Coda Condition of Ito (1986) should be revised in favour of an instantiation of the general constraint family Align (and cf. McCarthy and Prince 1993). In languages with strong constraints on codas, the CodaCond should be restated as an alignment of consonant place with the left edge of the syllable. Thus in Japanese, where the only allowed codas are a homorganic nasal or homorganic stop (i.e. geminate), the constraint would be (Ito and Mester 1994:34):

CodaCond (Japanese, etc): Align-Left (CPlace, σ)

The fact that, in cases such as Japanese, homorganic codas are commonly exempted from the general prohibition on codas must be accounted for within this theory. In the three cases in (13a-c) below, Align must be satisfied in all three:

(13)	a.	b.	c.
	σ σ	σ σ	σ σ
	/ \ / \	/ \ / \	/ \ /
	kama	kampa <i>i</i>	kappa
		\	\
	CPl	CPl	CPl
	[lab]	[lab]	[lab]

In these cases, therefore, alignment must be relatively 'loose,' since CPlace is associated not only with the onset (a, b and c) but also with the coda in (b and c). In very similar circumstances, however, alignment must fail, precisely because it is loose.

Consider the example of Axininca Campa examined in McCarthy and Prince (1993:39-40). In this language, stems maintain their prosodic integrity by epenthesis. Given the input form /iN-koma-i/ in tableau (14), the output is [iN.ko.ma.Ti]:

(14) /iN-koma-i/	Onset	AlignR (Stem, σ)	Fill
→ a) iN.ko.ma.Ti			*
b) iN.ko.mai		*!	

(N homorganic nasal, T an epenthetic consonant, periods indicate syllable boundaries)

Despite the fact that *[iN.ko.mai] is a completely well-formed word in Axininca Campa, phonologically speaking, candidate (14b) fails. The constraint responsible for these forms, McCarthy and Prince argue, is Align, specifically, an instantiation of Align which demands coincidence of the right edges of stems with the right edge of a syllable. Onset can compel violation of Align in (15):

(15) /cik-aanci/	Onset	AlignR (Stem, σ)	Fill
→ a) ci.kaan.ci		*	
b) ci<k>.aan.ci	*!		

But in (16) there appears to be a better candidate which satisfies both constraints:

(16) /kim+aanci/	Onset	AlignR (Stem, σ)	Fill
→ a) ki.ma.an.ci		*	
b) ki<m>.aan.ci	*!		
? c) kim.Paan.ci		?	*

The existence of forms like [ci.kaan.ci] from underlying /cik-aanci/ shows that the higher ranking of the universal constraint Onset can force misalignment. However, the real problem is with forms like underlying /kim-aanci/, realized as [ki.ma.an.ci]. The problem is explaining why the output isn't [kim.Paan.ci], with epenthetic onset. This form should be more optimal than the former candidate, since it not only has an onset, it also satisfies the alignment constraint.

McCarthy and Prince argue that the latter candidate fails, in essence, because of the association of the final segment of the stem (through CPlace) with the onset of the following morpheme. In their words "Align requires sharply-defined morpheme edges, but linking as in [kim.Paan.ci], undoes the desired relation between the morphological and prosodic constituency of a form" (McCarthy and Prince 1993: 39). They note that if the epenthetic consonant is not supplied with a CPlace node (in an attempt to satisfy Align), the form violates CodaCond, since the CPlace of the coda [m] is now not licensed through linking to the onset.

If Ito and Mester's reformulation of the CodaCond as an alignment constraint is well-motivated, then there is a conflict in the conception of alignment as regards syllable wellformedness and alignment as morpheme-to-prosodic category wellformedness. Their proposal is that there be a separate family of constraints, CrispEdge, requiring that PCategories should have uniquely associated edges. The distinction in the definitions of Align and CrispEdge rests on the formal difference between the upwards-tracing relation *is-a* and the downwards-tracing *be-the-content-of* (see Ito and Mester 1994 for further discussion).

Their definition (Ito and Mester 1994:38) is as follows:

(17)

- a. Dfn. Let A be a terminal (sub)string in a phonological representation, C a category of type PCat, and A be-the-content-of C. Then C is crisp (or: has crisp edges) if and only if A is-a PCat.
- b. CrispEdge[PCat]: PCat is crisp

Besides Axininca Campa, Ito and Mester cite Sino-Japanese compounds for CrispEdge[PrWd], English word-internal ambisyllabicity for CrispEdge[Ft]. CrispEdge[σ] rules out geminates and other cases of cross-linking. Ito and Mester have no examples of CrispEdge[μ] but I suggest that this is precisely the case of Ngalakan. The application of this constraint to explaining Ngalakan stress is explored more fully in the following sections.

4.2 CrispEdge in Ngalakan stress. I assume the Weight-to-Stress Principle (Prince 1990; Prince and Smolensky 1993) is operative in this language. WtS demands that heavy syllables receive an accent in metrical structure. In polysyllabic words with some open and some closed syllables, the ranking of Weight-to-Stress >> AlignL(Pk, PrWd) derives the correct result, that heavy syllables receive primary stress over initial syllables:

(18)	WEIGHT-TO-STRESS	ALIGNL(PK, PRWD)
→ a) luŋúrwa		*
b) lúŋurwa	*!	

Given an underlying representation (UR) like [mołoppo!] then, we might expect that stress will move to the second syllable. In current theory (e.g. McCarthy and Prince 1993; cf. Hyman 1985) geminates are assumed to be represented underlyingly as a segment pre-linked to a mora. Singletons, by contrast, are assumed to be moraified only as a possible candidate analysis supplied by GEN (the device which generates potential surface outputs for an underlying representation). Given the moraic theory of geminates, then the second syllable of a form like [mołoppo!] should be considered as bimoraic and therefore heavy by the grammar. It should therefore be stressed, under WtS.

Rather than the moraic theory, I will instead be assuming the 'Two Root Theory' of length proposed in Selkirk (1988), for reasons which will become clearer below. Under this theory, segment length is distinguished at the root node level, rather than being represented by pre-linking to a mora underlyingly. URs then consist only of autosegmental feature-node structure. I assume that GEN supplies candidates with a number of possible prosodic parses (as is assumed generally in OT) but that it can also supply various moraifications, to be evaluated by universal constraints. The family Parse[ProsodicCategory] prefers representations that are as fully parsed as possible. Markedness constraints such as CrispEdge[μ], and potentially Zec's conditions on coda sonority for weight, serve specifically to prune these representations of moras at the surface level.

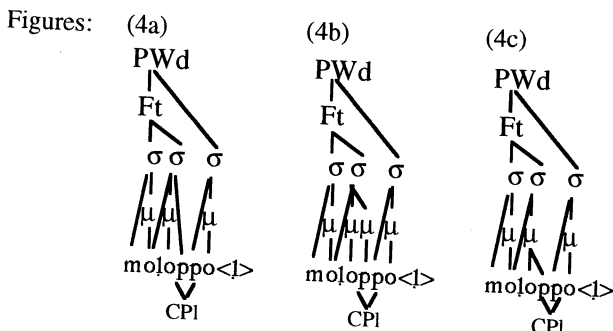
Now consider the tableau in (19). I assume a constraint demanding moraification of codas, called Parse[Seg].⁵ This constraint demands that codas be moraic, rather than being adjoined to the syllable node directly. This constraint will account for the weight of syllables with non-homorganic codas. In Ngalakan however, this constraint is ranked below a constraint CrispEdge[μ], which disprefers

moras dominating linked structure (cf. figures (4a, b, c)).⁶

CrispEdge[μ]: Moras are crisp.

(19)	CRISPEDGE[μ]	PARSE[Seg]
→ a) +mólóp`po!		*
b) mo+!ólp`po!	*!	

The candidate representation supplied by GEN in (4b) fails this constraint. Consider the diagrammatic representation in (4b) (=19b) in reference to the definition of CrispEdge given in (17).



(where CPI represents consonant place-structure features (assuming the feature geometry proposed in Padgett 1991[1995]); IPA symbols represent root nodes. The final segment, being extrametrical, is associated directly to the PrWd node).

Let A = the CPI node of (4b); this is the terminal substring of the phonological representation of this segment. Let ProsodicCategory C = the mora dominating the coda root node of the second syllable (i.e. the first half of the geminate segment). Tracing downwards from the PCat, the content of this mora is the root node in the coda and the CPI node to which it is associated. Tracing upwards from this CPI node, however, does not result in a *unique* PCat of the relevant kind. The CPI associated with the geminate can be traced upwards not only to the mora associated with the coda position, but also to the syllable node of the following syllable. Therefore, this mora is not crisp, since it is not true that the CPI node 'is a' (unique) mora. It is clear that Parse[Seg] and CrispEdge[μ] will always conflict where the coda segment in question is homorganic to a following onset, since the coda/onset boundary is non-discrete in that case.

In forms with two possible peaks, CrispEdge[μ] again prefers the candidate with the non-linked coda, even though by doing so it violates Parse[Seg]. Consider then the candidates in (20) (moraic association represented for codas only, all vowels are assumed to be moraified by universal convention):

(20)	CRISPEDGE	WTS	PARSE[SEG]
$\begin{array}{c} \mu \\ \\ \rightarrow a)(k\grave{u}ri)(c\acute{a}t)p\grave{o}ŋko \end{array}$			* [ŋ]
$\begin{array}{c} \mu \quad \mu \\ \quad \\ b) (k\grave{u}ri)(c\acute{a}t)(p\grave{o}ŋ)ko \end{array}$	*! [ŋ]		
$\begin{array}{c} \mu \\ \\ c) (k\grave{u}ri)cat(p\acute{o}ŋ)ko \end{array}$	*!		* [t]

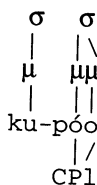
In (20a), GEN has supplied a candidate which assigns a coda mora only to the heterorganic coda in the third syllable. This form violates Parse in not realizing the mora of the homorganic coda in the following syllable. Since WtS demands that the heavy syllables are stressed, primary stress falls on the heavy third syllable, the first two syllables form a secondary, bimoraic foot. Candidate (b) maximally satisfies Parse and WtS by realizing the moras of, and stressing, both medial syllables. However, the moraic assignment to the homorganic nasal violates higher-ranked CrispEdge. Candidate (c) fatally violates CrispEdge as well. However it has not parsed the coda of the third syllable with a mora, and thus in some sense does not violate WtS either. I assume that Parse[Seg] is violated in this candidate because the coda is not moraified.

The (20b) candidate shows what is at issue here is not whether the syllable with a homorganic coda receives stress. It is simply that such a syllable can not be associated with a mora. Thus, it cannot receive stress as compelled by Weight-to-Stress. Although homorganic-coda syllables can freely be stressed under purely metrical assignment, as shown in the examples in (6).

5. Implications. Part of the justification of constraints is the work they can do for us in explaining a range of phenomena, rather than a single feature of one language. This section will outline how CrispEdge[μ] can derive some other, previously problematic, phenomena.

Like other constraints, CrispEdge[μ] is ranked and violable. The existence of CrispEdge[μ] in the grammar of Ngalakan could also explain the absence of contrastive long vowels in the language, unusual in quantity-sensitive systems, although long vowels do appear in stressed open monosyllabic roots under the compulsion of Align L(Stem, Foot) and Foot Minimality, e.g. [ŋùrunmu-ŋé:] 'it (sun, MU-class) is burning us'. Long vowels in a representation such as figure (5) below would also be ruled out by CrispEdge[μ], since the mora is associated with a non-discrete segment:

Figure (5)



(SR of /ku-po/ NounClass-river)

Ngalakan shows an asymmetry with respect to the crispness of stem edges: the left edge must be crisp but the right edge often is not. The right edges of roots and stems can be 'blurred' with the addition of suffixes beginning in geminates or homorganic nasal-stop clusters. Stem initials often geminate when compounded to the right of reduplicants or other stems. However, stem initials never geminate after inflectional prefixes (as broadly opposed to derivational ones)(see Baker 1997b for details).

This pattern is by no means uncommon among prefixing languages. The Nilotic language Shilluk (Gilley 1992) has phonemically distinctive gemination of all consonantal segments. The final segment of many verb and noun roots is geminated to express morphological derivation and inflection (plurality and possession in nouns, tense/aspect in verbs) (Gilley 1992:41). Consider exx. (21)=(Gilley (156), 1992:75).

- (21) a. ya yep:a ɔ̃ ɔ̃ 'I opened the door.'
 b. ya yep 'I opened.'
 c. ya yep̄i meya 'I opened (it) for my mother.'
 d. ya yɛ:ba tɔ̃ɔ̃ 'I opened (it) with a spear.'

Here the verb tense/aspect is indicated by weight contrasts of the rhyme among other things (the underlining of the vowel signifies expanded pharynx, the colon indicates phonemic gemination). Shilluk also has several regular prefixes for tense/aspect distinctions and some frozen prefixes for gender. None of these cause gemination of the initial segment of the stem.

In both languages, the Prosodic Word is associated to the left edge of stems. In Shilluk the initial association of tone to words is to the first TBU of the stem, excluding the prefix. In Ngalakan, footing for word stress is aligned in the first instance to the left edge of the stem, again excluding prefixes from stress assignment. Hence, I assume that the asymmetry of gemination in Shilluk and Ngalakan stems is to be handled by a constraint *CrispEdgeLeft(Prosodic Word)*, in association with *AlignLeft(Stem, ProsodicWord)*. The former constraint refers specifically to the left edges of stems, and bars non-discrete association of feature nodes to the segments at the left edges of stems (cf. Ito and Mester's (1994) '*CrispEdge[PrWd]*' with reference to Sino-Japanese compounds).⁷

6. Conclusion. The stress patterns in Ngalakan suggest that our notions of what can contribute to the distinction of weight in syllables needs to be revised. We need to be able to recognize that segment-to-syllable association can play a role, as well as the characteristics of segments *qua* codas in terms of sonority. OT provides a framework that can handle a stress system like Ngalakan's, which integrates metrical structure with a distinction of weight that respects the discreteness of mora association. A constraint family *CrispEdge[PCat]* has already been proposed and defended on the basis of evidence from several languages, showing that prosodic categories often require exclusive isomorphism with morphological categories, i.e.

no cross-association or multiple exponence, as it were, is allowed. My suggestion is that this same type of constraint is also at work here, in that the segments associated with moras in Ngalakan must be entirely within the respective syllable, and must not be ambiguous as to syllabic affiliation. The interaction of CrispEdge with well-established constraints on stress assignment elegantly derives the Ngalakan facts without recourse to any new language-particular constraints.

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Data come from my own fieldnotes mid 1994-mid 1996 and also Merlan (1983). Merlan's judgements on stress differ in some cases from mine. This and other differences in our data possibly reflect distinct dialects spoken by our respective teachers.

¹The glottal stop shows a restricted distribution in all the languages of this region (the north of the Northern Territory) in which it occurs (and see Harvey 1991 for an analysis). In Ngalakan it occurs only morpheme-finally, except for a few frozen compounds. Historically, it appears to have marked morpheme boundaries in languages of this region, and still has this purpose synchronically in Dalabon.

²Thanks to Mark Harvey for pointing this out.

³Evidence for this position comes from the productive, open class of verb stems in the language (McKay 1975 makes the same argument for the closely related language Rembarrnga). Stems regularly form the potential and future inflections by geminating a final consonant of the stem: [manɨj], [manɨj-ɲa] 'help, help-FUT'; [pu], [pu-lə] 'drown, drown-FUT'. Stems which end in a sonorant followed by a glottal stop geminate the sonorant, ignoring the glottal stop: manɨjʔmanɨjʔ-ɲa 'make', tuʔʔtuʔ-lə 'light' (exx. from Merlan 1983:120, and own field notes).

⁴ Though there is some variation: in bisyllabic roots stress sometimes vacillates between initial and second stress.

⁵ I use 'Parse' here in the sense of McCarthy and Prince's (1993) 'Parse[syll]' constraint, demanding syllables be parsed into feet. This use of Parse should not be confused with earlier OT uses ruling out deletion. These are now handled by 'Correspondence' constraints.

⁶ Sharon Inkelas has pointed out that this constraint predicts that other feature nodes (besides [place]) could contribute to a moraic-linking situation barred by CrispEdge. The example she suggests, [voice], is non-contrastive everywhere in Ngalakan, but this is certainly a possibility to be considered in other languages.

⁷ Ngalakan and Shilluk therefore provide empirical support for edge specification in CrispEdge constraints, evidence for which was lacking in Ito and Mester (1994).

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