Bartosz Kurzyca
Department of African Languages and Cultures
University of Warsaw

Shaping the word structure by iambic foot in Migama

Abstract

The following paper analyzes the role of metrical structure in shaping the East Chadic B language, Migama. Specifically, it will be argued that, similarly to Hausa, while having no overt influence on the language's tone distribution, iambic foot serves as a crucial factor in determining its morphology. The study concentrates on the most characteristic traits of iambicity found in Migama verbs, sensitive to metrical structure in unequal way: it will be demonstrated that verbs in imperfective aspect surface on an iambically parsed template while perfective forms are subject to phonotactic requirements, which results in their opaque structure. Finally, vowel harmony will be shown to mark the boundaries of iambic foot in both categories of verbs.

1. Introduction: Metrical Structure and its Applications

Initially treated as a theory of stress (Liberman & Prince 1977; Hayes, 1985, 1995), metrical theory deeply reorganized the classical generative approach to morpho-phonology. Going beyond a linear arrangement of segments grouped into morphemes and words, the theory introduced a hierarchical order of constituents well grounded in extra-linguistic, rhythmic phenomena: within metrical structure, segments are organized into higher units, like syllables, feet, phonological words. In turn, these phonological domains may not only account for "stress" or "prominence", but are also utilized by certain processes, like word formation (e.g. Selkirk 1980). According to McCarthy & Prince (1990, 1993a, 1996), various morphological categories are formed on the basis of prosodically specified templates. One of the basic constituents called on by Prosodic Morphology, is a metrical foot.

Likewise, boundaries of metrical units may be marked by vowel harmony. While this process of partial or total assimilation of vowels within certain domain was traditionally handled in terms of autosegmental theory, like "feature-spreading", it is functionally grounded as a typical instance of gestural overlap. According to Anderson (1980), some "features" characterizing a segment may not be synchronized by the same temporal function. "Retimings of articulatory gestures may result in coarticulation" (Blevins 2004: 140). Vowel-to-vowel coarticulation is often temporally coordinated with rhythmic patterns, like feet.

Still dealing with word-prosody, Hayes (1995: 47) states that: "typically (though not universally), the kind of foot required by a language's morphological system is the same as that required by its stress system". Languages deviating from traditional frames of prosodic typology (stress vs. tone) used to be termed "pitch accent" systems, yet the notion itself failed to survive close scrutiny, proving not to cover the variety of ways languages utilize metrical foot, and thus was explicitly rejected (Hyman 2001, 2006, 2009). Consequently, pointing to the flaws of such a typology, in which the so-called „pitch accent languages" do not constitute a coherent prosodic „type", Hyman (2009) calls for a different approach, namely a „property-driven typology", where, along the lines of Plank (2001), „the distributions of individual traits – units, categories, constructions, rules of all kinds, [and] not languages as such, are the primary objects of comparison" (Plank 2001:1399).

1.1 Iambicity in Chadic

Recent findings in Chadic have added to the evidence for the limitations of traditional prosodic typology, as, while languages comprising the group have been typically termed tonal, some do exhibit sensitivity towards metrical structure to a varying degree. For instance, in Kera, an East Chadic A language spoken by 45,000 people in Chad, iambic (i.e. right-headed) foot does not point to stress accent, and yet it shapes word structure, serves as a domain for vowel harmony and constrains tones in a subtle manner (Pearce 2006, 2007). All Kera words conform to iambic make-up and use universally attested strategies to avoid ill-formed feet, such as vowel deletion/lengthening, and form an acceptable iambic foot comprised ei-

ther of a heavy syllable ($\sigma_{\mu\mu}$) or a sequence of a light and heavy syllable (σ_μ $\sigma_{\mu\mu}$). The choice of the strategy depends on the word's position in the phrase: final vowel gets deleted phrase-medially (as in *beg*, derived from *bege* 'animal'), while in the phrase-final position, lengthening occurs (cf. *be.gee*). The foot-tone interaction reveals its presence in Kera in words containing more than two syllables, where – with a few exceptions – each iamb is associated with only one of the three tones, cf.

(gɜ̀.dàà)(mɔ̀ɔ̀) type of bird, (sáá)(tɜ̄.rāw) 'cat' (non-heads avoid H-tone assimilation – instead, middle tone occurs by default, e.g. (kɜ̄.kám)(náá).

On the other hand, in Hausa, a West Chadic A language used by more than 30 million native speakers, iambs do not overtly interact with the tonal system, but still impose direct size requirements on major nominal and verbal categories (for a detailed discussion see: Kurzyca 2009). For instance, productive noun plurals are formed on a condition to contain at least two iambic feet, and, if necessary, use universally attested strategies to augment in weight in order to meet the requirement, that is reduplication, gemination, or the insertion of a long vowel, e.g.:

(1)   Hausa
  Sg.   Pl.

  gá.ɓàà   *joint*   →(gá.ɓàà)(ɓúú)
                                 (gáɓ) (ɓú.nàà), (gàɓ)(ɓái)
  bá.kìì   *mouth*   → (bá.kún)(kú.nàà)
  bí.káá   *baboon*   → (bí.kàà)(kéé)

  cf. no augmentation:

  jáákìì   *donkey*   → (jáá)(kúnàà), (jàà)(kái)
  gààtáríí   *axe*   → (gáá)(túràà)

Accounting for the multiplicity of ways in which Hausa forms plural nouns, Hellwig & McIntyre (2000) presented a thorough diachronic analysis of the category. In this view, one can observe that prosodic requirements emerged in plurals in the course of their

development, triggering the establishment of new formation principles (reduplication, gemination, long vowel insertion), and thus laying new foundations for the category in question. Those forms which did not meet the 'two iambs' requirement, ceased to function or have been reinterpreted as singulars and acquired another plural (Kurzyca 2009: 18):

(2) Hausa

Archaic Sg. Archaic Pl. = Modern Sg. →Modern Pl.

dúmèè   (dú.máà)   (dú.màà)(méé) gourd
gíjìì   (gí.dáà)   (gí.dàà) (jéé) house
kárèè   (ká.ráà)   (ká.ràà) (réé)
                                        cornstalk
ƙújèè   (ƙú.dáà)   (ƙú.dàà)(jéé) *fly*

Modern plural patterns such as -*aa.ee* above, utilize bi-iambic domains also to mark the boundaries of Prosodic Word. This can be illustrated by the alternations below.

(3) Hausa
a.   two iambs in plural

  Sg.   Pl.
  dá.móó   (dá.màà)(méé)   *land monitor*
  gí.dáá   (gí.dàà)(jéé) < /gì.dàà.déé/   *house*

b.   three iambs in plural

  Sg.   Pl.
  súú.náá   (súú)(nàà)(yéé)   *name*
  kíí.fíí   (kíí)(fàà)(yéé)   *fish*

In (3a) the consonant is copied from the root if the plural stands within the domain of two iambs, i.e. within the Prosodic Word designed for Hausa plurals. If the plural exceeds the edges of PrWd, the least-marked /y/ occurs as the -*aa.ee* hiatus-breaker (as in 3b).

76

While consonant-repetition generally occurred in the prosodic system in a restricted environment, later it has developed into a morphological plural formative, as in the most recent -*oo.ii* type:

(4)   Hausa
a.   two iambs in plural

Sg.	Pl.	
dí.láá	(dí.lóó)(líí)	*jackal*
gá.ɓáá	(gá.ɓóó)(ɓíí)	*joint*

b.   three iambs in plural

Sg.	Pl.	
móó.táá	(móó)(tóó)(číí) < /moo.too.tii/	*car*
gáá.šíí	(gáá)(sóó)(šíí)	*hair*

In sum, iambicity plays a defining role in Hausa plurals, while its emergence and interaction with other requirements found in the system has produced a range of allomorphy rules. Similar observations can be found in other categories in Hausa, such as denominal and pluractional verbs (Kurzyca 2009: 26).

As will be seen below, prosodic system of Migama resembles that of Kera and Hausa inasmuch as it employs iambically-defined size requirements to shape the language's morphology.

2. Migama

Spoken by around 20,000 users in Chad (Chesley 2000), Migama is an East Chadic B language of Dangla branch. Described by Jungraithmayr (1974, 1975), as a tonal language with two distinctive level tones, Migama also reveals a strong sensitivity to syllable weight (with CV vs. CVV/CVC distinction). As shown below, it is specifically an iambic foot which shapes the word structure in Migama, and furthermore its boundaries are marked by vowel harmony. Since nearly all the available data and its subsequent analyses refer to the verbal system of the language (perfective, imperfective and anterior past, cf. Jungraithmayr 1974, 1975, and Adams 1992, Wolff 1977, Seymur *et al.* 1983, Frajzyngier 2004) , the following

study is mainly based on this category, while the data comes from the works mentioned.

2.1. Metrical Structure and Verb-Formation

Migama words are built of the following syllable shapes:

(5)   short σ_μ

CV   kà.mé   *haunt mice*

heavy $\sigma_{\mu\mu}$

CVV   sàà.làw.wá   *whistle*
CVC   gîr.lé   *look at*

Jungraithmayr and Adams (1992) divides Migama verbs into Aspect 1 (perfective) and Aspect 2 (imperfective), further classifying them along morphological criteria. The author states that the occurrence of high vowels (i, u) generally characterizes verbs found in perfective group, while imperfective forms usually pair with middle/low vowels (o, e, a), and occur typically with the last consonant geminated. Jungraithmayr (1974) and subsequent analyses of Migama verbs treat absolute past and progressive tenses as archetypical for Aspect 1 and 2 verbs respectively.

Table I: Classification of Migama Verbs (Jungraithmayr and Adams 1992)

PERFECTIVE (Jungraithmayr's 'Aspect 1')	IMPERFECTIVE ('Aspect 2')
Absolute Past	Progressive
Subjunctive	
	Anterior Past
Relative Past	
	Immediate Past
Future / Conditional	
	Imperfective II

The following analysis acquires Jungraithmayr's approach, yet concentrates on explaining all the alternations in vowel distribution and syllable structure with reference to metrical structure exhibited by the language. Paraphrasing the author's remark on gemination often found in Aspect 2 group, I assume that imperfective verbs are highly sensitive to iambicity and surface typically on a template built on a canonical (light-heavy) iambic foot followed by a short syllable. As such, gemination is but one of many ways of optimizing the verb form to fit the desired template, e.g.:

(6)   Migama
ʔay   *grind*   kalp   *climb*   TENSE

ASPECT 2 (Imperfective): Iamb + CV

(ʔà.yàk)ká	(ká.láp)pá	(progressive)
(ʔà.yàk)ké	(ká.làp)	(immed.past)
(ʔa.yáɗ)ɗě	(ká.làp)ɗě	(ant.past)
(ʔa.yáɗ)ɗò	(ká.làp)ɗò	(imperf.II)

79

cf.   ASPECT 1 (Perfective)

ʔá.yé	kâl.pé	(abs.past)
ʔá.yù	kál.pú	(subjunctive)
ʔáy.dě	kâl.pì.dě	(rel.past)
ʔáy.dò̃	kál.pí.dò̃	(future)

All the alternations exhibited by the verbs above will be ana-lyzed in what follows. For now, suffices to say that the imperfective template is fully regular, while the last syllable marking the type of the verb in both Aspect 1 and 2 is always kept short.

The occurrence of light syllables in ultimate position might be considered opaque in iambic languages, in which the rightmost syllable in the foot is considered prominent and typically marked by longer duration. On the other hand, iambic systems often treat such syllables as extrametrical, i.e. not parsed by a higher prosodic struc-ture: a foot. The notion of syllable extrametricality is well-established cross-linguistically and accounts usually for alternations in stress-placement, as in Latin: a trochaic (i.e. left-headed) language in which stress falls on the head of the last trochee, built either of a heavy syllable ($'\sigma_{\mu\mu}$) or two light syllables ($'\sigma_\mu\sigma_\mu$). In polysyllabic words, the ultima is not taken into account in stress-placement, i.e. not parsed by the foot, and therefore considered extrametrical. As a result, stress may fall on the penult, antepenult, or – in monosyllabic words – on the last syllable. Extrametrical syllables are marked by brackets <CV>, e.g.:

(7)   Latin

Antepenult	'a.ni<mus>	*anger*
Penult	a.'cer<vus>	*heap*
Ultima	'lux	*light*

Returning to Migama, if we assume that the final syllable is not parsed by the metrical structure, than a substantial number of the verbs appear to be neatly parsed by iambic feet. In the imperfective, for instance, by far the most frequent word structure is CV.CVC.CV,

80

which – not counting the ultimate syllable – is based on a light-heavy, canonical iambic foot:

(8)　　　Migama: iambic parsing in imperfective[1]

| (gà.sàk) | <ká> | *find* | (kó.tóm) | <má> | *wrap* |
| (ba.kam) | <má> | *hold* | (cè.pèl) | <lá> | *lift* |

On the other hand, roughly one in ten perfective verbs comprises a sequence of three light syllables, which is hardly tolerated in iambic systems:

(9)　　　Migama: CV.CV.CV in perfective

| ʔá.pì.ré | *choose* | dá.ɓì.ré | *rest* |
| wà.tì.yé | *warm up* | gù.zì.lé | *inflate* |

Observe however, that all of these idiosyncratic verbs occur in phonologically-restricted environment, penult being formed by an obstruent in the onset and a high vowel standing for the nucleus. Moreover, their counterparts in the imperfective avoid such a sequence by creating iambic feet followed by a stray syllable:

(10)　　　Migama

	Perfective	Imperfective	
a.	ʔá.pì.ré	(ʔá.pár)rá	*choose*
b.	dá.ɓì.ré	(dá.ɓár)rá	*rest*
c.	wà.tì.yé	(wà.tày)yá	*warm up*
d.	gù.zì.lé	(gò.zòl)lá	*inflate*

Again, assuming that the last syllable is extrametrical, gemination in the imperfective aims at optimizing the iambic shape. Ob-

---

[1] If not stated otherwise, imperfective verbs are cited in progressive tense and describe the general pattern in Aspect 2 verbs. The same holds for the perfective aspect, which occurs typically in absolute past.

serve also, that the vowels share the same quality when within iambic foot, as exhibited by imperfective verbs above (and further lower in (10d): *gù.zì.lé* – (*gò.zòl)lá* 'inflate'). The last vowel, on the other hand, is provided by the suffix indicating the tense of the verb: perfective: *-Ce*, imperfective: *-Ga*, anterior past: *-ɗe/-Vdɗe*, subjunctive: *-Cu*, etc.

Before I present a detailed analysis of vowel harmony, it is practical to scrutinize Migama metrical system in verbs.

3.Metrical Analysis of the Verbal System
3.1 Imperfective

Canonical imperfective verbs in Migama are formed on the basis of at least three syllables. The last consonant is geminated and serves as the onset for final short *-a*:

(11) Imperfective: -Ga, at least 3 σ   Perfective

ŏσ̄ŏ	gà.sàk.ká	*find*	gàs.sé
σ̄σ̄ŏ	sàà.ɗǎy.yá	*winnow*	sáá.ɗì.yé
ŏσ̄σ̄ŏ	gò.nyòl.gòw.wá	*become an idiot*	
			gò.nʸòl.gù.wé

σ̄ŏ   7 verbs out of 1241 in the Seymur *et al*. (1983) corpus
ŏŏσ̄ŏ represented by only two verbs

As observed by Frajzyngier, the choice of the geminated consonant "depends solely on the underlying form of the verb, and more specifically on its segmental structure. (…) Stems that have two consonants add the suffix *-kk-* to the root":

(12)   Migama
ka.ɓ-   ká.ɓá**k.k**á   *pull in stomach*
be.s-   bé.sé**k.k**á   *save*

If the stem consists of more than two consonants, the last one is geminated:

(13)   Migama

kal.p-	ká.láp.pá	*climb*
hoo.kV.l-	hòò.kòl.lá	*scream*
ʔa.sV.d-	ʔà.sàd.dá	*suck*
ɗop.pV.nʸ-	ɗõp.pòn.nʸá	*stew*

Similar alternations characterize other forms in imperfective, including anterior past tense, in which the suffix -*de* is "added to triconsonantal verbs [and] the last consonant of the verb precedes the consonant of the suffix, thus satisfying the template". For smaller stems, the geminated form -V*dde* is attached:

(14)   Migama

a.	ɗă.kV.l-	ɗă.kàl.dě	*have an erection*
	mi.gVs-	mí.gís.dě	*get used to*
b.	be.s-	bé.sèɗ.dě	*save*
		*bes.ɗe,	
		*be.se.ɗe	
	wa.l-	wá.láɗ.dě	*pass the night*
		*wal.ɗe,	
		*wa.la.ɗe	

From the surface-oriented perspective, we may observe that in (14a), the added anterior past suffix -*de* forms a canonical iambic foot and a stray syllable. Verbs in (14b) surface on a basis of the same template, shunning the forms which are either disyllabic (**bes.de*, **wal.de*) or contain a sequence of three light syllables (**be.se.de*, **wa.la.de*).

To paraphrase these observations, indeed all the verbs in (11-14) surface on the condition to contain at least three syllables parsed iambically. For shorter stems, epenthetic /k/ is inserted by default to expand the prosodic word and fulfill the size requirement. Gemination of the last consonant is also conditioned metrically and adds

weight to the penult that heads the iambic foot. Ultimate short syllable is extrametrical and does not take part in the process:

(15)   Migama
        a.   Progressive

        ka.ɓ-   (ká.ɓák)<ká>   *pull in*   *ka.ɓa, *(kaɓ)ɓa
                                        stomach
        be.s-   (bé.sék)<ká>   *save*   *be.sa, *(bes)sa
        kal.p-   (ká.láp)<pá>   *climb*   *ka.la.pa
        hoo.kV.l-   (hòò)(kòl)<lá>   *scream*   *(hoo)ko.la
        d'op.pV.ny- (dòp)(pòn)<nyá>   *stew*   *(dop)po.nya
        da.ɓV.r-   (dá.ɓár)<rá>   *rest*   *da.ɓa.ra
        dʸal.kV.y-   (dyàl.kày)<yá>   *woo*   *(dʸal)ka.ya

        b.   Anterior past

        be.s-   (bé.sèɗ)<ɗé>   *save*   *bes.ɗe, *be.se.ɗe
        wa.l-   (wá.láɗ)<ɗé>   *pass*   *wal.ɗe, *wa.la.ɗe
                                        the night
        ɗa.kV.l-   (ɗă.kàl)<ɗé>   *have an erection*
        kal.p-   (ká.làp)<ɗé>   *climb*

       Both */k/*-insertion and prosodic size requirements are also found in Hausa morphology. As already mentioned, Hausa plurals surface on the condition to have at least two iambic feet. In the *-u.aa* plural type, the last consonant from the stem is inserted to brake the hiatus. If the singular stem is too small, as in raa.fii 'stream', epenthetic */k/* is inserted by default (*ráá.fú.kàà*), and, if necessary, part of the suffix is further reduplicated to meet the bi-iambic constraint: *gà.ɾii* 'city', pl. (*gá.ɾúú*)(*rú.kàà*). Close synchronic and diachronic analysis of this plural type can be found in Kurzyca (2009).

        (16)   Hausa

        Singular   Plural = 2 iambs

        gàà.tá.ríí   (gáá)(tú.ràà)   *axe*   *(gaa)ta(ru.kaa)

84

| ràà.fíí | (ráá)(fú.kàà) | *stream* | *(ru.faa) |
| gà.ríí | (gá.rúú)(rú.kàà) | *city* | *(gu.raa),*ga(ru.kaa) |

As for the trisyllabic size constraint in Migama, the same operates in the construction of Hausa denominal verbs. The so-called Hausa verbalizer surfaces with roughly two types of the suffix: *-taa* or *-a(a).taa*. The shorter variant corresponds to items comprising at least two syllables, while the longer one is designed for monosyllabic stems. Further *-a.taa/-aa.taa* choice is constrained by iambic parsing (Kurzyca 2009: 27):

(17)   Hausa

	Stem	Verbalizer
a. 2σ: -taa	tii.las-	tíí.làs.táá *perforce*
b. 1σ, 2 moras: -a.taa	yaa.f-	yàà.fá.tàà *beckon*
c. 1σ, 1 mora: -aa.taa	ku.s-	kù.sáá.tàà *approach*

Prosodic requirements on size are well-established in the literature. Drawing on frequency-based analyses by Zipf (1935) and Mańczak (1965, 1969), Kraska-Szlenk (2009) points to strong functional grounding of such constraints, stating that

"(...) augmentation of lexical words to a more conspicuous size makes them more salient in the discourse, which complies with their greater functional value" [Kraska-Szlenk 2009: 274].

To be precise, there is a handful of imperfective verbs in Migama corpus – all of them referring to basic notions – which contain only two syllables. Still, all such verbs are unique in yet another way: they contain minimally one iamb, and as such are the only ones that lengthen the last vowel, ignoring syllable extrametricality. Moreover, most of such verbs have an alternative form, augmented by epenthetic geminated *-ww-* to fit the template e.g.

(18)   Migama

	Disyllabic imperf. verbs		Alternative
ʔar-	(ʔá.ráá)	*drink*	(ʔá.ráw)wá
ber-	(bè.ráá)	*descend*	(bè.rèw)wá
kil-	(kè.láá)	*hide*	
wan-	(wà.náá)	*dream*	(wà.nàw)wá
yok-	(yò.káá)	*return*	
zeg-	(zé.gáá)	*light*	

In other words, while the verbs above are apparently ignoring the requirement on the minimal number of [three] syllables, all of them are clearly sensitive to iambic parsing: final syllable, which elsewhere behaves as extrametrical, is now included in iambic foot and lengthened to serve as its head.

3.2 Perfective

As already mentioned in the introduction, there is a considerable number of "ill-formed" verbs found in perfective tense, containing a sequence of up to three light syllables:

(19)   Migama

Perfective: -*e*

σ̄σ̆σ̆	dʸál.kì.yé	*woo*
σ̆σ̆σ̆	kú.dĩ.sé	*heat up*
	mí.gí.sé	*get used to*
	ʔà.bì.ré	*deter*
	wà.tì.yé	*warm up*
	gù.zì.lé	*inflate*

It was observed further above that such forms occur in a restricted environment: the penult always comprises a light syllable built of an obstruent and a high vowel. Given this, I assume that Migama generally disallows obstruents in coda position and there-

fore /i/ is epenthesized to repair the ill-formed syllable *(*ʔab.re, *mig.se, *guz.le)*.

Consider also the following alternations:

    (20)   Migama

    nʸáà.wé (Perfective)   nʸà.káw.dě (Anterior Past)   *rain*
    zóò.né   (Perfective)   zó.kóŋ.ŋá (Imperfective) *be caught*

        Anterior past *nʸà.káw.dě* corresponds to the perfective *nʸáà.wé* above. As noted by Frajzyngier (2004), this would suggest that AP is actually formed on the basis of a trisyllabic stem, *//nʸa.kV.we//* on analogy with the pair *kal.pe – ka.lap.dě* 'climb' (*<//ka.lV.pe//*). Imperfective *zó.kóŋ.ŋá* appears with a similar idiosyncrasy. Indeed, Jungraithmayr (1983) reconstructs this class of verbs as having historically an intervocalic velar consonant *zo.kV.ne*, *nʸa.kV.we*. Apparently, the nucleus was lost in the course of the development of the system, presumably because of the emergence of iambic constraint on the word structure of Migama, which strains from building sequences of light syllables. Consequently, obstruents were weakened and lost in the coda, resulting in a heavy syllable with a long vowel *(*nʸak.we > nʸaa.we)*. According to Frajzyngier (2004), "The rule operates in a very specific environment, the third consonant is either *m*, *w* or *ŋ* ". The archaic velar consonant has prevailed in other forms, where it occupies an onset (cf. imperfective and anterior past in (21)). Similar historical process operated in Hausa (cf. Klingenheben's Law, Newman 2004, Kurzyca 2009: 54).

        The question remains, however, how Migama copes with those verbs that seem to overtly violate iambic structure and surface in a sequence of three light syllables (*wa.ti.ye* 'warm up', *gu.zi.le* 'inflate', etc.). Given that /i/ is epenthetic, I assume that Migama treats such vowels as invisible to metrical structure, i.e. that they are ignored by the iambic constraint. Such a phenomenon is widely attested in languages sensitive to metrical structure, cf. Mohawk (Michelson 1989), Arabic dialects found in Iraq (Erwin 1963), Palestine (Blanc 1953, Johnson 1979), Lebanon, Syria (Behnstedt 1994, Cowell 1964, Grotzfeld 1965), and certain parts of Egypt (Woidich 1980:

207, Behnstedt & Woidich 1985), among others. Drawing on examples similar to that found in Migama, Hall (2000) states that "syllables whose nuclei are epenthetic vowels frequently fail to count as syllables in patterns such as stress alignment, minimal word requirements, and conditioning of open syllable lengthening" (Hall 2000: 1586). The author gives an example of an interaction between stress-placement and epenthesis in Lebanese Arabic. Here, stress usually falls either on a super-heavy ultima, a heavy penult, or otherwise on an antepenult:

(21)   Arabic (Lebanese)

a.   naz.'zalt   /n a z z a l - t/   *I brought down*
b.   fi.'him.na   /f i h i m - n a/   *he understood us*
c.   'fi.him.na   /f i h m - n a/   *our understanding*

In (21c), epenthetic /i/ breaks a consonant cluster and forms a closed, heavy penultimate syllable, yet the stress falls on the antepenultimate syllable rather than on the penult (cf. 21b). Thus, the epenthetic vowel seems invisible to metrical structure. Hall (2000) concludes that "although epenthetic vowels are usually added in order to syllabify stray consonants, the syllables they form do not necessarily count as syllables for other aspects of the phonology".

While, as mentioned before, Migama is not a stress-accent language, it clearly treats epenthetic vowels as invisible to iambic pattern. For independent evidence, consider the formation of verbal noun. Nouns are derived from verbal stems by adding -*o* or -*aw* suffix to the perfective, e.g.

(22)   Migama

Perfective	VN	
gàr.té	gàr.tò	*becoming sweet*
rúù.mé	rúú.mó	*cooking in water*
cf. ʔá.zé	ʔá.záw	*boasting*
kà.mé	ká.máw	*haunting mice*

The choice of the suffix attached depends on the quantitative make-up of the word: -*o* pairs with stems already containing a heavy syllable (*gar-*, *ruu-*), while -*aw* forms an iamb with other stems, comprised of light syllable(s). As a result, all verbal nouns contain at least one heavy syllable, which serves as the head of an iambic foot: (*gàr*) <*tò*>, (*ká.máw*). In other words, the category of deverbal noun surfaces on the condition to contain at least one iamb.

Observe however, that nouns derived from verbs with an epenthetic vowel (underlined below), attach -*o* suffix rather than the predicted -*aw*:

(23)   Migama

Perfective   VN

ʔì.<u>bì</u>.né	ʔì.bì.nò	*knowing*
ʔá.<u>cì</u>.pé	ʔá.cì.pò	*engraving*
wà.<u>tì</u>.yé	wà.tì.yò	*warming up*
kú.<u>dí</u>.sé	kú.dí.só	*heating up*

Vowel /*i*/ is epenthesized after obstruents to avoid marked coda (*ʔib.ne, *ʔac.pe). The reason for which idiosyncratic forms like /ʔì.bì.nò/, /wà.tì.yò/ pair with /gàr.tò/, /rúú.mó/ clearly points to the fact that epenthetic /*i*/ is invisible to iambic parsing and treated as if their structure was *(wat)<yo>*, *(ʔi.b)<no>*. Our assumption, that phonotactic requirements in Migama (coda condition) do not interfere with metrical structure, is borne out.

The last argument for iambicity in Migama comes from vowel harmony, analyzed in the following section along with a brief description of the language's vowel system.

3.3   Vowel Harmony
3.3.1   Background: Inventory and Distribution of Vowels
There are five basic vowels in Migama:

i   u
    e   o
        a

In verbs, full inventory of vowels is exhibited mainly in the first syllable of perfective tense. Furthermore, as claimed by Jungraithmayr (1992) and Frajzyngier (2004), initial vowels mark the verb's transitivity: "great majority of verbs with the vowel /a/ are intransitives, and verbs with /i/ or /u/ are overwhelmingly transitive. Moreover, whenever /a/ or /e/ in the first syllable is opposed to /i/, [they] indicate an intransitive verb while /i/ indicates a transitive verb" (all the examples below come from [Frajzyngier 2004:99]):

(24) Migama

tà.tì.dě	*be lost*	tì.tì.dě	e*liminate, lose*
wè.sì.nyé	*be spread*	wì.sì.nyé	*spread*
tàl.lì.yé be	*said openly*	tìl.lì.yé	*say openly*
nân.gé	*spoil* (intr.)	nîn.gé	*spoil* (tr.)

As for the vowels vocalizing Migama verbs internally, I will argue that their quality is predictable due to metrical structure and/or morphophonology. The problem of vowel harmony marking the boundaries of iambic foot will be discussed in the following section.

3.3.2 Iambically-driven vowel harmony

Prior analyses (Jungraithmayr 1974, 1975, and Adams 1992, Wolff 1977, Seymur *et al.* 1983, Frajzyngier 2004) have suggested that whether or not Migama vowels harmonize depends strictly on the occurrence of geminates/consonant clusters in the word, e.g. ʔácáppá 'engrave', cf. ʔácìpé. On the other hand, it was shown above that gemination in Migama is driven by iambic requirement. Indeed, the following analysis argues that in all imperfective verbs, based on a prosodic template, it is the iambic foot that serves as a domain for vowel harmony. Consider the following examples:

(25)   Migama

	Perfective	Imperfective	
a.	bé.sé	(bé.sék)ká	*save*
	bà.yé	(bà.yàk)ká	*fear*
	ʔá.cì.pé	(ʔá.cáp)pá	*engrave*
b.	kú.dí.sé	(kó.dós)sá	*heat up*
	gù.zì.lé	(gò.zòl)lá	*inflate*
	ʔì.bì.né	(ʔè.bèn)ná	*know*

Vowels standing within iambic foot in imperfective verbs in (25) share the same quality. In (25b), high vowels additionally lower to mid. Describing the category of imperfective, Wolff (1977: 171) divides the process into two rules, apophony & vowel-copy, and states that "apophony affects all high vowels in the first syllable of the base thus changing *i > e* and *u > o*. Vowel copy concerns the second syllable of all bisyllabic bases with the result that only three vocalization patterns may occur: *-a-a*, *-e-e*, *-o-o*." The rules operate in the context of consonant reduplication which "affects the final radical of the base". Frajzyngier (2004: 104) shares Wolff's observation, stating that "if the epenthetic vowel is followed by a cluster of consonants, it is a copy of the preceding (first) vowel". At the same time, the author generalizes that the rule has "no exceptions among perfective and verbal noun forms of [tri- and quadrisyllabic] verbs, where the second vowel is epenthetic and followed by the cluster of consonants". In other words, vowel harmony is said to affect iambically parsed Aspect 1 and 2 verbs, plus the category of verbal nouns.

(26)   Migama

a. Absolute Past (Aspect 1)		b. Progressive (Aspect 2)	
(bè.nêy)yé	*talk, say*	(cè.pèl)lá	*lift*
(ʔò.zôb)bé	*heat up*	(ʔà.sàd)dá	*suck*
(kò.tôp)pé	*thrust*	(gò.zòl)lá	*inflate*
(tʸà.lâl)lé	*fail*	(wà.tày)yá	*warm up*

91

We need to bear in mind however, that Frajzyngier's corpus of 1,241 verbs published in Seymur *et al*. (1983), cites all Aspect 1 and 2 items only in absolute past and progressive tense respectively. All the observations based on these forms implicitly generalize that other tenses behave in the same way. However, perfective verbs in both relative past and future tense do not harmonize vowels in the said context (27a), and ignore the rule of leveling high vowels to mid (27b):

(27)   Migama

	Perfective:	Relative Past	Future	
a.	ʔapil-	(ʔà.pîl)ɗé	(ʔà.píl)ɗò	*wash*
	kadir-	(kà.dîr)ɗé	(kà.dír)ɗò	*contourner*
b.	pigil-	(pì.gîl)ɗé	(pì.gíl)ɗò	*make sth fall over*
	misil-	(mì.sîl)ɗé	(mì.síl)ɗò	*lose*

Interestingly, verbs in relative past and future tense do not only disregard vowel harmony in all its aspects, but also appear to be free of light-heavy, canonical iambic template that typically shapes imperfective forms with the same suffix, as in (28a) below. Moreover, vowel harmony serves as a contrastive factor between these forms – examples of minimal pairs are given in (28b).

(28)   Migama

	ASPECT 1	ASPECT 2	
a.	Future	Imperfective II	
kalp-	(kál)pí.ɗò	(ká.làp)ɗò	*climb*
pilk-	(ʔáy)ɗò	(ʔày.áɗ)ɗò	*grind*
b.	Relative Past	Anterior Past	
pigil-	(pì.gîl)ɗé	(pè.gêl)ɗé	*make sth fall over*
ʔapil-	(ʔà.pîl)ɗé	(ʔà.pâl)ɗé	*wash*

Future and imperfective II tense verbs (28a) share the same suffix, yet they differ from each other inasmuch as the former simply adds the suffix to the stem, while the shape of the latter is optimized to fit the light-heavy template. Similarly, in (28b) anterior and relative past verbs are parallel in shape, tonal melody and suffix, yet may be differentiated according to the distribution of vowels: anterior past verbs pair with other Aspect 1 forms in vowel harmony.

Moreover, if it is metrical theory that we apply to Frajzyngier's claim that vowel lowering – inherent element of the harmony – operates also in perfective/absolute past, we should also verify the rule with respect to monosyllabic iambs. Examples below prove that in Aspect 1, iambic feet built over one heavy syllable are free of the lowering (29a)[2]. One exception here is a closed set of reduplicated verbs, where a heavy syllable, i.e. an iambic foot, stands for a duple (29b)[3].

(29)   Migama

a.   Perfective (Absolute Past)

icc-   (ʔíc)cé   *take*
surd-   (sùr)dé   *shave*
diyy-   (dîy)yé   *look for sth*
pilk-   (pìl)ké   *pay*

---

[2] Partial reason for which monosyllabic iambs – occuring typically in word-initial position – do not lower high vowels may be that the first syllable in Migama verbs usually serves a grammatical function. According to Frajzyngier (2004: 99), "whenever /a/ or /e/ in the first syllable is opposed to /i/ (…) /a/ and /e/ indicate an intransitive verb while /i/ indicates a transitive verb". Frajzyngier adds that he has "no information regarding the productivity of the low vowel-high vowel contrast in Migama", pointing to verbs which ignore the general pattern, e.g. intransitive *mi.gi.se* 'get used'. Regular leveling of vowels in Aspect 2 surely further blurred the division.
[3] For alternative, non-prosodic analysis of this category, see Frajzyngier (2004: 106). According to the author, there is no particular semantic/syntactic properties associated with reduplication.

b.   RED $\sigma_{\mu\mu}$ - Perfective (Absolute Past)

kVs-	(kós)kì.sé	*court sb*
cVp-	(cep)ci.pé	*crush*
gVdVr-	(gè.dêr)dì.ré	*vibrate*

On the other hand, Aspect 2 verbs are fully regular in surfacing on iambic template with the vowels harmonized, and their inventory restricted to /a/, /o/ and /e/. Basing on this observation, Jungraithmayr and Adams (1992) postulate that all verbs in imperfective aspect, apart from adding a particular suffix and a tone melody, vocalize internally with the so-called "archiphoneme A", as in *ʔa.sì.de* – (*à.sÀd*)*dá*. When the internal A combines with high vowel in the first syllable, they mutually assimilate with each other: "dans le cas ou la premiere voyelle est un *-u-*, la combinaison avec l'archiphonème A donne un *-o-* en position V1 et V2, et le *-i-* donne analogiquement un *-e-*" (Jungraithmayr and Adams 1992: 49).

Regular templates found in Aspect 2 verbs seem to confirm the authors' remark which, however, does not account for vowel harmony found in all relative past and subjunctive verbs or verbal nouns that share the template with the imperfective, i.e. comprise at least one canonical, light-heavy iamb and a stray syllable, or in reduplicated forms (cf. 26a, 29b, and below):

(30)   Migama

Verbal Noun	Absolute Past	Subjunctive	
(tà.wâɗ)ɗò	(tà.wâɗ)ɗé	(tà.wàɗ)ɗù	*hunt*
(tè.pêl)pì.lò	(tè.pêl)pì.lé	(tè.pêl)pì.lú	*ride*
(pà.rây)yò	(pà.rây)yé	(pà.rây)yù	*be sick*
(ɗ'è.ɗẽŋ)kì.lò	(ɗ'è.ɗẽŋ)kì.lé	(ɗ'è.dên)kì.lú	*be unstable*

Internal vocalization may be traced in the category of verbal nouns. Traditionally, VN is claimed to be formed by adding one of the suffixes, *-aw/-o* depending on the quantitative make-up of the

stem. On the other hand, the category may be equally claimed to have just one underlying form, *//-a-o//*, which surfaces as a suffix *-aw* in words lacking an iambic foot, and otherwise – as internal A and *-o* attached at the end of the stem. Both strategies aim at building a word with at least one iamb:

(31)   a.   luw-   luw-a-o → lú.wáw   *sow*
              pan-   pan-a-o → pá.náw   *build*
       b.   parVyy-   par-a-yy-o → pà.rây.yò   *be sick*
              tawVɗ́ɗ-   taw-a-ɗ́ɗ-o → tà.wâɗ.ɗò   *hunt*

This hypothesis leaves us with a question of what happens with internal A when a verbal noun is formed on the basis of a stem with a heavy syllable, as in *zúb.bó* 'wrap', *kìì.lò* 'hide', or with an invisible epenthetic vowel, as in *ʔí.pì.rò*, 'untie', *cì.pì.lò* 'lift'. Again, partial explanation comes from the fact that the nucleus of initial syllables traditionally played a grammatical role, marking (in)transitivity.

In any case, we are left with a strong generalization that vowel harmony occurs within iambic foot in all Aspect 2 verbs, which are always built on a basis of an iambic template and contain at least three syllables. Furthermore, all the rest of verbs (and verbal nouns), comprising at least three syllables with a canonical light-heavy iamb exhibit vowel harmony parallel to Aspect 2 forms. On the other hand, while vowel-lowering is displayed by initial heavy syllables of reduplicated verbs (29b), all the other, non-derived forms strain from leveling vowels in this position, presumably because of the grammatical functions they (used to) play. The only forms which do not comply with the above generalization – relative past and future tense verbs – preserve the original quality of vowels (and insensitivity to iambic parsing) as the only contrastive element in Migama verbal paradigm (cf. 28).

4. Conclusion

Through the analysis of two major verbal categories – perfective and imperfective – I provided evidence that Migama exhibits sensitivity towards iambic structure, utilizes universally attested strategies of maximizing rhythmic asymmetries and conditions the

size of a prosodic word by iambically defined constraints. Further arguments for iambicity in Migama are provided by vowel harmony operating within the foot boundaries. Furthermore, the alleged violations to iambic parsing (cf. vowel epenthesis creating a sequence of light syllables) were explained and proved not to harm iambic structure. As such, Migama serves as yet another evidence for iambicity established in Chadic, while contributing to the discussion on the multiplicity of ways metrical structure may be used cross-linguistically.

References

Anderson, S. R., 1980, "Problems and Perspectives in the Description of Vowel Harmony", in: R. Vago (ed.), *Issues in Vowel Harmony*, Amsterdam: Benjamins.

Behnstedt, P., Woidich M., 1985, *Die Ägyptisch-arabischen Dialekte* Wiesbaden: L. Reichert.

Behnstedt, P., 1994, *Der arabische Dialekt von Soukhne (Syrien)*, Wiesbaden: Harrassowitz.

Blanc, H., 1953, "Studies in North Palestinian Arabic; linguistic inquiries among the Druzes of western Galilee and Mt. Carmel", *Oriental Notes and Studies*.

Blevins, J., 2004, *Evolutionary Phonology: The Emergence of Sound Patterns*, Cambridge: Cambridge University Press.

Chesley, W., 2003, *An Analysis of the Phonology of Migaama*, SIL (Manuscript), N'Djamena.

Cowell, M. W., 1964, *A reference grammar of Syrian Arabic, based on the dialect of Damascus*, Washington: Georgetown University Press.

Erwin, W. M., 1963, *A short reference grammar of Iraqi Arabic*, Washington: Georgetown University Press.

Goldsmith, J., 1990, *Autosegmental and Metrical Phonology*, Oxford: Basil Blackwell.

Grotzfeld, H., 1965, *Syrisch-arabische Grammatik*, Wiesbaden: Harrassowitz.

Frajzyngier Z., 2004, "On Segment Counting and Heavy Segments", *Folia Orientalia*, 40, 95-132.

Hall, N., 2000, "Vowel Epenthesis", in: M. van Oostendorp, C. J. Ewen, E.Hume, K. Rice (eds.), *The Blackwell companion to phonology*, Malden, MA & Oxford: Wiley-Blackwell, 1576-1596.

Hayes, B., 1985, *A Metrical Theory of Stress Rules*. New York: Garland Press.

Id., 1995, *Metrical Stress Theory: Principles and Case Studies*, Chicago: University of Chicago Press.

Id., Stivers T., 1996, *The phonetics of post-nasal voicing*, Los Angeles: UCLA.

Hellwig, B., McIntyre J. A., 2000, "Hausa plural systems: a diachronic presentation", *Journal of African Languages and Linguistics*, 21,1, 1-43.

Hyman, L., 2001, "Tone systems. In Language typology and language universals" in: M. Haspelmath, E. König, W. Oesterreicher, W. Raible (eds.), *An international Handbook,* vol. 2, Berlin & New York: Walter de Gruyter.

Id., 2006, "Word-prosodic typology", *Phonology*, 23, 225–257.

Id., 2009, "How (not) to do phonological typology: the case of pitch-accent", *Language Sciences*, 31, 213-238.

Johnson, C. D., 1979, "Opaque stress in Palestinian", *Lingua*, 49, 153-168.

Jungraithmayr, H., 1974, "Perfektiv und (...), in: ZDMG", *Supplementa II*, Wiesbaden: Franz Steiner, 583-595.

Id., 1975, "Der Imperfektifstamm im Migama", *Folia Orientalia*, 16, 85-100.

Id., 1983, "On mono- and triradicality in early and present-day Chadic: How reliable are reconstructions?", in: E. Wolff, H. Meyer-Bahlburg (eds.), *Studies in Chadic and Afroasiatic Linguistics*, Hamburg: Helmut Buske.

Id., Adams A., 1992, *Lexique Migama, avec un introduction grammaticale*. Berlin: Reimer.

Kurzyca, B., 2009, "Iambic Templates in Hausa Morphology", *SDALC*, 43, 21-97.

Kraska-Szlenk, I., 1999, "Syllable structure constraints in exceptions", in: J. R. Rennison, K. Kühnhammer (eds.), *Phonologica 1996: Syllables!?. Proceedings of the English International*

Phonology Meeting, Vienna 1996, Hague: Holland Academic Graphics,113-131.

Ead., 2009, "Size vis-à-vis frequency: minimality and maximality constraints in Swahili", *Language Sciences*, 31, 2-3, 271-284.

Liberman,M., Prince A.,1977, "On stress and linguistic rhythm", *Linguistic Inquiry*, 8, 249-336.

Lukas, J., 1963, „Der II. Stamm des Verbums im Hausa", *Afrika und Übersee*, 47, 162-186.

Mańczak, W., 1965, *Polska fonetyka i morfologia historyczna* [Historical Phonetics and Morphology of Polish], Warszawa: Państwowe Wydawnictwo Naukowe.

Id., 1969, *Le Développement phonétique des langues romanes et la fréquence*, Kraków: Uniwersytet Jagielloński.

McCarthy, J., Prince A., 1990, "Foot and Word in Prosodic Morphology: The Arabic Broken Plural", *Natural Language and Linguistic Theory*, 8, 209–282.

Id., 1993, *Prosodic Morphology: Constraint Interaction and Satisfaction*, Ms., University of Massachusetts, Amherst and Rutgers University, Rutgers Center for Cognitive Science technical report 3.Cambridge, MA: MIT Press.

Id., 1993, "Generalized Alignment", in: G.Booij, J. van Marle (eds.), *Yearbook of Morphology*, Dordrecht: Kluwer.

Id., 1994, "The Emergence of the Unmarked: Optimality in Prosodic Morphology", in: M. Gonzaléz (ed.), *Proceedings of the North East Linguistics Society*, 24, 333–379. Amherst: Gradute Linguistic Student Association.

Id., 1996, *Prosodic Morphology.* Technical Report 32, Rutgers University Center for Cognitive Science. Annotated version of 1986 Manuscript.

McIntyre, J. A., 2008, "Regular and Irregular Verbs in Hausa: An alternative to ˃grade system˂?", *Afrika und Übersee*, 88, 1-2, 187-228.

Michelson, K., 1989, "Invisibility: Vowels without a timing slot in Mohawk", in: D. Gerdts, K. Michelson (eds.), *Theoretical perspectives on Native American languages*, New York: SUNY Press.

Newman, P., 1972, "Syllable weight as a phonological variable", S*tudies in African Linguistics*, 3, 301-323.

Id., 1990, "Internal evidence for final vowel lowering in Hausa", *Studies in African Linguistics*, 21, 251-255.

Id., 1990, "Nominal and Verbal Plurality in Chadic", *Publications in African Languages and Linguistics*, 12, Dordrecht: Fortis Publications.

Id., 1997, "Hausa phonology", in: A. S. Kaye (ed.), *Phonologies of Asia and Africa (including the Caucasus)*, Winona Lake: Eisenbrauns, 537-552.

Id., 2000, *The Hausa Language: An Encyclopedic Reference Grammar*, New Haven and London: Yale University Press.

Id., 2004, *Klingenheben's Law in Hausa*, Köln: Köppe Verlag.

Pawlak, N., 1989, *Gramatyka języka hausa. Fonologia i fonetyka. Morfologia* [Grammar of Hausa: phonology & phonetics. Morphology]. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego.

Ead., 1998, *Język hausa* [Hausa Language], Warszawa: Dialog.

Pearce, M., 2006, "The Interaction between metrical structure and tone in Kera", *Phonology*, 23, 2, 259-286.

Ead., 2007, "Iambicity in Kera", in: D. L. Payne and J. Peña (eds.), *Selected proceedings of the 37th Annual Conference on African Linguistics*, Somerville, MA: Cascadilla Proceedings Project, 66-76.

Pilszczikowa-Chodak, N., 1972, "Tone-vowel height correlation and tone assignment in the patterns of noun plurals in Hausa", *Studies in African Linguistics*, 3, 3, 399- 421.

Plank, F., 2001, "Typology by the end of the 18th century" in: Sylvain Auroux *et al.* (eds.), *History of the Language Sciences: An International Handbook on the Evolution of the Study of Language from the Beginnings to the Present, vol. 2*, Berlin: Mouton de Gruyter.

Prince, A., Smolensky P, 1993-2004, *Optimality Theory: Constraint Interaction in Generative Grammar. (* Technical Report, Rutgers University and University of Colorado at Boulder, 1993. Revised version published by Blackwell, 2004).

Selkirk, E., 1980, "Prosodic Domains in Phonology: Sanskrit Revisited", in: M. Aronoff, M.L. Kean (eds.), *Juncture*, Anma Libri: Saratoga.

Id., 1984, *Phonology and Syntax: the Relation between Sound and Structure*, Cambridge: MIT Press.

Seymur *et al*., 1983, *Essai de classification des verbes migaama*, Sarh (Tschad): Centres d'Etudes Linguistiques.

Schuh, R. G., 1989, "Long vowels and diphthongs in Miya and Hausa", in: P. Newman and R. Botne (eds.), *Current Approaches to African Linguistics*, 5, Dordrecht: Foris, 35-43.

Id., 2003, "A Comparative Study of West Chadic Verb Suffixes", in: M. L. Bender, G. Takacs, David L. Appleyard (eds.), *Selected Comparative-Historical Afrasian Linguistic Studies. In Memory of Igor M. Diakonoff*, München: Lincom.

Weeda, D., 1992, *Word Truncation in Prosodic Phonology*, Ph.D. thessis, Austin: University of Texas.

Westermann, D., 1911, *Die Sprache der Haussa in Zentralafrika*, Berlin: Akademie-Verlag.

Woidich, M., 1980, "Das Ägyptisch-Arabische", in: W. Fischer, O. Jastrow (eds.), *Handbuch der arabischen Dialekte*., Wiesbaden.

Wolff, E., 1977, "Verb Bases and Stems in Migama", *Afrika und Übersee*, 60, 3, 163-177.

Id., 1993, *Referenzgrammatik des Hausa*, Hamburg: Lit Verlag.

Zipf, G. 1935/1965, *The Psycho-Biology of Language: An Introduction to Dynamic Philology*, Cambridge: MIT Press.