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Quantitative Metrics in Chadic and Other Afroasiatic Languages[1]

Russell G. Schuh
UCLA, Department of Linguistics
schuh@humnet.ucla.edu

Abstract
Metrics is the study of the properties of metrical language found in poetry and song in languages throughout the world. This paper looks at examples of metrical language from traditions of poetry/song in two languages of the Chadic family, Ngizim and Hausa. These languages organize their metrical patterns on quantitative principles of syllable weight rather than of stress or syllable counting. The paper adopts an analytical framework of generative metrics using a grid and constraints for setting text to the grid. The paper shows that despite very different cultures and methods of transmission, poetry/song in these two languages conform to exactly the same principles. Moreover, the Hausa poems, composed in meters of Classical Arabic origin, show that principles underlying poetry composed in the Classical Arabic tradition should be analyzed in similar ways. The final section of the paper shows that the oral performance of texts is systematically related to the more abstract properties of the text itself, and moreover, is crucial in understanding properties that do not emerge from examining the text alone.

Keywords
Chadic; Hausa; Ngizim; Arabic; metrics; syllable quantity; text-setting

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1. Introduction

Perhaps universal to every human culture is the utilization of properties inherent to that culture's language to create texts with regular and recurrent rhythmic structures. Such texts are called "poetry", "verse", or "song" (the latter usually referring to texts that have a musical setting). When texts have regular rhythmic properties, they are said to be *metrical*. The study of these properties is *metrics*, a field that has roots dating to ancient times in a number of traditions of poetry and song. The central theme of *generative metrics* has been to characterize what makes lines of verse metrical as well as what would render text "unmetrical" or "non-metrical". That is, why would a series of lines of *verse*, each comprising *n* prosodic units (say, syllables) in some language, be judged "metrical" whereas a similar series of lines of *prose* of the same number and same type of prosodic units in the same language be judged "non-metrical"? The more ambitious goal of generative metrics is to work out the principles of *Universal Metrics* (UM) that underlie the human ability to work basic linguistic material into the particular forms that are recognized as "metrical".

In addition to leading to understanding the metrical properties of a text, metrics also provides direct evidence of speakers' tacit knowledge of phonological, morphological, and syntactic structures, since composing metrical text often imposes conditions regarding stress, syllable weight, syntactic constituency, and the like, properties which most speakers could not explicitly describe.

Systems of metrical language are mainly of three types: systems based on *stress*, systems based on syllable *weight* and/or *mora counting* (= *quantitative* metrics), and (for lack of a better term) *syllable fitting* systems. Perhaps most familiar are systems based on stress, the type found in most English metered poetry, with canonical poetic feet such as *iambs* (unstressed-stressed), *trochees* (stressed-unstressed), etc. Quantitative systems, which are the subject of this paper, distinguish *heavy* and *light* syllables, hence the term syllable *weight*. A majority of languages with quantitative systems of metrics have a phonological distinction between long and short vowels, corresponding to heavy and light syllables, though there are other determinants for weight such as open vs. closed syllables. Putative examples of syllable fitting systems would be French *alexandrine* (poetic lines consisting of 12 syllables) or Korean *shijo*, which is traditionally described as consisting of three lines, each line comprising four syllable groupings with intervening pauses (3 4 3 4/3 4 3 4/3 6 4 3).[2]

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[2] It is unlikely that any system of meter works solely by syllable counting. Both *alexandrine* and

All the major living families of Afroasiatic have languages that use quantitative systems of metrics, for example, Classical Arabic in Semitic, the Somali genre *heello* in Cushitic (Johnson 1974), Tashlhiyt songs in Berber (Dell and Elmedlaoui 2008), and Hausa poetry and song of all types in Chadic (Hiskett 1975, among many others). Most work in generative metrics has focused on stress-based systems. There are generative studies of the quantitative systems of Latin, Ancient Greek, Sanskrit, and Classical Arabic, but there is very little published generative work on living quantitative systems (Dell and Elmedlaoui (2008) being an important exception). The purpose of this paper is to outline some of the properties of quantitative meters in selected Afroasiatic languages, and to argue for a unified system for formalizing and understanding these meters. In § 2, I will outline the formal framework that I will apply to the languages to be considered. In § 3, I will present a metrical analysis of two songs/poems in Ngizim, a Chadic language spoken in northeastern Nigeria. In § 4, I will apply the same type of analysis to two Classical Arabic meters. The texts to be studied are actually in Hausa, but many Hausa poets are well-trained in Arabic scholarship, and as far as I can tell, they have adapted Classical Arabic meters to Hausa in all relevant respects. In this section, I will argue that generative studies of Classical Arabic metrics have actually hindered the serious study of quantitative metrics by being side-tracked into analyzing the traditional Arabic descriptive *system*, not the poetry itself. Section 5 looks at oral performances of the meters discussed in §§ 3–4. Although the musical meter of performance may differ from the meter instantiated by the text alone, the two are linked in systematic ways, and aspects of performance are often crucial for a full understanding of the metrical organization of the text. Section 6 is a conclusion calling for study of *living* systems of quantitative metrics as part of the program of UM.

2. Formal Framework

All the texts that I will consider in this paper were either delivered directly in the form of song or they were composed with the intent of being chanted or sung. Both the texts, abstracted away from performance, and the performances of a specific text have well-defined metrical properties. As noted at the end of the preceding paragraph, these two metrical manifestations may not be identical, but in § 5 I will argue that they are systematically related and can be formalized in the same terms. In the current section I consider the metrical properties of the texts themselves.

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shijo, for example, require syntactic breaks at particular fixed intervals, and probably every system prefers, or even mandates, that line ends align with relatively large syntactic breaks.

The descriptive framework that I will be using is the *metrical grid* (Liberman and Prince 1977, Lerdahl and Jackendoff 1983, Hayes 1983).[3] The bottom line of the grid consists of a sequence of *grid positions*, indicated by "×'s" here. These positions correspond to the maximum number of basic prosodic units available to a line of metrically well-formed language. In a stress-based metrical system, grid positions correspond to syllables (for example, ten grid positions for iambic pentameter, twelve positions for dactylic tetrameter, etc.). In the quantitative systems discussed here, grid positions correspond to moras, where a heavy syllable comprises two moras and a light syllable one mora.[4] The rhythmic pattern inherent to metered language is indicated by projecting grid positions to *metrical positions*, which alternate between *weak* and *strong* at regularly spaced intervals. Projections to weak metrical positions are indicated by a grid column of two "×'s" and those to strong metrical positions by a column of three "×'s".

Metricality is determined by the way a text aligns to a grid. Acceptable deviations from a canonical alignment result in metrical *complexity*. Unacceptable deviations result in *unmetricality*. What is "acceptable" vs. "unacceptable" is a matter of poetic tradition and variation among individual poets, and a major part of the metrist's job is to draw the line between the two types of deviations.

In quantitative metrical systems such as those found in Afroasiatic languages, distinct meters and variations within those meters are defined by the way sequences of heavy and light syllables are set to the metrical grid. The typical inventory of heavy and light syllables across the Afroasiatic languages, including the Chadic languages discussed here, is the following:[5]

(1) Inventory of syllable types:
– *light* (indicated "◡"): (C)V (V = short vowel)
– *heavy* (indicated "-"): (C)VV (VV = long vowel)
(C)VC

[3] Dell and Elmedlaoui (2008) use a similar system, which could be translated into the system here and vice versa. The specific inventories of meters in the languages examined differ from each other, of course.

[4] Some languages allow extra-heavy syllables. Most seem to treat these as metrically bimoraic. Chadic languages generally disallow extra-heavy syllables, though they exist in a few languages, such as Bade. I have no data revealing how such syllables would be treated metrically in Chadic languages.

[5] Strictly speaking *weight* should be expressed in terms of *moras*, not vowels and consonants, i.e. a *light* syllable has one mora, a *heavy* syllable has two. By far the most common realization of moras is that shown in (1), but Tashlhiyt Berber, for example, has C_1C_2 syllables like *tr* or *kn*, where C_2 is the realization of a mora.

Using the framework of the metrical grid, we can typologize grids across the three following parameters:

– Duple vs. Triple rhythm (four vs. three/six ×'s between Strong Metrical Positions)
– Number of Strong Metrical Positions per line (4 is by far the most common, but some meters have 3 or 6)
– First Metrical Position of a line = Weak or Strong

Restricting ourselves to just meters with four-S's per line, there would be four basic grid types. Each of these grid types can align with a variety of meters depending on specific syllable configurations in a line. For example, the poems/songs exemplified in (2), (5), and (9) below all align with a grid having a *duple* rhythm, *four S's* per line, and *initial W*, but the syllable configurations differ. Likewise, the *triple* meters of (3) and (12) both have *four S's* per line and *initial W*, but the favored syllable patterns differ.

In (2) and (3), I illustrate two of the possible grids that the three bulleted parameters define with a few lines from Hausa poems/songs. Terms referring to components of grids are as follows:[6,7]

GP *Grid Position*: Each GP is represented by "×" in the bottom line of the grid. In the quantitative meters here, the number of GP's in a line will be the maximum number of *moras* that a single line of text could accommodate.

MP *Metrical Position*: MP's are abstract units of metrical "strength" that fall at regular intervals along the line of GP's. An MP is a sequence of one, two, or three GP's, where the leftmost GP is the strongest. MP's themselves alternate between *S(trong)* and *W(eak)* shown by columns of three or two ×'s respectively.

S, W See "MP".

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6) Audio files of all the selections in this paper can be heard at http://www.linguistics.ucla.edu/people/schuh/Metrics/quantitative_metrics_2010.html

This page also has longer selections of the texts that more fully illustrate metrical options.

7) In addition to the terms for components of grids, a few further remarks on terms should be useful: a *text grid* is an abstract template that characterizes meters of a particular type; a *performance grid* is an abstract template that characterizes the rhythm of a performance (song, chant, recitation); a *meter* is a pattern of syllables and/or moras that characterizes a particular text; I will use the term *align(ment)* when referring to the way the meter of a text matches a text grid; I will use the term *set(ting)* when referring to the way a performer matches a text to a *performance grid* during an actual performance.

(2) **Duple Rhythm** (four S's, starts on W)[8]

MP	W		S		W		S		W		S		W		S	
			×				×				×				×	
	×		×		×		×		×		×		×		×	
GP	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
(a)	Mu	zi-	yaR-		ci	mu-	tan		Mo-	ri-	taa-		niy-		yaa,	
(b)	Da	Sa-	haa-		Raa		tai		ma-	su	ƙaa-		wan-		yaa,	
(c)	Mun		nee-		mi	zu-	mun-		taa		*da*	*ji-*	yay-		yaa,	
(d)	A	a-	zum-		ta	a	zaa-		bu-	ra	ai		a-	ni-	yaa,	
(e)	Ai-		kin		ha-	ɗa	kan		I-	fi-	Rii-		ƙiy-		yaa.	

(a) Let's visit the people of Mauritania,
(b) Around whom the Sahara has formed a ring around,
(c) We have sought clanship and mutual understanding,
(d) Let one fast (in order to reflect, then) leap forth and act with zeal,
(e) The work of uniting Africa.

(ALa_HKA, p. 45, verse 76)

(3) **Triple Rhythm** (four S's, starts on W)

	W	S		W	S		W	S		W	S	
		×			×			×		×		
	×	×		×	×		×	×		×	×	
GP	×	×	×	×	×	×	×	×	×	×	×	×
(a)	Ka-	maR		ka	ɗii-		Ø	baa		ha-	ka,	
(b)	Mi-	ya-	R	ka-	maR		Ø	tsaa-		ki-	yaa,	
(c)	Mi-	ya-	R-	ki	Laa-		Ø	di-n		O-	gaa.	

(a) As if you dip out thus,
(b) The sauce is like (a string of) agates,
(c) Chorus: Your sauce, Ladi-of Oga ["Ladi, Oga's wife"].

(MSK_LOg)

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8) In grids for Hausa and Ngizim, R = tapped/trilled [r] contrasting with "r" = retroflex flap [ɽ], c = IPA [tʃ], j = IPA [dʒ]. sh = IPA [ʃ], dl = IPA [ɮ], tl = IPA [ɬ]. Doubled vowels = long vowels. A hyphen following a syllable indicates that the next syllable is part of the same word. I have not marked tone since it plays no role in the metrical systems of the languages considered here, though linguistic tone and performance melody do show interesting correspondences, a subject for future research.

The text-to-grid matching shows that both moras and syllables are metrically relevant. In (2), there are 16 GP's, and each line of text comprises 16 moras, but the number of syllables ranges from 10 to 12. Careful examination will reveal that S's overwhelmingly align with heavy syllables (the only exception being the third S of (2b)), whereas W may align with a heavy or two lights.

S-to-heavy also applies in (3), but in this triple rhythm, W always aligns to a single light syllable. The latter, where an MP consists of only one GP violates principles of metrical organization proposed by others. Prince (1989:55) argues for the principle of MAXIMAL ARTICULATION: "All metrical structure is binary." Thus for an amphibrach foot, he proposes the structure $[W\ [S\ W]_S]_{\text{AMPHIBRACH}}$, i.e. the S itself bifurcates into S W. In effect, this is what the grid in (3) does, i.e. the first MP in (3) is W (= the first W in Prince's foot), and the S in (3) branches into a three-× column (= the embedded S in Prince's foot) and a one-× column (= the embedded W in Prince's foot). However, the rhythmic character of the text is not one of amphibrachs, but one of iambs, created by the alternating sequence of light and heavy syllables.[9] Lerdahl and Jackendoff (1983:72), analyzing rhythmical properties of music, treat triple rhythms in a different way. Translating their analysis into the metrical terms being used here, each MP would be the leftmost of three GPs, and the alternating W and S would be the MPs themselves, i.e. the grid of 3 would be [× S × ×W × × S × × W ×]. This representation fails to match the character of the text meter of (3) in two ways. First, there is nothing about the text to justify labeling the first and third S's of (3) as "stronger" than the second and fourth. Second, and more important, the second and third GPs of each MP are not metrically equal. The second never aligns with a syllable of its own, while the third almost always aligns to a light syllable. In this paper, I will use the grid in (3) to represent triple rhythms, fully realizing that this runs counter to previous

[9] In traditional teminology on metrics, the *foot* is a fundamental unit, the traditional foot types being *iambs* (σ Σ), *trochees* (Σ σ), *anapests* (σ σ Σ), *dactyls* (Σ σ σ), and *amphibrachs* (σ Σ σ), where Σ = more "prominent" syllable and σ = less prominent. *Foot* may be a convenient term to refer to a S+W or W+S pairing of MPs, but the traditional terminology of labeling meters by groupings of foot types (*iambic pentameter*, *dactylic hexameter*, and the like), doesn't work very well for quantitative meters of the type being studied here. Although one can recognize the traditional feet, these fall out from the parameters of duple vs. triple rhythm, starting W or S, and the syllables that align with GPs. For example, the syllable sequence ˘--˘ … as in (3) may be recognized as a series of *iambs*, but this is just another way of labeling "triple rhythm beginning with W". Likewise, the syllable sequence ˘˘-˘˘- … as in line (2a) may be recognized as a series of *dactyls*, but this is just another way of saying "duple rhytm beginning with W". And while it might work to call (2a) a line of *dactylic tetrameter*, it wouldn't help in understanding (2b), which would be *dactyl-iamb-dactyl-iamb*! Moreover, "iambs" in this meter would comprise -- while in the meter in (3), they would comprise ˘-.

practice. Alternatively, one could represent (3) with four Ss consisting of three GPs each and no positions designated W.

In Schuh (2010), a study of 14 Ngizim songs, I made a preliminary attempt at formulating principles of metrical well-formedness in terms of constraints as used in the framework of Optimality Theory (OT), though I put forth the constraints as tentative and made no attempt to produce a full-fledged OT analysis with constraint rankings. Here, I will formulate constraints informally as descriptive generalizations about how text fits to a metrical grid, with a few comments referring to the examples in (2–3) where they appear not to conform to these generalizations.

(4) **Basic constraints on text setting**

(a) LINE END MATCHING: The last metrical position of a line must be filled with text. This is in contrast to English folk metrics, for example, where some meters have obligatory line-final "empty" positions (Hayes and McEachern 1998, Kiparsky 2006). It is also in contrast to line beginnings, where, as in many poetic traditions, grid positions may be left unfilled or may be filled in "irregular" ways.[10]

(b) ALIGN ALL GRID POSITIONS: Every mora should be aligned with a grid position and vice versa.
Comment: In (3), the third W is shown as not aligning with a syllable, marked "Ø" for convenience. This can be viewed either as violating (b), i.e. leaving a grid position unaligned to a mora, or as violating (d) below, i.e. aligning a heavy syllable to three grid positions rather than two. This is an example of an acceptable deviation that obviates deviations that would result in complete unmetricality in a number of ways, for example, by aligning the heavy syllable at the third S with the grid position now aligned with Ø.

(c) FINAL SYLLABLE LENGTHENING: Syllables at line ends always scan as heavy, regardless of lexical weight.[11] We will see that in Ngizim, but

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[10] Hayes (1983:373) states this principle, "Correspondence to a metrical pattern tends to be lax at the beginnings of units; strict at the ends," and he cites references for a number of traditions in stress-based, quantitative, and even tone-based metrical traditions where this generalization holds.

[11] One reviewer suggested that the weight of line final syllables is simply free, but metrics argue against this. I have noted that S almost always aligns to heavy, a fact amply illustrated in (2) and (3). In both these examples, the line final MP is S, hence, we would expect that it would align with a heavy syllable, yet line (3a) ends in a lexically light syllable. This holds across the board for meters that end in S. There is a widely used Hausa meter that scans -⏑-⏑-⏑-- (Schuh 1994). This will be rccognized as being like (2), but with W and S reversed. The expectation is that each MP will align with two moras, and, as in (2), the W's often align with two light syllables, but the last (W) MP is always a single syllable, never two lights. Here is a line in this meter from

rarely, if ever in Hausa, lengthening can also apply to word-final syllables internally in a line to fit exigencies of a meter.

(d) MORA MATCHING: A *heavy syllable* aligns to two grid positions and a *light syllable* aligns to a single grid position.

(e) S(TRONG) TO HEAVY: In the overwhelming majority of cases, the two grid positions of an S align to a heavy syllable.
Comment: The converse is not true, i.e. heavy syllables need not be exclusively aligned to S's. Thus, in (2) there are a number of cases where a heavy syllable aligns with the two grid positions of a W.

(f) LIGHT TO W(EAK): An unpaired light, i.e. a light that is not adjacent to another light, always aligns to the first or only × of a W.

(g) PAIRED LIGHTS TO W(EAK): In a meter with duple rhythm, paired lights overwhelmingly align with the two grid positions of a W.
Comment: Example (2) abundantly illustrates this, though the italicized syllables at the third S in (2c) show a deviation. The moraic equivalence of two lights = one heavy aligned to an S is a deviation that is available to poets when called for by the exigencies of their composition. However, in this poem, comprising several hundred verses (see ALa_HKA in the list of song citations), the poet only occasionally does this in S, whereas every verse has several examples of paired lights aligning to a W.

(h) HEMIOLA: In a meter with triple rhythm, three heavy syllables can be evenly matched to six grid positions. An example will be seen in § 3.2. HEMIOLA is not a *constraint* on text-to-grid alignment, but rather an option that follows as an automatic result of having three heavy syllables corresponding to six GP's.[12] Since this paper is not proposing a full formal constraint-based analysis, I will continue to use the term HEMIOLA as a convenient term for a particular type of text-to-grid matching.

The constraints here all have to do with the correspondence of phonological metrical units to the grid. There are also constraints on the alignment of syntactic structure to a grid. A number of the constraints formulated in Dell

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Aƙilu Aliyu, "'Yar Gagara" (AAA_FA, p. 8): *Baa ta nufin zikiRii, sai baatsa* 'She aims not to recite the names of Allah, only obscenities'. The underlined syllable is lexically light, but to parallel the other W's, it must be scanned as bimoraic, i.e. heavy.

12) As a possible account we could have a constraint ranking (f) LIGHT TO W >> (b) ALIGN ALL GRID POSITIONS >> (e) S TO HEAVY. In a line like - - - ◡ [- - -], where the hemiola is boxed, the ◡ preceding the hemiola and the first - of the hemiola are aligned by (f) and (e) respectively, and the following two -'s are aligned by (b). Offsetting a - to achieve (e) would violate the higher ranked (b).

and Elmedlaoui (2008) are of this type, e.g. LINE/PHRASE: "The end of a line is also the end of a syntactic constituent" (p. 122), a constraint that also applies to the traditions examined here.

3. Metrics of Two Ngizim Songs

In this section, I will describe the metrical structure of two Ngizim songs. Ngizim is a West Chadic language (Newman 1977) spoken in the area of Potiskum, the largest city in Yobe State of northeastern Nigeria. These songs were collected as part of research project on six Chadic languages of Yobe State funded by the US National Science Foundation (see footnote 1). The analysis of these two songs comes from unpublished work on 14 Ngizim women's songs (Schuh 2010). The two main modes in which these songs are performed are (1) as a solo and chorus, where the chorus "answers" the soloist with a fixed refrain or a verbatim repetition of the soloist's line, and (2) as an unaccompanied solo, usually while doing some kind of work. The texts typically deal with social or cultural issues, such as philandering husbands, rivalries with co-wives, praise of noteworthy individuals, funeral laments, and the like. The texts do not tell a linear story, as would be the case, for example, in English folk ballads. Lines tend to be self-contained comments relating to the theme and are often highly allusive, making the sense virtually impossible for an outsider to fully grasp and somewhat obscure even to members of the community (indeed the singers themselves are often at pains to explain the full meaning of a particular line).

3.1. *Analysis of a Song with Duple Rhythm*

In (5) are representative lines from a song in a duple rhythm aligned to the grid in (2).

(5) "Ai karniga jinga karniga" (duple rhythm, four S's, starts on W)

	W		S		W		S		W		S		W		S	
			×				×				×				×	
	×		×		×		×		×		×		×		×	
	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Ref	**Ai**		**kar-**		**ni-**	**ga**	**jin-**		**gaa**		**kar-**		**ni-**	**ga**,		
003	Kaa-	ne	soo		bee		kaa-		rak		de-n-		ga-	ra,		
004	A n-	də-	mii-		na		Maa-		lam		Baa-		ba-	yoo,		
007	Kaa-	ne	Dok-		ta		Gim-		ba		de-n-		gə-	ri,		
008	Kaa-	ne	a n-		ci	kə-	muu		yaa-		ree-		wa	da,		
009	Kaa-	nee	yaa-		re	Ngə-zəm			see		ɗak		Ja-	la,		
011	Kaa-	ne	bee		kaa-		rak		ku-	ma	de-n-		ga-	ra,		

Ref(rain): *Ai karniga jingaa karniga*.
003: Well, here's something pleasant (it) has come,
004: Y'all greet Malam Babayo,
007: Well, Dr. Gimba has come,
008: Well, he wants to hear our language indeed,
009: Well, Ngizim language, none but Jala town,
011: Well, something pleasant moreover has come

The numbered verse lines are sung by a soloist with the chorus singing the refrain, *Ai karniga jingaa karniga*, between each of the soloist's lines. The refrain is a meaningless phrase that is iconic for the meter, like "*Hickory dickory dock*, (The mouse ran up the clock)" in the English nursery rhyme. This same refrain can be used with other songs in the same meter.[13] The syllable configuration of this meter is as in (6), where - = heavy, ˘ = light, and ⏑⏑ = two lights or a heavy:

(6) Base meter of (5): ⏑⏑-⏑⏑-⏑⏑-˘˘-

One apparently non-metrical aspect of the text-to-grid matching in (5) is the soloist's text for the first W. I have set the text to the grid for this position as she actually performs it in the respective lines. The setting of the word *kaane(e)*, translated "Well", varies as does the apparent length of the final vowel. This is an example of variability found at line beginnings, mentioned in (4a). The soloist can even come in before completion of the preceding line, since that line will always be the refrain sung by the chorus. Beginning with the first S, however, the syllabic and moraic patterns of the lines show regular alignment with the grid.

Like the sample Hausa verse in (2), (5) illustrates (4g) PAIRED LIGHTS TO W, seen at the second or third W in the refrain and lines 008, 009, 011. I have 25 distinct (i.e. non-repeated) transcribed lines of Ngizim songs in this meter, and there are no cases where paired lights are aligned with S.

The final syllables of *a ndəmiin<u>a</u>* 'you (pl) greet' (004) and the name/title *Dokt<u>a</u> Gimb<u>a</u>* (007) are lexically light. By (4f) LIGHT TO W, these unpaired light syllables align to the first GP of a W, but this results in a violation of (4b) MATCH ALL GRID POSITIONS, since it leaves the second GP of the W unaligned with a mora. To repair this violation, we can invoke (4c) FINAL SYLLABLE

13) I have recordings of two other Ngizim songs with this refrain. This refrain is also heard in a recording that I have by a professional singer, Bazaza (~ Basasa), who is Karekare though most of his recordings are in Hausa, suggesting that its use in song is regional, not restricted to Ngizim. This meter is widespread and old. Many contemporary Hausa poets/singers use it, and I have a transcription of at least one Hausa poem from the early 19th century in this meter.

LENGTHENING, which allows word final vowels to be scanned as long if needed for the meter. As noted earlier, scanning word final vowels as long when needed for the meter is fairly common in Ngizim, rare in Hausa. Word internal short vowels are never scanned as long in either language.

A defining feature of the meter illustrated in (5) is the obligatory light syllable at the fourth W. Conforming to (4f), this unpaired light is always set to a W and, conforming to (4d), it is set to a single grid position. The next syllable, which, by (4c), will always be scanned as heavy, will be set to two grid positions, but this setting offsets the syllable, causing non-conformance to (4e), which wants the two grid positions of an S to align to the two moras of a heavy syllable. Thus, (4c, d, f) gang up to override (4e).[14] The performed rhythmic effect is to create a syncopation at the end of each line, which one might argue is rhythmically more interesting than the meter seen in (2), where the first GP of every MP aligns with a syllable.[15]

3.2. *Analysis of a Song with a Triple Rhythm*

In (7) are representative lines of an Ngizim song in a triple rhythm.[16] This song continues for well over 100 lines. The grid in (7) differs from that in (3) in that (3) starts on W whereas (7) starts on S.

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14) Strictly speaking, this pattern also overrides (4a), which requires the last MP of a line to be filled. However, since the last syllable of a line must be scanned as heavy, its final mora does align with at least the first grid position of the line final S. Filling the first grid position of a line-final MP thus seems to be sufficient to satisfy (4a). Alternatively, one could characterize this meter as systematically violating (4a) by always leaving the final GP unaligned to text.

15) Both reviewers queried the principles used to align text with grids and in particular why the alignment of the final two syllables of the lines in (5) is preferred to alternative settings. With reference to the first part of the query, working out alignment of a text to a grid is, in part, art rather than science. One seeks an alignment in which the grid best characterizes the metrical regularities found in the text, and these may sometimes be ambiguous. As to the second part of the query, I think that I have addressed that in this final paragraph, showing informally how the (tentative!) constraints proposed in (4) show the alignment in (5) to be the optimal outcome. This outcome happens to match the performance setting, which is relevant to text-to-grid alignment, since it reveals something about what performers "know" about the text. Moreover, it cannot be an accident that the penultimate syllable is always light. If, as an alternative to the alignment in (5), this light were allotted two grid positions, there would be nothing to distinguish this meter (in either text alone or in performance) from the meter in (2).

16) A longer selection and audio recording are available at the URL listed in footnote 6. The full recording is nearly ten minutes long and has not been fully transcribed.

(7) "Ruwa Aɗak Vənyi" [Song On a Grindstone] (triple rhythm, four S's, starts on S)

	S		W	S		W	S		W	S		W		
	×			×			×			×				
	×		×	×		×	×		×	×		×		
	×	×	×	×	×	×	×	×	×	×	×	×		
HEMIOLA	×		×		×		×		×		×			
001a				Ii		Dlə-	rii		kee		bai,			
001b				Ii		Ngu-	zəm		gu	tə-	nu,			
001c	Naa		ra-	mau		da	yaa-		ree-		gaa.			
002a	[Naa		ra-]	mau		da	yaa-		ree-		gaa,			
002b	Naa		ra-	mau		da	yaa-		ree		bai.			
003a	[Kun]		ngaa-		kun?		Ja n-		gaa-		ja,			
003b	Su n-		də-	ma	N-	gə-	zəm		bii		bi?			
003c	Sau-		ra-	gaa,		A-	la n-		gəb-		roo.			
003d	Na n-		də-	mau		kə	ndat-		taa-		wa.			

001a: I am not a Karekare (*Dlərii*),
001b: I am that Ngizim one,
001c: I am speaking in my (native) language.
002a: [I am speak-]ing in my native language,
002b: I am not speaking in a (foreign) language.
003a: "Are [you] well?" "We are fine,"
003b: Isn't this a greeting of the Ngizims?
003c: "My in-law, may Allah grant abundant (life)."[17]
003d: I have greeted (in the manner) of elders.

This song was performed by a solo singer as she ground millet on a grindstone, as seen in Figure 1. Her down and up movement, where the downward grinding stroke (requiring more effort) had longer duration than the upward stroke, created a natural 6/8 rhythm (♩♪♩♪) to which she sang. This triple musical rhythm translates exactly into the triple meter of the text grid in (7).[18] The song is divided into "verses", where verses are numbered and lines within verses are

17) This greeting is actually in Kanuri, but it is well integrated into Ngizim. Kanuri was the politically dominant language in this region for centuries and was spoken as a second language by most Ngizims until the mid 20th century.

18) Below the GP's of the grid, shown by lower case x's, is a line labeled HEMIOLA, with upper case X's. This is not part of the grid *per se*, but rather shows where syllables line up when (4h) HEMIOLA is invoked.

Figure 1. Woman singing while grinding

lettered. Verses are defined primarily by melodic cadences, but they also correspond fairly closely to sense groupings.

This song abundantly illustrates (4a), where the ends of lines always have text aligned with grid positions but the beginnings are freer. Lines 001a–b have no text at all in the first S and W. Lines 002a and 003a omit text that can be reconstructed [indicated by brackets].

The song also always conforms to (4b) (aligning every mora of text with a grid position), (4d) (aligning heavy to two grid positions, light to one), and (4f) (aligning an unpaired light to W).

Finally, with very few exceptions, the text in the first half of a line has a *heavy-light-heavy-light* configuration, whereas the second half has the moraically equivalent (6 moras) *heavy-heavy-heavy*, i.e. these half-lines illustrate (4h) HEMIOLA. In the sample in (7), (4h) applies to the second half of every line as well as to the first half of 003a. A few lines, such as 001b have *heavy-light-light-heavy* in the second half, but there are no instances in the entire song where a light syllable aligns to S. There are thus no six mora configurations **light-light-heavy-heavy* (which would violate 4e) or **light-heavy-heavy-light* (which would violate both 4f and 4e).

As a final note, line 003b contains the words *ndəma* 'greeting' and *Ngəzəm* 'Ngizim', with initial prenasalized consonants. Lexical prenasals exist only word initially; all word-medial VNCV sequences are syllabified VN.CV. Syllabification takes place postlexically, and as seen in line 003b, the nasal components of the prenasals are syllabified as the codas of the final syllable of the preceding

word, creating the heavy syllables required for the meter. It seems, however, that depending on metrical exigencies, lexical syllabification can be retained. In (5), line 009, the meter requires that the underlined syllables in the phrase *yaare Ngəzəm* 'Ngizim language' be paired lights, so the prenasalized onset of *Ngəzəm* is retained as such.

4. Applying General Quantitative Metrical Analysis to Classical Arabic Meters[19]

Fabb and Halle (2008:186) say, "The fundamental work on which all subsequent analyses of Arabic meters (including this chapter [Chapter 7 of F & H 2008]) are based was composed in the 8th century CE by the philologist al-Xalīl Ibn ʾAḥmad (d. 791 CE)," and in footnote 1, "Our analysis begins, like all analyses, with the foundational work of Al-Xalīl." The unfortunate fact is that this approach, used by Maling (1973), Prince (1989), Golston and Riad (1997), and Fabb and Halle (2008), among others, has derailed an understanding of the basic principles underlying the practice of poets writing in Classical Arabic meters and, more importantly, an understanding of how these meters fit into a broader picture of quantitative meters in the program of generative metrics. The problem with all these studies is that they have analyzed the *system* of al-Xalīl, not the *poetry* composed in the Classical Arabic tradition.[20]

The Xalilian system is, in fact, an ingenious generative analysis, working from a set of underlying abstract meters to which precise rules are applied to arrive at the observed metrical practices. Al-Xalīl recognized sixteen distinct meters, grouped into five *circles*. The circles are defined by five infinite strings comprising distinctive configurations of heavy and light syllables. Meters within a circle are defined by selecting different beginning and end points in the string characterizing that circle. In this paper, I will be concerned only with two meters, one from al-Xalīl's Circle 2 and one from his Circle 3. The bases of these circles are outlined in (8). Meters within each circle are in small caps.

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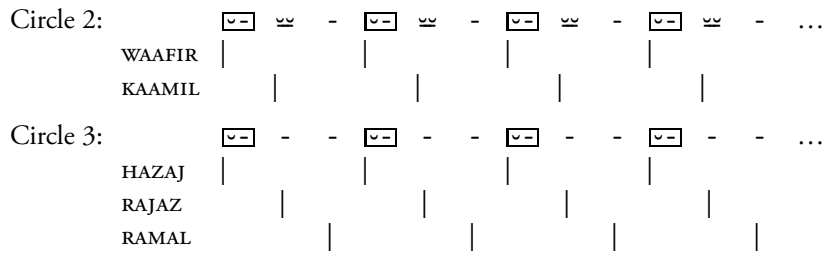
19) In Schuh (1996), I argued for essentially the same type of analysis of Classical Arabic meters as presented here. There I considered the Arabic meters *kaamil* and *basiit*. Paoli (2009:196–198) comments on my analysis of *basiit*, revising it somewhat in the light of a much better knowledge of Arabic and Arabic metrics than I have.

20) Paoli (2009) is critical of these studies for essentially the same reasons that I cite. He says (193), "… a detailed descriptive analysis of actual instances of classical verse-patterns in terms of free and fixed metrical positions reveals a system which relies on principles and constraints that consistently depart from the classical framework and should thus serve as the basis for future analyses of Arabic meter."

(8) Meters in Al-Xalīl's Circles 2 and 3



The vertical strokes show the start and end points of a Xalilian foot in each meter. Xalilian terminology uses the metaphor of tent: a verse is called a *bayt* 'tent', the boxed quantitative iamb is a *watid* 'peg' (in principle the unmodifiable part of a foot), and the other syllables are *sabab* 'cords' (potentially modifiable parts of a foot).[21] In actual practice, lines of Arabic poems, rarely have the idealized syllable configurations of the underlying representations (the exception being Circle 2 meters, where the only variations are the ˘˘ = - equivalence at the positions seen in (8)). Al-Xalīl accounted for surface variants of an underlying meter with a complex set of rules that delete moras, transpose moras, reassociate moras, etc. To understand all the surface variants of a meter within the Xalilian system is a complex task, requiring knowledge of the rules, their order of application, and the like. Fortunately, however, working out the surface variants for all the meters was done by Ewald (1825), summarized in Wright (1967). Ewald lists all the observed variants of the Xalilian feet for each meter and usually identifies what Wright (1967) translates as a "basis"—presumably the most common variant. It is these data, not al-Xalīl's list of putative underlying forms, that are the key to analysis of these meters in generative metrics.

Unfortunately, my limited knowledge of Arabic prevents me from examining actual Arabic poetry. Fortunately, there is an alternative route that is available to me, viz. Hausa poetry composed in meters of Classical Arabic origin. The syllable inventory relevant for metrics in Classical Arabic, basically that in (1), is identical to that of Hausa.

Islam came to Hausaland at least a millenium ago, and today, well over 90 % of people who speak Hausa as their first language are Muslims. A strong tradition of Islamic scholarship and the study of Arabic has existed among the

[21] The potential start points for meters that are missing are precluded by the fact that a meter cannot start in the middle of a *peg* (the boxed segment) and cannot obligatorily end in a light syllable.

Hausas for centuries, and at least since the early 19th century, Hausa Islamic scholars have been writing poetry in Hausa using meters from Classical Arabic. These scholars internalized these meters by learning and reciting Arabic poetry, then composing poetry in Hausa using the same meters, typically to teach the non-Arabic speaking populace Islamic principles and the history of figures and events important to the practice of Islam in Hausaland, though beginning in the 20th century, themes of Hausa poets composing in Arabic-derived meters have expanded to every imaginable topic. Comparison of lines of Hausa poetry with the inventories of configurations in Arabic poetry from Ewald (1825) shows that Hausa pratice conforms very closely to that of Arabic. I therefore consider it justifiable to use Hausa poetry to exemplify analyses of Arabic meters. In the following sections I will consider two Hausa meters of Arabic origin.[22]

4.1. *Kaamil*

Among Hausa poets, this is the most popular meter of Arabic origin. In my database of over 500 Hausa poems, about 130 are *kaamil*. The example in (9) is a dimeter (two Xalilian Circle 2 feet) by one of the most prolific and imaginative 20th century Hausa poets, the late Alhaji Akilu Aliyu. The poem is in couplets with external rhyme *-ni*.[23] Like all Hausa poets, Akilu wrote his work to be performed orally, and he sang his own works in a dynamic rhythmic style, making it easy to hear the musical tactus and the way he set the text to the music. The first five couplets (of a total 57) are seen in (9). I have aligned the syllables to the grid in a consistent way for all the lines. See § 5 for discussion of Akilu's setting in performance.

[22] It would be worth studying ways in which Hausa practice departs significantly from Arabic practice. One difference that I know of is relatively free use of the ⏑⏑ = - equivalence by Hausa poets in positions where Arab poets apparently would not have allowed it. Moreover, there are Hausa meters and variants of meters that have an Arabic "look" but seem not to have existed in Arabic practice. Nonetheless, for meters clearly identifiable as being of Arabic origin, all evidence suggests that any distinctions between Arabic and Hausa practice are insignificant in terms of how the meters should be analyzed.

[23] The standard rhyming pattern for couplets is to rhyme the lines of the first couplet, then rhyme only second lines. In the selection in (9), both lines end in *-ni* in four of the five couplets, but this seems to be fortuitous for this selection. In the full poem, comprising 57 couplets, the final syllables of the first lines are random.

(9) "Saƙo a Hannun Mumini" [Message in the Hand of a True Believer (in Islam)]

	W	S	W	S	W	S	W	S
		×		×		×		×
	×	×	×	×	×	×	×	×
	× ×	× ×	× ×	× ×	× ×	× ×	× ×	× ×
001a	Saa-	ƙoo	ʾa	han-	Ø	nun	muu-	mi- nii,
001b	Zai	kai	shi	baa	Ø	wa- ni	bim-	bi- nii.
002a	Nii	naa	ki-	raa	Ø	Sar-	kii	gwa-nii,
002b	Wan-	nan	da	yaa	Ø	saa-	maR	da nii.
003a	Yaa	al-	ha-	zaa-	Ø	waa	kun	ga- nii,
003b	ɗim-	bin	bu-	kaa-	Ø	taa	cee	da nii.
004a	Sai	dai	ya-	wan	Ø	rau-	nii	ga- ree
004b	ni ʾa-	kwai	ra-	shin	Ø	ƙar-	fii	ʾa nii.
005a	Baa	yau	ba	nee	Ø	maa	tun	tu- ni,
005b	Ni- ka	son	ʾa	jee	Ø	Ma- ka-	tan	da nii.

001a: A message in the hand of a true believer,
001b: He will carry it without any anxiety.
002a: Me, I call upon The Expert King (= Allah),
002b: The one who has brought me into being.
003a: Oh, pilgrims, you see,
003b: Many needs there are with me.
004a: It is just that there are many wounds upon
004b: me, there is lack of strength within me.
005a: It is not (only) today but since times past,
005b: That I want that one go to the (?)Final Resting Place[24] with me.

(AAA_FA)

The grid in (9) is copied from that in the Ngizim song in (5). Moreover, the syllable pattern of the text will be recognized as being nearly identical to that of the Ngizim song, the only difference being at the third MP, to which (5) aligns ⏑ whereas (9) aligns ˘.

(10) Syllable pattern of (5): ⏑-⏑-⏑-˘-
Syllable pattern of (9): ⏑- ˘ -⏑-˘-

[24] The word *makatan* (or *makata*) is not in any dictionary. I have guessed at the meaning. It may be related to Arabic *katama* 'conceal'.

Akilu's sung setting of the text, which rhythmically has the same duple feel as (5) (4/4 time in Western musical terminology) takes care of this by playing with the setting of syllables to the second, third, and fourth MP's. I discuss the specific settings in § 5, but the most common performance setting parallels the one chosen for the alignments in (9). As in (5), the penultimate syllable which is always light, is aligned to the first grid positions of the fourth W, and the final (metrically heavy) syllable is retracted to the second GP of the W. I have discussed the interplay of constraints that optimizes this alignment in the last paragraph of § 3.1.

In the first half of the line (the end of the first Xalilian foot), which also ends ⏑--, in principle, there would be several options. One would be to retract the entire remainder of the line to avoid violating (4b), which seeks to leave no grid position unaligned with a mora, as in 001a',

	W	×	S	×	W	×	S	×	W	×	S	×	W	×	S	×
001a'	Saa-		ƙoo-		ʾa		han-		nun		muu-		mi-		nii	

but this is obviously disruptive of the duple meter and results in multiple violations of the constraints in (4). Performance indicates that the poet never chooses this option for text setting. He always sets the first syllable of the second half of the line to the third W. Taking a cue from this fact of performance, (9) shows the alignments for the two half lines to be parallel, with an unaligned grid position separating the two halves, in violation of (4b). In performance, the final syllable of the first half of the line is lengthened so as to not leave a break in the singing.[25]

This framework using a metrical grid, which provides a straightword unified account of quantitative meters from two culturally distinct traditions, is in contrast to generative accounts of the Arabic meters. Prince (1989) does not cite a single line of Arabic poetry. Rather, he takes the abstract Xalilian feet (the spans between vertical strokes in (8)) as parallel to feet in the traditional sense of *iambs*, *anapests*, etc. In the traditional terminology, these feet comprise two or three syllables, but the Xalilian "feet" in (8) comprise four or five. Prince treats al-Xalīl's pegs as metrical units corresponding to the strong position of a traditional foot. His analysis would therefore make a Xalilian *kaamil* foot look like a traditional *anapest* as heard in an English word like *reeléct*, i.e.

25) There is another option for assuring that an unpaired light align with only one grid position, viz. to leave an unaligned grid position BEFORE the light (and, in performance, to lengthen the preceding heavy to span three grid positions). Akilu uses this option in performing other poems composed in *kaamil*.

$[\text{-}]_{\text{CORD}}[\text{-}]_{\text{CORD}}[\breve{}\text{-}]_{\text{PEG}}$.[26] The alternation between ⏑- and ˘- as seen in (9–10) is completely obscured.

Fabb and Halle (2008:204–206) fare slightly better. They build grids from the syllables of a text using iterative rules that group metrical units into a hierarchy of strength (or better, "headedness"). Without going into the details of how their rules work, their grouping of the syllables of *kaamil* is as in (11). They use asterisks instead of ×'s, and they have 3rd and 4th gridlines, but gridlines 0–2 show enough structure for discussion.

(11) Fabb and Halle (2008) metrical grouping of *kaamil* syllables

	˘	˘	-	˘	-	˘	˘	-	˘	-
Gridline 0:	*	(*	*)	(*	*)	*	(*	*)	(*	*)
Gridline 1:			(*		*			(*		*
Gridline 2:					(*					*(

Strikingly, their gridlines 1 and 2 match the W and S metrical positions of the grid in (9), showing that in metrics there is often more than one way to skin a cat! However, Fabb and Halle make a fundamental error in their analysis of Arabic metrics in taking the *syllable* rather than the *mora* as the base metrical unit. This is what accounts for the heterogeneous looking gridline 0. They say (p. 205), "… meters of circle 2 permit optional ungrouped asterisks within the line, with the consequence that the line may vary in length." Obviously, the asterisks (= light syllables) in question ARE grouped, but the grouping is moraic, not syllabic. Moraically, all the lines are identical in length! A more important consequence of their working from the syllable, not the mora, is that it seems to be pure accident that the second asterisk in each of their gridline 0 (* *) groupings aligns with a heavy syllable. A comparison of (11) with the grid in (9) shows these alignments to be exactly the S metrical positions in (9). Using syllables as the base metrical unit misses the regular correlation of *heavy* syllables with S positions and thus gives no principled way to exclude a myriad of non-existent meters, e.g. "*humped kaamil*" with a gridline 0 group ˘ (- ˘) (˘ -) … and other such impossibilities.[27]

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[26] Prince's analysis of *kaamil* is actually a bit more complex (not to mention *ad hoc*). He treats ⏑ as a special type of cord that can be realized as a single heavy or can be "resolved" into two lights.

[27] Paoli (2009:197), discussing the meter *basiit* (a Circle 1 meter) shows that even internally the Xalilian system overgenerates, predicting non-existent patterns. Paoli notes that Xalilian rules could modify the putative underlying pattern of *basiit* in a large number of ways, but there are only four common patterns, and "they really have to be considered as four independent verse-patterns, whatever their generative analysis may be."

Yet another error that Fabb and Halle (2008) make by working directly from the Xalilian system is to treat all al-Xalīl's cords as ancipitia. When one examines actual poetic practice rather than al-Xalīl's underlying forms, it turns out that this is far from being a correct generalization. A case in point is the Xalilian *kaamil* foot, which Fabb and Halle represent as ⏑̲ × ⏑ – –, where × = anceps. This syllable, in fact, is not an anceps (it is always heavy), but treating it as such obscures the fact that a heavy syllable is required in alternating positions.

4.2. *Rajaz*[28]

This is a circle 3 meter with a Xalilian underlying foot – –[⏑ –], but Ewald's (1825) inventory of line types for this meter shows many attested syllable configurations. He considers the "basis" to be ⏑ – ⏑ – – with – ⏑ ⏑ – – as a common variant, but with many others as well. In (12) are two verses from a Hausa poem in praise of traditional rulers of northern Nigeria, "Tutocin Shehu da Waninsu" [Banners of the Sheikh and Others] by the late Muʾazu Hadejiya. The poem is in quintains with internal rhyme of the first four lines and external rhyme *-ya* across quintains. Lines are dimeters (two Xalilian feet).

(12) "Tutocin Shehu da Waninsu" [Banners of the Sheikh and Others]

	W	S		W	S		W	S		W	S	
		×			×			×			×	
	×	×		×	×		×	×		×	×	
	×	×	×	×	×	×	×	×	×	×	×	×
hemiola	×		×		×		×		×		×	
001a:	Ka-	noo		ta	Ab-		du	shaa		ya-	boo,	
001b:	Duk	wan-		da	kee		bi-	ɗar		ra-	boo,	
001c:	A-	kwai		shi	can		zu-	boo		zu-	boo,	
001d:	Ka	tab-		ba-	taa		fa	Mod-		di-	boo,	
001e:	Doo-	min		fa-	ɗaa		ta	gas-		ki-	yaa.	
002a:	Sai	zuu-		ci-	yar		Ni-	jee-		Ri-	yaa,	
002b:	Sak-		kwa-	to	bir		nin		man-		yaa,	
002c:	Ko	daa		a	yau		koo		a	ji-	ya,	
002d:	Suu		mu-	ka	bi	Ø	da	gas-		ki-	yaa,	
002e:	Ga-	rin		da	baa-		bu	too-		shi-	yaa.	

[28] Paoli (2009:199–200) discusses *rajaz*, and proposes an analysis that is essentially the same as that in (12), though in metrical tree format rather than a grid. However, he describes the foot variants that I refer to as *hemiola* in terms of the Arab metrists *ziḥāfāt* (realization rules) rather than moraic equivalence as I do here.

001a: Kano, that of Abdu, take in (my) praise,
001b: Anyone who is seeking a full share,
001c: It is there, poured out in all directions,
001d: Be assured (concerning) *Moddibo* [name of a title],
001e: Because of speaking in truth.
002a: Then (there is) the heart of Nigeria,
002b: Sokoto, city of the great ones,
002c: Whether today or in the past (lit: yesterday),
002d: It is they whom we follow in truth,
002e: A city in which there is no bribery.

(MHa_WMH)

In this selection, not a single line matches the configuration concatenating two canonical Xalilian feet of the shape --˘-. Nonetheless, the poem is absolutely metrical when three factors are considered: (1) parsing by moras rather than syllables; (2) identifying S and W metrical positions; (3) hemiola as an alternative parse.

Consider line 001a. This has four groupings of ˘-, i.e. two iterations of the ˘-˘- "basis" for this meter cited by Ewald. This pattern is repeated in 001c, 001d, and 002e. It is also nearly repeated in 001b, 001e, and 002a, the only difference being that the first syllable of these lines is heavy rather than light. The pattern of anceps in a line-initial syllable that is, in principle, underlyingly light, is a common feature in quantitative meters (see, for example, Hayes (1979:199) for Classical Persian verse).[29] Six of the ten lines in (12) thus show alternating W and S metrical positions, where W aligns to a light syllable and S to a heavy. This will be recognized as requiring a grid for a triple rhythm like that exemplified in (7), and in fact, the only difference between the grids in (7) and (12) is that (7) starts with S whereas (12) starts with W.

Now consider line 002b. This line has seven syllables compared to eight syllables in the lines mentioned in the preceding paragraph. Moreover, the syllable configuration is -˘˘----, which looks unrelated to the alternating ˘- for those lines. However, in terms of mora count the lines are identical: 12 moras. Here again, there is a crucial point of comparison with (7), viz. *hemiola* which allows three heavy syllables to be distributed evenly across six grid positions. Line 002b takes adantage of the - = ˘˘ moraic equivalence over the 3rd and 4th grid positions (line 002d does the same thing, and line 002b does this at grid positions 9–10). There are, indeed, lines in this poem where

[29] In stress-based iambic meters, this corresponds to relatively free use of inversion (substituting a trochee or a spondee for an iamb) in line initial position.

six heavy syllables are distributed over the 12 grid positions, e.g. 022b *Gaa kiifii gaa naamaa* 'Here's fish, here's meat'.

In short, by using the mora as the basic metrical unit, and a grid with alternating W and S positions, we can show the apparent mish-mash of *rajaz* line types as conforming to a completely regular metrical pattern. Moreover, we can account for it in identical terms to those used for Ngizim folk song metrics. Prince's (1989:77) analysis of this meter as a $[\text{-}]_{\text{CORD}}[\text{-}]_{\text{CORD}}[\breve{}\,\text{-}]_{\text{PEG}}$ dactyl fails for the same reasons as the essentially identical analysis of *kaamil* (not to mention giving no principled way to account for variant syllable configurations). Fabb and Halle (2008:187–189) select lines of Arabic *rajaz* that fit their syllable-counting analysis with four syllables per Xalilian foot, conveniently omitting mention of Xalilian feet realized as --- and giving no way to recognize the moraic equivalence ˘--˘- = -˘˘- that typifies this meter.

4.3. *Al-Xalīl as Generative Phonologist*

In devising his system for characterizing Arabic metrics, al-Xalīl followed the standard practice of all generative linguists. He observed a large variety of metrical forms and realized that generalizations would be possible if, instead of listing and taxonomizing the surface patterns, he could aggregate patterns that shared certain properties as deriving from a single underlying form, with a limited set of principled and general rules that derived surface patterns from those underlying forms. He actually had two levels of underlying form: *circles* and the *meters* within those circles. He call his rules *ziḥāfāt* 'deviations' (rules applying within individual lines) and *'ilal* 'defects' (global departures from the underlying form). At the very least, al-Xalīl's system provides a convenient classification for meters, and it provides an account of varying syllabic configurations in lines of a poem which a poet composed, presumably, in the same meter throughout.

Al-Xalīl's goal was to account for the facts of a particular poetic tradition, not to pursue a framework for UM, but most modern generative metrists have failed to recognize this. As typified by the quote from Fabb and Halle (2008) cited at the beginning of §4, generativists have accepted the Xalilian system as characterizing correct generalizations that hold for Arabic metrics, then attempted to accommodate those supposed generalizations to a more general generative framework. An exception is Maling (1973), who took al-Xalīl on his own terms and basically translated his system into generative phonological formalisms current at the time. What others have done, however, is to adopt al-Xalīl's underlying forms while ignoring his rules and the actual poetry that the system was devised to account for. This is like trying to say something meaningful about English phonology by, on the one hand, adopting /fotagræf/, /fotagræfər/, and /fotagræfək/ as the respective underlying froms

of *photograph*, *photographer*, and *photographic* (cf. al-Xalīl's underlying forms), while, on the other hand, ignoring both rules of English stress placement and vowel reduction (cf. al-Xalīl's realization rules) and also the way that speakers actually pronounce these words (cf. the actual verse composed by Arab poets).

Whether al-Xalīl's system provides special insights into the practices of poets composing in the Classical Arabic tradition is for specialists to decide. It is, however, not a system that is likely to provide much insight into broader issues of quantitative metrics, much less Universal Metrics.

5. Performance

All poetry in Chadic languages, whether folk poetry/song or written poetry, is intended for oral performance, and oral performance means musical singing or chanting. Music can be characterized using grids that are geometrically like those for text displayed in the sections above:[30] a baseline with grid positions corresponding to the smallest relevant metrical units (e.g. eighth notes) and grid columns corresponding to relatively stronger and weaker musical beats. Some metrists, e.g. Fabb and Halle (2008), argue that the study of oral performance is not part of metrics proper. Kiparsky (2010) refers to this position as *narrow metrics*, in which all that is relevant to the linguistic study of metrics is *verse design* (the metrical system, characterized in this paper as metrical grids and constraints on aligning text to a grid) and *verse instance* (specific text parsed by the rules/constraints of the system). Kiparsky (2010), however, argues for a *broad metrics* that incorporates *delivery instance* (the oral performance of the text).

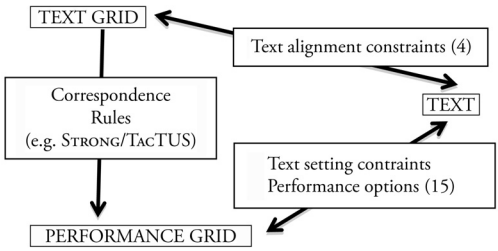
For some traditions, such as written English art poetry, narrow metrics may suffice, but for any tradition where metrical language is rooted in oral performance, a complete account of metrical properties of a text requires broad metrics. Kiparsky (2006) argues, "… that the composer and performer of a song constructs a match between *three tiers* of rhythmic structure: linguistic prominence, poetic meter, and musical rhythm. They are organized along similar principles, as hierarchies of alternating prominence representable by trees or grids."[31] The figure in (13) schematizes the relationships between *verse*

[30] Metrical grids for music were pioneered by Lerdahl and Jackendoff (1983). Dell and Elmedlaoui (2008) call these "time grids", since they demarcate actual temporal realization, as opposed to the abstract text grids, which characterize the distribution of metrical units (syllables or moras) but have no direct implications for timing of those units in performance.

[31] As noted at the end of § 2, in addition to constraints that account for matching alternating text prominence to a *text grid*, there are constraints that match syntax of a text to positions in a text grid. There are parallel constraints governing correspondence of syntactic structure

design (TEXT GRID), *verse instance* (TEXT), and *delivery instance* (PERFORMANCE GRID).

(13) Relations between *verse instance* (TEXT), *verse design* (TEXT GRID), and *delivery instance* (PERFORMANCE GRID)



The arrow connecting TEXT GRID and TEXT, filtered through constraints on text alignment, goes both ways reflecting the relationship between composition vs. evaluation of metrical text. The arrow between PERFORMANCE GRID and TEXT also goes both ways. This accounts for matching a given text to a tune (TEXT → GRID) and composing new text for a given tune (GRID → TEXT). Informal discussion with Hausa poets (recorded interviews by Neil Skinner) suggests that they "try" new lines of poetry by singing them to the tune that they have chosen for a particular poem.

I will not attempt to formulate specific *text setting* constraints found in the box connecting TEXT and PERFORMANCE GRID. I assume that some of these will be similar or identical to text alignment constraints like those listed in (4), e.g. S(TRONG) TO HEAVY, which matches S grid positions to heavy syllables probably applies between any text and performance in any musical meter. In addition to text setting constraints, the connection between TEXT and PERFORMANCE GRID also passes through *performance options*, i.e. alternatives to the setting predicted by text setting constraints. We return to this in (15) below.

The TEXT GRID and the PERFORMANCE GRID in some cases have the same geometry. In these cases, it seems likely that essentially the same constraints will apply to alignment of text to a TEXT GRID and setting of text to a PEFORMANCE GRID. Under this assumption, performance may help resolve indeterminacies in alignment of text to a text grid that cannot be resolved from the text alone. A case in point is the setting of the Ngizim song in (5) and the example of

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to the *performance grid*. For example, Dell and Elmedlaoui (2008:116) formulate a constraint LINE/GROUP, which aligns the end of a text line with the end of a melodically defined musical phrase.

Arabic *kaamil* in (9). Recall that the syllabic configurations for these meters are those in (10).

(10) Syllable pattern of (5): ⏑-⏑-⏑-⏑-
Syllable pattern of (9): ⏑- ⏑ -⏑-⏑-

The question is how to align an unpaired light syllable and the following heavy. If one were to simply count moras, then set up a grid with a baseline having one × per mora, the respective grids would have 15 ×'s for (5) and 14 ×'s for (9) (or 7 ×'s per half line). One reviewer points out that a typology of *duple* or *triple* rhythms for text grids as used in the account here would disallow grids with numbers of grid positions not divisible by 4 or 6, and in fact, performance indicates that the text is not felt to have such asymmetries—both songs are performed in a duple 4/4 meter.[32] In order to achieve a symmetrical performance from an asymmetrical number of moras, one or more of the constraints on text alignment in (4) must be relaxed. Some options would be the following:

(a) Align the unpaired ⏑ to one × and retract the following - one × to the left.
(b) Offset the unpaired ⏑ one × to the right and leave the preceding × unaligned.
(c) Align the unpaired ⏑ to the first available × and leave the next × unaligned.

As noted in the discussion of (5) and (9), option (a) is always chosen for the last unpaired ⏑ in the line, and it is usually chosen for the first unpaired ⏑ in (9), but with only the following - retracted; the second half of the line is put "back on track" by aligning ⏑ with the next W metrical position. Footnote 25 notes that option (b) is chosen in some performances of *kaamil*. What the musical setting makes clear, but is indeterminate from TEXT alone, is that option (c) is rarely, if ever chosen. It turns out that in performance light syllables are virtually always set exhaustively to a single grid position, whereas setting of heavy syllables is less constrained. In performance they can be lengthened to fill out empty grid positions, and, particularly at line beginnings, they can be set to positions where a light is expected (see the initial syllables in the lines of (12) and discussion there). It is only through observation of musical performance that these generalizations emerge.

I implied above that the TEXT GRID and the PERFORMANCE GRID for the meters in (5) and (9) are identical, further implying that we would expect a natural musical phrase to align with a line of text. This is not quite accurate. In (14) is the musical setting for the refrain of (5), which is iconic for the meter.

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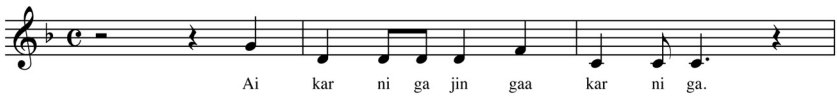
32) I have some experience performing Balkan music, which does have assymetrical meters, such as 7/8, 15/8 and the like. The performance rhythms of the African songs bear no resemblance to those of such Balkan meters!

(14) Musical transcription of the refrain of (5)



The music is in 4/4 time with two 4/4 measures per text line. The downbeat of the music, however, does not fall at the beginning of the text line, nor does the end of the second measure of the music coincide with the end of a text line. From the musical standpoint, the text is offset one beat, with the fourth beat of each second measure corresponding to the first metrical position of a text line. In § 2, one of the three parameters listed for typologizing meters was whether a line starts on a S or a W metrical position. The meters of (5) and (9) start on a W. Constraints governing correspondence between TEXT GRID and PERFORMANCE GRID remain to be studied, but one such constraint, perhaps inviolable, is S(TRONG)/TACTUS, i.e. the S's of a TEXT GRID must align with the *tactus*[33] of the music,[34] which in this song, is on the first and third beats of the 4/4 measure. Since the tactus will, by definition, fall on the downbeat of a measure, any meter whose lines start on W will be offset musically in a way similar to that in (14), where the W is an upbeat and the first S is on the downbeat.

The diagram in (13) indicates that, in addition to *constraints* governing the setting of TEXT to TEXT GRID (called *alignment constraints* here) and to PERFORMANCE GRID (called *text setting constraints* here), there are also *performance options* that may relate TEXT to the PERFORMANCE GRID. As in the case of correspondence constraints between TEXT GRID and PERFORMANCE GRID, performance options remain to be studied in detail, but in (15), I tentatively propose a few such options that seem to have fairly wide application in songs that I have considered.

(15) **Options in performance**

(a) LENGTHEN TO FILL: Lengthen a heavy syllable interior to a line to fill out spans of ×'s not aligned with moras.[35]

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33) Lerdahl and Jackendoff (1983:71), referring to Western instrumental musical tradition, call the *tactus* "the level of beats that is conducted and with which one most naturally coordinates foot-tapping and dance steps."

34) The converse does not hold. In the first two lines of (7), the grinding maintains the tactus with no text set to the first beat, and below in (17–18) we will see an example where the melody line is prolonged in the middle of a text line such that there is a musical tactus but no text syllables set to it.

35) One of the reviewer's refers to this as "automatic stretching", that is, the stretching of segments to fit note durations in performance.

(b) LENGTHEN AND OFFSET: Lengthen a heavy syllable over a span of more than two ×'s and offset following material to the right.
(c) START LATE (SQUEEZE): Begin the performance of a line after the musical downbeat, and squeeze text to bring the end of the line back on track.
(d) START LATE (OMIT): Begin the performance of a line after the musical downbeat by omitting material that is repeated or understood from context.

The example in (16) repeats (9), but with the actual performed setting of the syllables by Akilu. This performance exemplifies (15a, b, c).

(16 = 9) "Saƙo a Hannun Mumini" [Message in the Hand of a True Believer (in Islam)]

	W	S	W	S	W	S	W	S	
		×		×		×		×	
	×	×	×	×	×	×	×	×	
	× ×	× ×	× ×	× ×	× ×	× ×	× ×	× ×	
001a	Saa-	ƙoo	ʾa	> han-	nun	muu-	mi-	nii,	Ø
001b	Zai	kai	shi	baa +	wa- ni	bim-	bi-	nii.	Ø
002a	Nii	naa	ki-	raa +	Sar-	kii	gwa-	nii,	Ø
002b	Wan-	nan	da	yaa +	saa-	maR	da	nii.	Ø
003a	Yaa	ʾal-	>	ha- zaa-	waa	kun	ga-	nii,	Ø
003b	ɗim-	bin	bu-	kaa- +	taa	cee	da	nii.	Ø
004a	Sai	dai	>	ya- wan	rau-	nii	ga-	ree	+
004b	ni ʾa-	kwai	ra-	shin +	ƙar-	fii	ʾa	nii.	Ø
005a	Baa	> >	[yau	ba nee	maa	tun	tu-	ni,	Ø
005b	Ni- ka	son	ʾa	jee +	Ma- ka-	tan	da	nii.	Ø

001a: A message in the hand of a true believer,
001b: He will carry it without any anxiety.
002a: Me, I call upon The Expert King (= Allah),
002b: The one who has brought me into being.
003a: Oh, pilgrims, you see,
003b: Many needs there are with me.
004a: It is just that there are many wounds upon
004b: me, there is lack of strength within me.
005a: It is not (only) today but since times past,
005b: That I want that one go to the (?) Final Resting Place with me.

(AAA_FA)

A plus sign (+) represents (15a), i.e. a heavy syllable sung as lengthened to span empty grid positions, i.e. grid positions to which no text is set. In all the cases interior to a line, the grid position is empty because the lengthened syllable is offset one grid position to the left due to the setting of the unpaired light to only one grid position. At line ends, on the other hand, Akilu does not apply (15a) in most lines, but rather inserts silence equaling the duration of the ×, demarcated by Ø[36] (in musical terms, he inserts a *rest*), presumably as a way to demarcate line ends (and to take a breath!). The one exception is lines 004a–004b. Here, he does apply (15a), carrying 004a into 004b. The reason is the *enjambment* between the preposition *garee* 'at, *chez*' and the clitic *ni* 'me', which is a configuration that would never permit a break in speech. Enjambment such as this would never be encountered in Chadic oral folk songs, but it is relatively common, even interior to a word, in the practice of accomplished literate Hausa poets.

A greater-than sign (>) represents (15b), i.e. a heavy syllable lengthened, presumably for rhythmic interest, causing offset of the following material. In this text this is a fairly frequently chosen option in the first half-line because there will always be seven text moras but eight grid positions, leaving a grid position to be dealt with at the performer's discretion. In line 001a, by my hearing at least, there is a rare case where a light syllable is lengthened. However, Akilu does not pronounce the glottal stop (ʾ) at the beginning of the third syllable, making the actual syllable division between … *k'oo (ʾ)a* … somewhat vague. Finally, the bracket ([) in line 005a represents (15c). Akilu invokes (15b) to sing the first syllable extra-long. This causes the heavy syllable *yau* to be offset, then "squeezed" by (15c) to fit only one grid position, allowing the remainder of the half line to finish with a canonical one-grid-position-per-mora setting.

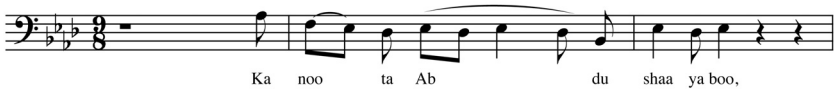
Example (7), the Ngizim song sung while the singer was grinding, illustrates (15c, d). Lines (001a, b) illustrate the limiting case of (15d), i.e. the singer chooses a text that is shorter than a canonical line and picks up at the point where the chosen text will fill out to the end, thus conforming to (4a). Line 002a omits text (shown by brackets) that would have been repetition from the preceding line, and line 003a omits text from a fixed formulaic phrase that can be supplied by anyone knowing the language. In this song, the singer sometimes also invokes (15c), starting the first (heavy) syllable late, setting it to only one grid position. Performance options (15c, d) typically will only be available

[36] As pointed out by one of the reviewers, Ø here is used differently from the way it is used in (9). In (9), the Ø is merely a notational convenience to show that a grid position is unaligned with text, whereas in (16), it represents a rhythmic unit, which in musical notation would be an eighth rest (𝄾) in a 4/4 meter.

if there is some external source holding the beat, such as drumming, clapping, or, as in (7), the action of grinding. In (16), which is a cappella, the meter starts on a W, putting the musical downbeat on the second syllable. In line 005a of (16), Akilu performs the syllable aligned to this W so that the line beginning is established, then delays the text *yau* … that would be on the musical downbeat.

I conclude this section with an account of the recording of a performance of (12).[37] In (17) is a musical transcription of the first line. In (18) are both stanzas of (12) set to a performance grid corresponding to the 9/8 rhythm of the musical performance.

(17) Line 001a of "Tutocin Shehu da Waninsu" [Banners of the Sheikh and Others]



(18) "Tutocin Shehu da Waninsu" [Banners of the Sheikh and Others]

	W		S			W		S			W		S			W		S										
			×										×															
			×					×					×					×					×					
	×		×			×		×			×		×			×		×			×		×					
	×		×		×	×		×	×		×		×		×	×		×	×		×		×	×				
001a:	Ka-		noo			ta		ʾAb-			+					du		shaa			ya-		boo,			Ø		
001b:	Duk		wan-			da		kee			+					bi-		ɗar			ra-		boo,			Ø		
001c:	A-		kwai			shi		can			+					zu-		boo			zu-		boo,			Ø		
001d:	Ka		tab-			ba-		taa			+					fa		Mod-			di-		boo,			+		
001e:	Doo-		min			fa-		ɗaa			+					ta		gas-	<		ki-		yaa.			Ø		
002a:	Sai		zuu-			ci-		yar			+					Ni-		jee-			Ri-		yaa,			Ø		
002b:	Sak-			kwa-		to		bir			+					nin			man-				yaa,			Ø		
002c:	Ko		daa			ʾa		yau			+					> [		koo	ʾa		ji-		ya,			Ø		
002d:	Suu			mu-		ka		bi			+					da		gas-			ki-		aa,			+		
002e:	Ga-		rin			da		baa-			+					bu		too-	<		shi-		yaa.			Ø		

001a: Kano, that of Abdu, experience praise,
001b: Anyone who is seeking a full share,
001c: It is there, poured out here and there,
001d: Because of speaking in truth.
002a: Then (there is) the heart of Nigeria,
002b: Sokoto, city of the great ones,
002c: Whether today or in the past (lit: yesterday),
002d: It is they whom we follow in truth,
002e: A city in which there is no bribery.

(MHa_WMH)

[37] The song is performed by Abubakar Ladan, himself a prolific poet who wrote the poem

I interpret this performance to be in a 9/8 meter in Western musical terminology, with two measures per line. The vertical lines in the grid indicate the beginnings of musical measures as well as where the tactus falls. As can be seen in (17), this musical setting requires considerable lengthening of the syllable aligned to the second S (= the fourth syllable in (17))[38] and silence or lengthening of a syllable at the end of the text line. Because this meter begins on a W, the text must be offset such that the text line begins on the last 8th note of a 9/8 measure in order to make the first S align with the tactus.

Marking of (15a) LENGTHEN TO FILL with +, (15b) LENGTHEN AND OFFSET with >, (15c) START LATE (SQUEEZE) with [are as in (16). The way the performer ends lines is of interest. There is a period of silence at the end of each of the first three lines, but the performer applies (15a) at the end of each fourth line such that the fourth and fifth lines form a single musical phrase. This is what Hayes and MacEachern (1998:484) refer to as *cadentiality*, "the degree to which a line ending possesses the ability to induce the perception of a group ending." The silences at the ends of the first three lines, indicated by Ø (see footnote 35), are cadential for line endings; the performance of the fourth and fifth lines as a single musical phrase is cadential for a stanza. As a final remark, note that lines 001e and 002e include a notation "<" and the penultimate syllable is offset slightly to the left. The performer seems to use this rhythmic device as an additional indicator of the end of a stanza.

6. Conclusion

This paper has looked at the metrical properties of songs/poems in two Chadic languages, both of which use syllable weight as the basis of their poetic meters. The examples from Ngizim are oral folk songs, sung by women with no special training other than growing up in the communities where these songs are sung. The examples from Hausa are poems composed in writing by poets who have had extensive education, particularly in Islam and Arabic. Yet the metrical language used in both traditions follows the same principles of metrics and

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exemplified in (2). The recording is from the archives of the Centre for the Study of Nigerian Languages, Bayero University, Kano. Recording date is not known.

38) Rather than sing the lengthened syllable on a long note with a single pitch, the performer adds a considerable amount of melisma. Although I have had almost nothing to say about melodic aspects of performance and have not marked lexical tone, it is worth pointing out that the melodic line respects tone. The tones of the respective words of the line in (17) are *Kanòo* (HL) *ta* (H) *Abdù* (HL) *shaa* (H) *yàboo* (LH). By comparing these tones with the melody in (17), the interested reader will see that, with the exception of *ta* (H), the (beginning) pitch of each sung note matches the contour predicted by the tones. The transcription here is impressionistic, and it may well be that the very short clitic *ta* 'that of' is sung on a rising pitch that reaches the level of the following H.

exhibits the same patterns of regularity. These principles have been formalized in terms of a grid with positions of metrical strength alternating at regular intervals. A text, in order to be considered "metrical", must align with the grid according to a set of constraints that assure, among other things, that strong positions in the grid align with heavy syllables and that lines ends be filled with text of regular moraic patterns.

The Hausa poems examined here were composed in meters that have their origin in Classical Arabic tradition, and Hausa poets writing in these meters learned them from reciting Arabic poetry themselves or from scholars who learned the meters in this way. The metrical patterns in these Hausa poems are thus considered fair representations of some of the meters used by Arab poets composing in the classical tradition. The standard analysis of the Classical Arabic meters is that of Al-Xalīl, an eighth century metrist, and it is this analysis that has been adopted and formalized by generative phonologists for the past several decades. This paper parallels the work of Paoli (2009) and other work by Paoli in arguing that this approach has thwarted a serious study of Arabic meters and of quantitative meters in general. When one examines the actual practice of Arab (and Hausa) poets rather than basing analyses on the putative underlying representations of Al-Xalīl, it turns out that these meters follow the same general principles that apply to quantitative metrics in traditions that are unrelated to that of the Arab poets except in terms of the cognitive principles that underlie quantitative metrics in general. I believe that I have shown this for the metrics of Ngizim folk songs, and Dell and Elmedlaoui (2008) have applied similar principles in the analysis of songs in Tashlhiyt, a Berber language of Morocco.

The final section of the paper turned to the relationship of text metrics to musical performance. The rhythmic properties of music can be formalized in terms of grids with the same properties as text grids (Lerdahl and Jackendoff 1983). There is a belief held by some that the metrical properties of song texts are fundamentally their musical meters and that prosodic regularities of song texts are just the consequence of musical text setting. Careful studies of text-to-tune matching, such of that of Dell and Elmedlaoui (2008), show that, in fact, the matching of a text to a tune can be formalized in essentially the same way as matching of text to a text grid, that is, as argued in Kiparsky (2006), inherent text prosody, poetic meter of that text (formalizable as a TEXT GRID), and musical rhythm to which that text is performed (formalizable as a PERFORMANCE GRID) are all interrelated properties of an object that we can call "metrical language". While text grid and performance grid of the same text may differ, they are systematically related. Moreover, analysis of text-to-performance reveals linguistic principles that do not emerge (at least in unequivocal fashion) from examination of the text alone.

It is my hope that this paper and other works cited here will demonstrate that the study of living systems of quantitative metrics is not an arcane niche for specialists but rather has much to say about linguistic structure and human cognition.

References

Dell, François and Mohamed Elmedlaoui. 2008. *Poetic Meter and Musical Form in Tashlhiyt Berber Songs*. Köln: Rüdiger Köppe.

Ewald, G.H.A. 1825. *De Metris Carminum Arabicorum Libri Duo*. Braunschweig.

Fabb, Nigel and Morris Halle. 2008. *Meter in Poetry, a New Theory*. Cambridge: Cambridge University Press.

Golston, Chris and Tomas Riad. 1997. "The phonology of Classical Arabic meter." *Linguistics* 35:111–132

Hayes, Bruce. 1979. "The rhythmic structure of Persian verse." *Edebiyat* 4:193–242.

Hayes, Bruce. 1983. "A grid-based theory of English meter." *Linguistic Inquiry* 14:357–393.

Hayes, Bruce and Margaret MacEachern. 1998. "Quatrain form in English folk verse." *Language* 74:473–507.

Hiskett, Mervyn. 1975. *A History of Hausa Islamic Verse*. London: SOAS.

Johnson, John W. 1974. *Heellooy, Heelleellooy: the Development of the Genre Heello in Modern Somali poetry*. Bloomington: Indiana University Press.

Kiparsky, Paul. 2006. "A Modular Metrics for Folk Verse;" In E.E. Dresher & N. Friedberg (eds.), *Formal Approaches to Poetry. Recent Developments in Metrics*, pp. 7–49. Berlin/New York: Mouton de Gruyter.

Kiparsky, Paul. 2010. "Meter and performance." Presentation at LSA Metrics Symposium, January 8, 2010. [I am grateful to Paul Kiparsky for providing me with the slides to this presentation.]

Lerdahl, Fred and Raymond Jackendoff. 1983. *A Generative Theory of Tonal Music*. Cambridge MA: MIT Press.

Liberman, Mark and Alan Prince. 1977. "On stress and linguistic rhythm." *Linguistic Inquiry* 8:249–336.

Maling, Joan M. 1973. "The theory of classical Arabic meters." PhD dissertation, MIT.

Newman, Paul. 1977. "Chadic classification and reconstructions." *Afroasiatic Linguistics* 5(1):1–42.

Paoli, Bruno. 2009. "Generative linguistics and Arabic Metrics." In J.-L. Aroui, & A. Arleo (eds.), *Towards a Typology of Poetic Forms. From Language to Metrics and Beyond*, pp. 193–207. Amsterdam: Benjamins (Language Faculty and Beyond, 2).

Patel, Aniruddh D. 2008. *Music, Language, and the Brain*. New York: Oxford University Press.

Prince, A. 1989. "Metrical forms." In P. Kiparsky and G. Youmans (ed.), *Phonetics and Phonology, Volume 1: Rhythm and Meter*, pp. 44–80. San Diego: Academic Press.

Schuh, Russell G. 1994. "Text and performance in Hausa metrics." Unpublished ms. downloadable at http://www.linguistics.ucla.edu/people/schuh/Papers/ms_1994_anti_mutadarik.pdf

Schuh, Russell G. 1996. "Metrics of Arabic and Hausa poetry." In Paul F.A. Kotey (ed.), *New Dimensions in African Linguistics and Languages*, Trends in African Linguistics 3, Trenton and Asmara: Africa World Press, Inc.

Schuh, Russell G. 2010. "The form and metrics of Ngizim songs." Ms, UCLA, downloadable from http://www.linguistics.ucla.edu/people/schuh/Papers/ms_2010_Ngizim_songs.pdf

Wright, W. 1967 [1896, 1898]. *A Grammar of the Arabic Language*. Cambridge: Cambridge University Press.

Song Citations

AAA_FA	Aliyu, Alhaji Aƙilu. 1976. *Fasaha Aƙiliya*. Zaria: The Northern Nigerian Publishing Company.
ALa_HKA	Ladan, Alhaji Abubakar. 1976. *Waƙar Haɗa Kan Al'ummar Afirka*. Zaria and Ibadan: Oxford University Press.
MHa_WMH	Hadejiya, Mu'azu. 1955. *Waƙoƙin Mu'azu Haɗejiya*. Zaria: Northern Nigerian Publishing Company.
MSK_LOg	Häussler, Bettina. 1987. "A poet of the people: orality and music in the songs of Alhaji Mamman Shata." MA thesis, University of Wisconsin, Madison.